United States
International Trade Commission

Rice: Global Competitiveness of the U.S. Industry

April 2015
Publication Number: 4530
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United States International Trade Commission

Commissioners

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Acronyms

Terms	Definitions
AAY	Antyodaya Anna Yojana
ADB	Asian Development Bank
AFET	Agricultural Futures Exchange of Thailand
APL	above the poverty line
APTERR	ASEAN Plus Three Emergency Rice Reserve
APHIS	Animal and Plant Health Inspection Service (United States)
ARC	Agricultural Risk Coverage
ASEAN	Association of Southeast Asian Nations
AUV	average unit value
AVE	ad valorem equivalent
BAAC	Bank for Agriculture and Agricultural Cooperatives (Thailand)
BLBU	Direct Superior Seed Aid (Indonesia)
BP3	Puso Rice Alleviation Aid program (Indonesia)
BPL	below the poverty line
BULOG	Indonesian National Logistics Agency
CAFTA-DR	Dominican Republic-Central America Free Trade Agreement
CARDI	Cambodian Agricultural Research and Development Institute
CAVAC	Cambodian Agricultural Value Chain
CBOT	Chicago Board of Trade
CBN	National Seeds Reserve (Indonesia)
CCC	Commodity Credit Corporation
CFRS	Cambodian Food Reserve System
CIP	Central Issue Price
COA	Committee on Agriculture (WTO)
CONAB	Companhia Nacional de Abastecimento (National Food Supply Company) (Brazilian Ministry of Agriculture)
COP	cost of production
CSP	Conservation Stewardship Program
CTS	Consolidated Tariff Schedules
CV	coefficient of variation
EBA	Everything But Arms Agreement
EFAP	Emergency Food and Assistance Project
EIU	Economist Intelligence Unit
EJF	Environmental Justice Foundation
Embrapa	Brazilian Agricultural Research Corporation

Terms	Definitions
EQIP	Environmental Quality Incentives Program (United States)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Statistics Division database
FAS	Foreign Agricultural Service
FCI	Food Corporation of India
Fecarroz	Central American Rice Federation
FMD	Foreign Market Development Program
FY	fiscal year
G2G	government to government
GAFSP	Global Agriculture and Food Security Program
GDP	gross domestic product
GDSR	General Department of State Reserves (Vietnam)
GM	genetically modified
GRBS	Government Rice Buffer Stock (the Philippines)
GSP	Generalized System of Preferences
GTA	Global Trade Atlas
GTIS	Global Trade Information Services
GWI	ground water irrigation
ha	hectare
HS	Harmonized Commodity Description and Coding System
HTS	Harmonized Tariff Schedule of the United States
IBIS	Indus Basin Irrigation System
IpSard	Institute of Policy and Strategy for Agricultural and Rural Development (Vietnam)
IRGA	Instituto Rio Grandense do Arroz (Rio Grande do Sul Rice Institute) (Brazil)
IRRI	International Rice Research Institute
KKP_E	Food Security and Energy Credit (Indonesia)
KUR	People’s Business Credit (Indonesia)
kWh	kilowatt-hour
LDCs	least-developed countries
MADB	Agricultural Development Bank (Burma)
MAP	Market Access Program
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MEP	minimum export price
MFN	most-favored nation

Terms	Definitions
MMA	Minimum Market Access
MMK	Burmese kyat
MNFSR	Ministry of National Food Security and Research
MOIT	Ministry of Industry and Trade (Vietnam)
MRE	milled rice equivalent
MRLs	maximum residue levels
MSP	minimum support price
mt	metric ton(s)
MY	marketing year
NAFTA	North American Free Trade Agreement
NFA	National Food Authority
OECD	Organisation for Economic Co-operation and Development
PEP	Premium for Product Flow (Brazil)
PLC	Price Loss Coverage
PSD	Production, Supply and Distribution (USDA database)
REAP	Rice Exporters Association of Pakistan
PhilRice	Philippines Rice Research Institute
PUAP	Rural Agribusiness Development Program (Indonesia)
SCO	Supplemental Coverage Option
SOE	state-owned enterprise
SRI	System of Rice Intensification
SRR	Strategic Rice Reserve (the Philippines)
TPDS	Targeted Public Distribution System (India)
TRQ	tariff-rate quota
TY	trade year
USD	U.S. dollar
USDA	United States Department of Agriculture
USDA RMA	U.S. Department of Agriculture Risk Management Agency
USRPA	U.S. Rice Producers Association
VAT	Value-added tax
VFA	Vietnam Food Association
VND	Vietnamese dong
WTO	World Trade Organization

Glossary

Terms	Definition
Broken rice, a.k.a. brokens	Broken kernels of rice
Big brokens	Broken rice smaller than 80 percent but not less than 50 percent of the average length of an unbroken kernel
Medium brokens	Broken rice smaller than 50 percent but not less than 20 percent of the average length of an unbroken kernel
Small brokens	Broken rice less than 20 percent of the average length of an unbroken kernel
Brewers rice	Rice that is small enough to pass through a sieve with round perforations 1.4 mm in diameter
Certified seed	Seed of a known variety that has been inspected for varietal purity and weed seeds
Hybrid seed	Seed produced by crossing two genetic lines. Hybrid seed must be purchased for each planting, as seed saved by the farmer will not have the same genetics
Milled rice	Whole or broken kernels of rice (*Oryza sativa L.*) from which the hulls and at least the outer bran layers have been removed and which contain not more than 10.0 percent of seeds, paddy kernels, or foreign material, either singly or combined http://www.gipsa.usda.gov/fgis/standards/ricestandards.pdf
Milled-rice-equivalent basis	The volume of milled rice that can be produced from a given volume of paddy (rough) rice or brown rice
Paddy rice	Rice that is not yet hulled: also called rough rice
Panicle	Rice flower that, when fertilized, produces the rice seed

Executive Summary

Major Findings

Global rice producers vary widely in their cost structures, level of product quality, and status as reliable suppliers.

Global competitiveness in the production of white long grain (non-aromatic) rice—the most commonly traded type and form—depends on three broad factors: delivered cost, product differentiation, and reliability of supply. The cost of producing paddy (rough or unmilled) rice is the main determinant of the delivered cost of long grain white rice. Milling and transportation costs also contribute to delivered costs and can be significant for some countries. Product differentiation in long grain white rice is principally a function of product quality and the ability to meet customers' product specifications. The third major factor, reliability of supply, has been undermined in many countries in recent years by weather-related production shortages and changes in government policies. In a complex competitive landscape, global rice producers present a wide range of costs, quality, and reliability (table ES.1).

Table ES.1: A comparison of competitive factor categories for long grain white rice in selected countries

Country	Delivered cost	Product differentiation (quality)		Reliability of supply	
		Domestic	Export	Domestic	Export
Brazil	High	Medium	Medium	Medium	Low
Burma	Low	Low	Low	High	Low
Cambodia	Low	Low	Low	High	Low
China	High	Low	[a]	Medium	[a]
India	Low	Medium	Low	High	Low
Indonesia	High	Low	[a]	Low	[a]
Pakistan	Low	Medium	Low	High	Medium
Philippines	Medium	Low	[a]	Low	[a]
Thailand	Medium	Medium	High	High	Medium
Uruguay	Low	High	High	High	High
United States	Medium	High	High	High	High
Vietnam	Low	Low	Low	High	Medium

Source: Compiled by USITC staff.

Note: Rankings are high, medium, and low for each factor. For example, Brazil has a high delivered cost, which would make them less price-competitive.

[a] Not applicable because not a major exporter of rice.

The global rice market is characterized by significant government intervention in both imports and exports.

Government intervention has affected trade and price trends in the world rice market more than it has for most other agricultural products. This intervention stems from the critical role that rice plays for both consumers and producers globally. Rice is the leading staple food in much of the world, and it is an important part of the diets of billions of low-income, food-insecure consumers. Its vital role makes its availability and price politically sensitive for governments in several regions. Many government policies aim at retaining rice in-country to keep domestic prices low, making it a relatively thinly traded commodity with a more volatile global market. But this volatility only increases the incentives for further government action, and so when a crisis strikes, policy interventions tend to multiply.

Many of the policies in place today originated as a reaction to a spike in world rice prices from late 2007 to mid-2008. As prices started to rise, governments in several major rice-exporting countries started to restrict exports in an effort to keep domestic prices of rice, a food staple in those countries, at levels affordable to poor consumers. For example, India, Vietnam, Egypt, China, and Cambodia introduced export restrictions and taxes that resulted in a 40 percent drop in the supplies available for export worldwide. Even though by early 2009, global rice prices had fallen to half their peak levels, many of the policies introduced in reaction to the spike remain in place today. Rice production is also highly protected, with governments in many major rice-consuming countries limiting imports to support prices and incomes for domestic rice growers, thereby encouraging domestic production in line with self-sufficiency objectives.

Global rice trade continues to be heavily influenced by tariffs and nontariff measures.

Rice is one of the most protected food commodities in the world, and many major rice-consuming countries use a variety of means to shield their domestic rice industries from the international market. Although barriers have been reduced through multilateral and bilateral trade agreements, significant obstacles to trade remain, and tariffs and tariff-rate quotas (TRQs) in key importing countries create major distortions in the global rice market. Nontariff measures also distort trade. These include quotas and other forms of government involvement in trading, such as import permit requirements and state trading.

The United States faces little direct competition in its domestic market, but has lost market share in key export markets in recent years.

The U.S. rice industry relies heavily on export markets; exports account for about half of the annual crop each year. U.S. rice imports, which represent a small, though growing, share of U.S.

consumption, are mainly of aromatic white rice, which the United States does not produce in large volumes. The United States exports predominantly long grain rice, mainly to countries in the Western Hemisphere, including Mexico and Central America, where it has traditionally faced little competition. These markets are large, are situated near the United States, and give the United States favorable tariff treatment under free trade agreements. Moreover, they have historically had a preference for paddy rice, which the United States is able to supply. However, in recent years, U.S. rice has become less competitive and has lost market share in some key markets for long grain rice, particularly during 2007–13. The United States faces increased competition in several traditional markets, including Mexico, Central America, the European Union (EU), Haiti, and Ghana. The competitors are both low-priced Asian suppliers with improving rice quality (e.g., Vietnam) and high-quality South American suppliers (e.g., Brazil and Uruguay) that have successfully taken U.S. market share in these markets.

U.S. medium grain exports are mainly to Japan, Taiwan, and South Korea, where trade agreements have provided U.S. rice with guaranteed minimum access. These U.S. medium grain exports have been largely stable over time.

U.S. long grain rice exports face several challenges.

Several factors have contributed to the recent changing pattern of U.S. rice exports. In 2006, genetically modified rice was discovered in shipments of U.S. long grain rice, costing U.S. producers much of the EU market. Weather-related quality problems with the large 2010/11 U.S. rice crop may have eroded the high quality reputation of U.S. rice in some other markets. Additionally, U.S. long grain rice has become more genetically diverse since 2007. The number of varieties, both conventional and hybrids, has grown, and with it, the range of milling characteristics and other attributes, calling into question the current U.S. practice of commingling rice of various characteristics. Changing consumer preferences may also be a factor, given the recent growth in global demand for aromatic rice (jasmine and basmati)—a product not generally exported by the United States.

Of the policies in place in 2013, import tariffs on rice in major consuming countries weighed the most heavily on U.S. production and exports.

The Commission assessed the effects of government policies and other factors affecting production, consumption, and trade using a partial equilibrium model of global rice trade developed at the University of Arkansas. The policies were grouped into the following categories: producer price support, intermediate input support (e.g., reducing the cost of fertilizer, energy, water, and seed to farmers), factor support (e.g., reducing the cost of land and capital to farmers), consumption support, tariffs, and export taxes. The estimated results of eliminating specific existing policies, grouped by type, are presented in table ES.2. In 2013, had all countries' tariffs on rice been eliminated, U.S. production of paddy rice would have been higher by nearly 1.3 million mt in milled rice equivalent (MRE) (over 21 percent); U.S. rice exports, by 1.3 million mt (about 45 percent). The elimination of global rice tariffs would have a large effect on many of the largest rice-producing and -consuming countries, because they have higher tariffs than those of the United States.

Table ES.2: Simulation results by policy instrument on rice, United States and global, 2013 (1,000 mt)

Policy instrument	United States				Global total	
Change from removal of	**Production**	**Consumption**	**Exports**	**Imports**	**Production**	**Consumption**
Producer price support	105	[a]	107	1	-329	-329
Factor input support	44	[a]	46	1	-523	-523
Intermediate input support	51	[a]	47	-4	-3,098	-3,098
Consumption support	-14	[a]	-12	2	-6,066	-6,066
Tariffs	1,269	-7	1,329	75	2,190	2,189
Export tax	-2	[a]	-2	[a]	14	14
All except tariffs	182	-1	182	-1	-9,950	-9,950
All including tariffs	1,359	-7	1,435	69	-7,650	-7,651

Source: USITC economic modeling simulation using the RiceFlow model.
Note: In 2013, U.S. and global totals (in million mt) were: U.S. production = 6.3; U.S. consumption = 3.8; U.S. exports = 3.2; U.S. imports = 0.6; global production = 472, and global consumption = 467.
[a] Less than 500 mt.

Of all the policy instruments assessed, however, consumption support has the largest effect on the global rice market. Consumption support mostly involves governments making rice available to lower-income consumers at below-market prices. Had such support not been in place in 2013, global paddy production and rice consumption would have been 6.1 million mt MRE (over 1 percent) lower than observed levels.

Another factor shaping rice production in non-U.S. countries is government support for inputs such as seed, fertilizer, and fuel. Without such programs in place in 2013, production in those countries offering them would have been lower, raising global rice prices. Higher global prices would have led to increased production in other countries, but net global production would have still declined by about 3 million mt.

The Request

The Committee on Ways and Means (Committee) of the House of Representatives asked that the United States International Trade Commission (Commission) conduct an investigation and provide a report on factors affecting the global competitiveness of the U.S. rice industry. The Committee requested that the report focus primarily on the period 2009 through 2013.

To the extent that information is publicly available, the Committee asked that the report include the following:

- An overview of the rice industry in the United States and other major global producing and exporting countries (such as China, India, Indonesia, Thailand, Vietnam, Uruguay, and Brazil), including production of rice, processing volumes, processing capacity, carry-over inventory, and consumption;

- Information on recent trade trends and developments in the global market for rice, including U.S. and major foreign supplier imports and exports;

- A comparison of the competitive strengths and weaknesses of rice production and exports in the United States and other major exporting countries, including such factors as producer revenue and costs of production, industry structure, input prices and availability, processing technology, product innovation, exchange rates, pricing, and marketing regimes, as well as government policies and programs that directly or indirectly affect rice production and exporting in these countries;

- A qualitative and, to the extent possible, quantitative assessment of the impact of government policies and programs of major producing and exporting countries on their rice production, exports, consumption, and domestic prices, as well as on rice prices globally; and

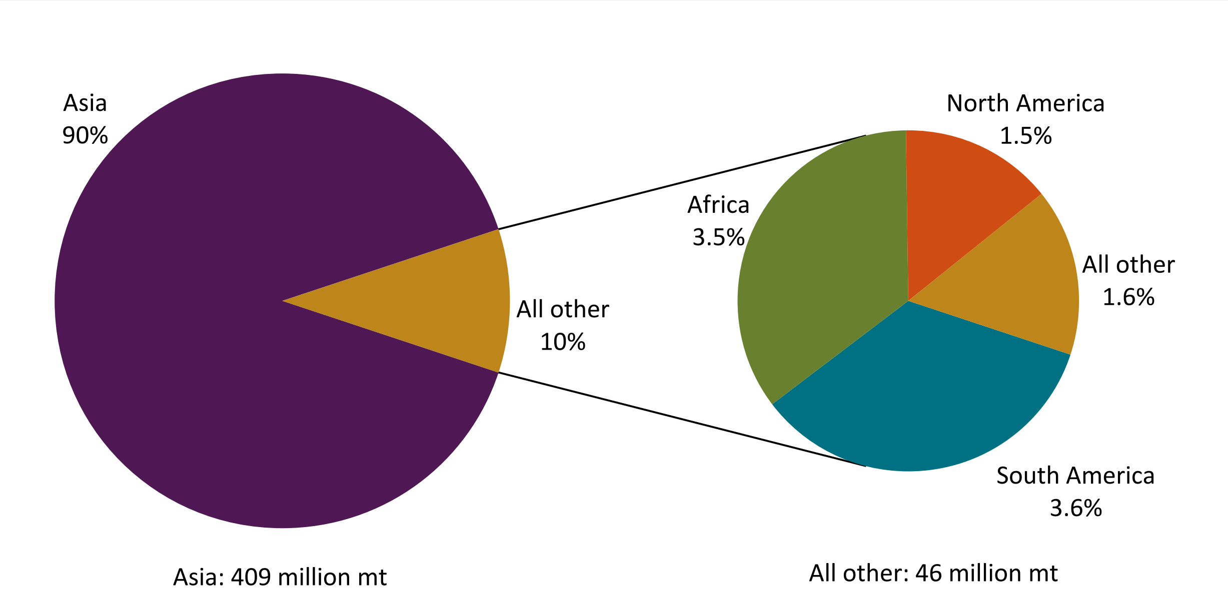
- An overview of the impact on the U.S. rice industry of exports from the highlighted countries of rice to the United States and to traditional markets of the United States such as, but not limited to, Mexico, Haiti, and West Africa.

Global Overview

Global rice production and consumption are highly concentrated in Asia.

Rice is hugely important to the Asian economy, culture, and diet. Asia is the world's predominant rice-producing and -consuming region: during 2007/08–2013/14, it accounted for 90 percent of milled rice production (figure ES.1) and 86 percent of consumption. Roughly one-half of global rice production and consumption is in China and India. In Asia, rice is the primary staple food for most of the population, especially for the region's poor, and the per capita consumption rate is the highest worldwide. In Southeast Asia, for example, per capita consumption was 167 kilograms (kg) in 2013/14, compared with just 12 kg in the United States. Asian rice consumption is rising modestly, driven mostly by population growth. Asia also has over 90 percent of global rice stocks, much of which is held by governments to meet domestic policy requirements that attempt to ensure adequate supplies and affordable prices for consumers.

Figure ES.1: Global white rice production, by region, average 2007/08–2013/14



Source: USDA, PSD Online (accessed December 29, 2014).
Note: All other includes the Middle East and the EU, both of which account for less than 0.5 percent of global rice production. Totals based on period average.

While rice is culturally less important outside Asia, it is produced and consumed worldwide.

Africa accounts for about 6 percent of global rice consumption, while South America accounts for another 3 percent: each supplies about 4 percent of global production. Rice consumption is growing most rapidly in West Africa, where annual per capita consumption has reached 50 kilograms, a response to rising incomes and urbanization. The United States is a surplus producer, accounting for about 1 percent of global rice production but less than 1 percent of global rice consumption.

The global rice market is thinly traded and highly segmented.

Only a small share of rice production is traded. Exports by quantity accounted for an average of 8 percent of global rice production during 2007/08–2013/14, compared with 37 percent for soybeans, 21 percent for wheat, and 12 percent for corn. The major rice-consuming economies are largely self-sufficient, with the top five importers during 2007/08–2013/14 (Nigeria, the Philippines, Iran, China, and the EU) importing only 2 percent of their combined consumption by quantity. Because of consumer preferences, rice trade is highly segmented by processing level, grain length, and type. In terms of processing level, using quantities, 69 percent of global imports were white rice during 2007–13. Broken rice totaled 14 percent, brown rice was 8 percent, and paddy rice accounted for 9 percent. In terms of type, in 2013 about 77 percent of global exports were long grain rice (excluding aromatics); 5 percent were medium grain and short grain combined; and 18 percent, aromatic.

Global rice exports are concentrated among a few major countries, while global imports are more diversified.

A significant majority of world exports originated from South Asia and Southeast Asia during 2007-13, with about 60 percent from the top three suppliers—India, Vietnam, and Thailand. During 2011–13, South Asian exporters (India and Pakistan) shipped rice primarily to the Middle East and West Africa because of consumer preferences in those markets, competitive export prices, and logistical advantages. There were also shipments of higher-quality long grain rice to the EU and North America. Southeast Asian exporters (Burma, Cambodia, Thailand, and Vietnam) shipped mostly within their region and to West Africa, East Asia, and the Middle East. Exports from the United States and South America (Brazil and Uruguay) had diverse destinations, including North, Central, and South America, West Africa, the Middle East, and East Asia.

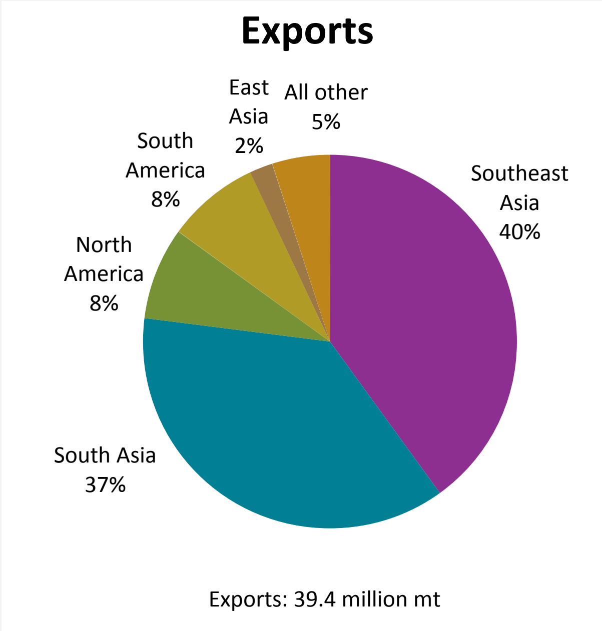
In contrast to exports, rice imports are spread across many countries, with the top 10 importers making up less than half of annual global imports in 2013. West Africa, the Middle East, and East Asia were the top importing regions (figure ES.2). Consumption has outpaced production in West Africa and the Middle East, prompting increased imports. In East Asia, China is a relatively new (and large) importer; elsewhere in the region, government policies largely determine import levels.

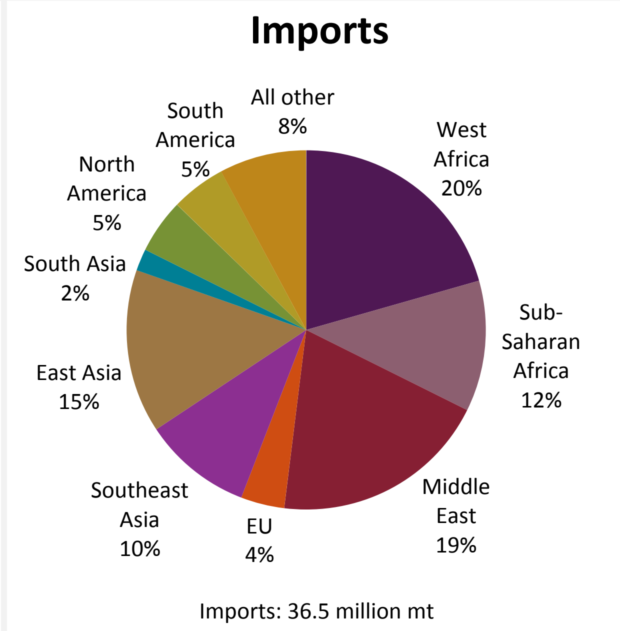
Government policies for rice generally depend on a country’s status as a major producer, consumer, importer, or exporter.

The major rice-producing countries profiled in the report can be characterized as (1) major consumers and surplus producers, (2) major consumers and importers, or (3) producers and major exporters, but not major consumers. Countries in the first group (both major consumers and surplus producers) include India, Thailand, Vietnam, Burma, and Cambodia. Rice policies in this group of countries include government support for the purchase of agricultural inputs, price floors for paddy rice, and the provision of below-market credit to farmers. These countries also impose export controls, such as export permits or licenses, minimum export prices, and, occasionally, export bans. In addition, they maintain large government stocks and enable consumers to buy rice at below-market prices.

Countries that are principally rice-consuming and -importing countries include Indonesia, the Philippines, and China. Common government rice policies in these countries include support for the purchase of agricultural inputs, support prices for paddy rice, government rice stocks, and

Figure ES.2: Rice: Share of global export volumes and import volumes, 2013





Source: USDA, PSD Online database (accessed November 18, 2014).
Note: Export and import totals for 2013 are not equal because of differences in data availability. See appendix F.

assistance to consumers purchasing rice. These countries also maintain control of rice imports, generally through state trading.

Countries that are major producers and exporters of rice, but not major consumers, include Brazil, Uruguay, Pakistan, and the United States. These countries provide less extensive support for rice producers than do major consuming countries. Brazil has provided transportation support during periods of low prices, while Pakistan offers financial aid to farmers to buy agricultural inputs and machinery, although the aid is not specific to rice production. In the United States, the 2014 Farm Bill offers risk management tools for farmers. Countries in this group provide little or no support to rice consumers.

The importance or rice as a foodstuff has led the governments of several major rice-consuming and -producing countries to intervene in their domestic rice markets, with pronounced effects on global market price levels and volatility.

For many low-income consumers, rice accounts for a high share of household expenditures, so large increases in its price can severely harm their purchasing power and lead to food insecurity. Where rice is an important food, its cost is a very sensitive political issue that has often led to government interventions in rice prices, especially in Asia. While these actions sometimes stabilize domestic prices, they often do so by shifting price volatility to the world market. The interventions distort price signals to producers and harm other consuming countries that do not have price stabilization policies. The distorted price signals affect how farmers see their opportunity costs of planting rice, inducing them to either over- or under-produce, depending upon the price signal. Consequently, world prices for rice tend to have less impact than those of other commodities on efficient resource allocation for global production and trade. Instead, they tend to be driven by government programs inside major producing and consuming countries.

Other Industry Observations

Global exports, as noted, are highly concentrated among a few countries, but global imports less so. India, Thailand, and Vietnam are generally the largest exporters of rice, as well as major producers and consumers. However, certain major rice exporters, such as Pakistan and the United States, do not account for a large share of either global production or consumption. Data on selected countries' shares of 2013/14 global rice production, consumption, and trade are presented in table ES.3. More detailed information on regions and individual countries appears in chapters 5–10.

The United States

Government support for the U.S. rice industry has fallen considerably over the last two decades.

The level of federal government support for the U.S. rice industry fell significantly between 2000 and 2014 and is expected to drop further with the implementation of the Agricultural Act of 2014.[1] Annual spending on rice programs averaged $377 million annually from fiscal year (FY) 2007 to FY 2013; the Congressional Budget Office estimates this spending will drop to an average of $244 million per year for FY 2014–18.

The global competitiveness of the U.S. rice industry is related to its reputation as an efficient and reliable supplier of high-quality rice.

U.S. rice production benefits from certain distinct advantages, such as access to good inputs, good crop management systems, and advanced technology. These contribute to high-quality rice at harvest and the ability to maintain that quality throughout the milling and distribution chain. At the same time, highly efficient transportation and logistics contribute to the U.S.

[1] Farm bills contain several different categories of support, including commodity programs, crop insurance, conservation, and international programs. In addition to direct payments under commodity programs, the U.S. rice industry benefits from two U.S. international trade programs, the Foreign Market Development program (FMD) and the Market Access Program (MAP).

Table ES.3: Share of global rice production, consumption, and trade for selected countries, 2013/14 (percent)

Country	Production	Consumption	Imports	Exports
India	22	21	0	24
Thailand	4	2	1	24
Vietnam	6	5	1	15
Pakistan	1	1	0	9
United States	1	1	2	7
Burma	3	2	0	4
Cambodia	1	1	0	2
Brazil	2	2	2	2
Uruguay	0	0	0	2
China	30	31	10	1
Indonesia	8	8	3	0
Philippines	2	3	4	0
All other	19	25	78	9

Source: USDA, PSD Online (accessed January 21, 2015).
Note: Totals may not equal 100 percent due to rounding.

industry's reputation as a reliable, timely supplier. Many of these competitive strengths have required considerable investment by the industry and add to production costs.

The U.S. rice industry faces increasing competition domestically and in global markets from lower-priced suppliers whose quality is improving. Additionally, weather-related quality problems with the large 2010/11 U.S. rice crop and the commingling of rice varieties with different milling characteristics and other attributes may be eroding the high-quality reputation of U.S. rice. The challenge for the U.S. rice industry is to remain price competitive without sacrificing its reputation for quality in light of increasing global competition, uneven market access vis-à-vis key competitors, complex government regulations in export markets, and water scarcity in major U.S. rice-growing regions.

China

The related goals of rice self-sufficiency and industry modernization have driven recent government policies in China.

China’s principal policy goal for rice is food security through total self-sufficiency. Government support programs give farmers incentives to meet production targets to satisfy rising domestic demand, mainly through input and capital support, minimum support prices, and import protection. In spite of these programs, imports have risen sharply in recent years—nearly fivefold between 2007 and 2013.

Despite recent modernization of the sector, China's rice industry suffers from rising costs and pressures on land and water resources.

Government policies have encouraged the development of transportation and irrigation infrastructure, which has contributed to the modernization of the rice value chain in China. Sustained growth in mechanization and yields has also had a major positive impact on competitiveness. The chief factors threatening the competitiveness of the Chinese rice sector are rising production costs and pressures on the availability of land and water. Other factors include food safety concerns and the appreciation of China's currency.

South Asia

India

The Indian government intervenes heavily in the domestic rice market.

Government support for the Indian rice industry includes subsidies on agricultural inputs and guaranteed prices for farmers, as well as support to domestic consumers. India heavily supports its rice farmers, who benefit from financial aid in purchasing fertilizer, fuel, and seed, and who are guaranteed a minimum support price (MSP) for their rice calculated to give them an adequate rate of return. MSPs are supported through government procurement that accounted for about one-third of production during 2007/08–2013/14. Government-held stocks are largely distributed to domestic consumers at below-market prices, although some stock volumes are exported.

India's competitiveness in the rice market benefits from its low cost of production and production improvements, but is hurt by poor infrastructure.

The growth of India's exports and its share of world markets since the late 2000s is a response to its global competitiveness in rice production. This competitiveness is based on India's low costs of paddy rice production, supportive government policies, and innovation in the development and distribution of new varieties and production methods for both long grain and aromatic rice. Improved seed varieties have raised field yields. However, Indian competitiveness is hindered by poor milling and storage infrastructure.

Pakistan

Government programs for the rice industry are limited, other than input support generally available to all farmers.

Pakistan assists its rice producers through general input support programs for fertilizer, water, electricity, and farm machinery that are available to all agricultural producers. In the past, the government announced indicative or reference prices for basmati and long grain rice, but has not done so since 2009/10. Pakistan imposed minimum export prices on basmati and non-basmati rice in April 2008, but these were lifted later that same year. Rice is not the primary staple food in the country, and the government provides neither specific support for rice production nor support to domestic rice consumers.

Pakistan's rice industry benefits from its location, some input support, and the availability of water, but is handicapped by low yields, poor infrastructure, and vulnerable to drought and flooding.

The industry's location in the Indus Basin Irrigation System provides irrigation water to the majority of rice growers. The industry also benefits from generally available support for inputs and an efficient milling sector which produces high-quality milled rice. However, these benefits are offset by low farm productivity due to poor agricultural practices and a lack of research and development in new seed varieties. Shortages also affect the supply of electricity and natural gas needed to dry the rice and operate the mills. In addition, Pakistan's rice production is also subject to both drought and floods. Pakistan is becoming a water-stressed economy, and its dams and barrages along the Indus Basin are inadequate to prevent major flooding.

The Southeast Asian Mainland

Thailand

The Thai government supports its millions of rice farmers through policies that guarantee producers minimum prices for rice.

Government programs in Thailand changed significantly during 2007–13. Under the Paddy Pledging Program of 2011, the government of Thailand pledged to buy paddy rice directly from farmers at a price 40 to 50 percent higher than the world market price. The program cost the Thai government over $15.9 billion and led Thailand to amass large stockpiles of rice that it was unable to sell at the artificially inflated purchase prices. The government of Thailand suspended the Paddy Pledging Program in June 2014. Government price supports and policies for the rice industry remained in flux as of March 2015.

Despite low yields and high farm costs, Thai rice exporters competitively supply high-quality rice to the global market.

Thailand produces a reliable surplus of high-quality rice each year. Thailand is home to an efficient rice supply chain, including a modern milling sector, infrastructure to support exports, and a private sector able to provide good customer service to global purchasers. These endowments make Thailand a competitive supplier of rice to the world market. However, Thai rice farmers have some of the lowest field yields in Southeast Asia, coupled with relatively high costs of production for the region. Additionally, Thailand’s reputation for reliability has been damaged in recent years due to market disruptions brought about by the 2011 Paddy Pledging Program.

Vietnam

The Vietnamese government sets high production targets for the rice industry and is heavily involved in export sales, but provides little direct support to farmers.

Government support to the rice sector is largely in the form of funding for seed research institutes, rice purchases and storage of national reserves, and large irrigation and lock projects benefiting rice-growing regions. In addition to these budgetary outlays, the Vietnamese government influences the rice sector by setting production and land-area targets, establishing minimum support prices during peak harvest seasons, setting minimum export prices, and imposing other export requirements. With limited funds to support farmers, the government encourages help from private sources, such as storage aid, production improvements, and improved inputs (e.g., seeds and fertilizers), from seed companies or mills. The government is also actively involved in exporting rice. State-owned enterprises negotiate government-to-government contracts for rice exports, which account for 40 to 60 percent of total exports. Large-scale government control of rice sales is likely discouraging private sector investment, hampering expansion into new export markets, and, by depressing prices, reducing the profitability of rice production.

Vietnam’s natural resource endowments greatly enhance its competitiveness.

Vietnam is competitive in rice production because of its rich natural resource endowments, including plentiful water and natural flooding. Successful adoption of better seed varieties and improved crop management have helped Vietnam increase yields and improve the overall quality of its rice. However, Vietnam’s competitiveness suffers from the industry’s lack of both an integrated supply chain and access to reliable market Information.

Burma

Government support for the rice industry in Burma is limited.

Burma's government provides little domestic support to rice producers and processors. The only significant Burmese program for the rice industry is the provision of low-interest loans to farmers through the government-owned Myanmar Agricultural Development Bank. Most government involvement with the industry is through export regulation to ensure an adequate domestic supply. However, Burma has liberalized its rice export regulations since 2003, when export quotas were abolished.

While Burma's natural endowments favor the rice industry, inefficiencies and high costs hamper its ability to export.

Abundant land and water, along with inexpensive labor, give Burma the potential to substantially expand its rice production. However, a number of factors limit Burma's export competitiveness. Milling is inefficient and involves the commingling of different varieties of rice, lowering the quality of the output. Poor transportation infrastructure and export procedures also increase export costs. In addition, many exporters have not been able to meet phytosanitary requirements of major destination markets.

Cambodia

Cambodian government programs are aimed at supporting rice production, protecting consumers against rising rice prices and emergencies, and influencing trade.

Cambodia's government has established programs to support production by improving farmers' access to credit and lowering the cost of inputs, as well as improving irrigation infrastructure. Starting in 2007/08, the government established a program to increase domestic consumer access to rice during emergencies (by maintaining stocks and making rice available at below-market prices) and expand production. In order to facilitate trade, the government eliminated export licenses and its export tax on rice.

Despite increasing exports, a number of factors limit the competitiveness of the Cambodian rice industry.

While there has been significant progress in increasing exports and improving the quantity of official exports, there is room to further improve production and reliability of supply. Cambodia's yields are among the lowest for major exporters. Cambodia faces significant obstacles to its competitiveness, including (1) the low skill levels of its farmers; (2) an underdeveloped domestic supply chain for inputs; (3) a lack of both irrigation and storage facilities; (4) expensive electricity and transportation, and (5) inadequate processing technology. In addition, infrastructure constraints, both on and off farm, create higher costs for the producers and processers, reduce the quality of rice, and decrease the reliability of supply to export markets.

The Southeast Asian Islands

Indonesia

Indonesian government programs for rice are aimed at ensuring food security through self-sufficiency and affordable rice prices for consumers.

Government support programs to promote production include subsidies on agricultural inputs, government purchases of rice through the Indonesian National Logistics Agency (BULOG), minimum support prices, and infrastructure maintenance and development. In addition, the government provides funds so that low-income households can buy rice at below-market prices under the Raskin program administered by BULOG. Finally, the government controls imports by maintaining high tariffs, allowing only BULOG to import medium-quality rice, and requiring importers of other types or forms of rice (e.g., high-quality or brokens) to obtain permits.

Indonesia’s climate provides an important competitive advantage, but many other factors, including slowing yield growth and high costs, hinder its rice sector.

Indonesia’s climate gives the country a competitive advantage by enabling an extended growing season. Its competitiveness is also enhanced by the use of high-yielding varieties, new investment in modern mills, and the increased use of fertilizers, pesticides, and irrigation. However, the growth in yields has slowed in recent years, and relatively high production costs, pressure on land and water resources, postharvest losses, and unpredictable weather patterns have undermined the competitiveness of the sector. Competitiveness has also been limited by an inadequate logistics infrastructure.

The Philippines

Philippine government programs for rice are focused on food security through self-sufficiency and ensuring adequate and affordable supplies.

Government support for the Philippine rice industry includes support prices for farmers and sales of rice to domestic consumers from government stocks at below-market prices. To support farmer incomes, the National Food Authority (NFA) sets a minimum price for rice purchased from domestic producers. However, market prices are often higher than the NFA’s minimum prices, encouraging farmers to sell to the private sector and forcing NFA to import rice for its stocks. The NFA also seeks to ensure affordable rice for consumers. In order to protect its rice market from imports, the Philippines will maintain a WTO-approved quantitative limit on imports of rice until June 2017 in exchange for lowering its tariff rates on other agricultural products and increasing its minimum market access for rice imports.

The Philippines has many constraints to its competitiveness in rice, including severe weather events and poor infrastructure.

The Philippines cannot easily expand its rice production area, since its archipelago geography limits the supply of arable land. Its geography also leaves the country vulnerable to severe weather events, which routinely lower production levels, hurting the reliability of supply. The Philippines is investing in new irrigation systems for the rice industry, but in some years gains are more than offset by the deterioration of the existing systems. Rice-growing areas lack good-quality roads, which increases the cost of transportation and hinders the distribution of rice. These disadvantages are only partly compensated for by world-class seed research and an efficient seed industry that makes modern seed varietals widely available to farmers.

South America

Brazil

Government programs for the Brazilian rice industry were not active for most of 2007–13.

Government support programs for rice in Brazil are aimed at offering farmers a minimum guaranteed price and aiding less competitive growing regions in getting their rice to market. During 2007–13, direct support programs included a support program known as the Premium for Product Flow program (PEP, for its Portuguese acronym), intended to help producers ship rice outside the state in which it was produced while guaranteeing them a minimum price. Brazil’s programs had little effect during the period because MSPs were below market prices. The PEP was active only in 2010 and 2011, when rice prices were very low.

Brazil is competitive in the paddy rice market, but its overall competitiveness is undercut by high production costs and competition for resources with other crops.

One key to Brazil’s competiveness is that it is one of a few countries able to reliably supply paddy rice to the global market. (The other major paddy supplier is the United States.) Yields in Brazil have also been improving in recent years, increasing the supply available for export.

However, these advantages are tempered by relatively high production costs and by the profitability of alternative crops in Brazil, such as soybeans.

Uruguay

Uruguay’s rice industry, which receives no government support, has many advantages enhancing its ability to export competitively.

Several factors contribute to Uruguay’s competitiveness in global rice markets. Uruguay produces cost-competitive, high-quality rice in part because of a favorable industry structure in which mills provide growers with support services and access to high-quality inputs and technological innovations. Also, as a small country with a large coastline, Uruguay has more efficient transportation and port access than many other rice-producing countries. These factors enable the Uruguayan rice industry to be a competitive exporter without government support. However, Uruguay faces constraints on production growth, including the scarcity of water and suitable land, which restrict its ability to expand exports.

Chapter 1
Introduction

Rice is an important commodity within the U.S. agricultural economy. In 2013, cash receipts by U.S. rice farmers reached $3 billion,[2] and more than 5,500 farms produced rice on about 2.7 million acres of cropland.[3] The value of shipments from the rice milling industry was close to $4 billion in 2012, and the sector was responsible for roughly 4,000 jobs.[4] Owing to climate and soil requirements, U.S. production is concentrated in several southern states (mostly Arkansas, Louisiana, Mississippi, Texas, and Missouri) and northern California.[5] In many of these states, rice accounts for a significantly larger share of agricultural production than nationally. In Arkansas, for example, rice is the second-largest crop (behind soybeans) with a 26 percent share of the total value of crop production, while in Louisiana it accounts for 17 percent of crop production value.[6]

The U.S. rice industry is highly dependent on export markets, which take about half of the annual crop each year.[7] These exports compete in a thinly traded global market. Roughly 92 percent of global rice production is consumed in the country in which it is produced, leaving just 8 percent for international trade. The United States accounts for about 7 percent of global rice exports, even though it contributes only 1 percent to global production (figure 1.1).[8] Over the past two decades annual U.S. rice exports have seen moderate but steady growth, increasing from 3 million metric tons (mt) in the mid-1990s to about 3.7 million mt during 2011–13.[9] Traditionally, U.S. rice exports have targeted countries in the Western Hemisphere, as well as Northeast Asia, the European Union (EU), West Africa, and the Middle East. Destination markets for U.S. rice have been consistent over time. In fact, Mexico, Canada, Japan, and Haiti were all among the top five export markets for U.S. rice every year between 1999 and 2013.[10]

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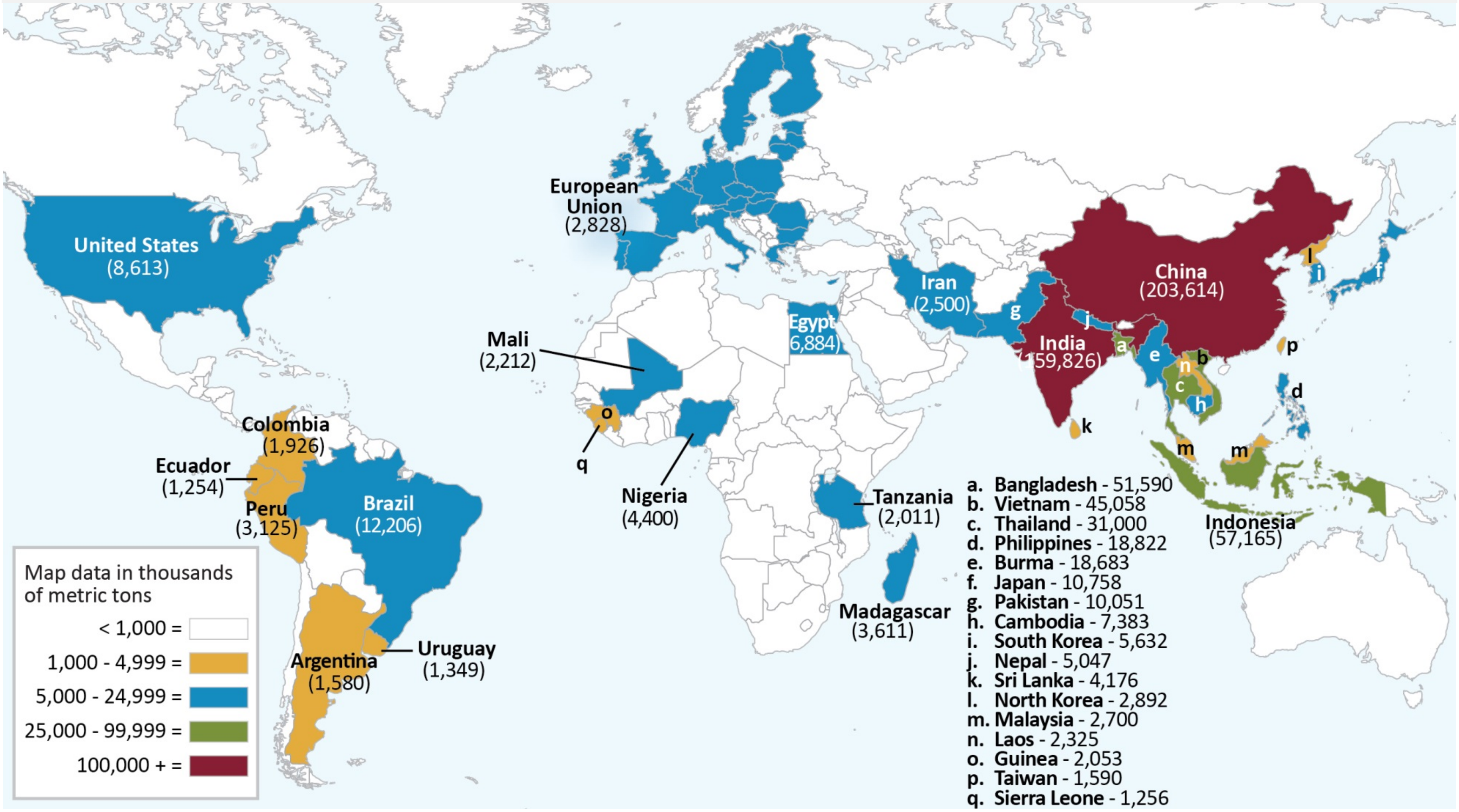
[2] USDA, NASS, Statistics by State (accessed December 2, 2014).
[3] USDA, NASS, *2012 Agricultural Census*, May 2014, 8 Table 1.
[4] 2012 data are the most recently available. USDOC, BEA, Census of Manufactures (accessed November 4, 2014).
[5] USDA, NASS, *Crop Production*, January 2014.
[6] Rice accounted for about 1.4 percent the value of all U.S. crops grown in 2013. USDA, NASS, Statistics by State (accessed December 2, 2014).
[7] In marketing year 2013/14, exports accounted for about 14 percent of corn production, 55 percent of wheat production, and 49 percent of soybean production. USDA, PSD Online (accessed December 2, 2014).
[8] USDA, PSD Online (accessed October 6, 2014).
[9] GTIS, Global Trade Atlas database (accessed August 26, 2014).
[10] Rice exports by quantity under HS 1006 of the Harmonized Commodity Description and Coding System (HS). GTIS, Global Trade Atlas database (accessed August 26, 2014).

Figure 1.1: Major producers of paddy rice, 2013/14



Source: USDA, PSD Online (accessed December 29, 2014).

In recent years, the U.S. rice industry has faced increased competition in several of its traditional markets[11]—notably, in Mexico, Haiti, and Central America—from Brazilian and Asian suppliers (including Thailand, India, and Vietnam). For example, between 2007 and 2013, the U.S. share of Central America's rice imports fell from 96 percent to 62 percent, while for Mexico it dropped from almost 100 percent to 90 percent. Partially offsetting this decline has been growth in other markets, such as Venezuela, the Republic of Korea (South Korea), and Iraq. Globally, however, the U.S. export share of world imports fell from a high of 12 percent in 2010 to a low of 8 percent in both 2012 and 2013.[12]

Several factors have contributed to these recent changes. U.S. rice exports to the EU declined following contamination of the U.S. long grain rice supply with a genetically modified rice variety in August 2006.[13] Changing consumer preferences may be another cause, given the sharp growth in global demand for aromatic rice (jasmine and basmati), a product not grown in large volumes in the United States. The ability of competing global suppliers to offer rice at lower prices than the United States may also have played a role in the loss of U.S. share in certain markets. Some U.S. rice industry representatives attribute this loss of price competitiveness to government policies in major producing and consuming countries—policies that were introduced after the sharp spike in world rice prices in mid-2008.[14]

Patterns and trends in U.S. rice exports are highly complex. In addition to the roles played by changing tastes, price competitiveness, and government policies, rice is a highly heterogeneous product. Rice is traded in different forms depending on the level of processing (e.g., paddy, parboiled, brown, and white). There are different varieties of rice (e.g., long, medium, and short grain, and aromatic), each with different taste, texture, and cooking characteristics. There are different qualities of rice, such as the share of rice kernels that are broken and the level of commingling (mixing of rice with different characteristics). Each rice form, variety, and quality has its own market and trade characteristics. Overall, several factors shape the competitiveness of U.S. rice exports, including those that affect cost of delivery (e.g., production and transportation costs, tariffs, and exchange rates), product differentiation (e.g., quality, safety, and packaging), and reliability of supply.[15]

[11] Industry representatives, interviews by USITC staff, Washington, DC, July 29, 2014, and Arkansas, December 10–11, 2014.
[12] Rice exports by quantity based on calendar year. USDA, PSD Online (accessed April 6, 2015).
[13] USA Rice Federation, written submission to USTR, October 28, 2014. Domestic production, mainly in Italy and Spain, supplies about 70 percent of EU consumption. IRRI, "Europe," (accessed December 5, 2014).
[14] USA Rice Federation, written submission to the USITC, April 2014.
[15] USITC, *China's Agricultural Trade*, 2011.

Scope

The Committee on Ways and Means (Committee) of the House of Representatives asked that the U.S. International Trade Commission (Commission) conduct an investigation and provide a report on factors affecting the global competitiveness of the U.S. rice industry. The Committee requested that the report focus primarily on the period 2009 through 2013.

To the extent that information is publicly available, the Committee asked that the report include the following:

- An overview of the rice industry in the United States and other major global producing and exporting countries (such as China, India, Indonesia, Thailand, Vietnam, Uruguay, and Brazil), including production of rice, processing volumes, processing capacity, carryover inventory, and consumption;
- Information on recent trade trends and developments in the global market for rice, including U.S. and major foreign supplier imports and exports;
- A comparison of the competitive strengths and weaknesses of rice production and exports in the United States and other major exporting countries, including such factors as producer revenue and costs of production, industry structure, input prices and availability, processing technology, product innovation, exchange rates, pricing, and marketing regimes, as well as government policies and programs that directly or indirectly affect rice production and exporting in these countries;
- A qualitative and, to the extent possible, quantitative assessment of the impact of government policies and programs of major producing and exporting countries on their rice production, exports, consumption, and domestic prices, as well as on rice prices globally; and
- An overview of the impact on the U.S. rice industry of exports from the highlighted countries of rice to the United States and to traditional markets of the United States such as, but not limited to, Mexico, Haiti, and West Africa.

Approach

As requested by the Committee, this report uses both qualitative and quantitative methods to evaluate the competeviness of the U.S. rice industry in the global market. Data gathering for the report centered on a review of literature from, and extensive interviews with, sources knowledgeable about the industry. These included the U.S. Department of Agriculture (USDA) Economic Research Service, the USDA Foreign Agricultural Service, the International Rice Research Institute (IRRI), the Asian Development Bank (ADB), the University of Arkansas, and Louisiana State University. Commission staff conducted extensive interviews with informed representatives from individual firms, cooperatives, trading companies, trade associations, international organizations, research organizations, academia, and government. Information was obtained from participants throughout the rice supply chain, including rice farmers, millers, processors, and retailers in the United States and abroad. Part of the information-gathering involved both domestic and foreign fieldwork. Commission staff traveled to Arkansas, the largest U.S. rice-producing state, where they visited rice farmers, millers, processors, and industry observers. Foreign fieldwork was undertaken in Vietnam, the Philippines, and Indonesia (figure 1.2), where staff conducted interviews with private sector and government officials to compile information on production and processing, as well as the types and coverage of government programs throughout the Asian region.

Figure 1.2: Rice paddies in Southeast Asia

Source: USITC staff.

Relevant trade and production data were obtained from Global Trade Information Services (GTIS); the Commission's DataWeb, a database built on U.S. Department of Commerce data; several foreign government websites; the United Nation's Food and Agriculture Organization (FAO); and USDA. Primary sources for information on government policies were the IRRI, FAO, the World Bank, and ADB, as well as many private sector and academic sources.

In addition to a qualitative analysis, the Commission undertook a quantitative assessment of the effects of government policies and other factors affecting demand and supply for this investigation. The quantitative analysis was based on a partial equilibrium model of global rice markets developed by academics at the University of Arkansas.[16] The RiceFlow model (described in more detail in appendix H) includes a database describing trade, supply, and demand data for 73 countries or regions of the world, three types of rice, and three stages of milling. The model includes government policies geared toward increasing rice production, as well as policies (such as subsidies and taxes) influencing inputs, consumption, and trade. For the analysis, Commission staff updated some of the trade data, modified some of the policy treatments, and introduced additional policy interventions. To make the requested assessment of the effects of these policies, simulations were performed in which policy interventions were reduced or eliminated. The resulting values for trade, production, consumption, and prices in the absence of the policy interventions, when compared to their values in the presence of the policies, gave a quantitative indication of the policies' effects.

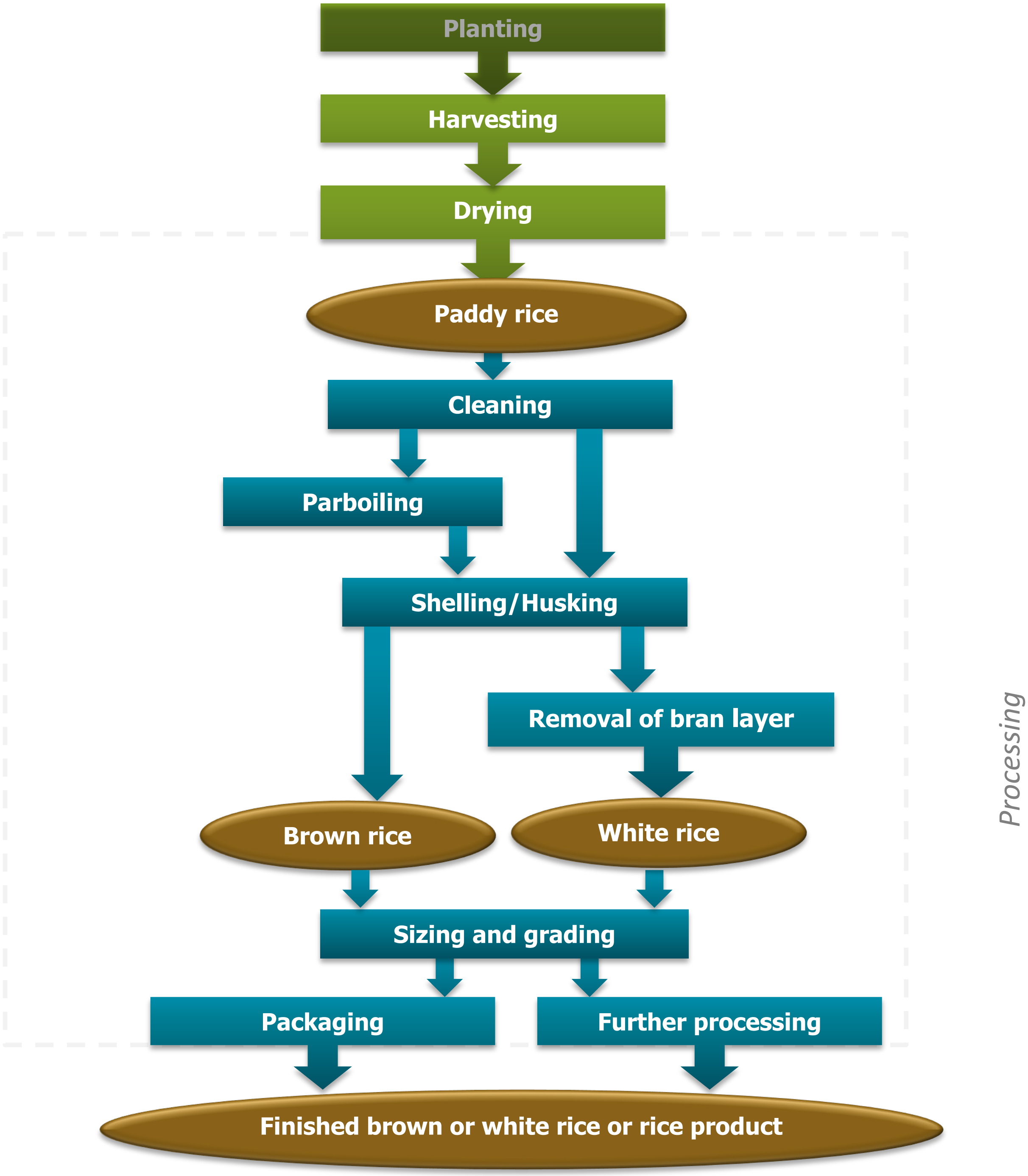
Simulation results of the effects of key policies in major markets (excluding Brazil and Uruguay) are presented in chapters 6 through 12. Chapter 12 includes several quantitative analyses of the global effects of different types of policies. Types of policies analyzed include price support policies, subsidies to inputs such as fertilizer and seeds, policies affecting consumption, and trade policies such as tariffs and export restrictions. The overall effects were assessed by the simulated removal of all policies of a given type for all countries.

Rice Production and Processing

Regardless of location, there are many common stages in the production and processing of rice (figure 1.3).[17] Rice is planted in paddies, which are either rain-fed or irrigated, and it is harvested roughly four months later.[18] Rice harvested from the paddy is called "paddy rice" or "rough rice." It is then threshed to remove other plant materials (the panicle) from the grain. After threshing, the paddy rice is dried to lower its moisture content from about 20 percent to 12.5–14 percent for storage. The level of mechanization and other technology used in planting, harvesting, and drying varies greatly among countries. For example, in the United States, these stages are highly mechanized, with modern planting and harvesting equipment and mechanized drying, commonly carried out by commercial drying companies. In developing countries, the use of technology varies enormously among producers. However, in many developing countries, rice is planted and harvested manually. Paddy rice is often sun-dried by farmers or traders, although more modern mills are investing in drying machines, which reduce spoilage and increase milling rates and quality (figure 1.4).

[16] Durand-Morat and Wailes, "RiceFlow," 2010.
[17] For this report, "rice" covers all products under HS 1006. This includes paddy (rough) rice, brown rice, white rice, and broken rice.
[18] Time to harvest depends on variety and whether the rice is direct-seeded or transplanted. IRRI, "Harvesting" (accessed August 4, 2014).

Figure 1.3: Simplified commercial rice production and processing



Source: Compiled by USITC staff.

Figure 1.4: Rice drying in Southeast Asia: Modern drying machines at a mill (left) and traditional air-drying of paddy (right)

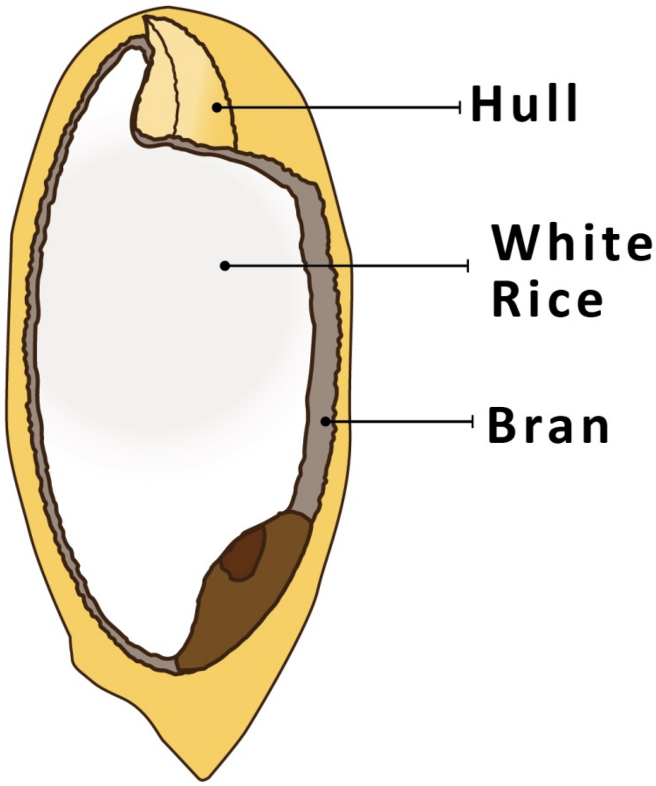
Source: USITC staff.

After further cleaning, rice can be parboiled—placed in hot water and heated further (generally by steaming)—then dried again. Parboiling changes the physical attributes of rice by making the grain harder and more resistant to breakage in milling, which increases the milling yield. Parboiling also is a way to salvage rice of poor milling quality. Some studies have found that parboiled rice is more nutritious, and there are certain large markets where consumers prefer parboiled to other forms of rice.[19] Parboiled rice is often preferred in food service.[20]

Next, cleaned paddy or parboiled rice is husked, a process to remove the rice hull (outer shell) (figure 1.5). At this point, the rice may be sold as brown rice. However, most rice is milled, a process in which the layer of bran is removed. When rice is further polished, the result is white rice, the most commonly consumed form of rice in the world. After milling, rice may be mechanically sized and graded to determine the amount of broken kernels. Both brown and white rice, whether or not parboiled, are end products in themselves and can be either packaged or further processed.

[19] IRRI, "Processing Paddy Rice" (accessed August 4, 2014); Unnevehr and Juliano, *Consumer Demand for Rice Grain Quality,* 1992, 10–11.
[20] Kernels of parboiled rice stay separated when under a heat lamp or sitting out for long periods of time, which is an attribute valued in food service.

Figure 1.5: Rice kernel diagram



Source: USITC staff.

Once packaged, rice is ready for distribution through retail chains, restaurants, and food service outlets, or for export. More than half of U.S. shipments are for direct food use, predominately through grocery stores and food service.[21] However, rice is also further processed into such products as rice noodles, rice cakes, rice flour, breakfast cereal, sake, and beer. Rice products also have some industrial uses, such as ethanol and starch used in the pharmaceutical industry. The terms used to describe forms of rice throughout the report are shown in figure 1.6.

[21] USA Rice Federation, *U.S. Rice Domestic Usage Report*, 7.

Figure 1.6: Forms of rice

Paddy rice	• Rough rice from the field (hull/husk and bran layers intact).
Parboiled	• After cleaning, rice is soaked, steamed, and dried. This process is said to preserve nutrients. Parboiled rice can be used to produce brown rice or white rice.
Brown	• Rice's outer hull is removed, but the bran layer remains.
White	• The bran layer has been removed or "polished off." Can be enriched after milling with vitamins and minerals such as iron, niacin, and thiamin. White rice is also known as milled rice.
Precooked	• Rice is cooked and then dried to reduce preparation time.
Crisped or puffed	• Further processed rice products, such as rice breakfast cereals or rice cakes.
Other processed forms	• Rice can also undergo other processes to make products including noodles, prepared frozen meals, brewed products, and pet food.

Source: Compiled by USITC staff.

Rice Classification and Quality Attributes

Classification

In general, rice is classified on the basis of either its grain length or its variety. Grain length refers to the length of the grain in relation to its width. Classification by length has three categories: long, medium, and short.

- Long grain rice has kernel lengths that are four to five times their width.[22] Typically, grains are easily separated and not sticky when cooked. Long grain (excluding aromatics) is the most commonly traded type of rice, accounting for 75 percent of global trade.[23] Most rice produced in the United States outside California is long grain rice.

- Medium grain rice has kernel lengths that are two to three times their width.[24] It is generally more moist when cooked than long grain rice, with a tendency for the grains to cling together. Medium grain rice is preferred to long grain in certain markets, such as Japan, Turkey, and the Middle East. Medium and short grain rice make up about 10 percent of global trade. In the United States, medium grain rice is produced mainly in California, and accounts for more than one fourth of overall rice production.

- Short grain rice has kernels that are nearly round. They are softer than longer grain rice types and tend to cling together. Short grain rice accounts for 1-2 percent of U.S. production.[25]

Rice is also classified by variety. There are thousands of varieties of rice cultivated around the world. Studies of rice genetics have identified the three major varieties of rice as indica, temperate japonica, and tropical japonica.[26] Aromatic rice is also generally treated as a separate variety because of its distinctive traits.

- Indica rice is typically long grain and not sticky when cooked. It is most commonly grown in hot climates and accounts for most of the rice grown in southern Asia (e.g., southern China, India, Thailand, and Vietnam).[27]

- Japonica rice is found in more temperate climates. The grains of many japonica varieties are more rounded and tend to stick together when cooked. Japonica accounts for about 10 percent of world rice trade.

- Aromatic rice is characterized by a nutty or popcorn-like aroma. Aromatic varieties (predominately jasmine and basmati rice) account for about 12 percent of world rice trade.[28]

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[22] FAO, "Physical Grain Characteristics" (accessed November 13, 2014).
[23] Long grain non-aromatic rice.
[24] FAO, "Physical Grain Characteristics" (accessed November 13, 2014).
[25] USDA, ERS, Rice: Background, accessed April 2, 2015.
[26] Garris et al., "Genetic Structure," March 2005.
[27] The term indica is often associated with long grain rice and japonica with medium grain, and these respective terms are sometimes used interchangeably. However, research shows that form and variety do not have such a clear-cut association. For example, U.S. long grain rice was long thought to be indica, but research shows it is, in fact, japonica. Industry representative, interview by USITC staff, Washington, DC, June 3, 2014.
[28] Of the two major types of aromatic rice, some research indicates that basmati originates from japonica rice and jasmine from indica. Ramanujan, "Highly Valued Rice," 2009.

- Glutinous rice (sticky rice or sweet rice) is used in desserts. It is primarily grown in Southeast Asia and accounts for less than 2 percent of world rice trade.[29]

In this report, rice is classified by grain length, with the exception of aromatic rice, which is covered separately. Treating aromatic rice separately from other long grain rice is a common practice because of the unique characteristics of aromatic rice and the price premiums it commands. Throughout this report "form" is used to describe the level of processing and "type" refers to the classification.

Quality Attributes

In addition to form and type, rice can be characterized by its quality (figure 1.7). Quality is subjective, and different attributes are important to different sets of consumers. Rice quality depends on several factors, including its variety, growing and storage conditions, milling, and handling. Common measures of rice quality are the percentage of broken kernels, the share of "chalky" kernels, the degree of commingled varieties, and organoleptic properties (e.g., taste, sight, smell, and moisture). Chemical characteristics, such as gelatinization temperature, amylose content, and gel consistency are also important to rice quality.[30]

Figure 1.7: Select physical rice quality attributes

Broken rice or "brokens"	•Broken kernels are kernals of rice which are less than three-fourths of whole kernals.
Chalky rice	•Chalky rice kernels are opaque or have an opaque area. Chalky kernals are more prone to break during milling. They are considered undesirable.
Commingled rice	•Rice with different characteristics (i.e., rice grown from different types of seeds) may be mixed together in a batch of rice. This is not always desirable. For example, a mix of kernels from several long grain hybrids may break more easily when milled.

Source: Compiled by USITC.

[29] USDA, ERS, "Rice: Background" (accessed May 27, 2014).
[30] Conservation Agriculture, "Rice Quality" (accessed November 18, 2014).

Rice prices are typically quoted on the basis of the percentage of broken kernels (brokens) in a unit, with a lower percentage associated with higher quality and prices.[31] Broadly, rice classified as high quality has no more than 10 percent broken kernels; medium quality, between 15 and 20 percent; and low quality, 25 percent or more. However, there are market niches for rice across the range of percentage brokens. For example, rice with a high percentage of broken kernels is reportedly preferred in some consumer markets (such as some countries in West Africa), as well as in some processed food and beverage applications, such as brewing.

In addition to the percentage of brokens, physical measures of quality include the percentage of bran removed, whiteness, and chalkiness. Chalky kernels are opaque and are more apt to break during milling. Chalk can be caused by excessively high nighttime temperatures during part of the growing season. Susceptibility varies with variety, and some hybrids are reported to be particularly susceptible to chalk.

Another factor that may impact rice quality is the extent to which varieties are commingled. For example, long grain milled rice may include a mix of kernels with different physiochemical properties, such as from several long grain hybrids and conventional seed varieties. If the milling properties vary among these varieties, then commingling rice at the mill may lead to more broken grains and lower quality. Some buyers specify a particular variety for their purchases, which requires a producer to have in place a practice known as "identify preservation" to avoid a loss of quality associated with commingling.[32]

Rice quality is a function of other factors as well. One important set of traits is cooked rice's organoleptic properties—its stickiness, color, firmness, texture, translucence, grain shape, aroma, and taste, which are important to most consumers. Other cooking characteristics, such as volume expansion and elongation, are also important to many consumers.[33]

Government Intervention in the Global Rice Market

The world rice market is characterized by heavy government intervention in both importing and exporting countries. Many of the policies in place today originated from the late 2000s as a

[31] Broken grains are often only half as valuable as unbroken grains. IRRI, "Determining the Physical Characteristics of Milled Rice" (accessed November 18, 2014).
[32] The extent of the problem is a matter of debate within the U.S. industry. Industry representative, interview by USITC staff, July 29, 2014.
[33] Unnevehr and Juliano, *Consumer Demand for Rice Grain Quality*, 1992, 8–10.

reaction to a spike in world rice prices starting in early 2008.[34] Prices started to rise in mid-2007 in response to the depreciation of the U.S. dollar, strong income growth in Asia, and higher oil prices (an important determinant of the cost of many farm inputs, such as fertilizer and fuel).[35] As prices began to rise, governments in many major rice-consuming and -exporting countries started to restrict exports in an effort to keep domestic prices of rice, a food staple, at levels poor consumers could afford. For example, India, Vietnam, Egypt, China, and Cambodia introduced export restrictions and taxes that cut supplies available for export by 40 percent. Thailand did not restrict exports, but instead maintained government stocks of more than 4 million mt of rice, which put further upward pressure on world prices. At the same time that exporting countries were restricting exports, major importing countries, including the Philippines and several West African countries, became concerned about food security and future higher prices.[36] This led to a surge in “panic buying” by these countries that pushed world prices even higher.

Even though by early 2009 global rice prices had fallen to half their peak level, many of the policies introduced in reaction to the spike remain in place today. The types of government interventions countries employ differ depending on their policy objectives, which, in turn, are based on whether the country is a major producer/exporter, major consumer/importer, or both.[37] In this report, three broad country types were identified as follows:

- Countries that are both major consumers and surplus producers include India, Thailand, Vietnam, Burma, and Cambodia. To support their farmers, policies affecting production include subsidizing agricultural inputs, supporting prices for paddy rice, and providing credit to farmers. However, to stabilize prices and assure affordable rice prices for their consumers, these countries also impose export controls (such as export permits or licenses, minimum export prices, and export bans), maintain large government stocks, and provide assistance for domestic consumers.

- Countries that are major rice consumers and importers include Indonesia, the Philippines, and China. Common types of government policies include financial assistance for agricultural inputs, support prices for paddy rice, government rice stocks, and assistance for domestic consumers. Instead of export controls, these countries maintain control of rice imports, generally through state trading.

[34] Childs and Baldwin, “Price Spikes in Global Rice Markets,” December 2010. In April 2008, the price of Thai high-quality long grain rice (a key benchmark price in the global rice market) was more than $1,000 per metric ton, compared to about $400 per metric ton in January that year.
[35] Because global rice prices are typically denominated in U.S. dollars, a weak dollar translates into higher prices.
[36] Childs and Kiawu, *Factors behind the Rise*, 2009, 10.
[37] The divisions between country groups are not clear cut. Over 2007–13, China moved from being a net exporter to being the world’s largest importer, and India became a major exporter.

- Countries that are producers and exporters of rice, but not major consumers, include Brazil, Uruguay, Pakistan, and the United States. These countries have a variety of less extensive support measures for rice producers. Brazil has provided transportation payments during periods of low prices, while Pakistan offers payments to purchase agricultural inputs and machinery, although not specific to rice production. The 2014 U.S. Farm Bill (see chapter 5) offers risk management tools for farmers. Countries in this group provide little to no support for consumers.

A range of policies covering production, consumption, and trade in countries covered in this report are shown in table 1.1 below.

More than most agricultural products, rice has inspired government intervention that affects global trade and price trends. This stems largely from the critical role that rice plays in the diets of billions of low-income, food-insecure consumers, making the availability and price of rice highly politically sensitive for a number of governments worldwide. Most interventions are aimed at keeping rice in country to keep domestic prices low, resulting in a thinly traded, and thus more volatile, global market. Research shows this volatility only increases the incentives for further intervention, and so policies tend to spiral.[38] Further, economic analysis of rice policies notes the "beggar-thy-neighbor" nature of rice policies. This means that if one country intervenes, other countries are better off intervening as well, in order to mitigate the harmful effects of the original intervention. Again, this strengthens the tendency for rice policies to spiral.[39] Rice pricing is covered in more detail in chapter 3.

Reliability of Data

This investigation uses the USDA's Production, Supply, and Distribution (PSD) Online database for data on production, consumption, stocks, and, in some cases, trade because of its comprehensive coverage (in terms of both country coverage and reporting years) and its consistent reporting. PSD data are based on official government statistics and are considered one of the most reliable sets of data available. Further, some of the data are adjusted and updated using a variety of sources that are more reliable and/or more timely than government sources.[40] For example, the USDA adjusts trade statistics for some countries to include estimates of unofficial, or gray market[41] trade (see chapter 3 and appendix F).

[38] For example, this price volatility strengthens the perceived need for self-sufficiency and more support to domestic producers. Setboonsarng, "Dynamics in the International Rice Market," October 28, 2014.
[39] Martin and Anderson, "Export Restrictions and Price Insulation," 2012.
[40] USDA, FAS, "About PSD Online" https://apps.fas.usda.gov/psdonline/psdabout.aspx (accessed October 6, 2014).
[41] Also, commonly spelled grey market trade.

Table 1.1: Policies affecting rice production, consumption, stocks, and trade in select countries, 2007–13

	East Asia	**South Asia**		**Southeast Asia**						**North America**	**South America**	
Policies	**China**	**India**	**Pakistan**	**Burma**	**Cambodia**	**Indonesia**	**Philippines**	**Thailand**	**Vietnam**	**United States**	**Brazil**	**Uruguay**
Production												
Insurance									X	X		
Input	X	X	X	X[a]								
Fertilizer	X	X	X	X[a]	X	X		X				
Fuel	X	X		X[a]								
Irrigation		X	X	X[a]	X							
Machinery	X	X										
Seed	X	X		X	X							
Water			X									
Credit to farmers			X	X	X							
Support prices	X	X				X	X	X[b]	X		X	
Consumption												
Consumer price assistance		X				X	X					
Government rice distribution		X				X	X					
Trade												
Export bans		X[b]		X					X[b]			
Export credit guarantees										X		
Export license(s) and/or permit(s)				X	X	X		X				
Import licenses/controls						X	X					
Minimum export price								X	X			
Minimum market access (MMA)							X					
State trading	X	X	X		X	X	X		X			
Tariff rate quotas (TRQs)	X											
Trade promotion support												
Other												
Direct payments to farmers	X									X[b]		
Public stockholding	X	X				X	X	X	X			
Transportation subsidy											X[b]	

Source: Compiled by USITC.

[a] Encouraged by government through microfinancing.

[b] Policy not currently in effect.

In the course of this investigation several industry experts and government officials expressed concern about the reliability of rice data, especially data on production, consumption, ending stocks, and trade for rice in certain countries, as well as global totals.[42] For example, some industry experts estimate that official production data are significantly over-reported by the Philippines and Indonesia—in the latter case, by as much as one-fifth. According to industry sources, this is likely because locally inflated numbers feed into national statistics, not because of a deliberate effort to mislead by these two central governments. The United Nations (UN) found that in Asia data collection by surveying local experts to gauge production, while providing timely data, is prone to significant measurement errors. Local data collectors have a vested interest in adjusting the data they report to the central government to ensure that it supports their claims of achieving a given goal or mandate.[43]

Data on rice stocks and rice consumption are also problematic in some places. In China, the accuracy of rice stock levels is called into question because of government secrecy and the decentralized nature of stock holdings in the country. As a result, industry experts widely report that China's true stock levels are unknown, possibly even to Chinese government officials. Stock data from several other countries, including India, Vietnam, and Thailand, are also thought to be unreliable. In addition, some industry experts view consumption data as over-reported in certain countries, especially because consumption is often calculated rather than measured. Factors contributing to this over-reporting may include some combination of (1) over-reported production data, (2) inclusion of residuals raising consumption data, and (3) difficulties in determining accurate stock data from some countries, which may result in some stocks being captured in consumption data.

Some industry experts believe that the apparent rise in global per capita consumption since 2010/11 is probably the result of flawed data reported by some countries. More broadly, there are concerns that a lack of transparency and inconsistent policy practices in some countries may undermine rice data reliability. UN-led assessments found widespread weaknesses in agricultural statistics of developing countries in Asia-Pacific, Latin America, and the Caribbean.[44] These included problematic statistical methodology and survey framework, erratic data collection, untimely data delivery, lack of funds, agricultural statistical systems existing outside

[42] Industry observer, interview by USITC staff, teleconference, October 15, 2014; U.S. government official, interview by USITC staff, Washington, DC, July 31, 2014; industry observer, interview by USITC staff, teleconference, July 31, 2014; industry and government representatives, interviews by USITC staff, Vietnam, October 20–24, 2014; industry representatives, interviews by USITC staff, Philippines, November 10–11, 2014. See also appendix F and box 2.2 in chapter 2 for an explanation of the concerns with trade data.
[43] FAO, "*Asia-Pacific Action Plan*," October 8–12, 2012, 12.
[44] FAO, "Asia-Pacific Action Plan", October 2012; FAO, "Action Plan to Improve Agricultural and Rural Statistics in Latin America and the Caribbean," April 23, 2013. Developed countries with large agricultural sectors tend to have well developed and reliable agricultural statistics.

national statistical offices or systems, lack of both up-to-date software and hardware, and too few qualified personnel.[45]

[45] The UN and its partners have established action plans to try to address these issues.

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Chapter 2
Global Overview of Rice Production, Consumption, and Trade

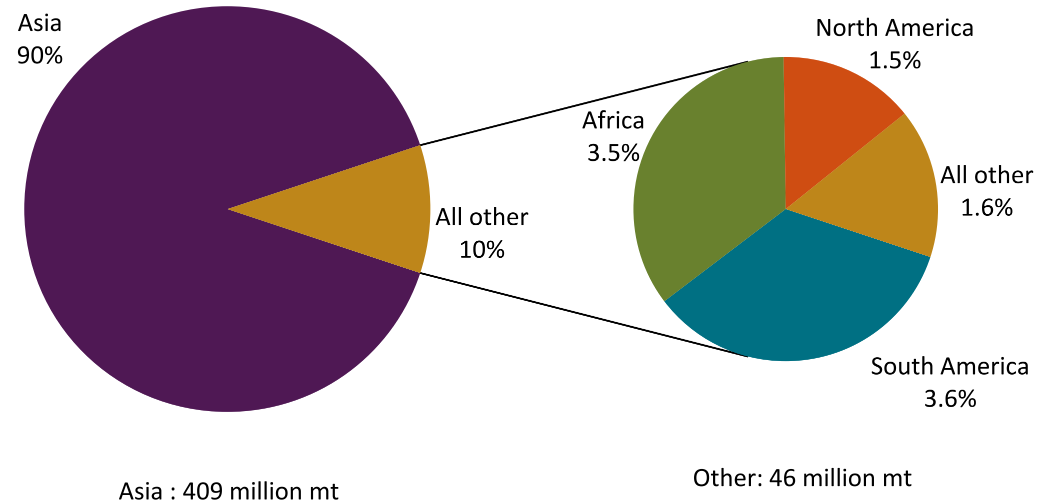
Rice is consumed in more than 175 countries around the world and serves as a staple in the diet of more people than any other food.[46] Cultivation of rice is among the largest uses of agricultural land globally, involving approximately 144 million farms, many of which are less than 2 hectares (ha) (5 acres) in size.[47]

During 2007/08–2013/14, Asia was the world's predominant rice region,[48] accounting for 90 percent of production and 86 percent of consumption (figures 2.1 and 2.2).[49] Rice is hugely important to Asia's economy, its diet (especially for the region's 560 million low-income population), and its culture.[50] Asia also holds most of the world's stocks of rice (about 91 percent),[51] because many of the region's governments maintain stockpiles aimed at ensuring adequate supplies and affordable prices for consumers. South America and North America are also surplus rice-producing regions, but on a much smaller scale than Asia. During 2007/08–2013/14, together these regions accounted for about 4 percent of global production and consumption.

Africa is the world's second-largest producing and consuming region. Unlike Asia, however, Africa has a deficit in rice. During 2007/08–2013/14, it accounted for less than 4 percent of the world's rice production, but 6 percent of its consumption.[52] Within the continent, rice

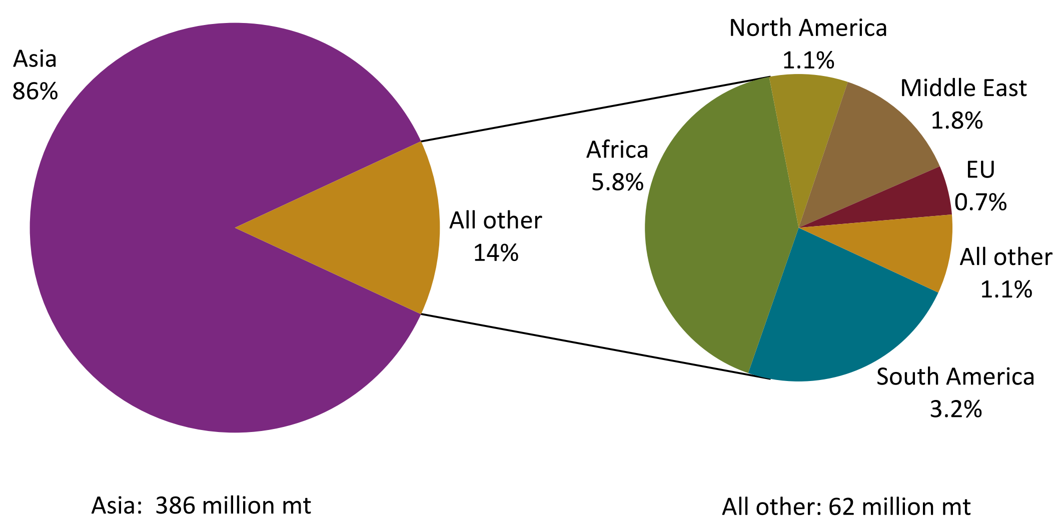
[46] USDA, PSD Online (accessed May 14, 2014, and June 10, 2014); GRiSP, *Rice Almanac*, 2013, viii–ix; FAO, FAOSTAT: Commodity Balances: Rice 2011.
[47] GRiSP, *Rice Almanac*, 2013, x, 1, 30; USDA, PSD Online (accessed December 29, 2014); chapter 4. PSD Online data are based on a milled rice equivalent, unless otherwise indicated. In addition, unless otherwise indicated, in this report, production, stock, and consumption data are based on marketing year, and trade data are based on calendar year. A marketing year (also known as a crop year) is the 12-month period starting with the month when the rice harvest typically begins. Marketing years vary by country.
[48] For purposes of this discussion, Asia refers to the rice-producing regions of East Asia, South Asia, and Southeast Asia. See appendix D for regional listings.
[49] During 2007/08–2013/14, South and East Asia each accounted for about one-third of global production, while Southeast Asia accounted for one-quarter. USDA, PSD Online (accessed December 29, 2014).
[50] See, for example, chapter 1 this report and GRiSP, *Rice Almanac*, 2013, x, 30, 80.
[51] USDA, PSD Online (accessed December 29, 2014). Based on data global stocks during 2007/08–2013/14.
[52] Africa held about 2 percent of global rice stocks in this period. USDA, PSD Online (accessed October 7, 2014). See appendix D for regional group listings.

Figure 2.1: Global white rice production, by region, average 2007/08–2013/14



Source: USDA, PSD Online (accessed December 29, 2014).
Note: All other includes the Middle East and the European Union, both of which account for less than 0.5 percent of global rice production. Totals based on period average.

Figure 2.2: Global white rice consumption, by region, average 2007/08–2013/14



Source: USDA, PSD Online (accessed December 29, 2014).
Note: Totals based on period average.

production and consumption are highly concentrated in West Africa, where the crop is becoming increasingly important as an easy-to-prepare food. The Middle East and the European Union (EU) also consume more rice than they produce. Between 2007/08 and 2013/14, the Middle East accounted for about 2 percent of global consumption and stocks, but less than 1 percent of production, while the EU accounted for around 1 percent of global consumption and stocks, and less than 1 percent of production.

Trends in Production[53]

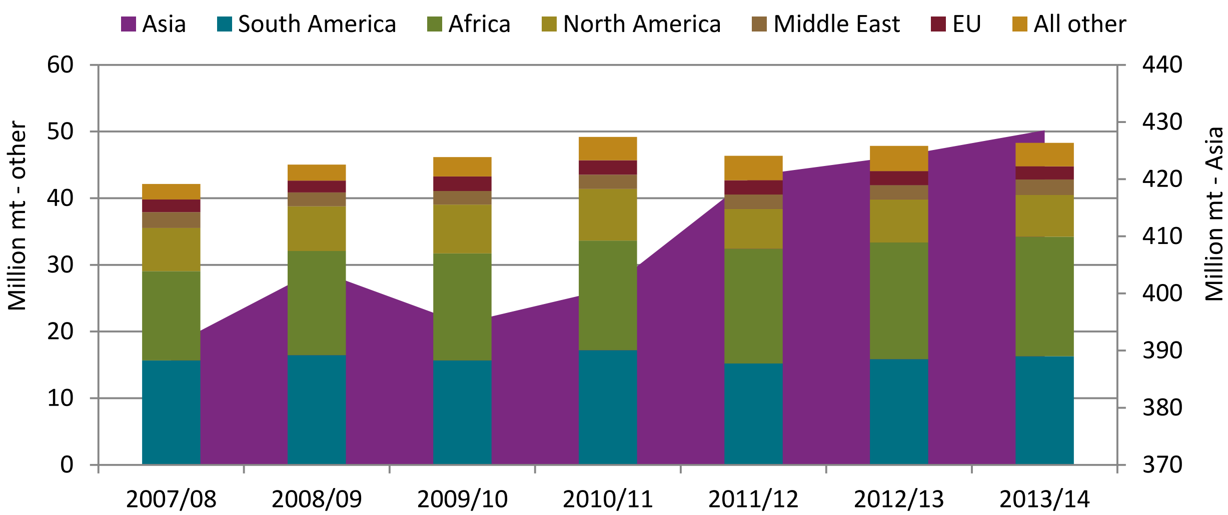
Between 2007/08 and 2013/14, global rice production grew from 433 million metric tons (mt) to 477 million mt, equivalent to about 1.6 percent growth annually.[54] Most of this growth was driven by production trends in Asia and, to a lesser extent, Africa. Throughout the period, Asian production generally increased, rising by about 1.5 percent annually to reach 429 million mt in 2013/14 (figure 2.3 and appendix E, table E.1).[55] Africa's annual production rose by 5 percent on average between 2007/08 and 2013/14, the fastest rate of any region, reaching a record high of 18 million mt in 2013/14. In the rest of the world, production fluctuated throughout the period, staying close to the period average of 30 million mt.[56]

Harvested Area

World rice harvested area remained stable throughout 2007/08–2013/14, at most deviating 2 percent annually from the period average (table 2.1).[57] Annual harvested area in Asia generally determines the global trend, with area increasing by about 0.5 percent annually between 2007/08 and 2013/14. However, there were significant differences in trends in other producing regions. The largest increases in harvested area were in West Africa and the rest of sub-Saharan Africa, which both recorded annual area growth of about 4 percent over this time period. Harvest area expanded owing to more intensive cropping (e.g., planting two or more

[53] Total rice production can be measured in paddy rice (also known as rough rice) or in milled rice equivalent. About 90 percent of "bought and sold" rice is processed within 50 miles of where it is grown. Hamilton, *When Rice Shakes the World*, 2014, 47. For this this study, "rice production" refers to production on a milled rice equivalent basis, unless otherwise stated.
[54] USDA, PSD Online (accessed December 29, 2014).
[55] Despite this growth, Asia's share of total production was consistent at about 90 percent through 2007/08–2013/14.
[56] Including production in South America, North America, the Middle East, and the EU.
[57] USDA, PSD Online (accessed December 29, 2014 and January 21, 2015). Year-on-year trends tend to be somewhat volatile because of farmers' annual planting decisions and weather conditions. A long-term upward trend is evident in an examination of the 14 years since 2000. During 2000/01–2004/05, harvested area averaged 150 million ha; during 2005/06–2009/10, 155 million ha; and during 2010/11–2013/14, 159 million ha.

Figure 2.3: Global rice production, by region, 2007/08–2013/14



Source: USDA, PSD Online (accessed December 29, 2014).

Table 2.1: Rice harvested area, by region, 2007/08–2013/14 (1,000 hectares)

Region	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
South Asia	59,830	62,174	58,987	59,448	61,461	59,395	61,321
Southeast Asia	45,595	45,632	46,093	46,232	46,769	47,232	47,188
East Asia	32,398	32,640	33,015	33,217	33,311	33,408	33,584
Asia subtotal	137,823	140,446	138,095	138,897	141,541	140,035	142,093
West Africa	4,996	5,266	4,963	5,908	5,946	5,649	6,366
North Africa	675	677	677	458	708	776	778
Rest of SSA[a]	2,805	3,265	3,421	3,910	3,810	3,555	3,460
Africa subtotal	8,476	9,208	9,061	10,276	10,464	9,980	10,604
South America	4,979	5,055	4,965	5,029	4,615	4,603	4,647
North America	1,183	1,256	1,312	1,502	1,091	1,119	1,034
Middle East	821	711	691	713	730	683	770
European Union	423	411	456	482	483	449	438
All other	991	1,009	1,175	1,285	1,349	1,303	1,259
Total	154,696	158,096	155,755	158,184	160,273	158,172	160,845

Source: USDA, PSD Online (accessed December 29, 2014).
Note: Rank based on 2013/14.
[a] Rest of SSA is sub-Saharan Africa excluding West African countries. See appendix D.

crops a year[58]) in some countries and expansion of land area planted to rice.[59] Offsetting the growth in Africa was a drop in harvested hectares in South America and North America, where the area under rice fell annually by 1 percent and 2 percent, respectively. In both regions, reduced rice planting was, to some extent, a function of higher prices for competing crops (e.g.,

[58] This doubles or triples harvested area, although the amount of land in production remains the same.
[59] See, e.g., GRiSP, *Rice Almanac*, 2013, 38, 92, 96; Coulibaly, "Ivory Coast on Quest," October 9, 2014; Government of Ghana, "Ghana: Rice Production," September 13, 2013 ; Kale-Dery, "Govt Moves to Increase Local Rice Production," March, 19 2014. Research has developed faster-growing plants, which allow farmers to increase the number of crops per year. See, e.g., GRiSP, *Rice Almanac*, 2013, x, 54.

soybeans and corn), although other factors, including weather conditions in North America, also contributed.[60]

Yields

For any given harvest area, crop yields[61] determine the level of production. Rising rice yields over almost half a century have been a major reason for its prominence in global food production and consumption today (box 2.1). The average global yield for paddy rice was 4.3 mt per ha between 2007/08 and 2013/14 (figure 2.4).[62] Owing to different rates of yield growth over time, there is now a large range of yields among the world's major rice-producing countries. East Asia, North America, and the EU generally have relatively high yields, with most countries in these regions exceeding the world average by at least 1 to 2 mt/ha. Yields in South Asia and Southeast Asia are generally below the world average: most countries there have yields between 2 and 4 mt/ha. Yields are also under the world average for most of West Africa, with about half the region below 2 mt/ha. Yield rates in South America and Central America vary widely by country, ranging from some of the lower yields in the world to some of the highest.[63]

Yield differences between countries can be attributed to such factors as irrigation systems, seed variety planted, use of fertilizers and pesticides, and overall crop management, along with water quality and availability, climate, and weather.[64] The type of irrigation system and seed variety planted are particularly influential.[65] Rice yields tend to be lower in regions where rain-fed production predominates, such as South Asia (e.g., India and Pakistan), Southeast Asia (e.g., Thailand and Vietnam), and Africa, compared to regions where rice is mainly irrigated, such as East Asia (e.g., China) and the United States.[66] Besides increasing yields, irrigation also lowers

[60] USDA, FAS, *Brazil: Grain and Feed Annual*, March 16, 2011, 15; industry observer and officials, interviews by USITC staff, Arkansas, December 8–12, 2014.
[61] A yield is the quantity of crop produced per unit of land. For this report, yields are given in metric tons per hectare (mt/ha).
[62] USDA, PSD Online (accessed December 29, 2014). Rice yields often vary between years because of weather and other factors, so three-year average yields are reported to smooth out annual variation.
[63] USDA, PSD Online (accessed April 2, 2014). During 2007/08-2013/14, Panama, Bolivia, and Guatemala had average yields of 3.0 mt/ha or below, whereas Uruguay, had the 4th highest yield in the world (7.9 mt/ha). In addition, Peru, Argentina and El Salvador all had average yields above 5.0 mt/ha.
[64] See, e.g., GRiSP, *Rice Almanac*, 2013, 52–53, 83–85; Sindhu and Kuma, "Quality Seed Production in Hybrid Rice," 2003.
[65] Government official, interview by USITC staff, Manila, Philippines, November 11, 2014; industry observer, interviews by USITC staff, Manila, Philippines, November 11, 2014; GRiSP, *Rice Almanac*, 2013, 17, 88, 90.
[66] GRiSP, *Rice Almanac*, 2013, 17, 37, 88, 92–96; Baldwin et al., *Southeast Asia's Rice Surplus*, December 2012, 7; USDA, PSD Online (accessed December 29, 2014); government official, interview by USITC staff, Washington, DC, June 3, 2014.

Box 2.1: Evolution of rice yields

Since the mid-1960s, global rice yields have more than doubled, although the rate of growth has fallen in recent years. The Green Revolution, spanning a period from the mid-1960s to the late 1980s, led rice growers in developing countries to adopt several yield-improving technologies, including better plant varieties, irrigation, fertilizers, and pesticides. As a result, global rice yields improved over 2 percent annually during this period.[a]

After 1990, rice yields continued to improve, although more slowly.[b] For example, between 2007/08 and 2013/14 yields rose by about 1 percent annually.[c] Several factors contributed to this slowdown, including (1) diminishing returns from increased use of fertilizer, pesticides, and modern seeds; (2) a long period between the mid-1980s and early 2000s when low global rice prices weakened incentives for on-farm improvements and research into new seed varieties; and (3) the lack of genetic seed improvements comparable to those made during the years of the Green Revolution (e.g., the development of rice varieties with shorter stalks).[d] Some industry experts also attribute slowing yield growth to shifts in rice area to less productive land (e.g., poorer soil and lower water quality) in favor of crops offering farmers more profitability.[e]

The development of new rice varieties provides an avenue to high yields in the future, but the prospect for such improvements varies by country.[f] In more advanced rice-producing countries, such as Japan, South Korea, and the United States, better seeds offer opportunities to improve yields. However, in less developed rice-producing countries there is scope to raise yields through better crop management, expanding and improving irrigation systems, and using already developed higher-yield seed varieties.[g]

[a] GRiSP, *Rice Almanac*, 2013, 37; USDA, PSD Online (accessed June 5, 2014). Average global yields rose from 2.0 mt/ha to 4.3 mt/ha between the five years at the start of the Green Revolution (1960/61 to 1964/65) and the last five years (2009/10 to 2013/14). There are, however, some country-specific exceptions to this trend.

[b] USDA, PSD Online (accessed December 28, 2014); GRiSP, *Rice Almanac*, 2013, 37, 39–40; Hazell, "Asia's Green Revolution," 2010, 73–74; Cassman, Olk, and Dobermann, "Scientific Evidence of Yield and Productivity Declines," 1997.

[c] USDA, PSD Online (accessed December 28, 2014).

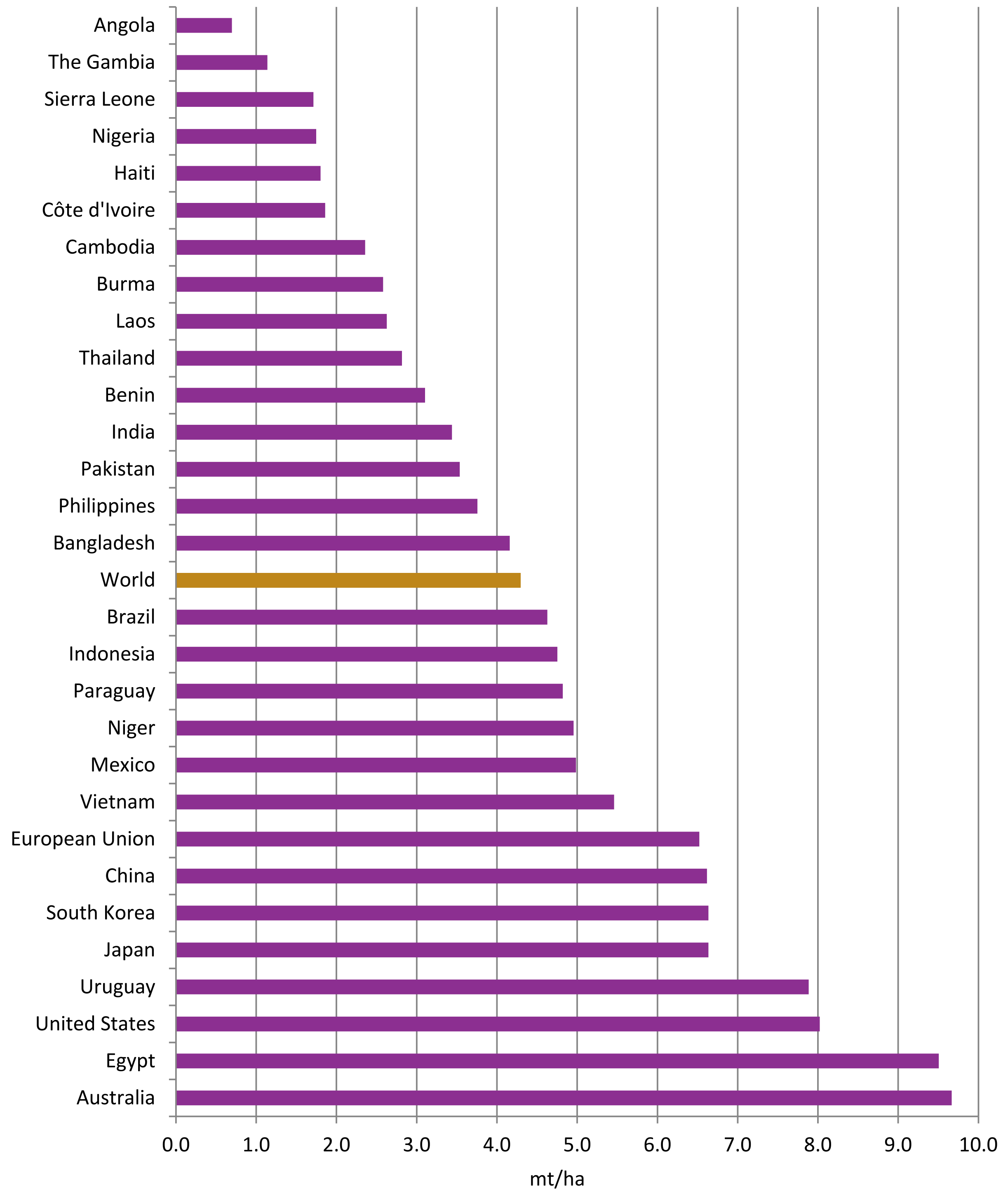
[d] GRiSP, *Rice Almanac*, 2013, 39,6; FAO, Bridging the Rice Yield Gap, 2000, 9; Dawe, "The Changing Structure," 2002, 355–57; Hazell, "Asia's Green Revolution," 2010, 73–74; Pandey et al., "Rice Price Crisis," 2011.

[e] GRiSP, *Rice Almanac*, 2013, 39; Hazell, "Asia's Green Revolution," 2010, 73–74.

[f] Hazell, "Asia's Green Revolution," 2010, 8; GRiSP, *Rice Almanac*, 2013, 54.

[g] Industry experts and government officials, interviews by USITC staff, Philippines, November 10–12, 2014; government official, interview by USITC staff, Hanoi, Vietnam, October 23, 2014; industry experts, interviews by USITC staff, Ho Chi Minh City, Vietnam, October 20–21, 2014. See also, e.g., GRiSP, *Rice Almanac*, 2013, 54, 66; Baldwin et al., Southeast Asia's Rice Surplus, December 2012, 6–8.

Figure 2.4: Rice yields, select countries, average 2007/08–2013/14



Source: USDA, PSD Online (accessed December 28, 2014).

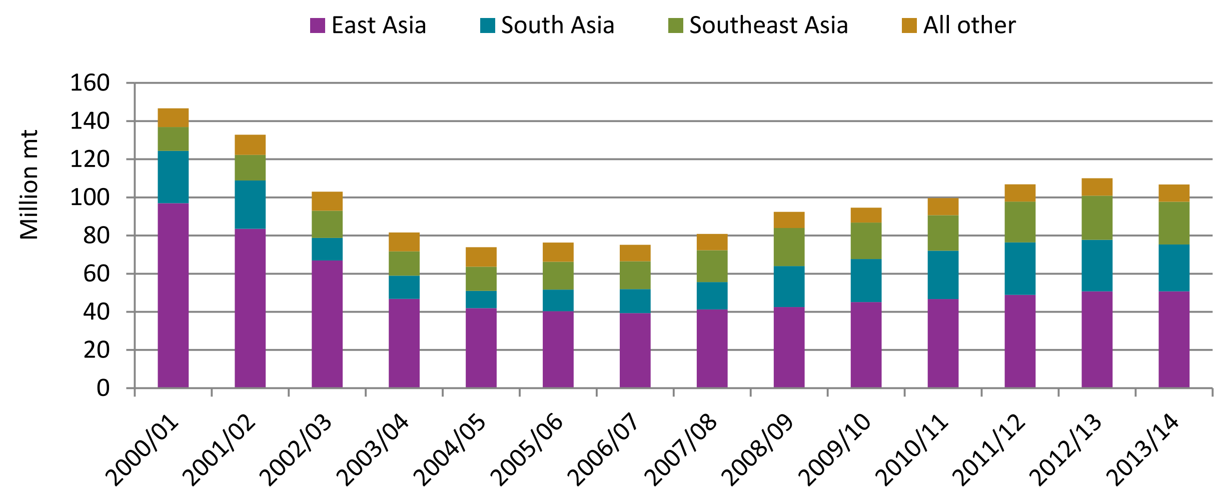
year-to-year yield fluctuations compared with production systems with little to no irrigation. Seed varieties and proper crop management also influence yields. About three-quarters of global rice production is from seed varieties developed for particular positive characteristics, such as disease and pest resistance, or that are better adapted to specific environments.[67] In some countries, the introduction of new hybrid rice varieties has led to recent yield improvements.[68] For instance, China has developed and widely adopted new hybrids, and their use is growing in a number of other countries, including India, the United States, and Brazil, with varying degrees of success and acceptance.[69] Other countries are interested in increasing the use of hybrids, but without proper crop management practices yields likely will fall well short of their potential.[70] Lack of good extension services to help rice farmers improve their crop management is currently a barrier to improving productivity, particularly in developing countries in Asia.[71]

Trends in Ending Stocks

Ending stock levels are a key determinant of global rice prices. They also influence government policy decisions in major rice-producing and -consuming countries. Between 2007/08 and 2012/13, global rice stocks rose steadily at an annual rate of about 6 percent, but fell slightly (3 percent) to 107 million mt in 2013/14, though they were still equivalent to almost one-quarter of global consumption that year (figure 2.5).[72] This growth followed a five-year period between 2000/01 and 2004/05 when world stocks roughly halved mainly because of falling Chinese stocks.[73] Stocks dropped from a record 147 million mt in 2000/01 to just 74 million mt in 2004/05, the lowest level in the past quarter-century. The rise of global stocks since 2004/05 partly reflects government policy decisions in a few major producing countries to increase domestic stock quantities by imposing export restrictions. Stock build up also reflects producer

[67] GRiSP, *Rice Almanac*, 2013, x and 54.
[68] A hybrid is the result of cross-breeding between two specific parent lines. Hybrids generally yield more than traditional varieties, but seeds must be purchased for each planting rather than reused. Baldwin et al., *Southeast Asia's Rice Surplus*, December 2012, 37.
[69] GRiSP, *Rice Almanac*, 2013, 54–55; U.S. industry expert, telephone interview by USITC staff, July 21, 2014; industry expert, interview by USITC staff, Philippines, November 10, 2014.
[70] Industry expert, interview by USITC staff, Philippines, November 10, 2014; Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), interview by USITC staff, Philippines, November 10, 2014; government official, interview by USITC staff, Manila, Philippines, November 11, 2014.
[71] SEARCA, interview by USITC staff, Philippines, November 10, 2014; industry observer, interviews by USITC staff, Manila, Philippines, November 11, 2014; government official, interview by USITC staff, Manila, Philippines, November 11, 2014.
[72] USDA, PSD Online (accessed November 3, 2014). Based on ending stocks of milled rice.
[73] In that period, China accounted for over-half to almost 100 percent of the decline in ending stocks each year. USDA, PSD Online (accessed April 6, 2015).

Figure 2.5: Rice ending stocks, by region, 2000/01–2013/14



Source: USDA, PSD Online (accessed December 29, 2014).

support programs (e.g., in Thailand and India) in response to sharp global price increases in 2008.[74]

Global rice stocks are highly concentrated in a few Asian countries.[75] In 2013/14, over 90 percent of rice stocks were held in Asia, including China (44 percent share of world stocks), India (21 percent), Thailand (12 percent), and Indonesia (5 percent).[76] Indian stocks almost doubled between 2007/08 and 2013/14; especially in 2008/09, when stocks grew by 6 million mt in response to policies that restricted exports of non-basmati rice.[77] In Thailand, stocks grew by an average of 29 percent annually during 2007/08–2013/14. Between 2010/11 and 2012/13, growth in Thai stocks was primarily a result of its 2011 Paddy Pledging Program, which was terminated in 2013/14.[78]

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[74] See chapters 7 and 8 for more details of these policy changes.
[75] Between 2007/08 and 2013/14, Africa and South America each held about 2 percent of global stocks, on average, and North America and the EU each held over 1 percent. USDA, PSD Online (accessed January 26, 2015).
[76] This distribution differs significantly from the early 2000s when China accounted for more than 60 percent of world stocks, and India and Thailand for 15 percent and 2 percent, respectively.
[77] This was a policy response to high global rice prices in 2007/08 (chapter 7). Childs, *Rice Situation and Outlook Yearbook*, February 2009, 1; Baldwin and Childs, *2009/10 Rice Yearbook*, January 2011, 1, 2–3.
[78] USDA, FAS, *Thailand: Grain and Feed Annual 2012*, March 20, 2012, 9–10; chapter 8 of this report. Under the 2011 Paddy Pledging Program, the Thai government purchased long grain rice at a fixed, relatively high, price from farmers. Most of this rice was stored in government stocks. See chapter 8 for further details.

Trends in Consumption

Global Trends

Between 2007/08 and 2013/14, apparent world rice consumption rose from 426 million mt to 477 million mt, representing growth of roughly 2 percent annually on average (figure 2.6).[79] Asia accounted for about 86 percent of global consumption during this period, followed by Africa (6 percent), South America (3 percent), and the Middle East (2 percent). Each of the other regions accounted for 1 percent or less of global consumption during 2007/08–2013/14. The growth in world rice consumption resulted from the rising global population, which increased by about 1.2 percent annually during this period, and higher apparent per capita consumption, which grew from 64 kg in 2007/08 to 67 kg in 2013/14 (figure 2.7).[80] Higher per capita consumption in East Asia (primarily China) and, to a lesser extent, in Africa and the Middle East pushed global consumption up, offsetting flat or slightly declining per capita rice consumption in the rest of the world. The figures also reflect large differences in levels of per capita consumption between regions—167 kg in Southeast Asia compared with just 11 kg in North America, for example. Many factors drive regional consumption patterns, including traditional staple foods, income level, and the amount of diet diversification.

Regional Trends

Asia

Asia is different from the rest of the world in that rice is the primary staple food for most of the population, especially for the region's poor.[81] In 2013/14, total Asian rice consumption was 410 million mt, about 11 percent higher than in 2007/08, primarily because of the region's growing population.[82] Asia has the highest per capita rice consumption worldwide, although there is variation by subregion (figure 2.7). Rice is an important source of calories in the region, contributing about 28 percent of caloric intake in 2011.[83] In Southeast Asia, one of the poorest

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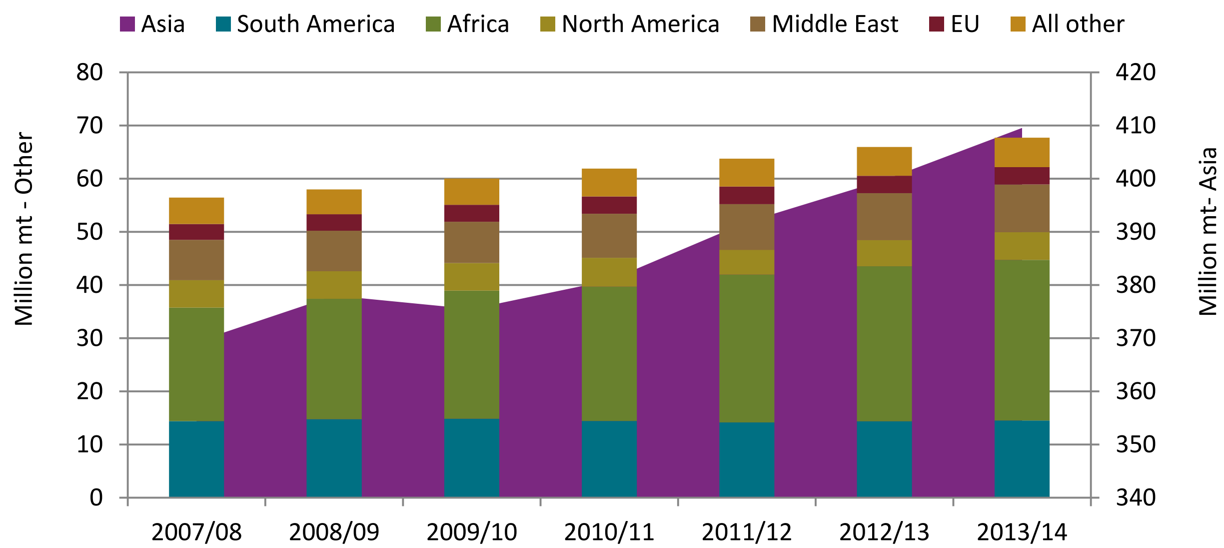
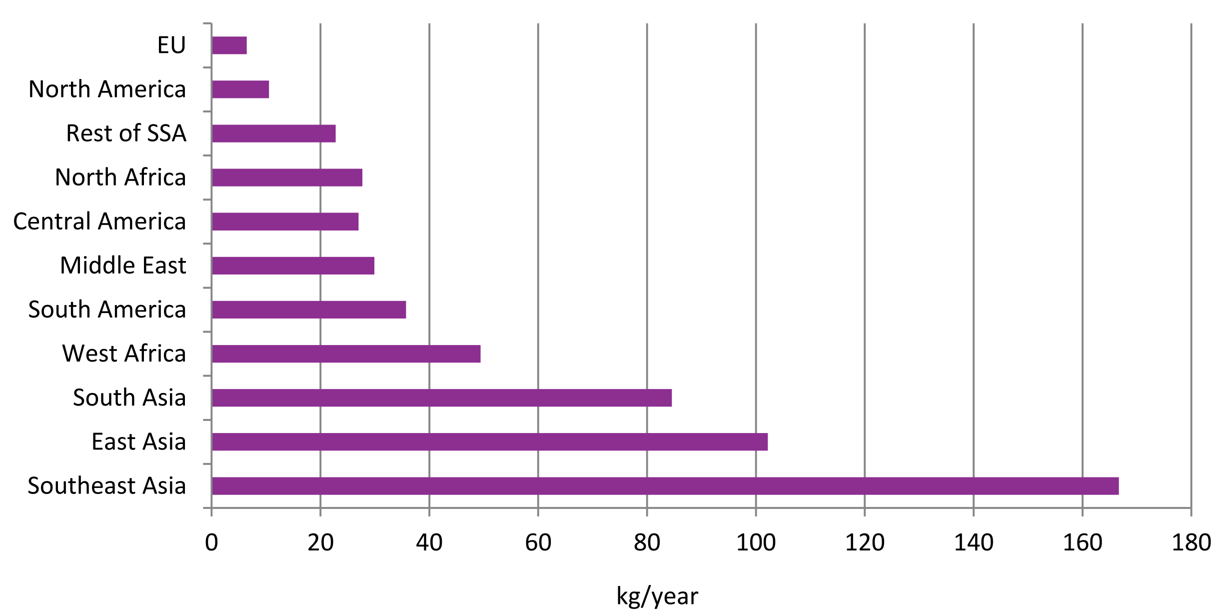
[79] Consumption data are based on domestic consumption, which includes all rice consumption (e.g., direct food use, processing use, livestock feed, and waste) as well as residuals.
[80] USITC calculation based on World Bank, Data: Population (accessed May 8, 2014) and USDA, PSD Online (December 29, 2014).
[81] GRiSP, *Rice Almanac*, 2013, 30, 80.
[82] World Bank, Data: Population (accessed May 8, 2014); USDA, PSD Online (accessed December 29, 2014); GRiSP, *Rice Almanac*, 2013, 80.
[83] FAO, FAOSTAT: Food Balance Sheet: Asia, 2011 (accessed July 14, 2014).

Figure 2.6: Total apparent consumption by region, 2007/08–2013/14



Source: USDA, PSD Online (accessed December 29, 2014).

Figure 2.7: Per capita consumption by region, average 2011/12-2013/14



Sources: USDA, PSD Online (accessed December 29, 2014 and February 19, 2015); World Bank, Data: Population (accessed May 8, 2014).
Note: Rest of SSA is sub-Saharan Africa excluding West African countries.

regions in Asia, rice accounted for 46 percent of total calories consumed, the highest share in the world.[84] Beyond its importance as a source of calories, rice is part of the culture and tradition of the region.[85] However, per capita consumption is not growing in much of Asia, with the apparent exception of China (chapter 6).[86] Flat and falling per capita rice consumption in most Asian countries reflects rising incomes, a more diversified diet, and urbanization.[87]

Africa

Compared with the rest of the world, African rice consumption is growing relatively rapidly. Between 2007/08 and 2013/14, it rose about 6 percent annually, reaching over 30 million mt in 2013/14 (appendix E, table E.2). This increase was due to both a growing population (over 2 percent annually) and higher per capita consumption (over 3 percent annually).[88] Growth in consumption was highest in West Africa, the largest rice consuming area in Africa on both an absolute and per capita basis.[89] By 2011, rice consumption represented 14 percent of caloric intake in West Africa; starchy roots, the traditional staples, made up 20 percent.[90] Between 2007 and 2013, rice became more prevalent in African diets, especially in West Africa, not only because of higher per capita incomes, but also because it is easier to prepare than traditional staples, a characteristic appealing to the growing urban population. Imported rice, in particular, is an affordable alternative in this price-sensitive market, and imports made up about 44 percent of African rice consumption during 2011/12–2013/14.[91] However, many West African countries are striving for self-sufficiency in rice.[92]

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[84] FAO, FAOSTAT: Food Balance Sheets: South-Eastern Asia, 2011 (accessed October 21, 2014). Although rice's contribution to caloric intake in Southeast Asia is high by global standards, the share of calories provided by rice has declined since the 1970s, when it was close to 60 percent. FAO, FAOSTAT: Food Balance Sheets: South-Eastern Asia, 1970, 1975, 1979 (accessed October 21, 2014).
[85] GRiSP, *Rice Almanac*, 2013, 30.
[86] Per capita consumption in South and Southeast Asia was largely stable, while it declined slightly in East Asia exclusive of China. World Bank, Data: Population (accessed May 8, 2014); USDA, PSD Online (accessed December 29, 2014).
[87] GRiSP, *Rice Almanac*, 2013, 80; Timmer, Food Security in Asia, October 2010, 10; World Bank, World Development Indicators database: GNI per capita (constant 2005 US$) (accessed July 22, 2014). Government interventions to control rice prices and to provide low-income consumers assistance to purchase rice may be slowing the rate of dietary diversification in some Asian countries. GRiSP, *Rice Almanac*, 2013, 82.
[88] USDA, PSD Online (accessed December 29, 2014); World Bank, Data: Population (accessed May 8, 2014).
[89] In 2007/08, 51 percent of all African rice consumption occurred in West Africa. This share rose steadily to 56 percent by 2013/14. USDA, PSD Online (accessed July 15, 2014). Between 2007/08 and 2013/14, total consumption grew by almost 6 percent annually because of both rising population (almost 3 percent annually) and per capita consumption (over 4 percent annually). West Africa also has the highest per capita consumption in the region: 49 kg per year on average between 2011/12 and 2013/14 (figure 2.7). USDA, PSD Online (accessed December 29, 2014); World Bank, Data: Population (accessed May 8, 2014).
[90] FAO, FAOSTAT: Food Balance Sheet 2011: Western Africa (accessed July 14, 2014).
[91] GRiSP, *Rice Almanac*, 2013, 33, 91; U.S. government official, interview by USITC staff June 17, 2014; USDA, PSD Online (accessed January 26, 2015).
[92] See, e.g., Fofana, Goundan, and Magne Domgho, *Impact Simulation of ECOWAS Rice Self-Sufficiency Policy*, 2014.

South America

South American rice consumption was stable between 2007/08 and 2013/14 at close to the period's annual average of 14.5 million mt (appendix E, table E.2).[93] During 2011/12–2013/14, per capita consumption was also relatively flat at about 36 kg per year. Although population grew slowly (1 percent annually) during this period, higher incomes (rising 3 percent annually) likely dampened demand, as many consumers, such as those in Brazil, diversified their diets to include more meat, dairy products, fresh fruits, and vegetables.[94] In 2011, rice consumption represented 10 percent of caloric intake in South America, while all cereals accounted for 32 percent of intake, meat for 12 percent, and milk for 7 percent.[95]

Middle East

Rice consumption in the Middle East grew by about 3 percent annually between 2007/08 and 2013/14, because of both rising population (about 2 percent annually) and rising per capita consumption (1 percent annually) (appendix E, table E.2).[96] By 2013/14, per capita consumption reached just over 30 kg in 2013/14, due in part to incomes increasing by over 4 percent annually during 2007–12.[97] In some large markets, like Saudi Arabia and Iraq, there is increasing demand for aromatic rice, which is primarily imported.[98] While rice is an important part of the diet in parts of the region (primarily the Levant), it is not a staple for the region as a whole. In 2011, wheat accounted for 36 percent and rice for just 6 percent of the region's caloric intake.[99]

Central America

Between 2007/08 and 2013/14, Central American consumption grew by less than 2 percent annually to reach 1.2 million mt. Since the region's population grew at a similar pace, per capita consumption stabilized at just over 27 kg annually during the period.[100] Rice accounted for

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[93] USDA, PSD Online (accessed January 26, 2015).
[94] World Bank, Data: Population (accessed May 8, 2014); World Bank, World Development Indicators database: GNI per capita (constant 2005 US$) (accessed July 22, 2014); Valdes, Lopes, and Lopes, "Brazil's Changing Food Demand," n.d. (accessed July 22, 2014).
[95] FAO, FAOSTAT, Food Balance Sheets: South America, 2011 (accessed October 21, 2014).
[96] USDA, PSD Online (accessed December 29, 2014); World Bank, Data: Population (accessed May 8, 2014).
[97] World Bank, Data: GNI (constant 2005 US$) (accessed May 8, 2014). Excludes Syria owing to lack of data since 2008. Data for 2013 has not been used due to lack of reporting for certain countries.
[98] USDA, FAS, *Saudi Arabia: Grain and Feed Annual, 2014*, February 20, 2014, 15; USDA, FAS, *Iraq: Grain and Feed Annual*, April 19, 2012, 6.
[99] Based on the FAO data for the West Asia subregion, which is made up of Afghanistan, Armenia, Azerbaijan, Bahrain, Cyprus, Gaza Strip, Georgia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, West Bank, and Yemen. FAOSTAT, Food Balance Sheets: West Asia, 2011 (figure 21-1) (accessed October 21, 2014).
[100] USDA, PSD Online (accessed December 29, 2014 and February 19, 2015); World Bank, Data: Population (accessed May 8, 2014).

about 4 percent of the region's average caloric intake in 2011. This is well below the region's main staple food, corn, which accounted for 30 percent of calories.[101]

North America and the European Union

Compared with Asia, both North America and the EU are relatively minor consumers of rice. Between 2007/08 and 2013/14, total North American consumption was close to about 5 million mt annually, largely because of population growth offsetting slightly declining per capita consumption, which was about 11 kg annually during 2011/12–2013/14.[102] In 2011, rice accounted for only 2 percent of daily caloric intake in both regions.[103] Both total consumption (about 3.2 million mt annually) and per capita consumption (about 6 kg) in the EU were largely stable for most of 2007/08–2013/14. Most countries in North America and the EU have developed economies with high incomes and very little population growth, leading to stable consumption patterns.

Overview of Global Trade

As noted earlier, the global rice market is thinly traded, with significant government involvement;[104] exports accounted for only 8 percent of global rice production on average during 2007/08–2013/14.[105] By comparison, other grains and oilseeds are more extensively traded, with exports' share of production averaging 37 percent for soybeans, 21 percent for wheat, and 12 percent for corn between 2007/08 and 2013/14.[106] A major reason rice lags behind other grains is the high degree of self-sufficiency among major rice-consuming countries, with the top five consumers importing only about 1 percent of consumption between 2007/08 and 2013/14.[107] Rice is also a highly protected commodity, with governments in many major rice-consuming countries limiting imports in attempts to support prices and incomes for domestic rice producers, thereby encouraging domestic production in line with self-sufficiency objectives.[108] Imports and exports in a number of these countries are closely regulated or even

[101] FAO, FAOSTAT: Food Balance Sheet: Central America, 2011 (accessed October 22, 2014).
[102] Per capita consumption fell by about 1 percent, while population rose by a similar percentage annually in this period. USDA, PSD Online (accessed December 29, 2014); World Bank, Data: Population (accessed May 8, 2014).
[103] Based on data for Northern America. FAO, FAOSTAT, Food Balance Sheets: Northern America, 2011 (accessed October 21, 2014); FAO, FAOSTAT: Food Balance Sheets: European Union, 2011 (accessed October 21, 2014).
[104] Slayton, *Pieces of the World Rice Market Puzzle*, December 18, 2013, 28.
[105] Based on marketing year. USDA PSD Online (accessed March 1, 2015).
[106] Ibid.
[107] The five leading rice-consuming countries by total quantity during 2007–13 were China, India, Bangladesh, Indonesia, and Vietnam. Based on marketing year. USDA PSD Online (accessed October 28, 2014).
[108] Slayton, *Pieces of the World Rice Market Puzzle*, December 18, 2013, 29; Wailes, *Tariff Escalation*, August 2004, 3.

conducted by the government.[109] Also, strong consumer demand for specific local rice types and grades result in rice trade being highly segmented by processing level, form, and type.[110]

The international Harmonized System (HS) for tariffs has subheadings for three processing levels and a separate category for brokens. By subheading, using quantities, 69 percent of global imports were of white rice (HS 1006.30); 14 percent, broken rice (HS 1006.40); 9 percent, paddy rice (HS 1006.10); and 8 percent, brown rice (HS 1006.20) during 2007–13 (table 2.2). White rice was the leading form of traded rice because of consumer preferences, costs (e.g., white rice is more cost effective to ship than paddy rice in most cases), and government policies that discourage or even prohibit paddy rice exports (to keep the employment and income from milling in-country).[111] By grain length, about 77 percent of exports were long grain rice (excludes aromatic), 5 percent medium and short grain combined, and 18 percent aromatic in 2013.[112] These shares are in line with global consumption, which favors long grain rice (see “Trends in Consumption” above). In addition to processing level and grain length, trade is also segmented by characteristic. Consumers in some countries prefer parboiled long-grain rice, while others prefer aromatic rice, which commands a premium price.

Market segmentation affects global rice trade flows: consuming countries choose supplying countries based on whether they can offer rice of the preferred form, grain length, and other characteristics, as well as whether logistics and trade terms are favorable.[113] However, trade data limitations make many trade flows difficult to measure accurately, as described in box 2.2.

South Asia and Southeast Asia are the top exporting regions (figure 2.8). There are also several significant exporting countries in North and South America. During 2011–13, South Asian exporters (India and Pakistan) primarily shipped rice to the Middle East and West Africa because of consumer preferences in those markets, competitive export prices, and logistical advantages (chapter 7). There were also significant interregional exports to other South Asian countries and shipments of high-quality long grain white and aromatic rice to the EU and North

[109] Slayton, *Pieces of the World Rice Market Puzzle*, December 18, 2013, 29.
[110] Wailes, *Tariff Escalation*, August 2004, 3.
[111] Calpe, “Status of the World Rice Market,” 2003; Slayton, *Pieces of the World Rice Market Puzzle*, December 18, 2013, 33.
[112] RiceFlow model database. See appendix H.
[113] For example, see Wailes, *Rice: Global Trade*, 2004, 177–78, and chapters 5–11 of this report.

Table 2.2: Rice (HS 1006): World imports by form, 2007–13

Product	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Paddy	1,565	1,907	2,076	2,071	2,276	2,565	2,063
Brown	2,191	2,062	1,657	1,659	1,970	1,687	1,839
White	17,376	17,161	14,435	17,135	17,654	17,943	15,717
Broken	3,979	4,152	2,923	2,654	3,145	3,440	4,237
Total	25,111	25,282	21,091	23,519	25,045	25,634	23,857
				Value (million $)			
Paddy	527	921	833	840	921	1,073	946
Brown	1,039	1,591	1,253	1,243	1,449	1,332	1,337
White	7,803	13,022	9,565	11,507	13,568	12,726	10,933
Broken	1,222	1,422	1,359	1,126	1,523	1,755	1,782
Total	10,591	16,957	13,010	14,715	17,461	16,886	14,998
				Unit value ($/mt)			
Paddy	337	483	401	405	405	418	459
Brown	474	772	756	749	735	790	727
White	449	759	663	672	769	709	696
Broken	307	342	465	424	484	510	420
Total	422	671	617	626	697	659	629

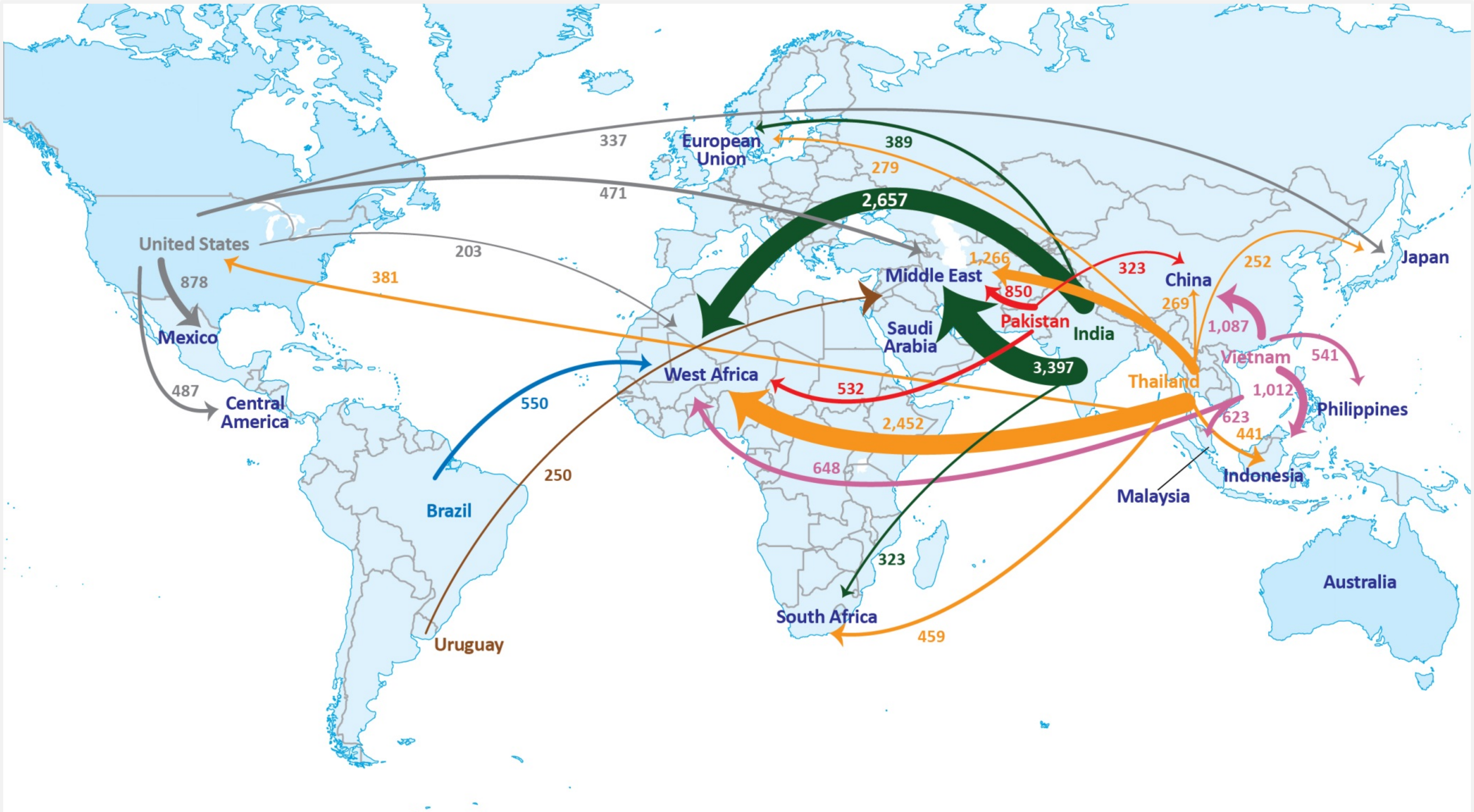
Source: GTIS, Global Trade Atlas database (accessed March 5, 2015).
Notes: As a result of data discrepancies, this table (1) uses GTIS mirror data (which incorporate information from the Global Trade Atlas and UN Comtrade) for imports by Egypt in 2012–13 and by Uruguay in 2007-13, and (2) excludes imports by Madagascar, and Mozambique which combined accounted for 2 percent or less of total imports. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods. Total trade volumes and values are not equal between tables 2.2, 2.3, and 2.4 because of the inclusion of unofficial trade data in some tables and the exclusion of certain country data, as noted.

Box 2.2: Rice trade data limitations

Rice trade data have several limitations that complicate analysis. Rice trade is highly segmented by form, grain length, quality, and other characteristics. However, rice trade data are harmonized at the global level only by form (paddy, brown, milled, or broken rice). This means that information about grain length, quality, and other characteristics are not uniformly available for all countries. There are several major importing and exporting countries (e.g., Burma, Haiti, Nigeria, Vietnam) that either do not report trade data to Global Trade Information Services Inc.'s Global Trade Atlas or to the UN Comtrade database, or that have missing or lagged data (e.g., Nigeria). For the non-reporting countries, no data are available on bilateral trade flows if the partner country also does not report. There is also a large amount of unofficial or "gray trade" in rice that is not included in official trade statistics. These constraints make it difficult to quantify exports and imports and to analyze trade trends.

Because of these challenges, trade data were used from different sources—the Global Trade Atlas, the USDA's PSD Online, the UN Food and Agriculture Organization statistics (FAOSTAT), UN Comtrade, and industry sources—and some calculations and estimates were made by Commission staff. Each source has benefits and limitations. PSD Online data do not include bilateral trade flows or trade values, but they include trade estimates for some non-reporting countries and account for quantifiable rice gray trade. FAOSTAT data were lagged and do not include data for 2012–13 or bilateral trade flows, but do include data for non-reporting countries and trade values. Analysis is based on the most appropriate data available for the type of analysis performed. See appendix F for additional details and comparisons of trade data from different sources.

Figure 2.8: Rice (HS 1006): Major global trade flows, 2011–13 (1,000 mt)



Source: USITC staff calculations utilizing GTIS, Global Trade Atlas database (accessed May 27, 2014).
Note: This map depicts global trade flows over 200,000 mt based on a three-year average (2011–13).

America. Southeast Asian exporters (Burma, Cambodia, Thailand, and Vietnam) shipped mostly within the Southeast Asian region and to West Africa, East Asia, and the Middle East (chapter 8). Logistical advantages likely supported exports to countries in Southeast Asia and East Asia, and competitive pricing and consumer preferences may have boosted shipments to West Africa and the Middle East. Exports from North America (virtually all originating from the United States) and South America (Brazil and Uruguay) had diverse destinations, including North, Central, and South America, West Africa, the Middle East, and East Asia. Logistical advantages and consumer preferences encouraged shipments to countries in the Americas.

Rice imports are dispersed across many countries, with the top 10 importers taking in less than half of annual global imports between 2007 and 2013.[114] West Africa, the Middle East, and East Asia were the top importing regions (figure 2.8). As noted, consumption outpaced production in West Africa and the Middle East, prompting imports. In East Asia, government policies largely determined import amounts. North America, Southeast Asia, South America, and the EU were also significant trading markets, although, except for the EU, a large portion of imports originated from countries within the same region.

Despite the highest levels of government involvement and market segmentation, global trade increased between 2007 and 2013. Export volumes grew by nearly one-quarter, from 32 million mt to 39 million mt.[115] Rising prices pushed export values even higher, nearly doubling; from $14 billion to almost $26 billion.[116] The expansion of trade reflects higher global rice consumption within rice-deficit countries, prompted by population and income growth. At the same time, production in exporting countries expanded, and export values rose more than quantity because of a nearly 60 percent increase in average annual rice prices between 2007 and 2008.[117] The price jump, often referred to as "the 2007–08 rice crisis," can be attributed to a variety of government actions that were intended to ensure adequate rice supplies for consumers and to protect both domestic consumers and producers from price volatility in a time of perceived rice shortages.[118] Prices tempered and stabilized in the following four years, then dropped in 2013. Nonetheless, they remained well above previous levels (table 2.2).

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[114] USDA, PSD Online (accessed November 17, 2014).
[115] Calculated by USITC based on data from GTIS, Global Trade Atlas database (accessed September 2, 2014); USD PSD Online (accessed August 26, 2014); FAO, FAOSTAT database (accessed August 26, 2014).
[116] Ibid.
[117] Short-term price spikes for specific rice segments were even higher than the annual price increase, estimated as high as 150 percent in four months by some sources. Clarete, Adriano, and Esteban, "Rice Trade and Price Volatility," September 2013, 1. The increase in average annual rice prices is calculated by USITC based on data from GTIS, Global Trade Atlas database (accessed September 2, 2014); USDA, PSD Online (accessed August 26, 2014); FAO, FAOSTAT (accessed August 26, 2014).
[118] Slayton, *Rice Crisis Forensics*, March 2009, 2; John, "Price Relations," 2014, 2; Heady, *Rethinking the Global Food Crisis*, March 2010, 3.

Trends in Global Trade

Global Exports

Global rice exports trended upward during 2007–13 (table 2.3). Between 2007 and 2009, export quantities were relatively stable. They then grew 12 percent annually during 2010–12 to reach a historic high of 40 million mt before falling slightly in 2013. Much of the growth resulted from the removal of Indian export restrictions, Vietnamese expansion, and the reemergence of Burma and Cambodia onto the global market (chapters 7 and 8). Between 2007 and 2013, all major exporters saw growth, albeit at different rates, with the exception of Thailand. Thai rice exports fell sharply in 2011 because of the Thai Paddy Pledging Program and ended the period below 2007 levels (chapter 8).

Table 2.3: World: Exports of rice (HS 1006), 2007–13

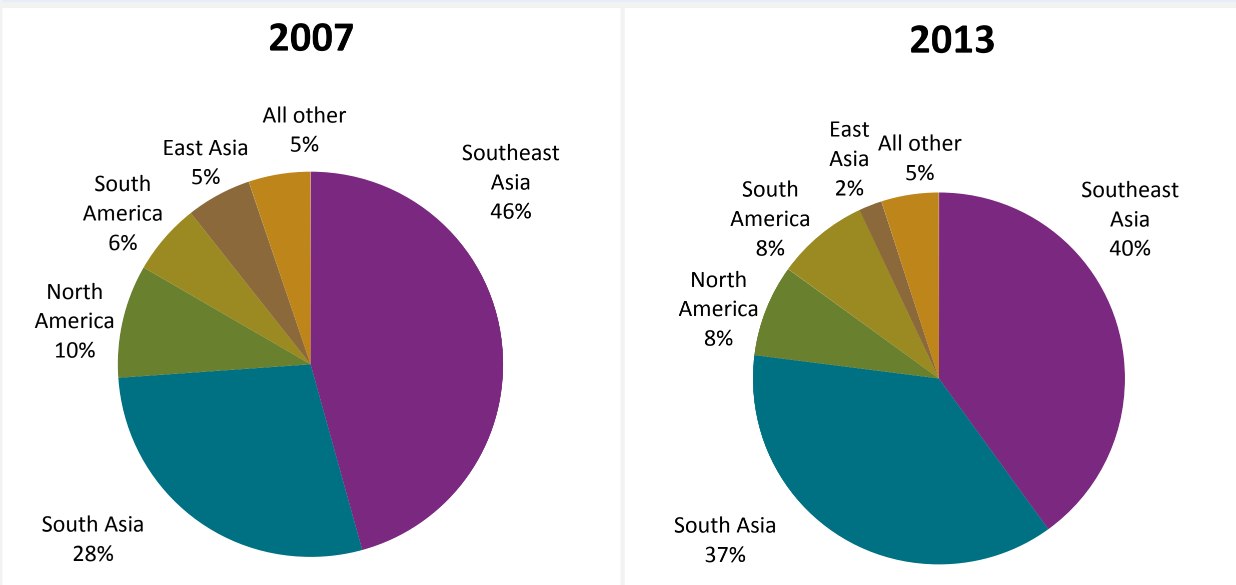
Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
India	6,177	3,519	2,152	2,229	4,752	10,550	10,591
Vietnam	4,558	4,679	6,053	6,754	7,105	7,720	6,681
Thailand	9,193	10,216	8,620	8,940	10,712	6,734	6,612
Pakistan	2,702	3,050	3,210	4,205	3,414	3,424	3,849
United States	3,480	3,809	3,448	4,475	3,717	3,782	3,763
Burma	31	541	1,052	700	1,075	1,357	1,163
Cambodia	460	315	820	750	860	900	1,075
Brazil	201	518	602	430	1,351	1,153	918
Uruguay	809	745	1,003	792	929	1,079	915
China	1,340	969	783	619	515	279	478
All other	2,966	1,209	1,654	1,896	2,140	2,973	3,386
Total	31,917	29,570	29,397	31,790	36,570	39,951	39,431
				Value (million $)			
India	2,360	2,891	2,392	2,298	3,857	6,129	7,476
Vietnam	1,490	2,663	2,464	2,912	3,507	3,450	2,893
Thailand	3,732	6,186	5,026	5,340	6,370	4,608	4,355
Pakistan	1,146	2,440	1,774	2,277	2,062	1,882	2,111
United States	1,389	2,206	2,178	2,331	2,113	2,049	2,183
Burma	10	176	322	231	449	535	363
Cambodia	161	126	566	509	524	638	768
Brazil	53	312	268	163	613	546	401
Uruguay	284	444	461	387	471	564	509
China	482	482	523	416	427	272	417
All other	2,628	2,153	3,132	2,890	2,794	3,372	4,451
Total	13,735	20,079	19,106	19,754	23,187	24,045	25,927

Sources: GTIS, Global Trade Atlas database (accessed March 5, 2015); USDA, PSD Online (accessed March 5, 2015); Vietnam Food Association, Yearly Export Statistics (accessed September 8, 2014); FAO, FAOSTAT database (accessed September 8, 2014); USITC calculations.
Note: For a detailed explanation of data sources see appendix F.

Global exports are highly concentrated, but market shares shifted among producing regions between 2007 and 2013 (figure 2.9). In both 2007 and 2013, nearly 80 percent of exports were from Asia (primarily Southeast Asia and South Asia), largely because this is where the majority of rice is produced and consumed (appendix E). Between 2007 and 2013, Southeast Asia was the world's largest exporting region, with four of the world's leading exporters: Thailand, Vietnam, Burma, and Cambodia. However, in that period, Southeast Asia lost export share to South Asia, the second largest exporting region, as exports from Thailand fell and Indian exports rose (chapters 7 and 8).

Most remaining global exports are from the Americas. North America and South America together accounted for 16 percent of exports in 2007 and 2013 (figure 2.9). The United States, Brazil, and Uruguay are the major suppliers for the Western Hemisphere and also export to Middle Eastern, African, and Asian markets. Between 2007 and 2013, however, North America lost market share, while South America's share expanded. Although export quantity increased between 2007 and 2013 for both regions, North America's growth was slower than that of South America.

Figure 2.9: Rice: Share of global export quantity, 2007 and 2013



Source: USDA, PSD Online (accessed November 18, 2014).

Global Imports

Like exports, global imports trended upward between 2007 and 2013 (table 2.4). Import quantities dipped slightly between 2007 and 2009, then grew by over one-quarter during 2010–12 to reach a record 37 million mt in 2012. In 2013, quantity leveled off slightly. While import values also trended upward, their growth differed from quantity growth because of large

Table 2.4: World: Imports of rice (HS 1006), 2007–13

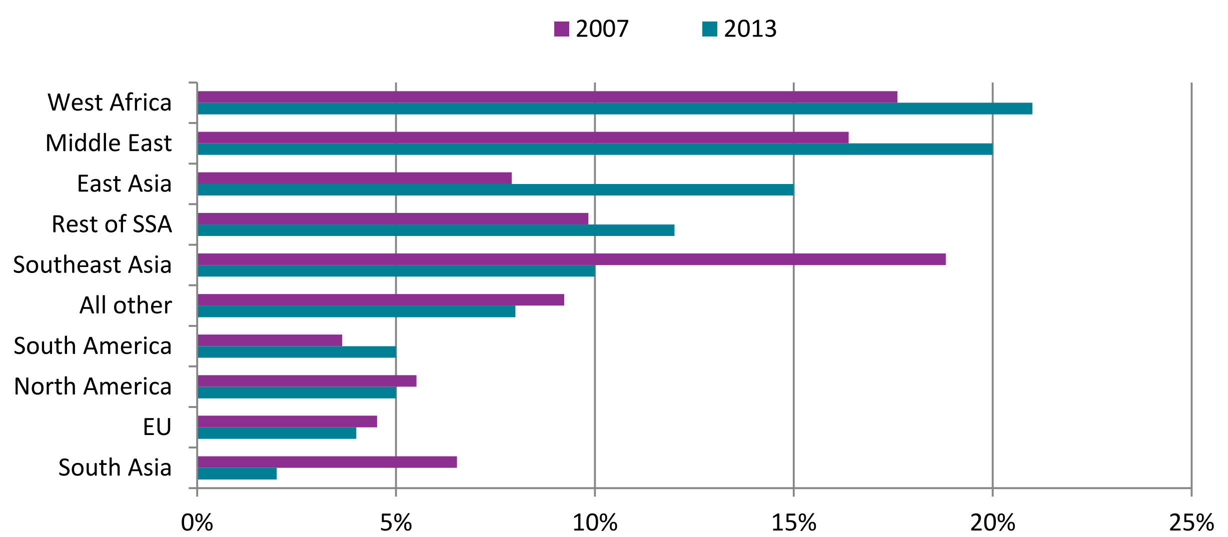
Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
China	472	295	337	366	575	2,900	3,483
Nigeria	1,550	1,800	2,000	2,000	2,550	3,400	2,400
Iran	1,460	1,430	1,470	1,520	1,870	1,500	2,220
EU	1,461	1,646	1,484	1,315	1,615	1,393	1,448
Iraq	736	1,052	1,100	1,123	1,021	1,386	1,304
Saudi Arabia	987	1,243	1,331	1,302	1,123	1,225	1,272
South Africa	963	653	748	733	886	1,296	1,265
Philippines	1,900	2,500	2,000	2,400	1,200	1,500	1,000
Mexico	823	798	822	842	947	849	932
Senegal	1,087	863	715	686	805	918	902
Côte d’Ivoire	809	757	1,106	838	935	1,268	803
Japan	643	597	671	664	742	630	692
United States	683	633	664	543	603	626	659
Indonesia	2,000	350	250	1,150	3,098	1,960	650
All other	14,213	13,864	12,410	13,809	16,058	16,373	17,448
Total	29,787	28,481	27,108	29,291	34,028	37,224	36,478
				Value (million $)			
China	218	183	201	253	384	1,392	1,633
Nigeria	498	1,242	1,050	796	1,237	1,688	978
Iran	612	1,353	1,389	1,297	1,565	1,422	2,473
EU	770	1,433	1,138	1,022	1,257	1,077	1,205
Iraq	304	589	570	587	561	838	837
Saudi Arabia	626	1,495	1,373	1,310	1,125	1,084	1,387
South Africa	302	464	459	426	497	679	651
Philippines	624	1,827	1071	1,508	599	573	391
Mexico	248	371	345	320	377	370	436
Senegal	357	518	336	271	365	394	377
Côte d’Ivoire	319	457	589	450	555	677	472
Japan	363	414	616	506	581	469	500
United States	385	545	588	574	631	659	735
Indonesia	665	150	108	603	1,704	1,024	338
All other	7,726	11,764	10,115	10,267	11,350	10,488	12,472
Total	14,017	22,805	19,948	20,190	22,788	22,834	24,885

Sources: GTIS, Global Trade Atlas database (accessed March 5, 2015); USDA PSD Online (accessed March 5, 2015); Vietnam Food Association, Yearly Export Statistics (accessed September 8, 2014); FAO, FAOSTAT database (accessed September 8, 2014); and USITC calculations.
Note: For a detailed explanation of data sources see appendix F.

fluctuations in global rice prices. Between 2007 and 2008, values rose by nearly two-thirds, despite a dip in volume because of higher prices associated with the 2007/08 rice crisis (see chapter 3 for more detail). In 2009, values fell by 13 percent because of both lower rice prices and lower import quantities. Between 2009 and 2013, import volumes grew by 6 percent a year and prices were relatively stable, pushing import values to a record $24.9 billion in 2013 (table 2.4).

Unlike global rice exports, which are highly concentrated, rice imports are widely dispersed among regions and countries.[119] There are many countries that rely on imports to meet consumer demand, for a variety of possible reasons, including: (1) they are not major rice producers but are important consumers; (2) rice consumption is growing faster than rice production; (3) they are major rice producers and consumers that face occasional production shortfalls; or (4) they have trade obligations for a minimum quantity of imports. The leading importing regions are West Africa, the Middle East, East Asia, and sub-Saharan Africa (excluding West Africa) (figure 2.10). North America, South America, and the EU are also important importing regions.

Figure 2.10: Rice: Share of global import quantity, 2007 and 2013



Source: USDA, PSD Online (accessed August 13, 2014).
Note: Rest of SSA is sub-Saharan Africa excluding West African countries.

Between 2007 and 2013, there were strong shifts in some regional shares of global rice imports for West Africa, Southeast Asia, and East Asia, while other regional shares were more stable (figure 2.10). West Africa and the Middle East were among the top three importing regions throughout 2007–13.[120] For West Africa, import share fluctuated between 18 and 23 percent, with slow import volume growth between 2007 and 2011. In 2012, the share jumped to nearly 25 percent, mainly because of higher Nigerian imports, then fell back to 20 percent when Nigerian imports fell again in 2013. The Middle East's share was fairly steady throughout 2007–13, ranging from 16 to 20 percent as import quantity steadily rose to meet growing consumption demand.

[119] The top 10 importing countries accounted for less than half of global imports during 2007–13, compared to more than 90 percent for the top 10 exporters. USDA, PSD Online (accessed November 20, 2014).
[120] USDA, PSD Online (accessed November 18, 2014).

Southeast Asia was one of the top three importing regions between 2007 and 2011, with 16 to 19 percent of imports. Between 2011 and 2013, however, its share dropped by half as countries pursued self-sufficiency policies, falling to 10 percent in 2013.[121] The East Asian share grew from 8 percent in 2007 to 15 percent in 2013, mainly because of higher Chinese imports (chapter 6). Between 2007 and 2012, the share of sub-Saharan Africa (excluding West Africa) was stable, averaging 9 percent, before increasing slightly to 12 percent in 2013.[122] North America, South America, and the EU each maintained relatively stable import shares of about 5 percent each during 2007–13.

West Africa

During 2007–10, West Africa was one of the top three rice-importing regions in the world, and it was the world leader during 2011–13.[123] Imports accounted for a large portion of rice consumption in this rice-deficit region.[124] Rice consumption grew because of rising incomes, population growth, and rice's ease of preparation. Nigeria was the region's largest importer and accounted for between 30 and 40 percent of imports between 2007 and 2013.[125] It was also the world's leading rice importer in 2009, 2011, and 2012 (table 2.4). Nigeria is a major consumer of parboiled rice, and its consumption growth outpaced production, encouraging imports.[126] Government efforts to expand domestic production included limiting competition from imported rice. However, growth in import quantity (including unofficial imports) averaged 17 percent a year between 2007 and 2012 before falling by 30 percent in 2013 (table 2.4).

Other major importing countries in the region were Senegal, Côte d'Ivoire, and Ghana.[127] Between 2007 and 2013, regional import shares for Senegal and Côte d'Ivoire trended slightly downward, while those for Ghana trended marginally higher.[128] There is substantial unofficial trade in the area in an attempt to avoid restrictive and varying tariff and nontariff measures. Nearly 90 percent of imports were sourced from South Asian or Southeast Asian countries, while most of the remaining 10 percent were from North and South America, primarily Brazil and the United States.[129]

[121] USDA, PSD Online (accessed November 18, 2014).
[122] Ibid.
[123] Ibid.
[124] West Africa also receives food aid in the form of rice; however, annual average volumes are small compared to imports. During 2007–12 West Africa's food aid shipments averaged 184,000 mt annually, while imports averaged 6.2 million mt annually. WFP, Food Aid Reporting System database (accessed April 2, 2015); USDA, PSD Online (accessed April 2, 2015).
[125] Note that Nigeria trade includes gray market trade. USDA, PSD Online (accessed November 18, 2014).
[126] U.S. government official, interview by USITC staff, Washington, DC, June 19, 2014.
[127] USDA, PSD Online (accessed November 18, 2014).
[128] Ibid.
[129] GTIS, Global Trade Atlas database (accessed November 20, 2014).

Middle East

Between 2007 and 2013, the Middle East was one of the world's top three importing regions.[130] Its share of world imports fluctuated between 16 and 20 percent, but import quantity grew steadily, averaging 7 percent growth a year.[131] The major importers in the Middle East were Iran, Iraq, and Saudi Arabia. Iran led the region's imports throughout the period; between 2007 and 2010, its import quantities were stable.[132] However, during 2011–13, Iran's imports were more erratic, rising by 23 percent in 2011, falling by 20 percent in 2012, and jumping by nearly half to record levels in 2013.[133] Saudi Arabia and Iraq each accounted for around 20 percent of regional imports during 2007–13. Both countries had slightly upward-trending import volumes, mostly resulting from rising rice demand and limited production.[134] Imports of aromatic basmati rice supplied by South Asia are increasing in Saudi Arabia and Iraq.[135] Over 80 percent of Middle Eastern imports originated from South and Southeast Asian countries, with most of the remainder supplied by the North and South America.[136]

Southeast Asia

In addition to being the world's largest rice-exporting region, Southeast Asia was also a significant importer between 2007 and 2013 (figure 2.10). In fact, in 2007 it was the top importing region in the world, and it maintained an average 18 percent share of world imports between 2007 and 2011.[137] Its share then dropped to 10 percent in 2013 as import quantities fell.[138] The rice self-sufficiency policies and annual production of major importing countries (the Philippines and Indonesia) affect import annual volumes (chapter 9). The majority of Southeast Asian imports are from exporters within the region, such as Thailand and Vietnam (chapter 8).[139]

East Asia

Between 2007 and 2013, East Asia's share of global rice imports nearly doubled primarily because of rapidly growing Chinese imports between 2011 and 2013 (figure 2.10).[140] During this

[130] USDA, PSD Online (accessed November 18, 2014).
[131] Ibid.
[132] Ibid.
[133] Ibid.
[134] Ibid.
[135] USDA, FAS, *Saudi Arabia: Grain and Feed Annual, 2014*, February 20, 2014, 15; USDA, FAS, *Iraq: Grain and Feed Annual*, April 19, 2012, 6.
[136] GTIS, Global Trade Atlas database (accessed November 20, 2014).
[137] USDA, PSD Online (accessed November 18, 2014).
[138] Ibid.
[139] During 2007–11, Southeast Asia imported 90 percent of its rice from Southeast Asian exporters. In 2012–13, that share was 78 percent on average.
[140] USDA, PSD Online (accessed November 18, 2014).

time, China transitioned from being a net rice exporter to the world's largest importer (chapter 6).[141] Other significant regional importers were Japan and South Korea. Both of these countries had stable rice import volumes in line with minimum market access (MMA) commitments (see below for additional details).

North America

North America's share of global imports averaged 5 percent during 2007–13.[142] Mexico and the United States each accounted for about 40 percent of the region's imports on average, and Canada for about 20 percent.[143] The United States is the largest supplier to Mexico and Canada, while it imports rice primarily from Southeast and South Asia (chapter 11).

International Tariff Treatment for Rice

Rice is one of the most protected food commodities in the world.[144] Many major rice-consuming countries shield their domestic rice industries from the international market through a variety of tariff measures, including high and restrictive tariffs, variable levies, tariff-rate quotas (TRQs),[145] World Trade Organization (WTO)-negotiated MMA quotas, and import licensing requirements. While barriers have been reduced through WTO multilateral and bilateral agreements, significant obstacles to trade remain.

Tariffs

Most-favored-nation tariffs

Tariffs and TRQs in key importing countries have caused major distortions in the global rice market.[146] Applied rates on white rice (HS 1006.30), the most commonly traded form, vary widely by region and country.[147] In West Africa, a rice-deficit region, most countries had applied tariffs between 5 and 20 percent on white rice in 2013.[148] However, Nigeria, the region's leading importer, had a tariff of 110 percent that year (table 2.5). In the Middle East, another rice-deficit region, white rice enters most countries duty free; however, Iran, a major importer,

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141 During 2007–11, China accounted for an average of 20 percent of the East Asian imports. However, in 2012 China accounted for 49 percent of the East Asian imports and by 2013 it reached 68 percent. While USDA estimates account for some unofficial trade, if all of China's unofficial "gray market" imports from Vietnam, Burma, and Cambodia were quantifiable it would be likely that actual Chinese imports are even larger.

142 USDA, PSD Online (accessed November 18, 2014).

143 Ibid.

144 Wailes, *Tariff Escalation*, August 2004, 3.

145 A TRQ has one tariff for in quota imports (i.e., imports within a set quantity limit), and a second, higher, tariff for imports that exceed the quota.

146 Pandey et al., *Rice in the Global Economy*, 2010, 366.

147 WTO Tariff Download Facility database (accessed June 24, 2014, and January 10, 2015).

148 Over half of the region's countries had duties of 10 percent.

had a 45 percent duty in 2013. In Southeast Asia, there were two distinct country groups: countries with high tariffs (40 to 50 percent) and countries with low tariffs (duty free to 7 percent). In both groups there seems little correlation between tariff levels and whether or not a country was rice deficit.[149] North America has the lowest applied white rice duties; white rice entered Mexico and Canada duty free, while the United States applied duties of 1 or 11.2 percent, depending on the type of white rice. Central American countries had relatively high tariffs, generally ranging from 23.7 to 60 percent. Costa Rica had the lowest tariffs on white rice (17.5 percent) in the region. It is also worth noting that many countries, especially in East Asia, have nontariff trade measures in place (such as import permits, state trading, and MMA agreements) that restrict imports, even when their applied tariff rates are low.

Tariffs vary by level of processing for some countries, which affects the form of rice traded (table 2.5). The EU and a number of countries in Central and South America use tariff escalation (lower applied MFN tariff rates for (unprocessed) paddy rice and/or brown rice compared with (processed) white rice) to protect their domestic milling industries.[150] For example, in Nicaragua, the applied MFN rate for white rice was 60 percent, compared to 22.5 percent for paddy rice. This encouraged larger imports of paddy rice (from the United States, Brazil, and Uruguay) for milling in the importing country. Similarly, the EU has higher duties on white rice than on paddy rice—€416 ($553) per mt, compared with €211 ($280) per mt—while duties on brown basmati rice from India and Pakistan are zero.[151]

Tariff levels also vary by grain length. Markets for medium and short grain rice have the highest degree of protection.[152] This is largely because of TRQs and MMA agreements in key markets for these types of rice (Japan, South Korea, and Taiwan).[153] In 2000, trade-weighted average rice tariffs were estimated at 217 percent for short grain and medium grain markets, compared with 21 percent for long grain markets.[154]

[149] Malaysia, the Philippines, Thailand, and Vietnam were in the high tariff group while Brunei, Cambodia, Indonesia, Laos, Burma, and Singapore were in the low tariff group.
[150] Pandey et al., *Rice in the Global Economy*, 2010, 366.
[151] Rakotoarisoa, *Policy Distortions in the Segmented Rice Market*, May 2006, 13; IMF, IFS database: Exchange Rate Query (accessed January 13, 2015). Exchange rate based on annual average for 2014.
[152] Pandey et al., *Rice in the Global Economy*, 2010, 366.
[153] Ibid.
[154] Wailes, *Rice Global Trade*, 2004.

Table 2.5: Rice: MFN applied and bound duties for selected major importing regions and countries, 2013 (percent)

	HS 1006.10 (Paddy)		HS 1006.20 (Brown)		HS1006.30 (White)		HS1006.40 (Broken)	
Region/country	**Applied**	**Bound**	**Applied**	**Bound**	**Applied**	**Bound**	**Applied**	**Bound**
West Africa								
Côte d'Ivoire	5	15	10	15	10	15	10	15
Ghana	10	99	20	99	20	99	20	99
Nigeria[a]	5	150	40	150	110	150	10	150
Senegal	5	30	10	30	10	30	10	30
Rest of Sub-Saharan Africa								
South Africa	0	0	0	0	0	0	0	0
Middle East								
Iran[b]	45	[c]	45	[c]	45	[c]	4	[c]
Iraq[d]	5	[c]	5	[c]	5	[c]	5	[c]
Saudi Arabia	0	5	0	7	0	5	0	7
East Asia								
China	1/65	65	1/65	65	1/65	65	1/65	10
Japan	0/9	62	0/38	266	0/46	319	0/48	336
South Korea	5	[c]	5	[c]	5	[c]	5	[c]
Southeast Asia								
Indonesia[e]	1	160	4	160	7	160	11	160
Malaysia	40	40	40	40	40	40	27.5	27.5
Philippines[f]	40/50	35	40/50	35	40/50	35	40/50	35
North America								
Mexico	0	9	0	45	0	45	7.0	45
United States	2	2	1 or 2	1 or 2	1 or 11.2	1 or 11.2	1	1
Central America								
Costa Rica	23.3	40	35	35	17.5	35	35	35
Honduras	22.5	40	45	45	45	45	45	45
Nicaragua	22.5	50	60	60	60	60	60	60
EU[g]	27	27	8	33	21	49	32	32

Source: WTO Tariff Download Facility database (accessed June 24, 2014, and January 10, 2015); ITC, Market Access Map (accessed August 19, 2014); GTIS, Global Trade Atlas database (accessed April 3, 2015); IMF, IFS database: Exchange Rate Query (accessed April 3, 2015); Government of Iraq , Ministry of Finance, Public Commission of Customs (accessed August 19, 2014); USDA, FAS, *Nigeria: Grain and Feed Annual*, May 21, 2013, 12; Government of China, MOFCOM, Schedule CLII, 62; Government of the Philippines, Tariff Commission, Philippine Tariff Finder Database (accessed April 3, 2015); WTO, Council for Trade in Goods, Request for Waiver, March 27, 2014, 1; Fukuda, Rice Sector Policies in Japan, March 2003, 12.

Note: Duties shown are ad valorem (AV) or on an ad valorem equivalent (AVE) basis. Specific tariffs were converted to an AVE basis using 2013 trade data and exchange rates. China, Japan, South Korea, the Philippines, and the EU all have TRQs. For China, Japan, and the Philippines, TRQ duty rates have been indicated under the applied tariff columns as in-quota duty/out-of-quota duty. South Korea did not have an over-quota duty rate in 2013. MFN=most favored nation.

[a] In 2013, the applied rate was 10 percent for HS 1006.20 and HS 1006.30 was 10 percent, however, Nigeria had an additional 30 percent levy on HS 1006.20 and additional 100 percent on HS 1006.30.

[b] Data from 2011.

[c] Not applicable.

[d] No year specified.

[e] Applied AVE for HS 1006.20 is based on 2012 because there were no imports of this HS in 2013.

[f] MMA waiver allows applied rates to be above bound rates.

[g] In addition, the EU has a number of country specific TRQs with varying tariff rates. See, e.g. EC, DG Agriculture and Rural Development, "The EU Rice Regulatory Regime," February 2015, 6-7.

Upon the expiration of their quantitative restriction agreements with the WTO, Japan (1999), Taiwan (2003), and most recently South Korea (2015) converted to TRQs with negotiated quota levels. The Philippines negotiated an extension through June 2017 in exchange for raising its MMA commitment to 805,000 mt from 350,000 mt.

Special access tariffs

Global rice trade is influenced by special access tariffs, such as the EU's Generalised Scheme of Preferences–Everything but Arms (EBA) agreement and bilateral free trade agreements. Through its EBA agreement, the EU grants zero-duty access to rice from a number of least-developed countries (LDCs), including Cambodia and Burma. This has resulted in growing EU imports from those countries, raising protests from Italian rice producers (see chapter 8 for additional details on Cambodian and Burmese exports). The EU also offers zero-duty access to a number of former colonies of EU member states. In addition, the United States received zero-duty access to Mexico through the North American Free Trade Agreement (NAFTA), which gave an added advantage to U.S. rice until 2008, when Mexico suspended its 20-percent duty on white rice from all origins. However, effective January 2015, the Mexican government reimposed import duties on rice from non-NAFTA countries.[155] The United States also has duty-free access to Central American markets under the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR).[156]

TRQs and State Trading

Nontariff measures also have distorting effects on global rice trade. These measures are often used to protect domestic rice industries and can prove even more restrictive than tariffs. Examples of nontariff measures include quantity commitments through WTO exemptions, TRQs, and government involvement in trading, such as through import permit requirements and state trading.

WTO exemptions and quantity commitments

A few major rice-consuming countries have negotiated WTO MMA agreements which allow them to maintain import quotas for rice.[157] Under WTO rules, MMA import quotas are established for a certain period of time, after which they are replaced by TRQs (table 2.6).[158] For example, in 1999 Japan converted its MMA import quota to a TRQ administered through

[155] USDA, FAS, *Mexico: Grain and Feed Update*, January 15, 2015, 4–5.
[156] USTR, Free Trade Agreements, https://ustr.gov/trade-agreements/free-trade-agreements (accessed February 3, 2015).
[157] MMAs were negotiated as part of the WTO's 1994 Uruguay Round Agreement. They can also be negotiated in a country's WTO accession agreement.
[158] FAO, *Agricultural Commodities: Profiles and Relevant WTO Negotiating Issues*, 2003, 72.

Table 2.6: Rice (HS 1006): 2014 Minimum market access commitments and TRQ levels

Country	MMA requirement or TRQ level	MMA or in-quota tariff rate	Out-of-quota tariff rate[a]	MMA expiration date	Country specific quota allocations
	mt	%	%		
Japan	682,000	0	486	1999	No
Philippines	805,000	35	50	June 30, 2017	Yes
South Korea	408,700	5	[b]	December 31, 2014	Yes
Taiwan	126,000	0	222	2003	Yes

Source: Fukuda, Dyck, and Stout, *Rice Sector Policies in Japan*, March 2003, 12; USDA, ERS, *Market Access and Domestic Policies for Rice* (accessed March 20, 2015); WTO, Request for Waiver Relating to Special Treatment for Rice of the Philippines, March 27, 2014, 5–6; Tobias, *Handbook on Rice Policy for Asia*, 2012, 20; USITC staff calculations using IMF, IFS database: Exchange Rate Query, 2014 (accessed March 20, 2015) and GTIS, Global Trade Atlas (accessed March 19, 2015).

[a] Japan and Taiwan's out-of-quota tariffs are AVEs for 2014 based on USITC staff calculations. Japan's out-of-quota tariff was converted from yen per kg using an exchange rate of ¥105.63 per U.S. dollar. Taiwan's out-of-quota tariff was converted from New Taiwan dollars per kg using an exchange rate of NT 30.30 per U.S. dollar.

[b] Not applicable for 2014. For 2015, proposal pending at WTO for over-quota tariff of 513 percent.

tenders,[159] while in 2003 Taiwan converted its MMA quota to two TRQs, one dedicated to private sector trade and the other for use by its public trading entity.[160] The MMA import quota established by South Korea expired in 2004, but was extended to the end of 2014 when it was converted into a TRQ. South Korea's MMA import quota had global and country-specific quota allocations which increased over time.[161] Finally, in 2014, the Philippines negotiated an extension of its MMA import quota for rice until 2017. This quota has both global and country-specific quota allocations.[162]

State trading

A number of major rice-consuming countries in East and Southeast Asia, as well as the EU, control imports through TRQs and state trading. In East Asia, China, Japan, South Korea, and Taiwan all have TRQs with high out-of-quota tariffs. In-quota imports for these countries are

[159] Japan does not have country-specific allocations for its TRQ. However, its tenders are sometimes restricted to specific countries. Fukuda, Dyck, and Stout, *Rice Sector Policies in Japan*, March 2003, 12.

[160] In 2007, Taiwan established country-specific allocations for its public sector quota. USDA, FAS, *Taiwan Grain and Feed Annual,* April 19, 2013, 15-16.

[161] As a result of its 10-year WTO MMA agreement expiring on December 31, 2014, South Korea acted to convert its absolute quota to a TRQ for 2015. South Korea's MMA agreement prescribed that the resulting TRQ be globalized, and the country specific allocations be terminated. South Korea notified the WTO on September 20, 2014, of its intention to establish a globalized TRQ, as set forth under the MMA, of 408,700 mt and and over-quota tariff of 513 percent. The United States filed a reservation in Geneva on December 23, 2014, indicating that it was reserving its position with respect to South Korea's proposed rectification and modification of its tariff schedule. The United States will continue to engage South Korea on the issue. Four other countries (Australia, China, Thailand, and Vietnam) have also requested consultations with South Korea regarding the proposal. USDA, FAS, *Republic of Korea Grain and Feed Update*, January 28, 2015, 11; USDA, ERS, *Market Access and Domestic Policies for Rice* (accessed March 20, 2015); U.S. government officials, emails to USITC staff, March 27, 2015; Yonhap News Agency, "S. Korea set to begin talks," January 6, 2015.

[162] WTO, "Request for Waiver Relating to Special Treatment for Rice of the Philippines," March 27, 2014, 5-6. See chapter 9 for more information on Philippine imports.

administered by government agencies or state commodity trading boards, often through tenders, country-specific quotas, or import certificates. In Southeast Asia, the Philippines has MMA requirements under which only the National Food Authority (NFA), a government entity, and private entities with import permits issued by the NFA are allowed to import rice (chapter 9). While Indonesia does not have TRQs, imports are conducted by the government through the Indonesian Bureau of Logistics (BULOG). BULOG is the only entity allowed to import medium-quality rice, the most commonly consumed rice in the country (chapter 9).

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Chapter 3
Overview of Global Rice Prices

Introduction

Prices for basic foodstuffs such as rice have real economic implications, particularly for developing countries, as they can affect balance of payments, inflation, and poverty, and even lead to riots and political unrest.[163] For many low-income consumers, rice accounts for a high share of household expenditures, so large increases in prices can severely harm their purchasing power and lead to food insecurity.[164] Because rice is the primary staple food throughout much of Asia and an important food in other regions such as West Africa, rice prices are a very sensitive political issue.

As a result, governments of several major rice-consuming and -producing countries intervene in their domestic rice markets with pronounced effects on global market price levels and volatility.[165] For instance, several countries have enacted a variety of policies with the explicit goal of becoming more self-sufficient and stabilizing rice prices and supplies for consumers, producers, or both.[166] While these actions sometimes succeed in keeping domestic prices stable, they often do so by shifting price volatility to the world market. The shift distorts price signals to producers, and harms other consuming countries that do not have price stabilization policies.[167] The distorted price signals affect how farmers see their opportunity costs of planting rice, inducing them to either over- or under-produce, depending upon the price signal.[168] Consequently, researchers have found that relative to other grains, world prices for rice have

[163] Roache, "What Explains," May 2010, 2; Gilbert and Morgan, "Food Price Volatility," September 2010, 3028; Dawe and Timmer, "Why Stable Food Prices," December 2012, 131.
[164] Dawe and Timmer report that rice often accounts for 25–40 percent of household expenditures of poor consumers in Asian countries. Dawe and Timmer, "Why Stable Food Prices," December 2012, 129–30.
[165] One analysis estimated that 45 percent of the movement in international rice prices over the period 2005–08 was due to border policies intended to stabilize domestic prices, with up to 90 percent of the price increase in 2008 alone linked to protection measures. Martin and Anderson, "Export Restrictions," November 2011, 425.
[166] Dawe and Timmer, "Why Stable Food Prices," December 2012, 129–31; industry representative, telephone interview by USITC staff, Washington, DC, October 15, 2014.
[167] Galtier adds that rigid price stabilization policies "prevent prices from playing their informational role . . . , prevent the market from functioning and would lead to all adjustments being made by public intervention." See Galtier, "Managing Food Price Instability," April 2013, 52; Gilbert, "Grains Price," 2011, 128–29; and Dawe and Timmer, "Why Stable Food Prices," December 2012, 128.
[168] Gilbert and Morgan, "Food Price Volatility," September 2010, 3028; Timmer, "Rice Price Formation," May 2009, 1.

less impact on efficient resource allocation for global production and trade. Instead, they tend to be driven by government programs inside major producing and consuming countries.[169]

This chapter first discusses market information in the global rice market and how incomplete information on rice prices may hamper efficiency in domestic and global rice markets. Next, it describes recent trends in global rice prices and explores factors behind these trends. Then, drawing from economic literature, the chapter explores certain domestic and international price relationships in order to get insight into the efficiency and competitiveness of the global rice market. Three major topics are covered. First, trends in price movements of rice from different exporting countries are analyzed to evaluate the extent to which exporters are competing with one another over the long run and the degree of global market integration. Second, economic literature on price leadership is reviewed to identify "world" or "benchmark" prices that are more likely to cause movements in other prices, and thus most strongly influence the global market. Third, economic literature is discussed on the extent to which domestic rice prices in major rice-producing and -consuming countries are driven by global benchmark prices, in order to gauge the efficiency (or lack thereof) of the global rice market.

Incomplete Market Information

Irrespective of the role governments play in affecting domestic prices, producers and consumers respond to the price signals they face. In global rice markets, accurate and timely information on prices is not always readily available. Access to accurate price and other rice market information is complicated by the way the sector is organized. Mostly based in developing nations, the industry is composed of millions of smallholder farmers, traders, brokers, and processors. In some countries, the rice value chain is short, while in others rice may change hands many times before reaching consumers. In addition, a large share of production in many countries is consumed locally and is not marketed commercially.[170] Furthermore, almost no data on inventory levels are available, even though rice can be stored for more than a year at virtually any link in the supply chain.[171] According to one industry observer, more widespread reporting of inventory levels could ensure that all decision makers have access to accurate information and help rationalize price expectations across actors.[172]

[169] Greb et al., "Price Transmission," September 2012, 16; Gilbert, "Food Reserves," September 2011, 7, 16; Gilbert, "Grains Price," 2011, 146–47.
[170] Timmer, "Rice Price Formation," May 2009, 1–2.
[171] Although both USDA and FAO post data on rice stocks, these are only estimates for most countries and are not based on surveys of inventories. Timmer, "Did Speculation Affect," 2010, 39.
[172] Galtier, "Managing Food Price Instability," April 2013, 74.

Global traders are also hindered by the fact that the rice market has few daily, freely available export price quotations from some of the largest exporting countries.[173] Moreover, the cash market for rice is often characterized by substantial information asymmetries between larger market players (such as trading houses and governments) and smaller market participants (other private traders).[174] Some industry observers have advocated for the creation of price-reporting systems in order to bring more transparency to market transactions.[175]

Futures markets help facilitate price discovery for most grains, but they play only a limited role in the rice market.[176] Rice futures are traded on very few exchanges, and existing contracts are either rendered obsolete by current government policies or apply to such a small portion of the rice market as to be of limited use as a tool for establishing prices globally (box 3.1).

Box 3.1: The role of futures markets in rice

Currently, there are four futures markets for rice. The Agricultural Futures Exchange of Thailand (AFET) hosts rice contracts for both long grain white rice and aromatic Hom Mali (jasmine).[a] However, these contracts have not been very successful; for the past several years, the government has offered minimum purchase prices that exceed international market prices, rendering the exchanges irrelevant.[b] Rice futures are also traded on China's Zhengzhou Commodity Exchange, but trading volumes are very small (estimated at around one-half of 1 percent of China's long grain production volume in 2011) due to high current government support prices.[c] Rice futures trading in Japan also resumed (on a trial basis) in 2011 on the Dojima Exchange, but traded volumes have reportedly been low there as well.[d]

Of all the existing contracts, the most active is the U.S. paddy rice futures contract on the Chicago Board of Trade (CBOT). However, traded volumes are much lower than for other grains contracts traded on CBOT, and the contract is widely regarded as an instrument for U.S. domestic use, with few impacts in the wider global market.[e]Analysis in 2011 estimated that Chicago paddy rice futures represented about 10 percent of the U.S. long grain crop that year, such that less than one-tenth of 1 percent of global rice production was covered in the U.S. futures market.[f]

Several observers have voiced the opinion that establishing a futures market for rice could aid pricing transparency and could act as an effective risk management tool.[g] There has been some support for setting up a rice futures contract on an existing commodity exchange—Singapore or Hong Kong, for instance.[h] However, in order for a futures market to be successful for rice, many outstanding issues would need to be addressed, including widespread government intervention in the rice market, the dominance of government sales in global rice trade, the lack of warehousing systems, and the lack of international standards for rice grades.[i]

[a] See the Agricultural Futures Exchange of Thailand, homepage, http://www.afet.or.th/2013/en/home/ (accessed November 10, 2014).
[b] Pochara, "Commodities Exchange," August 2012, 8.

[173] Timmer, "Did Speculation Affect," 2010, 57.
[174] McKenzie, "Prefeasibility Study," March 2012, 24.
[175] McKenzie, "Prefeasibility Study," March 2012, 46; industry observer, interview by USITC staff, Washington, DC, September 10, 2014.
[176] Timmer, "Did Speculation Affect," 2010, 45.

[c] McKenzie, "Prefeasibility Study," March 2012, 28, 41; industry representative, interview by USITC staff, Washington, DC, September 10, 2014.
[d] *Japan Times,* "Time Running Out," July 23, 2014.
[e] Gilbert, "Grains Price Pass-Through," 2011, 139; Timmer, "Did Speculation Affect," 2010, 45.
[f] McKenzie, "Prefeasibility Study," March 2012, 42. Author's calculation based on the following: In market year 2011/12, long grain represented an estimated 63 percent of the total U.S. rice crop (see USDA, ERS, "Table 1," March 28, 2014), such that the total U.S. long grain crop that year accounted for 0.76 percent of total world production (calculated using USDA, FAS, PSD Online, accessed October 9, 2014).
[g] Pochara, "Commodities Exchange," August 2012, 3–4; Hamilton, *When Rice Shakes*, 2014, 78–83; McKenzie, "Prefeasibility Study," March 2012, 47.
[h] Pochara, "Commodities Exchange," August 2012, 4; Hamilton, "Position Paper," March 2012, 1.
[i] Pochara, "Commodities Exchange," August 2012, 16–17; McKenzie, "Prefeasibility Study," March 2012, 45–47.

Trends in Global Rice Prices

Despite the perception that rice is a homogenous commodity, rice trade is highly fragmented, with more than 40 different kinds traded in Asia alone.[177] Demand for rice is shaped by consumer preferences for various rice attributes (including processing level, variety, quality, and source), and traded rice prices reflect the demand for these attributes.[178] Because the majority of the world's traded rice is long grain white rice, most export price quotes[179] are for this type of rice. But even for long grain white rice, price trends in the high-quality segment (e.g., rice with a low brokens content) differ from those in the low-quality segment (rice with a higher brokens content).[180] Moreover, aromatic, medium grain, and paddy rice are considered separate market segments, with pricing dynamics and trends that differ from long grain rice (table 3.1 provides a list of common rice export prices by segment). Figure 3.1 illustrates differences in Thai price trends according to market segment, including high-quality long grain (100 percent B), low-quality long grain rice (A1 Super), and aromatic (Grade A Jasmine).

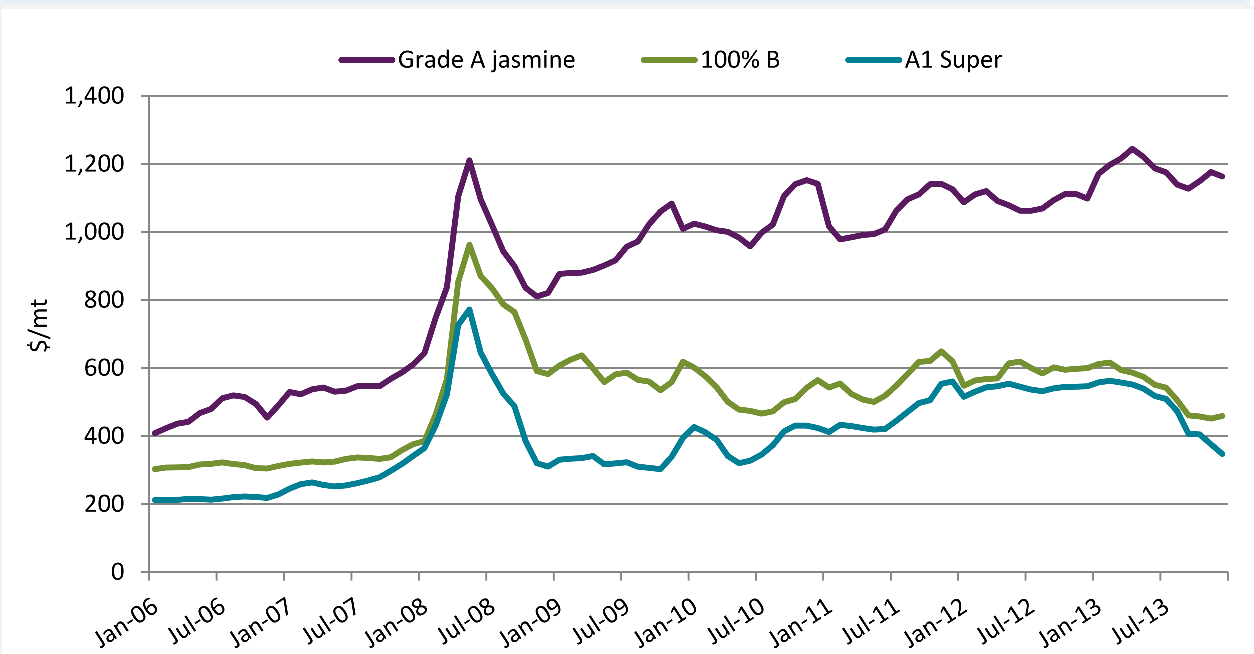
[177] McKenzie, "Prefeasibility Study," March 2012, 31.
[178] See chapter 1 and the glossary.
[179] Export price quotations were used to represent actual movements in prices. All studies reviewed in this section similarly use price quotations in their analyses. For a discussion on the validity of using price quotations to represent actual movements in prices, see Jamora and von Cramon-Taubadel, "What World Price?" October 2013, 8.
[180] See, for example, Ghoshray, "Asymmetric Adjustment," September 2008, 86–87; Chulaphan et al., "Different Causal Relationships," 2013; Jamora and von Cramon-Taubadel, "What World Price?" October 2013.

Table 3.1: Commonly quoted rice export prices, by market segment

Origin	Type	Share of brokens[a]	Abbreviations
High-quality long grain white rice		%	
Thailand	100 percent Grade B	4.5	Thai 100% B
Thailand	5 percent brokens	≤ 7	Thai 5% or Th5
Thailand	Parboiled rice 100 percent Sorted	4	Thai Parboiled 100%
Uruguay		5	Uruguay 5% or UR5
USA	Number 2	4	USA#2/4% or US4
Vietnam		5	Viet 5% or V5
Low-quality long grain white rice			
India		25	India 25% or I25
Pakistan		25	Pakistan 25% or P25
Thailand		≤ 28	Thai 25% or Th25
Thailand	A1 Super	100	Thai A1 Super
Vietnam		25	Viet 25% or V25
Medium grain white rice			
USA	California medium grain No. 1	4	Cal MG #1/4%
Aromatic and other			
Pakistan	Basmati	2	
Thailand	Hom Mali (jasmine) Grade A	4	Thai Grade A jasmine

Sources: FAO, GIEWS Food Price Monitoring and Analysis Tool (accessed August 19, 2014); Government of Thailand, DFT, OCS, “Rice Standards,” n.d (accessed December 12, 2014); Government of Thailand, MAC, ACFS, “Thai Hom Mali Rice,” 2009.
[a] Maximum brokens allowed for this grade.

Figure 3.1: Monthly Thai export price quotes for rice in three market segments



Source: FAO, GIEWS Food Price Monitoring and Analysis Tool (accessed August 19, 2014)

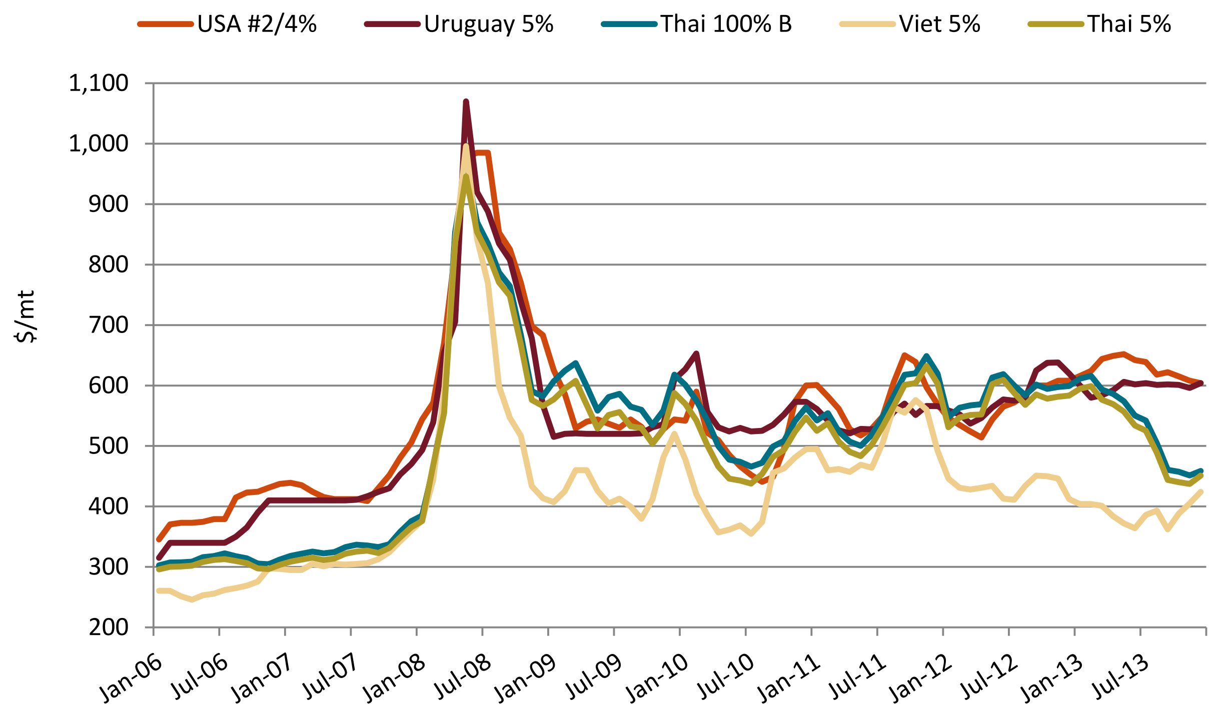
Long Grain Rice

Long grain milled prices for high-quality and low-quality rice are typically examined separately. Price movements since 2000 in each of these two segments have been characterized by steady, low prices at the beginning of the period, a large spike in prices in mid-2008,[181] and a post-spike decline in prices to an average level that is higher than pre-2008 levels. Within each segment, differences between exporting country prices at any given point in time could be due to one or more factors, including quality differences aside from brokens content,[182] reliability of supply in the eyes of importers (e.g., does an exporting country have a tendency to implement export restrictions?),[183] and other policy measures (such as minimum export prices and domestic support programs).

In the high-quality segment, some basic relationships can be observed for prices from the different origins (figure 3.2). First, U.S. rice generally trades at a premium over rice from Thailand and Vietnam, and Vietnamese rice is typically the lowest priced. However, before 2008, the difference between Thai and Vietnamese rice prices was small. From 2000 to 2008, the price of Thai 5 percent brokens was quoted at an average premium of $22 per metric ton over Vietnamese 5 percent brokens. Between 2009 and 2013, however, this average premium more than quintupled to $102. Prices for all grades of Vietnamese rice began to fall far below quotations from other origins in late 2011, owing to large low-priced government-to-government sales from Vietnam and price competition from India (which relaxed its ban on non-basmati rice exports in September 2011) and Pakistan.[184] Price declines for both high-quality (Thai 100 percent B and Thai 5 percent) and low-quality (Thai 25 percent and Thai A1 Super) rice made Thai exports more competitive with Vietnamese rice during 2013 and 2014 (figure 3.2 and 3.3).[185] Declining Thai prices in 2013 were mostly attributed to a weaker Thai baht, the pressure of large stocks, and few export sales.[186] Also, in marketing year 2013/14, the Thai government suspended its 2011 Paddy Pledging Program for the dry season (e.g. off

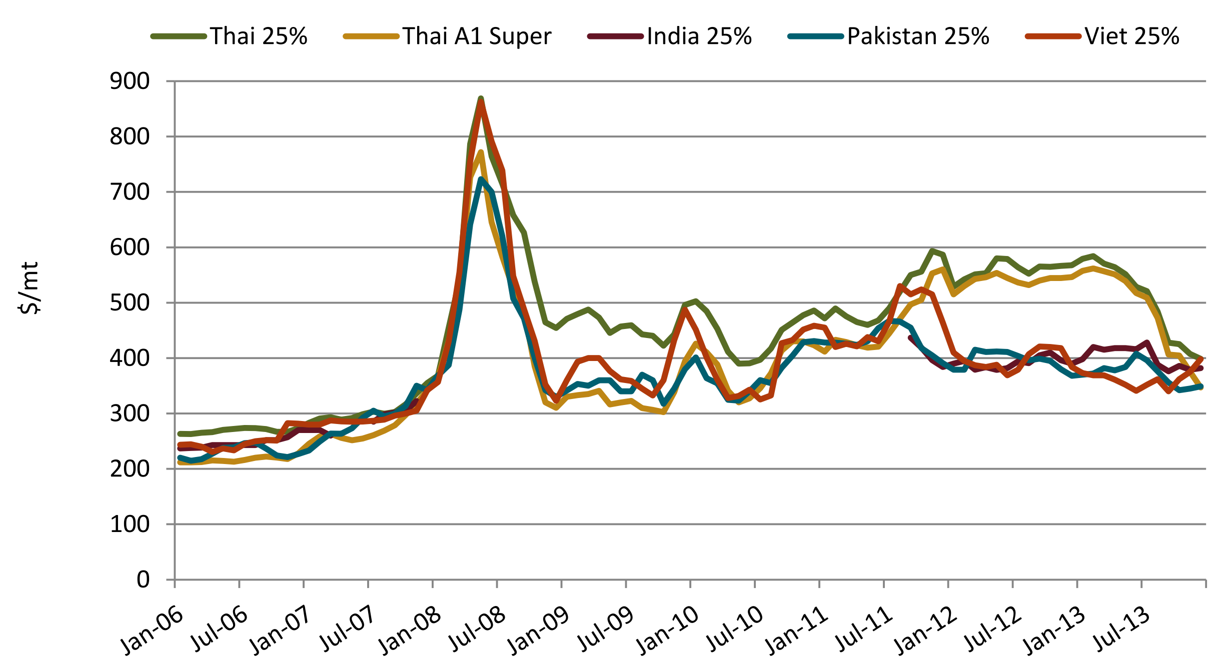
[181] This spike began in mid-2007, when prices started to rise in response to higher oil prices, depreciation of the U.S. dollar, and strong income growth in Asia. (Oil prices are a major determinant of two key farm inputs, fuel and fertilizer.) Policy responses to the rising prices exacerbated the situation and pushed prices higher in 2008. See chapter 1 for further details.
[182] Ghoshray, “Asymmetric Adjustment,” September 2008, 81.
[183] Gilbert notes that countries resorting to export restrictions “lose their reputation as reliable suppliers,” and that this loss of reputation often pushes their farmers to sell at prices below the world market price. See Gilbert, “International Agreements,” December 2012, 138.
[184] FAO, *Rice Market Monitor*, November 2011, 17; USDA, ERS, “Rice Outlook,” December 12, 2011; USDA, ERS, “Rice Outlook,” March 12, 2012.
[185] The 2011 Paddy Pledging Program for the main season crop remained in effect for 2013/14. USDA, FAS, *Thailand: Feed and Grain Annual*, March 7, 2014, 2.
[186] USDA, ERS, “Rice Outlook,” June 14, 2013; USDA, ERS, “Rice Outlook,” July 15, 2013; USDA, ERS, “Rice Outlook,” August 14, 2013; USDA, ERS, “Rice Outlook,” September 16, 2013; USDA, ERS, “Rice Outlook,” November 19, 2013.

Figure 3.2: Monthly price quotes for high-quality long grain white rice, selected origins



Source: FAO, GIEWS Food Price Monitoring and Analysis Tool (accessed August 19, 2014).

Figure 3.3: Monthly price quotes for low-quality long grain white rice, selected origins



Source: FAO, GIEWS Food Price Monitoring and Analysis Tool (accessed August 19, 2014).

season) crop and began selling off government rice stocks, putting downward pressure on Thai rice prices.

In the low-quality segment, prices before 2008 tended to stay within a narrow range regardless of origin. Since 2008, prices in this segment have varied more widely by country of origin. However, Thai prices have consistently stayed above prices of other origins—a difference attributed largely to the superior quality of Thai rice compared with other suppliers (figure 3.3). The other notable feature of prices in the low-quality segment is the occasional disappearance of India from the market altogether because of that country's sporadic export bans, designed to hold domestic food price rises in check by limiting the amount of Indian rice that can enter the world market (chapter 7).

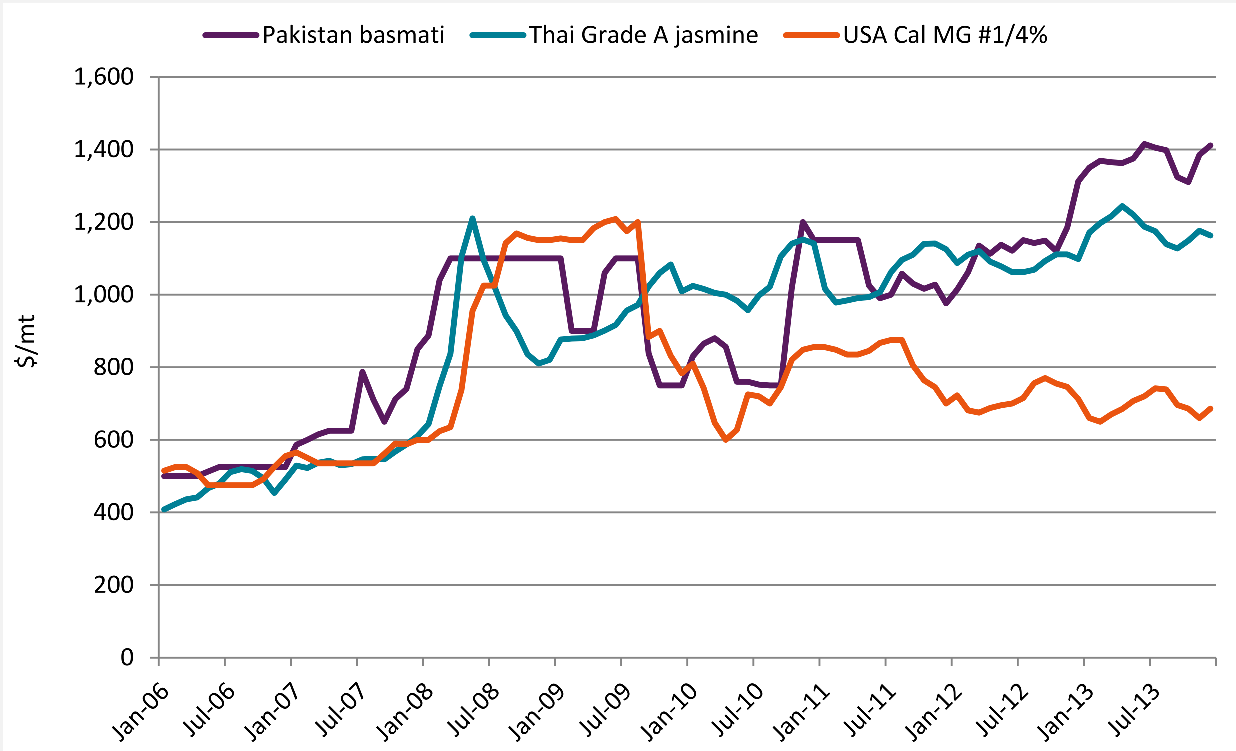
Other Rice Types

Outside the long grain segment, prices have generally followed a much different trajectory in the wake of the 2008 price spike. For example, prices of both aromatics (Pakistani basmati and Thai jasmine) and medium grain rice were driven higher in marketing year 2007/08 by factors that similarly affected long grain white rice—namely, export restrictions and uncertainty over available supplies (figure 3.4). However, prices for aromatics have not declined substantially since the height of the spike. Rather, prices for both Pakistani basmati and Thai jasmine reached levels in 2013 that exceeded those of 2008. Preference for aromatics among consumers as incomes rise, along with tight available supplies, have helped to buoy quotations for these rice types.[187]

Prices for medium grain rice—specifically California medium grain no. 1, 4 percent broken—increased significantly in 2008 and remained high in 2009 as shipments of medium grain rice declined from major exporters Australia and Egypt (figure 3.4). Australia experienced several years of drought, leading to smaller rice harvests and reduced exports, while Egypt banned or severely restricted exports starting in March 2008.[188] Prices declined in 2010, when U.S. acreage for medium grain rice increased 4 percent and overall production totaled 7 percent higher from the year before, but have remained about pre-2008 levels.[189]

[187] FAO, *Rice Market Monitor,* January 2013, 29; FAO, *Rice Market Monitor*, April 2013, 27.
[188] USDA, FAS, *Egypt Grain and Feed Annual*, April 2, 2012, 16; USDA, FAS, *Egypt Grain and Feed Annual*, April 23, 2014, 14–15.
[189] "Pressure on medium-grain rice prices," Western Farm Press, January 11, 2010.

Figure 3.4: Monthly price quotes for Pakistan basmati, Thai jasmine, and California medium grain No. 1, 4 percent broken rice



Source: FAO, GIEWS Food Price Monitoring and Analysis Tool (accessed August 19, 2014).

Relationships and Leadership among Global Rice Export Prices

Price Relationships

Trends in price movements of rice from different exporting countries provide a gauge of the extent to which exporters are competing with one another over the long run. Any two export price series that move together over the long run because they are traded openly and are substitutable indicates that those two types of rice are competitors. Likewise, export prices for rice types that do not move together over time suggest that their markets are segmented and not in direct competition.

Trends in rice prices from different origins as shown in figures 3.2 and 3.3 appear broadly similar, especially before mid-2011. However, several researchers have applied sophisticated analytical techniques that quantify pricing relationships and co-movement of prices over time, in order to assess market integration and competition among different segments and sources of global exports.[190]

Researchers found that, in general, Asian-origin[191] export prices within the different segments move together.[192] In the high-quality market segment, some pricing relationships were found to be asymmetric (i.e., the speed of adjustment depended on whether prices were rising or falling). Researchers noted that this finding was an indication of imperfect competition in this segment of the rice market.[193] In the low-quality segment, by contrast, adjustment was found to be symmetric, suggesting greater competition. This is a logical finding, given that low price is often the most important attribute for purchasers of rice types with high brokens content.[194]

The economic literature is mixed regarding relationships between U.S. export prices and Asian prices, and the level of competition between U.S. and Asian rice. Studies by Chulaphan et al. and John both found a long-run, if asymmetric, relationship between Thai, Vietnamese, and U.S. high-quality white rice prices, with U.S. prices responding to Thai and Vietnamese price movements, while U.S. price movements had no statistical effect on Thai or Vietnamese prices.[195] At the same time, no short-run relationship was found between U.S. and Asian-origin prices, suggesting that while U.S. prices responded to Asian price movements over the long run, month-to-month price movements were motivated by different factors.[196] One explanation for the lack of a short-run relationship between U.S. and Asian prices may be exports serving different market segments, with increasing volumes of U.S. rice exported as paddy rice instead of milled rice exported by Asia.[197]

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[190] To test for the existence of such a relationship, economists commonly conduct price transmission and cointegration analyses. Such analyses have their theoretical foundation in the Law of One Price, which states that at any given point in time, prices of the same product in two different places will differ only by the cost of transport between the two markets. See discussions of the Law of One Price in Ghoshray, "Underlying Trends," May 2011, 10, and John, "Price Relations," 2014, 3.

[191] Including Pakistani, Thai, and Vietnamese prices of various brokens contents.

[192] Various authors found strong evidence of rice market segmentation, such that most analyses surveyed here investigated price relationships among high- and low-quality segments separately. See Jamora and von Cramon-Taubadel, "What World Price?" October 2013, 16; Ghoshray, "Asymmetric Adjustment," September 2008, 86–87; Chulaphan et al., "Different Causal Relationships," 2013, 190; ; John, "Price Relations," 2014, 9.

[193] Ghoshray, "Asymmetric Adjustment," September 2008, 81, 86.

[194] Ibid., 86.

[195] Chulaphan et al., "Different Causal Relationships," 2013, 187; John, "Price Relations," 2014, 10, 12.

[196] One author noted that his finding suggests that in the short-run, "the former [U.S. price] is completely unrelated to the latter markets [Asian origins] even though their rice markets are of a similar grade and they compete in some of the same markets in Africa and parts of Latin America." See John, "Price Relations," 2014, 9; Jamora and von Cramon-Taubadel, "What World Price?" October 2013, 10–11.

[197] Dawe, "Changing Structure," February 2004, 8.

Price Leadership

For many globally traded agricultural products there is a single, or limited number, of world (or "benchmark") prices which other international and domestic prices tend to follow. Determining price leadership is another way to analyze competitive dynamics in the global rice sector by singling out which prices are more likely to cause movements in other prices, and thus most strongly influence the global market. Often, global benchmark prices are those of the most heavily traded product type of the leading global exporting country. Identifying countries whose domestic prices serve as a global benchmark prices is important, because government policies in these countries are likely to have the greatest spillover effects in global markets. Several researchers have explored the issue of price leadership in the global rice market.

In the high-quality long grain segment, market analysts and academic researchers generally consider either the Thai 100 percent B or Thai 5 percent brokens price to be the global benchmark price.[198] In their survey of the literature, Greb et al. found that Thai export prices were used as world benchmark prices in 72 percent of analyses, and the Thai 5 percent price was used in more than half of these. However, the FAO considers the Thai 100 percent B to be the global benchmark price.

In the low-quality long grain segment, relationships among price series suggest that either Thai or Pakistani prices could be considered market leaders, as both cause movements in other countries' prices in the segment but are not themselves affected by other export price movements.[199] Despite these segment-specific findings, researchers have found that Vietnamese prices move with more export market prices than any others, which supports regarding Vietnamese prices (Viet 25 percent) as the most appropriate single international benchmark price.[200]

Linkages between Domestic and Benchmark Prices

The extent to which domestic rice prices in major rice producing and consuming countries are influenced by global benchmark prices provides a gauge to the efficiency (or lack thereof) of the

[198] See Greb et al., "Price Transmission," September 2012, 12; FAO, *Rice Market Monitor*, July 2014, 2.
[199] Ghoshray, "Asymmetric Adjustment," September 2008, 86; Chulaphan et al., "Different Causal Relationships," 2013, 190; Jamora and von Cramon-Taubadel, "What World Price?" December 2012, 19.
[200] John, "Price Relations," 2014, 10, 12; Jamora and von Cramon-Taubadel, "What World Price?" October 2013, 13,17; Chulaphan et al., "Different Causal Relationships," 2013, 190.

global rice market.[201] If changes in global benchmark prices are strongly reflected in domestic prices, then producers and consumers are able to make decisions based on conditions in global markets, and the strong relationship between domestic and global price is a sign of market efficiency.

In several rice markets a number of factors weaken the relationship between global and domestic prices. Some of the most prominent in the rice market include: (1) real exchange rates—particularly during the 2008 price spike, which occurred at a time when many Asian currencies were appreciating against the U.S. dollar;[202] (2) the presence of a state trading enterprise, which significantly reduces the likelihood that domestic prices will be integrated with international prices;[203] and (3) the implementation of policies directly aimed at dampening price increases, such as export taxes, consumer subsidies, and export restrictions.[204] In countries where private entities are allowed to trade rice with fewer restrictions, pass-through is higher.[205]

Several researchers have explored statistical relationships between domestic and benchmark prices. For most developing countries, movements in global prices were found to be transmitted to domestic markets over the long run, with transmission commonly occurring relatively slowly—over a period of months—rather than instantaneously.[206]

For the world's largest rice-producing countries, researchers found differing degrees of price transmission between global and domestic prices. China takes an active role in setting policy on rice, and estimates suggest that between 23 and 46 percent of a change in world prices is transmitted to domestic Chinese prices in the long run. Evidence suggests, though, that global price changes are reflected in domestic prices when prices are rising, and that short-run world price fluctuations are often not transmitted to China's domestic prices.[207] For India, several studies found that domestic prices have generally not followed international benchmark

[201] The extent to which domestic prices reflect global prices is referred to as price transmission. Price transmission has its roots in the Law of One Price—namely, that in an efficient market, prices in the domestic market will differ from foreign market prices only by transportation costs.
[202] The reduction in transmission was particularly stark from 2003 to 2007 for the Philippines, where an appreciating exchange rate against the dollar saw world prices denominated in local currency rise by only 10 percent, versus a rise of 56 percent for world prices denominated in U.S. dollars. See Dawe, "Cereal Price Transmission," 2009, 2–6.
[203] Greb et al., "Price Transmission," September 2012, 19.
[204] Headey and Fan, "Anatomy of a Crisis," September 2008, 385–86.
[205] Dawe, "Cereal Price Transmission," 2009, 7.
[206] Baquedano and Liefert, "Market Integration," February 2014, 108; Kalkuhl, "How Strong," May 2014, 19, 35; Greb et al., "Price Transmission," September 2012, 13.
[207] Ghoshray, "Underlying Trends," 2011, 26-28; Kalkuhl, "How Strong," May 2014, 39; Dawe, "Cereal Price Transmission," 2009, 4, 6.

prices.[208] This lack of price transmission has been attributed to the Indian government's intervention in the rice market, including its use of public procurement policies, reserve management, and farmer support.[209]

In other markets, evidence that domestic prices follow global benchmark prices is also mixed. Various analyses have found long-run relationships between international and domestic rice prices for both the Philippines and Pakistan, but price transmission is estimated to be incomplete. An estimated 22 to 32 percent of international price movements are transmitted to domestic prices in the case of the Philippines, and between 29 and 53 percent are transmitted in Pakistan.[210] Price transmission was also found for Vietnam, but estimates of its magnitude ranged from 15 percent to 51 percent.[211] For various other developing countries throughout Africa and Latin America, estimated price transmission between domestic and global prices varies widely as well.[212]

While transmission from benchmark to domestic markets has been shown to occur, pass-back (in which movements in various domestic prices are transmitted back to global benchmark prices) in the rice market has also been observed.[213] Moreover, this pass-back is not limited to a few large countries, but rather has been estimated to occur with roughly 40 percent of the countries reported in the FAO's Global Information and Early Warning System database.[214]

[208] Acharya et al., "Market Integration," 2012, 23; Ghoshray, "Underlying Trends," May 2011, 25-26; Kalkuhl, "How Strong," May 2014, 39; Dawe, "Cereal Price Transmission," 2009, 4; Conforti, "Price Transmission," 2004, 12. In contrast to these studies, Baquedano and Liefert did find evidence of price transmission from international prices to domestic Indian prices. See Baquedano and Liefert, "Market Integration," 2014, 110.
[209] Rapsomanikis, "Price Transmission," 2011, 158; Acharya et al., "Market Integration," 2012, 21–22.
[210] Ghoshray, "Underlying Trends," 2011, 26; Kalkuhl, "How Strong," May 2014, 39; Baquedano and Liefert, "Market Integration," 2014, 110; Robles, "Price Transmission," 2011, 4; Conforti, "Price Transmission," 2004, 12.
[211] Baquedano and Liefert, "Market Integration," 2014, 110; Robles, "Price Transmission," 2011, 4.
[212] Kalkuhl, "How Strong," 2014, 35; Robles, "Price Transmission," 2011, 3; Baquedano and Liefert, "Market Integration," February 2014, 110.
[213] Greb et al., "Price Transmission," September 2012, 16; Gilbert, "Grains Price," 2011, 145.
[214] Greb et al., "Price Transmission," September 2012, 16, 45.

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Chapter 4
A Cross-Country Comparison of Industry Competitiveness in Major Rice Markets

The six chapters that follow assess the competitive strengths and weakness of several major rice-producing and -consuming countries. They include China, Thailand, Vietnam, Burma, Cambodia, Indonesia, the Philippines, India, Pakistan, Brazil, Uruguay, and the United States. In 2013, China, Indonesia, and the Philippines were major importers of rice, and the others major exporters. This chapter offers a cross-country comparison of the rice industries in each of these countries in order to evaluate several key competitive factors for rice.

Competitive factors determine the ability of suppliers to offer products with the characteristics sought by buyers, who base their decisions on three main criteria: delivered cost, product differentiation, and reliability of supply (appendix G). For rice, delivered cost reflects the cost to produce the primary input—paddy rice—as well as milling and transportation costs. Product differentiation largely concerns the quality of rice available. Reliability of supply refers to the ability of a supplier to deliver a given product to a specific location at a contracted time; it often depends on efficient supply chains and well-functioning market information systems. The comparison of competitive factors in this chapter focuses primarily on long grain, non-aromatic white rice. This is the type and form of rice that is most heavily produced, traded, and consumed worldwide.

Industry Comparison

Rice production levels and yields, industry structure, and geographic location provide a starting point for evaluating the relative strengths and weaknesses of a country's industry compared with its competitors. Larger farms that are able to take advantage of scale economies are typically more efficient and have higher yields than smaller farms, and, as a result, tend to be more competitive in world markets. This is the case for the rice industries in Uruguay and the United States, and, to some degree, Brazil (table 4.1).[215] Both the United States and Uruguay are important exporters, with some of the largest farms and some of the highest yields globally.

[215] Although Brazil's average yields are much lower than those in Uruguay and the United States, they are above the global average of 4.3 mt/ha. Chapter 2, figure 2.4; USDA, PSD Online (accessed December 28, 2014).

Table 4.1: Industry comparison, selected countries, averages, 2011/12–2013/14

Country	Total paddy rice production (1,000 mt)	Harvest area (ha)	Farm size (ha)[a]	Yield (mt/ha)[a]	Milling rates	Exports-to-production ratio (%)
Brazil	11,875	2,406	>200[b]	4.9	0.68	11
Burma	18,305	7,040	2.5	2.6	0.64	12
Cambodia	7,116	2,906	< 4	2.5	0.64	22
China	202,967	30,169	< 1	6.7	0.70	0
India	158,561	43,483	< 2	3.6	0.67	10
Indonesia	57,401	12,150	0.7	4.7	0.64	0
Pakistan	9,351	2,637	≤ 2	3.6	0.67	56
Philippines	17,987	4,692	1.5-2	3.8	0.63	0
Thailand	30,869	10,919	2.8	2.8	0.66	40
United States	8,690	1,047	195[c]	8.3	0.70	50
Uruguay	1,378	174	310	7.9	0.70	99
Vietnam	44,187	7,797	0.5–1.5	5.7	0.63	25

Source: USDA, PSD Online (accessed October 2, 2014 and January 8, 2015), unless otherwise noted.
Note: 1 ha = 2.5 acres.
[a] Based on most recently available data. See chapters 5–10 for sources, unless otherwise noted.
[b] Farm sized based on average in Rio Grande do Sul. See chapter 10.
[c] Farm sized based on 2012 average. USDA, NASS, "Quick Stats 2.0" (accessed March 24, 2015).

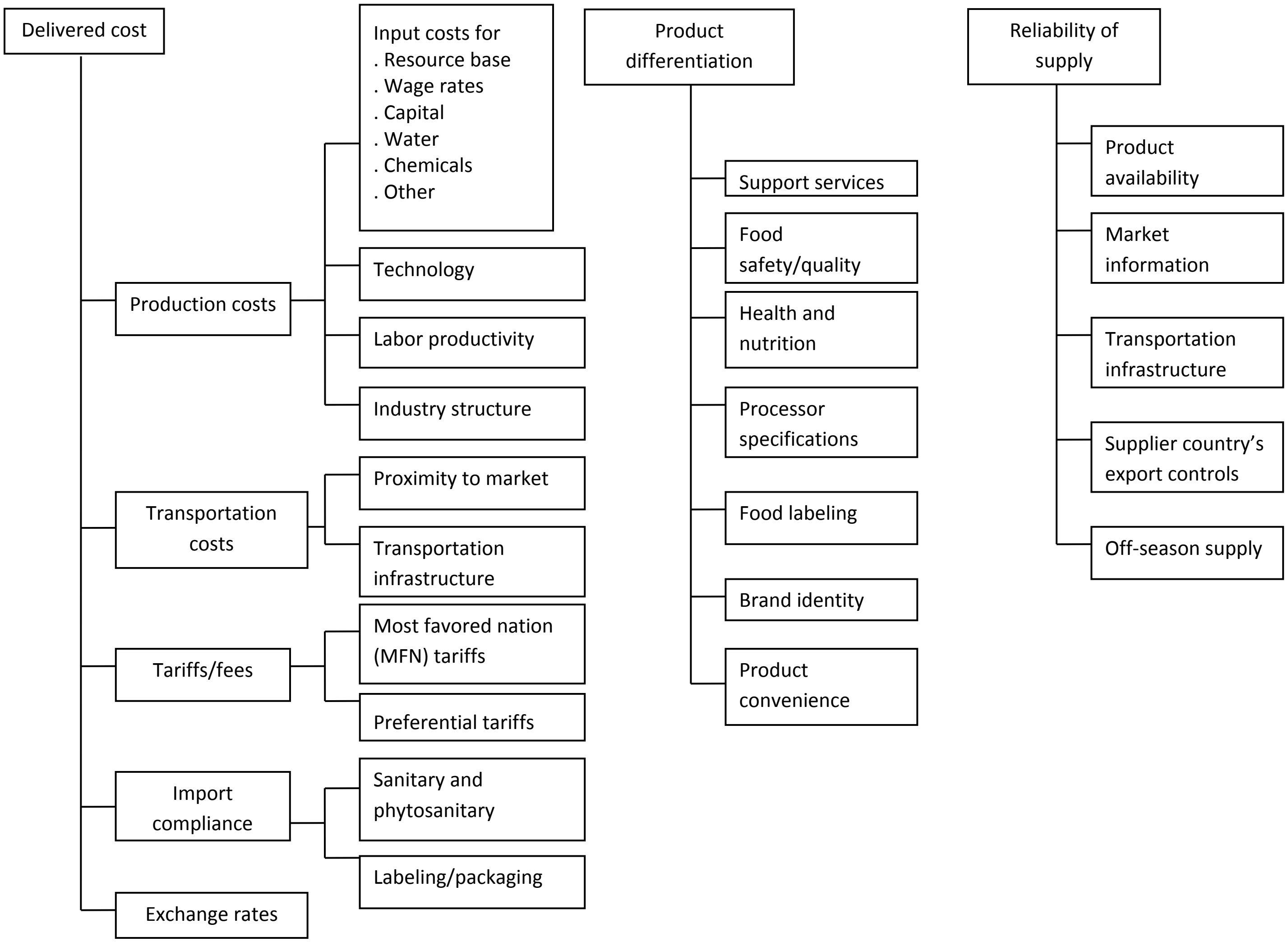
In Asia, rice farms are typically small and yields are close to or below the global average. Notable exceptions, however, are China and Vietnam, where government investment in seed research and distribution of better-quality seeds have resulted in some of the highest yields in Asia (see chapters 6 and 8). Despite small farms and often low yields, Southeast Asia mainland countries are mostly surplus producers and major exporters because of the region's natural endowments.

Competitive Factor Comparison

To analyze the competitive factors affecting the rice sectors across the selected countries, the Commission used a framework drawing together the analytical assumptions, parameters, and structure that define competitive conditions in agricultural trade. Competitive conditions in agriculture encompass the economic, institutional, and regulatory environment in which firms compete. In markets around the world, agricultural competitiveness is measured by comparing costs, product characteristics, and supplier reliability for domestically produced goods against those of imports, both in the home market and in importing countries.

Figure 4.1 shows several competitive factors for agriculture that affect delivered cost, product differentiation, and reliability of supply. It does not separately list government policies as competitive factors because such policies are already implicitly captured in the measures of all

Figure 4.1: Factors that affect competitiveness in agricultural markets



Source: Compiled by USITC staff.

three categories.[216] In this report, the analysis explores the relative importance of particular factors in determining the competitiveness of rice production in each selected country, and of U.S. rice vis-à-vis its competitors in third-country markets and in the United States.

The competitiveness of producers in each of the selected countries in terms of delivered cost, product differentiation, and reliability of supply of domestic long grain white rice are summarized in table 4.2. Countries have been grouped into three broad categories—high, medium, or low—for each factor. While these assessments mainly concern a country's export competitiveness, the table also gauges the country's competitiveness in its own domestic market. For most countries, the quality of domestic rice production and reliability of domestic supply are closely linked to their export competitiveness.

Table 4.2: Comparison of competitive factor categories for long grain white rice in selected countries

Country	**Delivered cost**	**Product differentiation (quality)**		**Reliability of supply**	
		Domestic	**Export**	**Domestic**	**Export**
Brazil	High	Medium	Medium	Medium	Low
Burma	Low	Low	Low	High	Low
Cambodia	Low	Low	Low	High	Low
China	High	Low	[a]	Medium	[a]
India	Low	Medium	Low	High	Low
Indonesia	High	Low	[a]	Low	[a]
Pakistan	Low	Medium	Low	High	Medium
Philippines	Medium	Low	[a]	Low	[a]
Thailand	Medium	Medium	High	High	Medium
Uruguay	Low	High	High	High	High
United States	Medium	High	High	High	High
Vietnam	Low	Low	Low	High	Medium

Source: Compiled by USITC staff.
Notes: Rankings are high, medium, and low for each factor. For example, Brazil has a high delivered cost, which would make them less price-competitive.
[a] Not applicable because not a major exporting country of rice.

The assessments of competitiveness shown in table 4.2 were based on attributes for which data were available for most of the selected countries.[217]

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[216] For example, government programs that allow farmers to purchase fertilizers, seeds, and machinery at below-market price levels lower the delivered cost of domestic producers. Government food safety regulations, as well as government-mandated grades and standards requirements, provide a mechanism for product differentiation. Government intervention can also influence the reliability of supply through publicly funded marketing and transportation infrastructure, as well as by imposing supply and export controls on producers. USITC, *China's Agricultural Trade*, March 2011.
[217] These assessments are subjective, based on Commission staff evaluation of a range of factors, including available data, fieldwork, and communication with several industry experts.

- **Delivered cost** assessments were based mostly on the costs of paddy rice production, the largest component of final delivered cost. Other costs were also considered, such as those for milling, transportation, and related transactions.

- **Product differentiation** was examined for both the domestic and export markets, with assessments largely based on quality, as measured by milling rates and shares of brokens. Export product differentiation relied on price comparisons, as well as other qualitative information, including domestic quality.

- **Reliability of supply** was assessed using four measures: (1) production volumes in relation to domestic market size; (2) the year-to-year variability of production; (3) the quality of transportation and market infrastructure; and (4) the presence of supply and export controls.

Assessing the competitiveness of global rice producers and exporters is highly complex. For example, the relative importance of delivered cost, product attributes, and reliability can differ depending on whether the customer is in the domestic market or overseas. Further, customers in export markets take a number of factors into account in deciding what rice to buy, such as type, form, taste, texture, and other qualities, as well as price. Given the wide variation in the product characteristics sought by customers, an exporter may be highly competitive in one market, but not at all in another. Table 4.3 summarizes the major product characteristics and reliability of supply for the net exporting countries covered.

Table 4.3: Characterization of selected rice-exporting countries

Country	Characterization of export products and reliability
Brazil	Less reliable exporter. Primarily exports medium-quality long grain rice with low to medium levels of brokens. Also exports parboiled and long grain paddy rice.
Burma	Less reliable exporter primarily of lower-quality long grain rice with low, medium, and high levels of brokens.
Cambodia	Less reliable exporter primarily of lower-quality long grain rice with low, medium, and high levels of brokens. Also exports 100 percent brokens and aromatic rice.
India	Less reliable exporter primarily of lower-quality long grain rice of all levels of brokens. Also exports parboiled long grain rice and aromatic (basmati) rice. Also a reliable supplier of basmati rice.
Pakistan	Reliable supplier. Exports lower-quality long grain rice of all levels of brokens. Also exports parboiled and aromatic (basmati) rice.
Thailand	Reliable supplier. Exports high-quality long grain rice with low, high, and 100 percent brokens. Also exports parboiled long grain rice and aromatic (jasmine) rice.
United States	Highly reliable exporter of high-quality long grain rice with low to medium levels of brokens. Also exports medium grain rice, parboiled, and both long grain and medium grain paddy rice.
Uruguay	Highly reliable exporter of high-quality long grain rice with low brokens. Also exports parboiled rice.
Vietnam	Reliable supplier. Exports low-quality long grain rice with low or high levels of brokens. Also exports parboiled, aromatic, and medium grain rice.

Source: Compiled by USITC staff.

Delivered Cost

For many globally traded agricultural products, delivered cost is the most important criterion importers use in making purchasing decisions. If suppliers of goods are to be competitive in export markets, they must be able to supply the products to purchasers at, or below, the price offered by other exporters and domestic producers of comparable goods. The price competitiveness of these suppliers depends on factors that tend to lower or raise their delivered costs vis-à-vis the delivered costs of other imported and domestic products.

The delivered cost of domestically produced rice depends on the costs of producing it and the cost of transporting it from production points to consumption points. Production costs, in turn, depend on the costs of inputs, including outlays for fertilizer, chemical inputs (e.g., pesticides and insecticides), labor, water, fuel and/or electricity, and land. The use of high-yielding seeds and advanced production technology (such as machinery and irrigation) also influences delivered cost for paddy rice. At the milling stage, direct inputs include electricity, paddy rice, packaging, and labor, while fixed costs include land and depreciation of equipment. The efficiency of milling machinery also affects the delivered cost for white rice. Transportation costs, incurred throughout the supply chain, likewise depend on several factors, including fuel costs and the efficiency of the transportation system. Transport efficiency, in turn, depends on such factors as the quality of roads, ports, and vehicles, and government policies that affect all of these.

Additional expenses affect the overall delivered cost to export markets. These include the costs of international transportation, currency conversion, trade risk coverage, and tariffs in foreign markets. The delivered cost of exported goods also includes spending to meet regulatory requirements, such as complying with phytosanitary standards, and labeling and packaging requirements.

Cost of Paddy Rice

Inter-country comparisons of data on cost of production (COP) present several challenges. Data availability and reliability vary significantly among the 12 countries. For example, cross-country comparisons of survey data on the cost of producing paddy rice are often complicated by differences in survey methods, cost definitions, rice types, and time frame. Sample size must also be taken into account when considering the robustness of survey results.

The COP for long grain paddy rice was used to assess delivered costs as it typically accounts for the largest share of the final delivered costs, and was a metric available for all selected countries.[218] The analysis of paddy rice COP for each country, combined with the consideration of other additional costs, such as milling and transportation costs, provides a comprehensive way to determine whether countries have high, medium, or low delivered costs.

The Commission obtained paddy rice COP data for the selected countries from multiple sources, including national government statistics and surveys.[219] In addition, survey data for six Asian countries produced through a private-public partnership provides an additional point of comparison of COP for paddy rice for those countries (table 4.4).[220] In most cases, the COP data collected by the Commission for this analysis were gathered in the country of origin in local currencies per hectare and converted to U.S. dollars per metric ton using appropriate rice yields and exchange rates.

Table 4.4: Costs of production estimates for long grain paddy rice in selected countries (dollars per metric ton)

Country	COP for paddy rice, estimate 1	COP for paddy rice, estimate 2
Brazil	413	[a]
Burma	137	[a]
Cambodia	89	[a]
China	349	291
India	224	190
Indonesia	294	294
Pakistan	172	[a]
Philippines	262	236
Thailand	272	215
United States	251	[a]
Uruguay	235	[a]
Vietnam	157	157

Sources: Estimate 1 is based on the sources discussed in chapters 5–10. Estimate 2 is from DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," 2014.
[a] Country not included.

Of the 12 countries, Burma and Cambodia fall into the lowest cost range, while Brazil is by far the highest-cost paddy rice producer. Lower-cost paddy rice producers tend to be either large-volume exporters or small net exporters whose exports are growing rapidly as a result of ongoing sector improvements. Countries with higher paddy rice COP, such as China and Indonesia, tend to be large domestic consumers of rice and less competitive exporters. Brazil is the outlier with the highest COP because of high transportation costs and taxes that raise costs for inputs and along the supply chain (chapter 10).

[218] Long grain rice accounts for the majority of rice trade, and COP data were available for long grain paddy rice in each of the selected countries.
[219] See chapters 5–10 for more detail and data sources for individual country paddy rice production costs.
[220] DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 3–4, 2014. These data are based on a small sample—100 farmers from a single location in each country—but were collected using consistent survey methodology.

Cost of Milled Rice

Beyond paddy rice COP, delivered cost depends on rice milling, transport, and other transaction costs. There are few data on such costs for the selected countries. However, other data can be useful proxies for final delivered cost. For example, the Commission examined average unit values (AUVs) for exporting countries and domestic wholesale prices for milled rice for importers because they broadly capture costs associated with milling, transportation, and other elements.[221] Milling efficiency and costs do not appear to be an important determinant of delivered cost, likely because milling costs account for only about 10–15 percent of the final delivered cost for milled rice.[222] Also, low milling efficiency may not necessarily result in high milling cost if such mills employ labor-intensive practices, such as hand sorting of rice kernels. Conversely, efficient transportation networks appear to be an important factor in determining delivered cost. For example, in the United States, the highly efficient transportation system helps offset higher paddy rice COP and is crucial to the global competitiveness of its rice industry.

The World Bank's "Trading Across Borders" indicator provides a measure for the ease of trading across borders.[223] Of our nine selected rice exporting countries, the United States ranks first, followed closely by Thailand, and then Vietnam and Uruguay. The rankings of Burma, Pakistan, Brazil, Cambodia, and India for the Trading Across Borders indicator are much lower, owing at least in part to poor transportation networks and border practices, offsetting much of their low COP for paddy rice.

As shown in table 4.2, based on available paddy rice costs and milled cost proxy data, Brazil, China, and Indonesia all have a high delivered cost for rice; the Philippines, Thailand, and the United States have a mid-level cost. The remaining six countries—Burma, Cambodia, India, Pakistan, Uruguay, and Vietnam—all have a low delivered rice cost.

Product Differentiation

In addition to considering delivered cost, purchasers also look at product characteristics in making their buying decisions. The more differentiated the product, the more likely product characteristics will form the basis of the purchasing decision, potentially making delivered cost less important. Similar products are differentiated from one another according to factors such as actual and perceived quality, brand identity, packaging, and labeling.

[221] In some cases, wholesale prices are regulated by the government and therefore are not good proxies for delivered cost.
[222] Shwetha, Mahajanashetti, and Kerur, "Economics of Paddy Processing," 2011, 334; Borromeo, "The Modern Integrated Rice Business," 2004, 61.
[223] World Bank, *Doing Business*, "Trading Across Borders," n.d. (accessed January 15, 2015).

A principal way rice is differentiated in the global market is through quality. Rice quality has many dimensions (chapter 1). One objective quality measure important in international trade is the share of broken kernels in a given quantity of milled rice. In addition, quality assessment can be based on such characteristics as milling yield (for paddy to white rice), kernel appearance (e.g., chalkiness),[224] and more subjective criteria, such as cooking properties, taste, texture, and aroma. Food safety and the perception of food safety differentiate food products as well; safety includes the levels of pesticide residues and other undesirable substances. Rice is also differentiated by specific variety and country of origin, which can serve buyers as proxies for quality.

Quality of Domestic Rice Production

There are few objective measures of rice quality for which there are data across countries. For example, the level of chalk in rice is measurable, but such data for individual rice-producing countries are not widely available. Other quality criteria, such as taste preferences, are subjective and vary greatly among and within countries. Two measurable criteria of quality for which there are data are average milling rates by country and the overall share of broken kernels in milled rice.

Milling rate is the ratio of the weight of milled rice (whole kernels and broken) to the weight of paddy rice before removing the husk. While the milling rate is not a perfect proxy for quality, higher milling rates are generally associated with advanced milling equipment and good quality control through the value chain. To achieve a high milling rate, care is necessary throughout the production, drying, storage, milling, and marketing phases to minimize the number of broken rice kernels. Rice with a high percentage of brokens sells at a considerable discount from whole-kernel rice. Paddy rice contracts commonly specify the expected milling rate, with a bonus for better yield and a discount for lower yield.[225] Annual average countrywide milling rates are presented in table 4.5. High milling rates are found in China, the United States, Uruguay, and Brazil, while Indonesia, the Philippines, and Vietnam have the lowest milling rates.

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[224] Chalky appearance in the center of the grain can be also referred to as “white belly.” USDA standards define chalky kernels as those that are one-half or more chalky, and U.S. no. 2 long grain milled rice may contain no more than 2 percent chalky kernels. USDA, Federal Grain Inspection Service, “United States Standards for Rice,” November 27, 2009, 6, 10.

[225] Industry representative, interview by USITC staff, AR, December 11, 2014.

Table 4.5: Milling rates of selected rice-producing countries, average 2011/12–2013/14 (percent)

Country	Milling rate
China, United States, Uruguay	70.0
Brazil	68.0
India, Pakistan	66.7
Thailand	66.0
Burma, Cambodia	64.0
Indonesia	63.5
Philippines	63.0
Vietnam	62.5

Source: USITC calculation using USDA, PSD Online (accessed October 2, 2014).

Rice grades are assigned to rice based on the percent of broken kernels, with rice containing high proportions of brokens sold at a lower price. In this assessment, high-quality is rice with less than 10 percent brokens; medium-quality rice, normally 15–20 percent brokens (but covers all rice with more than 10 percent but less than 25 percent brokens); and low-quality rice, 25 or more percent brokens.[226] Although there is a market for broken rice, particularly for use in pet foods and processed food applications, a higher level of brokens in a country's overall production can be broadly associated with lower-quality rice. Based on information for long grain white rice, the United States and Uruguay generally have a low share of brokens, Brazil and India likely have a medium share of brokens, and the remaining countries[227] have a high share of brokens.[228]

Based on data for milling rates and level of brokens, the United States and Uruguay generally produce high-quality rice. Brazil, India, Pakistan, and Thailand typically produce medium-quality rice on average, while Burma, Cambodia, China, Indonesia, the Philippines, and Vietnam generally produce low-quality rice in the largest volumes.

Export Product Differentiation

Many rice-exporting countries are able to produce and export several different qualities of long grain rice (based on level of brokens), as well as rice of different forms or types (e.g., medium

[226] The USA Rice Federation, "History of Rice in the USA," n.d. (accessed September 4, 2014).
[227] With the exception of Thailand, for which information on brokens was not found.
[228] See, for example, chapters 5–10; Limberger et al., "Produção de salgadinho extrusado" [Production of snacks from extruded broken rice," 2009; Pearson, Gotsch, and Bahri, *Applications of the Policy Analysis*, 2004, 274; IRRI, "Vietnam Trip Report," July 2013; IRRI, "Vietnam Trip Reports," November 2013; U.S. government official, email to USITC staff, February 11, 2015; Agrifood Consulting International, *Rice Value Chain Study: Cambodia*, 2002, 59; Rickman et al., "Rice Milling in Cambodia," 2000, 260–61; Sophea, *The Rice Situation in Cambodia*, January 2012, 13; World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 23; Food Corporation of India, "Uniform Specification for Grade 'A' and 'Common' Rice" (accessed February 17, 2015).

grain or aromatic rice). Publicly available rice price quotes for exporting countries attest to their ability to export diverse products (table 4.6).[229]

Table 4.6: Export price quotes available for selected countries

Country	Long grain white					Aromatic	Medium grain[a]
	≤ 10%[b]	15–20%[b]	≥ 25%[b]	Parboiled[c]	Brokens[d]		
Brazil	X	X		X	X		
Burma	X	X	X			X	
Cambodia	X	X	X		X	X	
India	X	X	X	X	X	X	
Pakistan	X	X	X	X	X	X	
Thailand	X		X	X	X	X	
United States	X	X		X	X		X
Uruguay	X			X			
Vietnam	X		X		X	X	X

Source: FAO, GIEWS Food Price Monitoring and Analysis Tool (accessed January 29, 2014); Oryza, Global Rice Quotes, http://oryza.com/ (accessed January 29, 2014); Rice Authority, http://www.riceauthority.com/prices/ (accessed February 11, 2015).

[a] Based on availability of price quotes for medium grain rice with any share of brokens.
[b] Share of brokens.
[c] Parboiled includes all levels of brokens.
[d] Based on the availability of any type of 100 percent brokens: A1 superior (Thailand and Cambodia), 100% broken (Vietnam, Pakistan, and India), half grain (Brazil), and pet food (United States).

Being able to produce a specific product for the export market indicates the capacity to supply a product of a certain type and quality (as measured by brokens), but does not convey comparative quality (actual or perceived) within that product segment. However, prices for the same product from multiple countries can serve as a proxy quality measure, given that they capture not only delivered costs, but also other aspects of product differentiation. Higher prices likely reflect favorable product characteristics, such as low levels of brokens and chalk, superior taste, or perceived safety. Comparable price data series were available for only six of the exporters in this analysis (chapter 3). Four countries (the United States, Uruguay, Vietnam, and Thailand) could be compared in the low-brokens (5 percent or less)/high-quality segment of the market, and four (India, Pakistan, Thailand, and Vietnam) in the high-brokens (25 percent or higher)/low-quality market segment. Prices within each product class were compared to Thai prices, which often serve as global benchmark prices. Based on this comparison and other relevant data, Thailand, the United States, and Uruguay are judged as suppliers of higher-quality long grain rice in the low-brokens segment of the market. In the high-brokens market

[229] Short grain (glutinous) rice and other specialty rice were excluded from this analysis. Paddy rice was also excluded because, while all rice-producing countries grow paddy rice, it is only exported by Brazil and the United States in significant volumes.

segment, India, Pakistan,[230] and Vietnam can be considered to be lower-quality suppliers than Thailand.[231]

Similar export price series were not available for Brazil, Burma, and Cambodia. However, qualitative information, including the general quality of rice produced in these countries, suggests that Burma and Cambodia are suppliers of lower-quality long grain rice, while Brazil is a medium-quality supplier (chapters 8 and 10).

Reliability of Supply

Reliability of supply refers to the ability of a supplier to deliver a specified product, of a particular quality and in an agreed-upon volume, to a given location at a contracted time. The risks inherent in agricultural production (potentially impacting both the quantity and quality of supply) make this criterion particularly important for purchasers. A number of factors affect reliability. Particularly important is the efficiency of the supply chain, including storage and transportation infrastructure, as well as market information systems. In agriculture, several factors may disrupt reliability by shrinking a country's exportable surplus, including: government-imposed export controls, political unrest, poor transportation infrastructure, and unstable production quantities (owing to poor weather). This section considers both the ability of the selected countries to reliably supply their domestic markets—a vital task in countries where rice is a staple food—and the ability of exporters to consistently supply global customers.

Reliability of Domestic Supply

A product within a country can be reliably supplied through domestic production, imports, or a combination of the two. Given the importance of rice in the Asian diet, most Asian countries see it as imperative to produce at least as much rice as they consume to ensure a reliable supply. The ratio of a country's annual rice production to its domestic consumption indicates the reliability of supply through domestic production. Ratios below 1 indicate that a country did not meet its domestic demand that year.

Ratios for selected countries during 2007/08–2013/14 are shown in table 4.7. In this period, the Philippines was the least reliable supplier to its domestic market, with domestic demand exceeding domestic supply in every year. The Philippines was followed by Indonesia, which was in rice deficit from 2009/10 to 2013/14. Bad weather, including typhoons, hurt production levels in both countries on a regular basis (chapter 9). By this measure, Brazil and China were

[230] In addition, Pakistan has had problems meeting phytosanitary requirements for export, including those in Central America and Mexico, as noted in chapter 7.
[231] FAO, GIEWS, FPMA (accessed December 19, 2014).

Table 4.7: Ratio of production to consumption, 2007/08–2013/14

Country	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Uruguay	15.52	15.02	13.4	19.17	16.62	15.87	17.16
Pakistan	2.1	1.98	2.33	2.04	2.43	2.5	2.55
Thailand	2.06	2.09	1.99	1.97	1.97	1.91	1.88
United States	1.56	1.6	1.78	1.75	1.68	1.68	1.53
Cambodia	1.1	1.24	1.24	1.26	1.26	1.32	1.29
Vietnam	1.26	1.28	1.31	1.36	1.38	1.26	1.28
Burma	1.1	1.04	1.07	1.1	1.12	1.13	1.14
India	1.07	1.09	1.04	1.06	1.13	1.12	1.07
Brazil	0.98	1.02	0.94	1.13	0.99	1.02	1.05
China	1.02	1.01	1.02	1.01	1.01	0.99	0.97
Indonesia	1.02	1.03	0.96	0.93	0.96	0.96	0.94
Philippines	0.78	0.82	0.74	0.82	0.83	0.89	0.92

Source: USDA, PSD Online (accessed January 21, 2015).
Note: Information based on a milled-rice-equivalent basis for the marketing year.

somewhat unreliable suppliers, as their domestic supply fell short in some, but not all, years. The eight other countries were all reliable suppliers of their domestic markets, especially Uruguay, Pakistan, Thailand, Vietnam, and the United States, where domestic supply significantly exceeded demand in every year of the period. In countries where rice is the primary staple crop for the majority of the population (especially in India, China, and most Southeast Asian countries), a stable domestic rice supply is of primary importance and the availability of export supplies is less so.

Reliability of Export Supply

In order to be a reliable supplier of rice to the export market, a country must have an exportable surplus. Measures of this factor include the share of exports in a country's total supply of rice (the "export supply") and the variability of this ratio over time (table 4.8). A large and stable export surplus indicates greater reliability of a country as an exporter. Export variability can be measured by the coefficient of variation (CV) of exports, which is the ratio of the standard deviation to the mean of the annual quantity of rice exported over the seven-year study period, divided by the average annual export quantity.[232] Countries with lower CVs can be considered more reliable suppliers of rice.

[232] The CV covers exports of all types and forms of rice as measured on a milled-rice-equivalent basis. The CV measures variability and is an indicator, rather than a precise measure, of reliability of supply.

Table 4.8: Exports as a share of total supply and coefficient of variation, selected exporters, 2007/08–2013/14

Country	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	Period coefficient of variation, exports
				Percent				
United States	40	37	40	38	40	41	37	0.07
Pakistan	47	38	50	55	53	56	54	0.11
Uruguay	78	93	86	80	83	93	92	0.13
Vietnam	18	22	25	25	26	23	22	0.15
Thailand	45	37	36	40	26	22	31	0.17
Cambodia	9	20	18	20	20	22	20	0.30
Burma	4	8	6	9	11	10	12	0.33
Brazil	6	6	5	14	10	9	9	0.41
India	4	2	2	2	8	8	8	0.68

Source: USDA, PSD Online (accessed January 14, 2015 and January 15, 2015) and calculations by USITC staff.

Between 2007/08 and 2013/14, the United States, Pakistan, and Uruguay had large exportable rice surpluses and low levels of supply variability. Vietnam had low export supply overall, but a fairly stable export flow and a lower CV. Thailand's export supply was noticeably lower in 2011/12 and 2012/13 due to government policies (see chapter 8), but it still maintained a low CV. The net exporters with the greatest variability in exports were India, Brazil, Burma, and Cambodia. Export supplies from Burma and Cambodia trended up over the period, but both countries restricted rice exports over part of the period to control domestic supply.[233] India restricted long grain exports during this period, resulting in an erratic export supply.[234]

As noted, many of the higher CVs reflect government controls on exports, generally to ensure rice supply at affordable prices for the domestic market. Many exporting countries imposed export bans or other export restrictions on rice exports between 2007 and 2009 (table 4.9). Countries that impose such restrictions can be considered less reliable suppliers of rice because of the trade disruptions such policies create. Restrictions may include outright export bans or policies that discourage exports, such as minimum export prices (MEPs) and export taxes. During 2007–13, government policies also triggered other types of supply disruptions, such as the buildup of massive stocks in Thailand acquired under the 2011 Paddy Pledging Program (chapter 8).

[233] Childs and Kiawu, *Factors behind the Rise*, 2009, 6.
[234] Most of this variation is likely from long grain rice policies. India's basmati rice likely has much lower variation, since it is an export-oriented product not often affected by export restrictions.

Table 4.9: Government policies negatively affecting the reliability of rice exports, 2007–13

Country	Restrictions
Brazil	None
Burma	Costly export permits, export taxes, and occasional export restrictions
Cambodia	Occasional export restrictions
India	Ban on non-basmati exports, MEPs, export tax and MEPs on basmati
Pakistan	MEPs on basmati and non-basmati rice
Thailand	Stocks amassed under 2011 Paddy Pledging Program
United States	None
Uruguay	None
Vietnam	Occasional export restrictions, MEPs, export restrictions, and taxes

Source: Sharma, "Food Export Restrictions," May 2011; chapters 5–10.

Finally, market information and transportation infrastructure both contribute to reliability of supply—or detract from it. As discussed in chapter 3, the lack of functioning futures markets for rice hampers price discovery on the global market for all suppliers. In addition, in many countries outside of the United States, a lack of information on stock levels, or even exports, hinders transparency and the ability to make informed business decisions. This is the case in China, Thailand, and Vietnam. While favorable transportation infrastructure for rice exists in the United States, China, Thailand, Uruguay, and Vietnam, rice exports from Cambodia and Burma are hindered by problems with port and other transportation infrastructure.

As shown in table 4.2, based on all available information, the United States and Uruguay are the most reliable exporters of rice in this sample. Pakistan, Thailand, and Vietnam are also reliable suppliers of rice to the global market. The remaining countries are less reliable long grain rice exporters.[235]

[235] India is likely a reliable supplier of basmati rice.

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Chapter 5
United States

Overview

Despite its relatively low share of global production, the United States is a rice surplus country and a significant exporter. Although U.S. rice exports were fairly stable in volume terms, their share of global exports fell during 2007–13, largely because of growth in global exports by other suppliers. The United States' global competitiveness is related to its reputation as an efficient and reliable supplier of high-quality rice. Its reputation stems from certain distinct advantages, such as access to high-quality inputs, good crop management systems, and advanced technology. In addition, highly efficient transportation, logistics, and infrastructure, along with proximity to certain key markets, contribute to the United States' reputation as a reliable, timely supplier. Many of these competitive strengths have required considerable investment by the industry and contribute to relatively high U.S. rice production costs. Despite its strengths, the United States faces increasing competition domestically and in global markets from lower-priced suppliers whose quality is rising. In addition, weather-related quality problems with the large 2010/11 U.S. rice crop and the commingling of rice varieties with different milling characteristics and other attributes may be eroding the high-quality reputation of U.S. rice.

This chapter describes the U.S. rice industry: trends in U.S. rice production, consumption, and trade; government support programs; and factors affecting U.S. competitiveness. Chapter 11 describes the impact of foreign exports on the U.S. rice industry in both the domestic and third-country markets.

Rice Production, Consumption, and Trade

Production

Between 2007/08 and 2013/14, the United States accounted for about 1 percent of global rice production.[236] In 2013/14, it was the 12th-largest producer of rice globally. Production was relatively steady during this period, other than a record-high crop of 7.6 million metric tons (mt) in 2010/11 (table 5.1). In most years, production was close to the 6.4 million mt average for

[236] USDA, PSD Online (accessed January 21, 2015). Data on production, consumption, and ending stocks are based on marketing year unless otherwise noted. Data are based on a milled-rice-equivalent basis for comparison purposes.

Table 5.1: United States: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	1,266	935	977	1,184	1,514	1,303	1,156
Production (milled) (1,000 mt)	6,288	6,546	7,133	7,593	5,866	6,348	6,117
Area harvested (1,000 ha)	1,112	1,204	1,256	1,463	1,059	1,084	999
Yield (rough) (mt/ha)	8.1	7.7	7.9	7.5	7.9	8.4	8.6
Imports (1,000 mt)	759	610	604	582	615	669	733
Consumption and residual (1,000 mt)	4,042	4,082	4,014	4,329	3,492	3,779	3,996
Exports (1,000 mt)	3,336	3,032	3,516	3,516	3,200	3,385	2,985
Ending stocks (1,000 mt)	935	977	1184	1,514	1,303	1,156	1,025
Exports-to-production ratio (%)	53	46	49	46	55	53	49
Ending stocks-to-use ratio (%)	13	14	16	19	19	16	15
Per capita consumption (kg)	13.4	13.4	13.1	14	11.2	12	12.5

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption used marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

2007/08–2013/14.[237] Production trends during this period closely follow area harvested, which depended on the returns available for competing crops, particularly corn and soybeans, and environmental conditions.

The United States produced about 40 percent more rice than it consumed annually during 2007/08–2013/14. Although the U.S. industry produces long, medium, and short grain rice, most U.S. production is long grain, non-aromatic rice. During 2007/08–2013/14, 71 percent of U.S. production volume was long grain rice, 27 percent medium grain, and the remainder short grain varieties.[238] Some U.S. aromatic rice varieties are produced and marketed in the United States, but they account for a very small share of total U.S. production.[239]

Consumption and Ending Stocks

During 2007/08–2013/14, the United States accounted for less than 1 percent of total global consumption. Most years during this period the United States consumed close to 4 million mt annually, except in 2011/12, when consumption was 12 percent below average because of lower shipments to most U.S. market segments, including warehouse clubs and military.[240] The United States has one of the lowest rates of per capita rice consumption in the world, averaging only 12 kg a year during 2011/12–2013/14 (figure 2.7).

[237] Average of 2007/08–2013/14, excluding 2010/11.

[238] USDA, NASS, *Crop Production 2013 Summary*, January 2014, 27; USDA, NASS, *Crop Production 2011 Summary*, January 2012, 25; USDA, NASS, *Crop Production 2009 Summary*, January 2010, 19.

[239] In Louisiana, the largest aromatic rice-producing U.S. state, aromatic rice varieties were planted on 14,820 ha in 2013 and 658 ha in 2014. In other states, the total was less than 800 ha in those years. Industry representative, email to USITC staff, November 13, 2014.

[240] USA Rice Federation, *U.S. Rice Domestic Usage Report*, 17.

The United States held about 1 percent of global ending stocks during 2007/08–2013/14. For most of the period, ending stocks represented about 15 percent of rice use (domestic consumption plus exports) and averaged almost 1.1 million mt annually.[241] However, owing to the large harvest in 2010/11, ending stocks in 2010/11 and 2011/12 were substantially higher, representing 19 percent of use.

Trade[242]

Although the United States is a small rice-producing country globally, it is a significant exporter, ranking fourth or fifth globally throughout 2007–13.[243] Exports are important to the U.S. rice industry, accounting for roughly half of annual production (table 5.1). U.S. rice exports have been relatively stable for decades, ranging from nearly 3 million to 4 million mt since the mid-1990s. During the period 2007–13, excluding 2010, U.S. exports were again largely stable, averaging about 3.7 million mt annually, with a value of $2.2 billion in 2013 (table 5.2).[244] However, their share of global exports fluctuated in that period: they grew from 9 percent in 2007 to 12 percent in 2010, then fell ending the period at 8 percent in 2013, largely because of growth in global exports by other suppliers.[245]

The United States exports rice in a variety of forms, the largest being paddy rice and white rice, which together made up close to 90 percent or more of U.S. shipments during 2007–13.[246] However, during this period, exports of white rice increased at the expense of paddy rice. During 2007–09, white rice accounted for 47 percent of U.S. exports and paddy rice for 43 percent. By 2011–13, however, the share of white rice rose to 52 percent of annual exports, while paddy rice fell to 39 percent.[247] The United States is one of the few countries exporting

[241] Based on data for 2007/08–2009/10 and 2012/13–2013/14.
[242] For a more detailed discussion of U.S. rice exports and imports, see chapter 11.
[243] USDA, PSD Online (accessed October 20, 2014).
[244] Exports in 2010 reached a period high of 4.5 million mt due to a record-high harvest that year.
[245] Global share is on a milled-rice-equivalent basis for comparison purposes. USDA, PSD Online (accessed October 20, 2014).
[246] GTIS, Global Trade Atlas database (accessed October 21, 2014). White rice includes all types (long, medium, short grain, and aromatics) and excludes brown rice.
[247] GTIS, Global Trade Atlas database (accessed October 20, 2014). Trade data are reported on an actual basis, as opposed to a milled rice equivalent basis. To convert paddy and brown rice into milled rice equivalent, USDA uses a conversion factor of 70 percent for volumes of paddy rice and 88 percent for volumes of brown rice. In other words, the total weight of paddy rice is reduced by 30 percent, and the total weight of brown rice by 12 percent, to arrive at the milled rice equivalent. Childs, "Developing Supply and Utilization Tables," November 2000, 45.

Table 5.2: United States: Rice exports (HS 1006), 2007–13

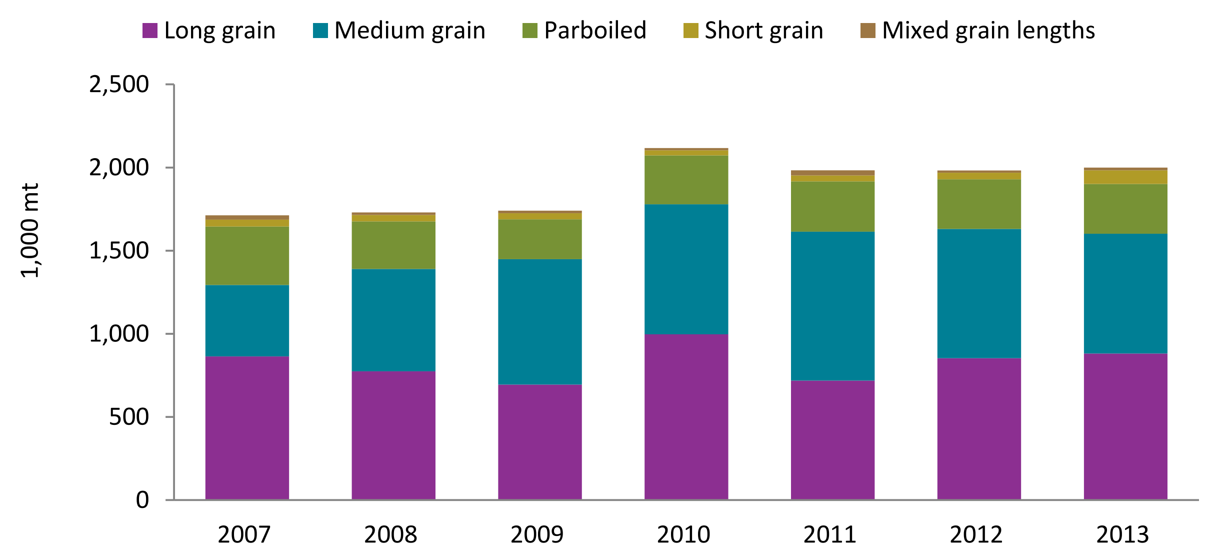
Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Mexico	829	779	843	817	925	848	862
Central America	710	611	563	576	529	567	364
Honduras	105	139	132	122	155	141	115
El Salvador	97	93	110	83	96	84	73
Guatemala	77	76	65	67	78	91	68
Haiti	277	289	277	320	293	361	324
Venezuela	3	314	44	340	53	227	296
Japan	303	274	400	317	375	342	295
Canada	248	243	214	226	226	225	241
South Korea	73	108	41	104	163	71	159
Turkey	2	133	44	427	97	153	141
West Africa	153	149	180	288	235	236	138
Ghana	86	60	37	95	98	109	103
Liberia	13	16	12	19	62	46	11
Nigeria	0	1	51	75	0	26	0
Saudi Arabia	127	131	115	115	142	115	137
Iran	0	31	0	0	0	3	126
All other	755	747	727	945	679	634	680
Total	3,480	3,809	3,448	4,475	3,717	3,782	3,763
				Value (million $)			
Mexico	242	353	350	312	364	365	403
Central America	216	271	222	212	190	220	151
Honduras	31	63	55	46	56	52	47
El Salvador	27	34	39	29	35	31	28
Guatemala	21	31	25	24	27	34	26
Haiti	110	197	146	160	161	198	195
Venezuela	2	171	18	122	18	86	135
Japan	167	167	422	232	303	232	204
Canada	122	164	180	166	165	166	175
South Korea	43	76	40	73	125	49	111
Turkey	1	75	18	180	45	59	62
West Africa	63	78	101	137	118	135	88
Ghana	35	32	21	44	57	62	68
Liberia	5	8	7	10	29	30	7
Nigeria	0	1	29	39	0	12	0
Saudi Arabia	80	117	118	93	113	88	116
Iran	0	24	0	0	0	2	78
All other	343	513	563	644	511	449	465
Total	1,389	2,206	2,178	2,331	2,113	2,049	2,183

Source: GTIS, Global Trade Atlas database (accessed July 9, 2014 and February 20, 2015).
Note: HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

paddy rice,[248] almost exclusively to Mexico, Turkey, and countries in Central and South America.[249] The remaining exports were of brown and broken rice.

U.S. white rice exports include long grain, short and medium grain, and parboiled rice (long grain and mixed grain lengths). During 2007–13, long grain and medium grain rice were the leading types of white rice exports (figure 5.1). U.S. markets for white long grain rice were diverse, with top markets including Haiti, Saudi Arabia, Canada, and Ghana during 2007–13.[250] The United States exported its medium and short grain rice primarily to Japan. For more information about U.S. exports, markets, and competitiveness, see chapter 11.

Figure 5.1: U.S. milled rice exports



Source: GTIS, Global Trade Atlas database (accessed October 21, 2014).
Note: Exports are on a volume basis and are not directly comparable to trade data on a milled-rice-equivalent basis.

U.S. Industry Structure

The U.S. rice industry comprises two distinct sectors—growing and milling. These sectors are linked by large grower-owned cooperatives which perform milling and marketing for their grower-members. However, a significant portion of U.S. rice production is marketed as paddy rice, exclusively for export, which bypasses the milling sector and is traded by rice or grain merchandisers.

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248 Many major exporting countries, including India and Thailand, have disincentives or restrictions on paddy rice exports. The only other leading global exporters of paddy rice are Brazil and Uruguay, with paddy rice accounting for 17 and 5 percent of their exports, respectively, during 2011–13. GTIS, Global Trade Atlas database (accessed October 21, 2014).
249 GTIS, Global Trade Atlas database (accessed July 9, 2014).
250 Ibid.

Rice growing is limited to certain U.S. regions because rice plants have particular requirements, including abundant irrigation water, heavy clay soils that retain water, level topography to maintain uniform water depth, and warm temperatures during critical growing stages. U.S. rice production area can be divided into four main growing regions (table 5.3 and figure 5.2). Rice production in each region shares similar characteristics, such as specific soil types and weather patterns, resulting in similar planting methods, growing conditions, and cost structures. While most U.S. rice production involves a single crop harvested each year, in the Gulf Coast region (Texas and southwest Louisiana), a second (or ratoon) crop may be harvested from a single planting because of the longer growing season.[251]

Table 5.3: U.S. rice-growing regions

Name of region	Area in region
Arkansas Non-Delta	Northeastern Arkansas, Bootheel of Missouri, and Arkansas Grand Prairie
Gulf Coast	Southern Louisiana and South Texas
Mississippi River Delta	Southeastern Arkansas, Mississippi, and Northeast Louisiana
California	Sacramento Valley

Source: USDA, ERS, *Consolidation and Structural Change*, April 2011.

[251] A ratoon crop is grown from the stubble of the first crop. It is generally smaller than the first crop, but takes fewer resources and less time to grow. Hence it can add substantially to a farm's overall yield and reduce costs of production per unit.

Figure 5.2: United States: Paddy rice production by state, 2013

Source: USDA, NASS, *Crop Production 2013 Summary*, January 2014.

The three southern U.S. rice-growing regions, collectively “the southern region,” accounted for 75–85 percent of U.S. rice acreage and production during 2007/08–2013/14, with California accounting for the balance. The southern region grows mainly long grain rice, with a small amount of medium grain production, while California grows exclusively high-quality medium and short grain rice (table 5.4). Arkansas and Louisiana are the two states most likely to shift acreage between long and medium grain because of changes in market or growing conditions. Mississippi, Texas, and Missouri produce mainly long grain rice.[252]

Table 5.4: U.S. paddy rice production and area, by rice type and by state, 2013

Product	Arkansas	California	Louisiana	Mississippi	Missouri	Texas	U.S. total
All rice							
Area harvested (1,000 ha)	433	227	167	50	63	58	999
Production (1,000 mt)	3,669	2,158	1,367	416	498	506	8,613
Production ($1,000)	1,253,764	789,728	479,147	144,981	168,907	189,465	3,025,992
Share of total production vol. (%)	43	25	16	5	6	6	100
Share of total production val. (%)	41	26	16	5	6	6	100
Long grain							
Area harvested (1,000 ha)	384	2	159	50	62	57	715
Production (1,000 mt)	3,257	16	1,303	416	491	499	5,983
Share of total production (%)	54	<1	22	7	8	8	100
Medium/short							
Area harvested (1,000 ha)	49	225	8	0	1	1	284
Production (1,000 mt)	411	2,142	64	0	6	7	2,630
Share of total production (%)	16	81	2	0	<1	<1	100

Source: USDA, NASS, *Crop Production 2013 Summary,* January 2014.

Arkansas is the leading rice-producing state, accounting for about 43 percent of total U.S. rice production in 2013 and about 54 percent of total U.S. long grain rice production, by volume. Rice is an important crop in Arkansas, ranking as the state’s second highest value commodity (behind soybeans) and the top agricultural export. Arkansas is home to the most rice mills and rice merchants in the United States, including the two largest rice-milling cooperatives. California is the second-largest rice-producing state, with about 25 percent of total U.S. production and more than 80 percent of medium and short grain rice production in 2013. Although its acreage has been shrinking over time, Louisiana rice production is also extremely important in the state’s agricultural production; it is the state’s second-largest agricultural export after soybeans. Louisiana is also the home of the largest acreage in U.S. aromatic rice production.

Over the last several decades, the number of U.S. rice farms declined at the same time that the average farm size and farm value for rice grew considerably, similar to other U.S. grain

[252] USDA, ERS, “Characteristics and Production Costs of U.S. Rice Farms,” March 2004, iv.

industries.[253] Most growers raise other crops in addition to rice or rotate rice with other crops for soil maintenance.

The U.S. rice milling sector is highly concentrated: the two largest U.S. rice mills—Riceland Foods, Inc. and Producers Rice Mill, Inc.—are farmer cooperatives and market approximately 40 percent of the nation's rice production.[254] Rice mills are either independently owned or operate under a farmer-owned cooperative structure. In 2012/13, 22 millers represented over 75 percent of U.S. rice production.[255] Mills produce white and brown milled and/or parboiled rice sold in bulk or under retail brands. Smaller independent mills may focus on the production of niche rice types, such as organic or other specialty rice, including the small volume of aromatic rice produced in the United States.

Futures contracts for U.S. paddy rice are traded on the Chicago Board of Trade (CBOT). The contract covers U.S. no. 2 grade or better long grain paddy rice, and thus serves the U.S. southern growing region. There is no contract for the California medium grain market because production volume is too low to support one. Although use of the futures market to manage price risk is available to rice producers, mill owners, merchandisers, food processors, exporters and importers, only a small share of the U.S. long grain rice crop is represented on the CBOT.[256]

The existence of a U.S. rice futures market has contributed to the efficiency of the U.S. rice marketing system by reducing handling, storing, and milling margins.[257] The CBOT rice futures exchange provides daily quotes of paddy rice prices for future delivery that serve to predict what buyers and sellers in the rice market expect prices to be at that time. This trading makes price discovery and price risk management possible. Price discovery allows all participants in the U.S. rice industry, from farmers to the operators of rice mills, dryers, and elevators, to make informed marketing decisions about when to buy, sell, and store rice. Price risk can be managed by hedging paddy rice contracts on the exchange and locking in a paddy rice price, as gains or losses in the cash market are usually offset by positions held in the futures market. Using this hedging tool, the operators of rice mills, dryers, and elevators can offset the daily price risk associated with storing rice.[258]

[253] There were 5,591 rice farms in the United States in 2012, a decline of 8 percent from 2007. USDA, NASS, *2012 Census of Agriculture*, 2014, 8 (table 1).
[254] Industry representatives, interview by USITC staff, Washington, DC, October 22, 2014.
[255] USA Rice Federation, *USA Rice Daily,* July 11, 2014.
[256] Salassi, "Rice Production Economics," June 2009.
[257] McKenzie, "Potential Risk Management Benefits," n.d. (accessed November 17, 2014).
[258] Ibid.

U.S. rice is sold into several marketing channels, including retail grocery outlets, food service establishments, industrial food processors, and for export.[259] The U.S. food service industry (including cafeterias and restaurants) procures mainly long and medium grain white rice and parboiled rice, while industrial food processers (such as brewing companies and pet food manufacturers) mainly buy 100 percent broken rice.[260] Medium grain table rice is used in sushi, in certain Southern-style dishes, and by certain ethnic groups for everyday table rice. Food processors are also heavy users of medium grain rice for puffed rice and other cereal applications.[261] Other industrial users, which represent a growing end-use segment, include food manufacturers that produce prepared frozen meals, cereal bars, and rice noodles. Most of these channels are served mainly by domestic rice production.

During 2007–13, U.S. exports were mainly in the form of paddy rice (42 percent) and long grain white rice (22 percent). Smaller shares of medium grain white rice (18 percent), long grain parboiled rice (7 percent), and medium grain brown rice (4 percent) were exported as well. U.S. exports of long grain brown rice, brokens, and short grain white rice were less than 3 percent each of total exports.[262] More information on U.S. exports and competitiveness can be found in chapter 11 of this report.

Government Support Programs

Farm Bill Support Programs

A large portion of U.S. farm policy and government support programs for rice are established in U.S. farm bills.[263] However, the level of government support for the U.S. rice industry has fallen significantly over the past 10 years and is expected to slide further with the implementation of the Agricultural Act of 2014 (2014 Farm Bill).[264] Annual spending on rice programs fell from nearly $1.8 billion in fiscal year (FY) 2000 to an average of $377 million in FY 2007–13

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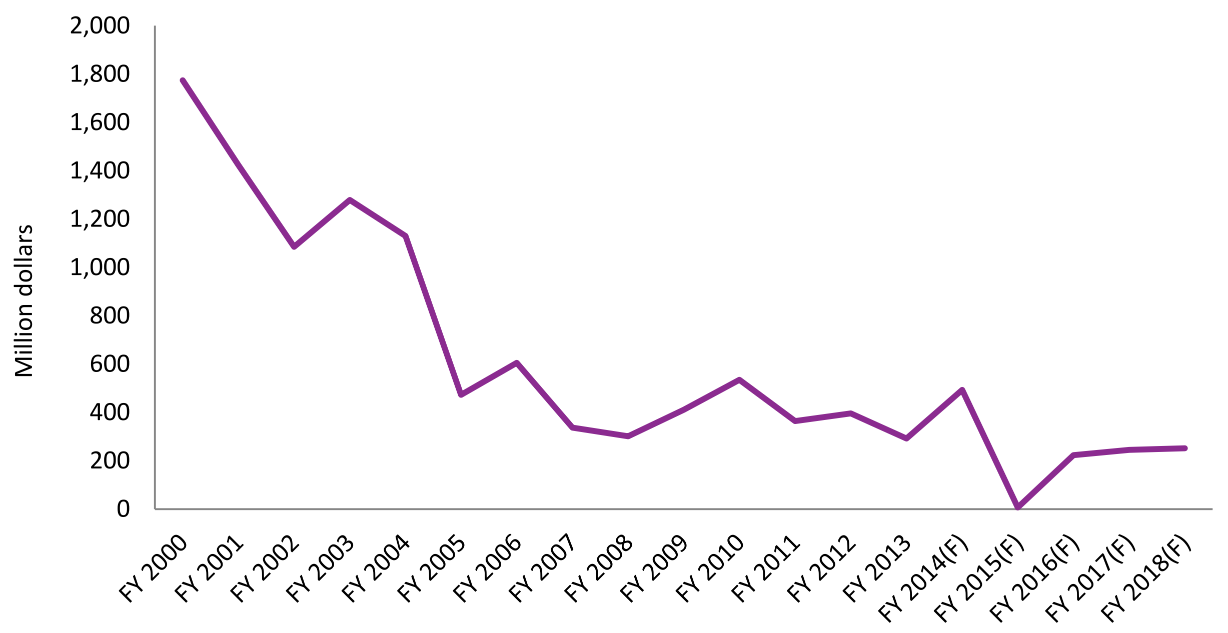
[259] Of domestic sales, 59 percent went to direct food use and the rest to food processing. Of direct food use, 30 percent went to retail grocers, 27 percent went to ethnic grocers, 19 percent went to food service, and 15 percent to repackers. The remainder of direct food use went to warehouse clubs, the military, and U.S. Department of Agriculture (USDA) feeding programs. USA Rice Federation, *USA Rice 2012/13 Almanac,* n.d., 8. (accessed September 4, 2014).
[260] USA Rice Federation, *U.S. Rice Domestic Usage Report,* n.d., 16. (accessed September 4, 2014).
[261] Industry representatives, interviews by USITC staff, Little Rock, AR, December 8–9, 2014.
[262] USITC DataWeb/USDOC (accessed October 8, 2014). U.S. export shares on a milled-rice-equivalent basis were 34 percent paddy, 25 percent long grain white rice, 20 percent medium grain white rice, 8 percent long grain parboiled rice, and 4 percent medium grain brown rice.
[263] Farm bills are omnibus, multiyear pieces of legislation governing agricultural and food programs that are renewed about every five years. The farm bills most relevant to the study period are the Farm Security and Rural Investment Act (2002 Farm Bill); the Food, Conservation and Energy Act (2008 Farm Bill); and the Agricultural Act of 2014 (2014 Farm Bill).
[264] Agricultural Act of 2014, Pub. L. No. 113-79, February 7, 2014, 113th Congress.

(figure 5.3). This is expected to drop further to an average $244 million per year for FY 2014–18.[265]

Figure 5.3: U.S. government expenditures on rice programs



Source: Congressional Budget Office for FY 2013–2018 and USDA Farm Service Agency for FY 2000–2012.
Note: F = forecast.

Farm bills contain several different categories of support, including commodity programs, crop insurance, conservation, and international programs. These programs are funded through the Commodity Credit Corporation (CCC), a government corporation created in 1933 to encourage adequate supplies of agricultural commodities, support farm incomes, distribute commodities, and promote soil and water resource conservation.[266]

Between FY 2005 and FY 2013, CCC expenditures were primarily in the form of direct payments, which fell under commodity programs.[267] Over the period, direct payments for rice

[265] U.S. government expenditures on rice programs are forecast to be much lower than the average in FY 2015 as a result in the gap between the expiration of the old program and the implementation of the new program and its payments schedule. The Congressional Budget Office estimates expenditures at only $7 million for FY 2015.
[266] USDA, OBPA, *2013 Explanatory Notes: Commodity Credit Corporation,* 2013, 24-1.
[267] The Marketing Loan Program, which was an important source of support for rice producers in the 1980s and 90s, was still in place during 2007–13. This program provides interim financing when the market price for a commodity falls below its reference price. However, rice prices have been generally above the reference price during the past decade, which has limited program payouts. Industry representative, interview by USITC staff, August 14, 2014.

averaged $378 million per year, or about $120 per harvested acre.[268] The Farm Security and Rural Investment Act (2002 Farm Bill) and the Food Conservation and Energy Act (2008 Farm Bill) included direct payments but decoupled them from production in 2002 and then from prices in 2008.[269] After direct payments were decoupled, market returns still remained fairly constant through FY 2011.

In addition to direct payments, during the period 2007–13 the rice industry benefited from two U.S. international trade programs, the Foreign Market Development program (FMD) and the Market Access Program (MAP), under the 2008 Farm Bill.[270] These programs continue under the 2014 Farm Bill. In FY 2014, rice received a combined $4 million under these programs (from the total allotment of $200 million for all agricultural products).[271] Rice exporters have also benefited from the Export Credit Guarantee Program, which provides competitive credit terms to buyers, mainly in developing countries, by reducing financial risk to lenders through credit guarantees. In FY 2014, rice accounted for $177 million (9 percent) of the $2 billion of U.S. registered export guarantees.[272] Rice producers have also been eligible for crop insurance programs administered by the USDA Risk Management Agency (RMA).[273] However, these producers' participation in the insurance programs has grown slowly because many farmers did not view insurance as a worthwhile option at first. They also reportedly hesitated because the program requires an up-front investment, as farmers must pay part of the discounted premium.[274]

The 2008 Farm Bill also authorized several U.S. programs for international food aid distribution. Between FY 2002 and FY 2011, average annual spending on these programs for all commodities

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[268] Direct payments were eliminated by the 2014 Farm Bill. Data sources are as follows:
Direct payment values for FY 2005–11: USDA, Farm Service Agency, CCC Budget Essentials, FY 2003–2011 CCC Actual Payments, Direct Payment Table (accessed November 17, 2014); Direct payment values for FY 2012: CBO, *CBO's May 2013 Baseline for Farm Programs*, May 14, 2013, 18; Direct payment values for FY 2013: CBO, *CBO's April 2014 Baseline for Farm Programs*, April 14, 2014, 18; Harvested acres: USDA, PSD Online (accessed November 7, 2014).

[269] Farm Security and Rural Investment Act of 2002, Pub. L. No. 107–171, May 13, 2002, 107th Congress, 116 Stat. 134; Food Conservation, and Energy Act of 2007, Pub. L. No. 110-246, June 18, 2008, 110th Congress, 122 Stat. 1651.

[270] Both the FMD and the MAP are administered by the USDA Foreign Agricultural Service in conjunction with agricultural trade associations, cooperatives, state and regional trade groups, and small businesses. The FMD program attempts to expand and maintain long-term export markets for U.S. agricultural products by funding promotional activities. The MAP is a cost-sharing program for overseas marketing and promotional activities that help build commercial export markets for U.S. agricultural products and commodities.

[271] USDA, FAS, Online Table, FMD Funding Allocations—FY 2014; USDA, FAS, Online Table, MAP Funding Allocations—FY 2014. The programs are administered through grants to industry associations with requirements for matching funds, based on proposals for international market development activities. For rice, the two industry associations (cooperators) are the USA Rice Federation and the U.S. Rice Producers Association.

[272] USDA, FAS, *Export Credit Guarantee Program Yearly Activity Report*, FY 2014.

[273] Industry representative, interview by USITC staff, August 14, 2014.

[274] Ibid.

totaled about $2.2 billion.[275] Rice accounts for only a small portion of the food aid distributed through these programs, averaging 6 percent of shipments during 2007–12.[276] Between 2003 and 2006, U.S. rice food aid shipments fell dramatically and became less important for the U.S. rice industry, accounting for only about 5 percent of total rice exports during 2007–12.[277]

Finally, rice growers also benefit from U.S. conservation programs under the Farm Bill, particularly the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP). Both of these help farmers with a share of the costs for carrying out conservation programs on working land. The rice industry was an early adopter because the CSP includes management of habitat for waterfowl and migratory birds, which rice lands provide.[278]

The 2014 Farm Bill

The most recent support package was the 2014 Farm Bill, which was enacted into law in February 2014, with implementation in the second half of 2014. This farm bill significantly changed the government support programs for rice that were in place during the period covered by this report, 2007–13, and its implications for the U.S. rice industry are not yet clear. The Congressional Budget Office estimated that under the 2014 Farm Bill, spending on the rice sector through the CCC will be $1.2 billion over five years (compared to $2 billion during FY 2009–13), compared to $8.2 billion for feed grains and $2.8 billion for soybeans.[279]

The 2014 Farm Bill eliminated direct payments and created new risk management tools under commodity programs via two programs, Price Loss Coverage (with a supplemental coverage option) and Agricultural Risk Coverage. These programs offer farmers protection when market forces cause substantial drops in crop prices and/or revenues. Producers must choose between the two programs and will be locked into that choice for the duration of the farm bill (five years). In addition, many programs from previous farm bills, including FMD, MAP, Export Credit Guarantees, marketing loans, crop insurance, and conservation programs, will continue.

[275] Schnepf, *International Food Aid Programs*, May 28, 2014, 1.
[276] World Food Programme, Food Aid Information System Quantity Reporting database (accessed November 17, 2014).
[277] World Food Programme, Food Aid Information System Quantity Reporting database (accessed November 17, 2014); USDA, PSD online database, accessed November 17, 2014; industry representative, interview by USITC staff, September 4, 2014.
[278] Ducks Unlimited, *Working Rice Lands,* May 6, 2014; industry representative, interview by USITC staff, September 4, 2014.
[279] Values for FY 2000–2012: USDA, FSA, CCC Budget Essentials, President's Budget, Table 35 for FY 2009 and FY 2014; values for FY 2013–24: CBO, *CBO's April 2014 Baseline for Farm Programs*, April 14, 2014, 4. In 2012, corn (a major feed grain) made up 17 percent of total crop value, soybeans accounted for almost 10 percent, and rice for less than one percent. USDA, NASS, *2012 Census of Agriculture*, 2014, Table 2.

Rice Checkoff Programs

In addition to support under the farm bill, individual state-run checkoff programs provide funds for rice marketing and research. Funds for these programs are collected from individual rice producers. Unlike some other commodities that have a national checkoff program administered by the USDA Agricultural Marketing Service, rice has state-specific checkoff programs operated by individual states. Each of the major rice-producing states has a checkoff program that collects a certain amount of money per bushel or hundredweight of rice produced and/or sold. The programs are voluntary in Louisiana and Texas but mandatory in Arkansas, California, and Missouri.[280] The programs fund rice research and development (primarily on seed development and cultivation practices), as well as marketing and promotion, both in the United States and overseas. Some of the marketing and research activities are conducted by the state organizations, and others by USA Rice Federation and the US Rice Producers Association. Checkoff budgets in the three largest rice-producing states were $4.9 million in California (2013), $3.4 million in Arkansas (2013), and $1.3 million in Louisiana (2014).[281]

Factors Affecting Competitiveness

Despite its small size relative to global producers, the U.S. rice industry has traditionally competed successfully in global markets. This is owing to its reputation as an efficient and reliable supplier of high-quality rice, in various forms, both domestically and abroad. Its reputation stems from certain distinct advantages that have traditionally set its product apart from that of many other global rice exporters. U.S. producers have access to high-quality inputs, such as seed and fertilizer; good crop management systems; and advanced technology for rice drying, storing, and milling. These help to ensure high-quality rice at harvest and the ability to maintain that quality throughout the distribution chain. Advanced farm systems, including the use of new seed technology and efficient irrigation systems, have consistently increased yields while controlling costs. At the same time, highly efficient transportation and logistics, particularly on inland waterways, and associated infrastructure have kept transport costs low and contribute to the U.S. reputation as a reliable, timely supplier. Many of these competitive strengths have required considerable investment by the industry and increase the cost of U.S. rice production.

[280] Growers in Louisiana and Texas can request checkoff refunds. Delta Farm Press, "Rice Checkoff Still under Fire," July 1, 2014; Texas A&M University, *Texas Rice*, March 2004, 1; Arkansas Rice Research and Promotion Board, "About the Board," http://www.arkrice.org/about/ (accessed January 10, 2015); California Rice Commission "About the Rice Commission" (accessed January 10, 2015); Missouri Department of Agriculture, "MDA Web Forms Information" (accessed January 10, 2015).
[281] California Rice Commission, *Annual Report/2013*, 2013, 17; Arkansas Rice Research and Promotion Board, *Statement of Research Allocations, Fiscal Year 2013–14*, 2014, 2; Louisiana Rice Research Board, *2013 Louisiana Rice Research Board Annual Report,* 2014, 6.

The United States faces increasing competition at home and in global markets from lower-priced suppliers whose quality is rising. The challenge, particularly for the U.S. long grain rice industry, is to remain price competitive without sacrificing U.S. rice's quality reputation in light of increasing global competition, uneven market access vis-à-vis key competitors, complex government regulations, water scarcity threats, and rising consumer expectations and concerns about food and the environment. The section below identifies and analyzes several key factors that affect U.S. competitiveness, including production costs, product diversity, reputation for quality, and research innovations.

Production Costs Limit U.S. Exports in Price-Sensitive Markets

As noted above, continuous technological improvements have kept U.S. rice production highly advanced and efficient. Leading-edge cultivation techniques and mechanization limit field labor to only 7 man-hours per acre in the United States, compared with 300 man-hours per acre in some Asian rice-producing countries.[282] As a result, U.S. rice farms generate some of the highest yields in the world. However, modern rice production practices make rice a high-cost crop in the United States.

USDA calculations show diverse costs and returns on rice for the major U.S. rice-growing regions.[283] Of the four major growing regions, the highest total production costs were for California at $1,377 per acre in 2013, owing to higher costs for purchased irrigation water, custom operations, and chemicals, as well as the opportunity cost of land (rental rate), which was more than double the average for the three southern regions.[284] California's high costs are mitigated by high yields and higher returns for the medium grain rice produced there.

In the Arkansas Non-Delta region the majority of rice produced is long grain, non-aromatic rice. Total variable costs for rice in the Arkansas Non-Delta region were $155 per mt in 2013

[282] USA Rice Federation, "History of Rice in the USA," n.d. (accessed September 4, 2014).
[283] Cost information for rice grown in the United States is available from commodity cost and return estimates compiled by the USDA's Economic Research Service, using Agricultural Resource Management Survey data and other sources. USDA, ERS, "Commodity Costs and Returns: Documentation," May 1, 2014.
[284] 2013 production costs in the Arkansas Non-Delta, Mississippi River Delta, and Gulf Coast regions were $888, $888, and $1,071 per acre, respectively. USDA, ERS, Commodity Costs and Returns: Rice 2012/13 (accessed September 4, 2014). Production costs vary among the U.S. rice-producing states and are influenced by natural endowments (e.g., soil type) and fertilizer needs of particular rice varieties, as well as the production system used (e.g., a particular seeding method), weed management practices, or irrigation water source (deep-well groundwater or surface canal). All of these factors and production system options have different costs. Salassi, "Rice Production Economics," June 2009, 130.

(table 5.5).[285] Allocated fixed costs add another $96 per mt to the cost, resulting in a total cost of $251 per mt. Major operating cost components are fuel and electricity costs, as well as fertilizer, seed, and chemicals. Of total fixed costs, the largest components are the opportunity cost of land (rental rate) and capital recovery of machinery and equipment. Between FY 2005 and FY 2013, direct payments for rice averaged approximately $120 per harvested acre, or about $37 per mt (at an average 7.9 mt/ha yield).

Table 5.5: United States: Cost of production of long grain paddy rice (Arkansas Non-Delta region), 2013

Item	**COP**	**Share of COP**
	$/mt	%
Seed	21.46	9
Fertilizer	26.44	11
Chemical inputs	19.81	8
Labor[a]	18.48	7
Water[b]	0.07	0
Fuel/electricity	43.51	17
Irrigation	0.00	0
Other operational[c]	25.25	10
Total, variable costs	155.03	62
Land	43.26	17
Physical capital	40.33	16
Other fixed costs[d]	12.38	5
Total, fixed costs	95.97	38
Total COP	251.00	100

Source: USDA, ERS, "Rice Production Costs and Returns," for 2012–13 (accessed December 19, 2014).
Note: Cost of production (COP) are for long-grain paddy grown in Arkansas' Non-Delta region.
[a] Includes hired labor and opportunity cost of unpaid labor.
[b] Includes purchased irrigation water.
[c] Includes custom operations, repairs, commercial drying, and interest on operating capital.
[d] Includes capital recovery of machinery and equipment, opportunity cost of land, taxes and insurance, and general farm overhead.

Rice production costs in the Arkansas Non-Delta region rose by 40 percent between 2007 and 2013.[286] The main contributors to the increase in variable costs were fuel/electricity, seed, and fertilizer costs. Other factors were increases in the opportunity cost of land and in capital recovery of machinery and equipment, included here under "other fixed costs."

High U.S. rice prices relative to some other sources have undermined U.S. price competitiveness globally.[287] This is particularly true in Africa, where price-sensitive markets have favored lower-cost, similar-quality supplies. In the last several years, U.S. rice sales to Nigeria have dropped dramatically because of higher U.S. rice prices compared to those of

[285] Costs and returns are presented by region, not by rice type. Both long and medium grain rice are grown in the Arkansas Non-Delta region, and production costs for each type are generally the same. One cost difference may be higher seed costs for long grain rice when using hybrid rice seed.
[286] USDA, ERS, "Rice Production Costs and Returns," n.d. (accessed December 19, 2014).
[287] See chapter 3 for U.S. rice price comparisons.

other origins.[288] Price competition has also intensified in Ghana, where the United States has lost sales to Thailand and Vietnam.

Although they have held steady in the most recent period (2007–13), U.S. exports of parboiled rice have fallen from their levels in the 1990s and early 2000s, owing to global parboiled rice supplies that have increased in quality and have become more price competitive. The loss of U.S. export markets for parboiled rice, particularly South Africa, has resulted in excess parboiling capacity in the United States, while price-competitive global supplies have lowered margins on the U.S. product.[289]

Ability to Supply Various Rice Types and Forms

The ability to produce and market rice of various forms and types, including long and medium grain rice in paddy, brown, milled, and parboiled forms, allows the U.S. rice industry to compete in a range of markets. The United States has large supplies of these rice types and forms, even after supplying most of U.S. consumption. U.S. rice competitiveness, however, varies considerably, depending on the rice type and form considered and the specific market where competition takes place.[290]

The United States competes in many segments of the global market for rice. It is one of the few global suppliers of paddy rice, giving it an advantage in this export market segment.[291] Mexico, Central America, and Turkey are important U.S. markets that prefer to capture the value-added process of milling in their own country, and so import rice in this form. Similarly, the United States is one of the few global exporters of medium grain rice, giving it the advantage in this market segment.[292] Although the United States is a limited global supplier of parboiled rice, U.S. parboiled rice is competitive in the U.S. market, and domestic demand is almost entirely supplied by U.S. production. Finally, the United States has traditionally been competitive in the high-quality segment of the market for long grain white rice, the segment in which the majority of global trade and competition in rice occurs.

One segment where the United States currently does not compete is in aromatic rice—a small but growing high-value segment in the United States and globally.[293] The U.S. market for

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[288] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 4–5.
[289] Industry representative, telephone interview by USITC staff, November 14, 2014; industry representatives, interview by USITC staff, Little Rock, AR, December 8, 2014.
[290] For more information on U.S. export competition by market, see chapter 11.
[291] In 2013, the United States accounted for more than 60 percent of total global exports of paddy rice. GTIS, Global Trade Atlas database (accessed February 9, 2015).
[292] USDA, ERS, *Consolidation and Structural Change*, April 2011, 11.
[293] U.S. aromatic rice is not widely accepted owing to differences in eating characteristics, such as taste and texture. U.S. Government official, interview by USITC staff, Washington DC, June 4, 2014.

aromatic rice is dominated by imported jasmine and basmati rice, and U.S. aromatic rice has not yet won over a large share of U.S. consumers.

Developments in Long Grain Rice Breeding Research

The continual development of new long grain rice varieties to increase yields while maintaining quality is a priority of the U.S. rice industry. Rice breeding research is a long-standing component of the U.S. rice industry, traditionally carried out by land-grant universities in the major rice-growing states.[294] Private industry interest in rice breeding and cultivar development has grown over the last two decades with the marketing of Clearfield (herbicide-resistant) technology and the development of hybrid rice, neither of which are genetically modified (GM).[295] Although other U.S. row crops are grown from GM seed, GM rice is not grown in the United States owing to strong market resistance.[296] One private company, RiceTec, Inc., headquartered in Alvin, TX, develops and markets hybrid rice varieties in the United States, while university breeding programs also recently have begun development on hybrids in addition to conventional seeds.

Despite the efforts of rice breeding programs over time, the proliferation of long grain rice varieties is a relatively recent phenomenon in the U.S. industry. Today the number of seed types, including hybrids, for long grain rice in the United States is large compared to just a decade ago. According to some estimates, the share of U.S. long grain rice acreage planted in hybrids is almost 40 percent.[297] The share of Arkansas acreage alone devoted to hybrids grew from 28 percent in 2010 to 41 percent in 2013.[298] Hybrid rice development and adoption has been driven by the desire for higher yields and disease resistance. Hybrid varieties have been attractive to rice growers, despite their higher seed cost, owing to their increased yields, less intense farming practices, and success on marginal land.[299]

The proliferation of rice seed varieties has changed the landscape of the U.S. rice industry. It was long a bulk industry: the few, mostly conventional, U.S. long grain varieties had similar traits and were commingled at rice collection points. Their grains had similar milling and cooking performance owing to uniform length and maturity. This uniformity grew out of the

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[294] In addition to state rice checkoff programs, provisions in certain U.S. trade agreements provide for a portion of revenues from auctioning TRQ import licenses to return to the United States for rice research.
[295] Genetically modified rice is rice that has been engineered to exhibit a specific trait, such as herbicide resistance, added nutrients, disease resistance, or insect resistance, by inserting a gene from another organism that will cause the plant to express that trait.
[296] USA Rice Federation, "USDA Says 'LibertyLink Is Out of the U.S. Rice Supply,'" April 1, 2014.
[297] Mayer, *U.S. Long Grain Rice Industry,* n.d., 6 (accessed December 5, 2014).
[298] Coats, "Arkansas' Rice Situation and Outlook," December 2013.
[299] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014.

traditional public rice breeding programs working towards rice varieties with "typical U.S. southern long grain" rice characteristics, which include particular chemical parameters.[300] Within these parameters, this conventional rice has a "typical southern U.S. cooking quality" which is dry, fluffy, and nonsticky when cooked.[301]

In contrast, currently available rice hybrids tend to have slightly different chemical parameters, which affect milling and cooking quality.[302] Researchers have found that hybrids are more apt to be chalky and to vary in grain length, grain width, and number of broken kernels. Some are more susceptible to extreme temperatures and temperature fluctuations during the growing season.[303] Current hybrids have also been found unsuitable for parboiling.[304] Early hybrid breeding programs appear to have focused more on improving yields and milling quality than on cooking quality.[305]

Despite considerable varietal improvement over many years, U.S. rice breeding research has not yet found a variety that boosts yields of current varieties without sacrificing some "typical U.S. southern long grain" quality traits. Ongoing research into hybrid rice improvements by public and private interests includes a focus on improving yields and milling quality, minimizing chalk, and maintaining grain length.[306] Researchers indicate that such a hybrid is several years from commercial development.[307]

Reputation for High Quality

U.S. rice has traditionally had a reputation for high quality in global markets, a key competitive strength for the industry. As noted earlier, U.S. long grain rice competes in the high-quality rice segment globally, being known for its low brokens content and its "typical U.S. southern long grain" milling and cooking characteristics. U.S. medium grain rice, particularly that grown in California, is also considered to be of extremely high quality, as reflected in its high price.[308]

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[300] These characteristics include 7 mm grain length; low chalk (opaque white spots, or "white bellies" on kernels); a translucent appearance; and particular chemical parameters, such as intermediate amylose (starch) content of 20–24 percent and intermediate gelatinization temperatures of 70° to 75°C (158° to 167 °F). Industry representatives, interviews by USITC staff, Little Rock and Stuttgart, AR, December 9–11, 2014. Wilson et al., "Rice Cultivars and Seed Production," n.d., 28 (November 17, 2014).
[301] Wilson et al., "Rice Cultivars and Seed Production," n.d., 29 (accessed September 4, 2014).
[302] Current hybrids tend to have lower amylose content, which results in a stickier rice, and higher levels of chalk, affecting grain color. Milled kernels from these hybrids also tend to be shorter than 7 mm. Industry representatives, interviews by USITC staff, AR, December 8–11, 2014.
[303] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014.
[304] Ibid.
[305] Industry representative, interview by USITC staff, Little Rock, AR, December 8, 2014.
[306] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014.
[307] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014. LSU, "Progress Continues on Hybrid Rice Breeding," November 14, 2014.
[308] USDA, ERS, *Consolidation and Structural Change*, April 2011, 26.

Moreover, U.S. rice benefits from its perceived ability to meet strict phytosanitary rules, along with the overall global reputation of the U.S. food and agricultural regulatory system.[309] This is of particular value in markets where domestic production quality and safety can be questionable. However, as discussed in the next section, in some areas that reputation may be in difficulty.

Inability to Meet Certain Customer Specifications

While many consumers of U.S. rice still hold its quality in high esteem, customers of U.S. long grain rice in certain markets have expressed dissatisfaction with its milling and cooking characteristics in recent years. Buyers in Mexico and Central America—the top two U.S. export markets for long grain paddy rice—have been the most vocal about the deterioration in the appearance, milling performance, and cooking qualities of U.S. long grain rice.[310] Large domestic buyers of U.S. long grain rice have also noted its declining quality, including high levels of chalk and the inability to use hybrid rice for parboiling.[311] The widened range of physiochemical properties in U.S. rice crops has also been cited as problematic for large U.S. food manufacturers, who find it increasingly challenging to source U.S. long grain rice with characteristics that match their product formulations.[312]

Although some observers noted changes as early as the mid-2000s, the U.S. long grain crop in 2010/11 was widely regarded to be of very poor quality, exhibiting high levels of chalk and poor milling yields, exacerbated by the very large crop that year.[313] Poor crop quality that year has been attributed to (1) adverse environmental conditions, particularly extreme and persistent high nighttime temperatures, and (2) the proliferation of new long grain rice varieties, particularly hybrids. In the U.S. industry there was, and still is, considerable debate about whether seed genetics or extreme weather contributed more to the 2010 crop problems.[314] The debate was further fueled by the fact that the 2010 crop showed high levels of chalk on kernels of both conventional varieties and hybrids. Despite better weather in the southern

[309] Moran, "Mexican Market under Siege," Winter 2014, 7.
[310] USA Rice Federation, "U.S. Rice Fighting Off Competition in Mexico," April 30, 2014; Fecarroz, "Fecarroz," December 8, 2014; Bennett, "Quality Paramount to U.S. Rice Importers," August 30, 2013; industry representatives, interviews by USITC staff, Little Rock, AR, December 8–11, 2014.
[311] Industry representative, telephone interview by USITC staff, November 14, 2014.
[312] Industry representatives, interviews by USITC staff, Little Rock, AR, December 8–9, 2014; industry representatives, telephone interviews by USITC staff, August 14, 2014, and November 14, 2014.
[313] USDA, ERS, *2010/2011 Rice Yearbook*, April 2012, 7. A very large, poor quality crop lowers the potential for mixing small amounts of low-quality rice with higher-quality rice.
[314] Mayer, "U.S. Long Grain Rice Industry," n.d. (accessed September 4, 2014); industry representatives, interviews by USITC staff, AR, December 8–11, 2014; industry representatives, telephone interviews by USITC staff, August 12, 2014, August 14, 2014, September 11, 2014, and November 14, 2014.

growing regions since 2010, the reports of diminished milling and cooking qualities of U.S. southern long grain rice have not abated.[315]

The common practice of commingling various long grain rice varieties at drying and milling points in the southern growing regions contributes to the poor milling and cooking quality cited by buyers.[316] Milling performance is diminished when varieties of different grain lengths and other physiochemical properties are combined. When fewer long grain varieties were grown in the United States, commingling was not a problem. However, as more of the U.S. long grain crop was planted to varieties with more diverse traits, particularly hybrids, commingling has begun to undermine quality.[317]

Some segments of the U.S. industry have responded to the critics. Several independent mills now segregate rice by variety, or by family of varieties with similar characteristics, a practice known as "identity preservation." End users can then specify rice varieties known to offer the milling and cooking properties they want. Several small U.S. rice mills reportedly began segregating rice types a few years ago when the difficulties with hybrids first became apparent.[318] These mills established new contract systems for buying rice from growers, paying them a discounted price for their hybrid rice or offering a premium for particular conventional varieties that were in demand by their customers. One mill in Texas began this practice in response to feedback regarding problems with parboiling hybrid rice.[319] Some mills in Louisiana started using a similar pricing approach with the 2012 crop.[320]

Most of the U.S. long grain rice crop, handled by the largest cooperative mills and large paddy rice traders/merchandisers, is not currently identity preserved, although some industry representatives said that it may be possible for them to do so.[321] Some mills indicated that the number of dryers a mill had could limit the number of varieties that could be segregated. Other industry observers noted that a recent increase in on-farm drying and storage could facilitate an effort to segregate rice by variety. Identity preservation, whether at the mill or on-farm,

[315] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014; industry representatives, telephone interviews by USITC staff, August 12, 2014, August 14, 2014, September 11, 2014, and November 14, 2014.
[316] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014; industry representatives, telephone interviews by USITC staff, August 12, 2014, August 14, 2014, September 11, 2014, and November 14, 2014.
[317] Industry representative, interview by USITC staff, Little Rock, AR, December 8, 2014.
[318] Industry representative, telephone interview by USITC staff, September 11, 2014.
[319] Ibid.
[320] Industry representative, telephone interview by USITC staff, September 11, 2014; Mayer, "U.S. Long Grain Rice Industry," n.d., 6 (accessed September 4, 2014).
[321] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014.

would also depend on correctly verifying the variety at specific rice collection points, and a timely lab test does not currently exist in the industry.[322]

Internationally, U.S. long grain rice is at a disadvantage relative to global long grain rice competitors whose national rice crops exhibit more uniformity and are, in effect, identity preserved. In recent years, long grain rice from Brazil and Uruguay has displaced U.S. long grain rice in a number of U.S. export markets. Uruguay, in particular, grows a small number of mainly conventional rice varieties—the same as those predominantly grown in the United States a decade ago. The issue of identity preservation has taken on greater importance since it comes at a time when the quality of rice from overseas is improving and increasingly competes with U.S. long grain rice in a number of U.S. export markets.

[322] Industry representatives, interviews by USITC staff, AR, December 8–11, 2014.

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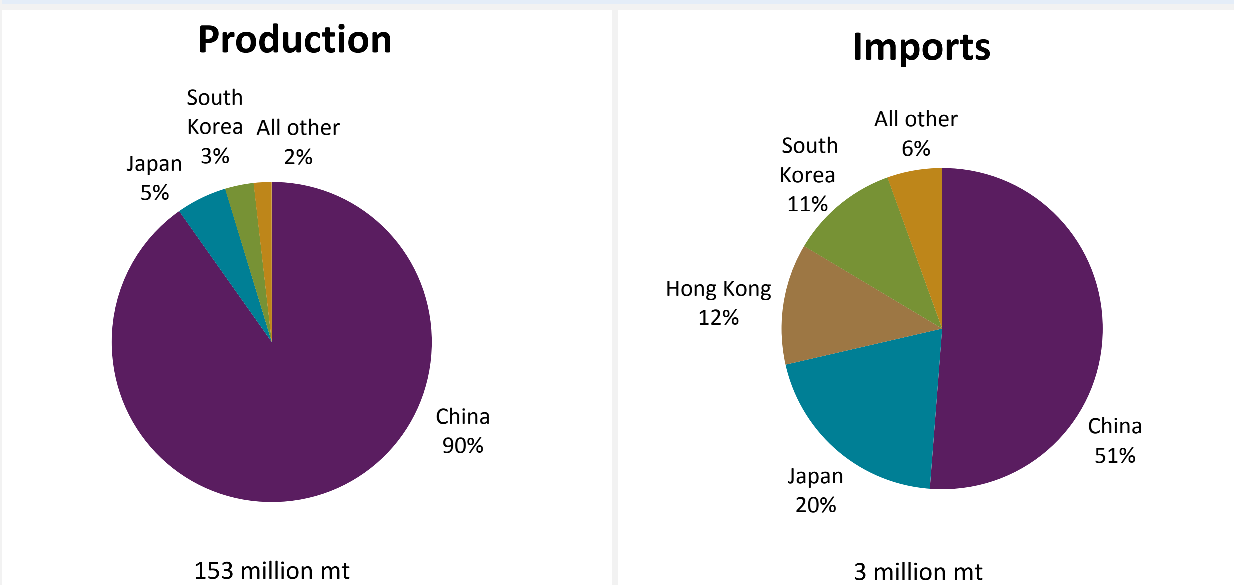
Chapter 6
East Asia: China

Overview

East Asia includes the largest global rice market, China, as well as other significant markets, mainly Japan and South Korea.[323] Rice is a major part of the East Asian diet, although demand in the more developed markets is mature, and diets have diversified. Government policies in the major East Asian markets are focused on supporting farmers through direct payments, minimum prices, support for the purchase of inputs, government purchases, stocks management, and import controls. China accounts for just under a third of global production and dwarfs other regional markets (figure 6.1).

Figure 6.1: Production and import shares among East Asian countries, 2007/08–2013/14



Source: USDA, PSD Online (accessed January 23, 2015 and March 5, 2015).
Notes: Shares based on quantity. Both production and import quantities are based on marketing year. Totals are based on the period averages.

Most countries in East Asia are importers, although China only transitioned to being a net importer in 2010/11. Prior to 2011/12, China accounted for a relatively small share of global and regional imports, but imports have been rising in recent years: it was the world's largest importer in 2013/14, and accounted for more than half of regional imports. Three other economies together accounted for over 40 percent of East Asian imports. Two of these—Japan

323 See appendix D for regional groupings.

and South Korea—are producers that carefully control import levels through minimum market access commitments (see chapter 2), while Hong Kong has minimal production and a generally open market. This chapter focuses on the Chinese market, given its regional dominance.

China

Overview

China is the world's largest rice market, accounting for nearly a third of global production and consumption.[324] Rice traditionally has been the primary staple food in China. A growing population has increased China's consumption of rice, and rice remains an important economic and cultural product, although recent demographic and dietary shifts have begun to erode its primacy in the Chinese diet.[325] Nonetheless, rice is a priority in the Chinese government's food security policy; the government has pursued a goal of complete self-sufficiency in recent years.[326] China's rice sector historically comprised a large number of small enterprises and many actors, involved in a long value chain that delivered rice from farmers to processors and final consumers. However, this structure is changing, as efforts are underway to transform and modernize the sector. The related goals of self-sufficiency and modernization have driven recent government policies directed to the sector.

Trade has always been residual, accounting for a relatively small share of China's rice market. However, given the market's vast size, the absolute quantities and the direction of China's trade have major implications for the world market. In recent years, China has shifted from being a net rice exporter to being a net importer, with a significant volume of imports believed to be unreported.[327] The uncertainty about China's ability to maintain self-sufficiency, coupled with uncertainty about the accuracy of data on China's rice market (particularly its stocks), are of concern to world rice market participants.[328]

[324] Production and consumption data for major rice producers are reported in appendix E.
[325] Reardon et al., *The Quiet Revolution in Staple Food Value Chains*, 2012, 17-18.
[326] Oryza, "China Targets Self Sufficiency in Rice," April 21, 2014.
[327] Government officials, industry representatives, and industry observers, interviews by USITC staff, various locations and June 17, 2014; July 21, 2014; July 28, 2014; July 31, 2014; October 22, 2014; October 23, 2014.
[328] Government officials, industry representatives, and industry observers, interviews by USITC staff, various locations, June 17, 2014; July 14, 2014; October 20, 2014; October 22, 2014; October 23, 2014; November 10, 2014; November 11, 2014.

Production, Consumption, and Trade

Production

China is the largest producer of rice in the world, accounting for about 30 percent of global rice production during 2007/08–2013/14. Throughout this period, Chinese rice production increased at an average annual rate of about 1.5 percent to reach 142.5 million metric tons (mt) in 2013/14 (table 6.1). The upward trend resulted from an increase in harvested area coupled with a rise in yields. Despite increasing production, demand rose faster than domestic supply, and in 2012/13 China transitioned from having a surplus in rice to a deficit.

Table 6.1: China: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	35,915	37,762	38,546	40,534	42,574	45,023	46,826
Production (milled) (1,000 mt)	130,224	134,330	136,570	137,000	140,700	143,000	142,530
Area harvested (1,000 ha)	28,919	29,240	29,627	29,873	30,057	30,137	30,312
Yield (paddy rice) (mt/ha)	6.4	6.6	6.6	6.6	6.7	6.8	6.7
Imports (1,000 mt)	445	201	388	540	1,790	3,700	4,015
Consumption and residual (1,000 mt)	127,450	133,000	134,320	135,000	139,600	144,000	146,300
Exports (1,000 mt)	1,372	747	650	500	441	341	257
Ending stocks (1,000 mt)	37,762	38,546	40,534	42,574	45,023	46,826	46,814
Exports-to-production ratio (%)	1	1	[a]	[a]	[a]	[a]	[a]
Ending stocks-to-use ratio (%)	29	29	30	31	32	32	32
Per capita consumption (kg)	96.7	100.4	100.9	100.9	103.9	106.6	107.8

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption used marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.
[a] Less than 0.5 percent.

Another major development has been a long-term shift in Chinese rice production from long grain to medium and short grain varieties to meet domestic and regional demand. In 2011, roughly one third of China's rice production was made up of medium and short grain rice, up from 11 percent in 1980 and 29 percent in 2000.[329]

There are two other important pieces to the Chinese rice picture: virtually all of China's rice farms are irrigated,[330] and nearly two-thirds of China's rice-growing area is planted in hybrid rice.[331] These two factors, combined with the use of fertilizers and pesticides, have resulted in average Chinese paddy rice yields above 6.6 mt per hectare (ha) in recent years, the highest among Asian producers.[332]

[329] IFPRI, *Rice Value Chains*, 2013, 19; Hansen et al., *China's Japonica Rice Market*, November 2002, 32.
[330] GRiSP, *Rice Almanac,* 2013, 109.
[331] Li et al., "Hybrid Rice Technology Development," November 2009, 3.
[332] GRiSP, *Rice Almanac, 4th edition*, 2013, 106.

Consumption and Ending Stocks

China is the largest consumer of rice in the world. During 2007/08–2013/14, it accounted for 31 percent of global consumption. In that period, total apparent consumption grew over 2 percent a year on average (table 6.1). The rise in consumption resulted mainly from population growth and the increased industrial use of rice for food products.[333] Chinese per capita consumption of rice also increased by almost 2 percent annually during 2007/08–2013/14.[334] According to official U.S. Department of Agriculture (USDA) data, during 2007/08–2012/13, Chinese ending stocks increased by over 4 percent a year (table 6.1). In 2013/14, ending stocks declined slightly, but were still relatively high for the period at 46.8 million mt. China's estimated ending stocks represent a relatively large share of total rice use (domestic consumption plus exports) compared to that of other major rice-producing and -consuming countries: 32 percent during 2011/12–2013/14. However, the actual stock level is uncertain, in part due to the decentralized nature of stock holdings.[335]

Given the concern among some global rice producers about the accuracy of official Chinese stocks data and the potential effects of such changes, the Commission modeled global and U.S. domestic market responses to changes in China's stocks.[336] First, a simulation was run assuming a stock increase of 5 million mt.[337] This resulted in a minor trade effect, with China's imports increasing by 86,300 mt (milled rice equivalent basis). Conversely, a simulation assuming a 5 million mt stock decrease also resulted in a minor trade effect, with China's imports declining by 80,300 mt (milled rice equivalent basis). In both cases, there was virtually no impact on the U.S. market, including exports.[338]

Trade

Between 2007 and 2013, China transitioned from being a net rice exporter to a net rice importer. During the first five years of this period, China's annual rice imports averaged 410,000 mt (table 6.2). In 2012, imports increased more than fivefold to 2.9 million mt.[339] In

[333] USDA, FAS, *China: Grain and Feed Annual 2014*, April 2, 2014, 6.
[334] While it is generally acknowledged that total consumption is rising in China, there is some question as to whether per capita consumption is rising as well. As explained in chapter 2, there are widespread doubts about the accuracy of Chinese stocks and import data, which, in turn, determine the data on absolute and per capita consumption.
[335] U.S. government official, interview by USITC staff, Washington, DC, July 31, 2014.
[336] Government officials, industry representatives, and industry observers, interviews by USITC staff, various locations and dates.
[337] The scenario was developed using Commission estimates based on conversations with various industry and government sources.
[338] Commission economic modeling simulation using the RiceFlow model (see appendix H).
[339] USDA PSD data are used for total Chinese imports in 2012 and 2013, because they account for measurable gray-market trade, which was substantial in these years and not included in GTA data.

Table 6.2: China: Rice imports (HS 1006), 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Vietnam	27	1	3	56	234	1,545	1,481
Pakistan	[a]	[a]	[a]	[a]	9	580	417
Thailand	440	286	317	299	326	175	300
Cambodia	0	[a]	[a]	[a]	[a]	4	21
Laos	4	4	17	7	7	22	17
Burma	[a]	3	[a]	2	1	6	7
All other	[a]	[a]	[a]	1	2	12	1
Total (GTA)	472	296	338	366	578	2,345	2,244
Total (PSD Online)	472	295	337	366	575	2,900	3,483
				Value (million $)			
Vietnam	7	0	1	22	124	682	616
Pakistan	[a]	[a]	[a]	[a]	4	269	172
Thailand	209	180	195	227	256	155	235
Cambodia	0	[a]	[a]	[a]	[a]	3	19
Laos	1	1	5	2	2	6	6
Burma	[a]	[a]	[a]	[a]	[a]	2	2
All other	[a]	1	[a]	1	1	8	1
Total (GTA)	217	184	201	253	387	1,125	1,052

Source: GTIS, Global Trade Atlas database (accessed August 8, 2014); USDA, PSD Online (accessed August 22, 2014).
Note: The Global Trade Atlas (GTA) database reflects officially reported statistics. USDA included estimated gray-market trade in its calculation of Chinese imports in PSD Online. PSD Online data is for trade year (TY) exports with TY 2006/2007 equivalent to calendar year 2007. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.
[a] Less than 1,000 mt or $1 million.

2013, China's rice imports rose by 20 percent to 3.5 million mt, accounting for 10 percent of global imports. China was the world's largest rice importer in 2013 and is forecast to remain so through 2014/15.[340] The substantial increase in Chinese rice imports beginning in 2012 resulted from a combination of high government support prices relative to world prices, food security concerns, and the structure of the import tariff-rate quota (TRQ). These factors encouraged an expansion of both official and unofficial (gray-market) trade.[341] Other factors include possible overstated production levels and changing consumer tastes.[342] The Chinese government recently indicated it would continue to import rice owing to relatively low world prices.[343]

[340] USDA, PSD Online (accessed September 17, 2014).
[341] Industry observer, telephone interview by USITC staff, December 3, 2014. The demand for long grain rice is more than double that for medium and short grain rice, and the bulk of the market is located in the southern part of China, adjacent to gray-market sources. The long grain TRQ typically fills every year, and the prohibitive over-quota tariff provides an incentive for smuggling.
[342] Ewing and Hongzhou, "China as the World's Largest Rice Importer: Regional Implications," September 12, 2013; Mohanty, "Game Changers in the Global Rice Market," September–October 2013, 44.
[343] Oryza, "China Plans to Import More Rice," December 8, 2014. For example, China has been negotiating a large government-to-government contract with Thailand. Oryza, "Thailand Plans to Clinch New G2G Rice Export Contract," November 13, 2014.

During 2007–13, major suppliers to China through official channels were Vietnam, Thailand, and Pakistan. These sources supplied 99 percent of the total reported quantity of Chinese imports of milled rice in 2013, 82 percent of which was long grain.[344] Imported rice is often blended with domestically produced rice or used for further-processed food products.[345] China is reportedly negotiating with Burma, India, and the United States to establish official trade access (e.g., phytosanitary protocols) for rice, although timelines for any actual trade openings are unknown.[346] As of January 2015, reports indicated that official trade with Burma is expected to begin in the spring of 2015.[347]

Beginning in 2012, as China's imports surged, large quantities of rice began to enter the country through gray-market channels, only some of which were included in USDA's Production, Supply and Demand Online estimates.[348] It is likely most of China's gray-market imports consist of long grain varieties.[349] Major suppliers of rice through gray-market channels were reportedly Vietnam and Burma,[350] and in August 2014, China began a crackdown on the flow of these unofficial rice imports.[351] However, this trade, which both Vietnam and Burma contend is legal because it breaks no domestic laws, continues despite these efforts.[352] The Chinese government subsequently emphasized that it would strengthen its efforts against food import smuggling in order to ensure domestic food stability.[353] The Chinese government also has tightened enforcement of the TRQs to prevent long grain rice from filling the medium and short grain TRQ.[354]

China's rice exports declined each year for the first five years of the period, falling from 1.3 million mt in 2007 to 279,000 mt in 2012 before rising to 478,000 mt in 2013.[355] The bulk of

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[344] GTIS, Global Trade Atlas database (accessed December 10, 2014).
[345] USDA, FAS, *China: Grain and Feed Annual 2014*, April 2, 2014, 6.
[346] For example, see Htike, "First Step Made," September 29, 2014; Oryza, "China Promises to Import," November 14, 2014; Oryza, "Myanmar Begins Formalities," January 14, 2015.
[347] Oryza, "Myanmar to Begin Official Rice Exports," January 20, 2015; *Eleven*, "Nine Firms to Export Rice Officially to China," January 19, 2015. See also Burma and Vietnam in chapter 8.
[348] Industry representative, telephone interview by USITC staff, July 28, 2014; U.S. government official, interview by USITC staff, Washington, DC, July 31, 2014.
[349] Industry representative, interview by USITC staff, Manila, Philippines, November 11, 2014; industry observer, telephone interview by USITC staff, December 3, 2014.
[350] Industry representative, telephone interview with Commission staff, July 28, 2014.
[351] FAO, "Commodity Policy Developments," August 2014; Oryza, "China Officially Bans Unofficial Rice Imports," August 7, 2014.
[352] See, for example, *Eleven,* "Rice Exports Surge," September 30, 2014; Oryza, "Myanmar's Illegal Rice Exports to China," December 26, 2014; Oryza, "Vietnam Scales Down Rice Export Expectation," January 21, 2015; Yap, "China's Low-Tech Smuggling Fad," December 30, 2014; Tuoi Tre News, "Vietnam Should Stop Cross-Border Trade with China," December 30, 2014; Oryza, "Myanmar Illegal Rice Exports to China," January 6, 2015.
[353] Wang, "In Winter and Spring Water Conservancy Construction Nationwide," October 24, 2014.
[354] USDA, FAS, *China: Grain and Feed Annual 2014*, April 2, 2014, 6. China maintains separate TRQs for long grain rice and for medium or short grain rice.
[355] GTIS, Global Trade Atlas database (accessed August 8, 2014).

these exports were destined for South Korea, North Korea, Japan, and Hong Kong and consisted mainly of medium and short grain brown and white rice.

Industry Structure

China's rice industry comprises a large number of geographically diverse farms and mills. The industry historically consisted of small-scale, labor-intensive enterprises. However, more recently, it has been slowly shifting towards larger, more capital-intensive enterprises in response to rising costs and pressures on resources, such as labor, land, and water. The modernization of the Chinese rice industry, driven in large part by food security concerns, has been facilitated by government policies on price supports, input subsidies, the development of hybrid varieties, and infrastructure development. As a result, the productivity of the Chinese rice industry has increased and is higher than that of other major Asian rice producers.[356]

Rice is grown on the majority of China's 200 million farms.[357] China has a range of climatic zones that enable diverse rice production areas, multicropping, and multiple harvests, offering the country a significant competitive advantage. Most Chinese rice production is in the Yangtze River valley and areas to the south, where water is relatively abundant (figure 6.2).[358] Hunan is the largest Chinese rice-producing province, accounting for 13 percent of total rice production in 2013.[359] Following were Heilongjiang (11 percent), Jiangxi (10 percent), and Jiangsu (9 percent). In recent years, production has increased in northern China, mainly in the northeast.[360] Industrialization in southern coastal areas of China, such as Guangdong and Zhejiang, has increased land and labor costs and contributed to the shift in rice production to the north.[361] The share of total rice production accounted for by northern China doubled between 1995 and 2009, reaching 15 percent in the latter year.[362]

The average Chinese farm size is relatively small, less than one ha.[363] Furthermore, farms generally are fragmented, comprising several smaller noncontiguous plots. A household may have up to 10 plots, with most of them less than 0.15 ha (0.4 acres).[364] Recently, there have

[356] China has identified to the World Trade Organization (WTO) Committee on Agriculture (COA) certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "China: Notification of Domestic Support Commitments," October 13, 2012, table DS:9.
[357] Huang, Wang, and Qiu, "Small-scale Farmers in China," 2012, 16.
[358] GRiSP, *Rice Almanac,* 2013, 106.
[359] NBS, *China Statistical Yearbook*, 2013.
[360] GRiSP, *Rice Almanac,* 2013, 106.
[361] Huang, Wang, and Qiu, "Small-scale Farmers in China," 2012, 9.
[362] GRiSP, *Rice Almanac,* 2013, 106.
[363] Reardon et al., *The Quiet Revolution in Staple Food Value Chains*, 2012, 19.
[364] Huang, Wang, and Qiu, "Small-scale Farmers in China," 2012, 16.

Figure 6.2: China: Paddy rice production by province, 2013

Source: Government of China, National Bureau of Statistics, *China Statistical Yearbook 2013*.

been efforts to consolidate plots to increase the average farm size in order to capture efficiencies.[365]

The Chinese rice milling sector traditionally comprised about 100,000 small-scale mills, mainly located at the town level in rice-producing areas.[366] However, in recent years there has been a substantial consolidation and modernization in the sector, driven largely by rising urbanization and income levels, as well as better infrastructure and shortening of value chains. These factors

[365] Some Chinese provincial governments provide incentives to large grain farms in the form of area payments and cash awards to encourage consolidation of farm land. The number of recipients reportedly has been small. Gale, *Growth and Evolution*, August 2013, 11.
[366] McKee, "Companies Race for Rice Market Supremacy," May 2010, 70.

have contributed to the entry of new firms, as well as more investment to upgrade and enlarge existing facilities.[367]

There are many actors in China's rice value chain. Growers may sell their paddy rice either to private dealers, state-owned grain depots, processors, or final consumers.[368] Private dealers are middlemen and sell paddy rice to the state-owned depots or to processors. The state-owned depots can keep paddy rice in state grain reserves or process paddy rice and sell milled rice to wholesalers. Rice processors sell milled rice to wholesalers, who in turn sell to retail markets.

The State Administration of Grain, under the direction of the National Development and Reform Commission (NDRC), is responsible for managing grain supplies and administering the government procurement and storage program.[369] The government intends to increase state grain reserves by 25 million mt during the 2014 season.[370] This is despite a shortage in storage space that led to plans to increase grain storage capacity by 50 million mt by 2015.[371]

China's rice distribution sector has been experiencing a rapid transformation, as the value chain modernizes by extending its geographic reach and eliminating the number of links, particularly in the middle.[372] This has lowered delivered costs and improved quality, thus enhancing the competitiveness of the sector.

Government Support Programs

The Chinese government provides support to the agricultural sector through policies focused largely on maintaining production levels and promoting modernization. It has set a goal of food security through full self-sufficiency in rice production.[373] To achieve this, the government has provided the rice sector with direct payments, input subsides, tax relief, support for storage cost, support prices, quality and consolidation incentives, and import protection (table 6.3).[374] Going into the future, general policy goals include safeguarding existing arable land, applying science to agricultural practices, improving production support policies, and putting a higher

[367] McKee, "Companies Race for Rice Market Supremacy," May 2010, 70.
[368] Decker and Bochnowski, *The Market for Rice in China*, January 2009, 27.
[369] Government of China, State Administration of Grain, "Message from the Administrator of SAG," 2002.
[370] FAO, *Rice Market Monitor,* July 2014, 2–3. This includes all grains, including rice.
[371] FAO, *Rice Market Monitor,* July 2014, 3.
[372] Reardon et al., *The Quiet Revolution*, 2012, 271.
[373] Oryza, "China Targets Self Sufficiency in Rice," April 21, 2014.
[374] China has identified to the WTO COA certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "China: Notification of Domestic Support Commitments," October 13, 2012, table DS:9.

Table 6.3: China: Rice sector policies

Policy	Comments
Tax policy	
Elimination of agricultural tax	The government phased out an agricultural tax levied on farmers based on grain production capacity. The tax was eliminated in 2006, but reportedly has been replaced by local fees in some places. The estimated value of the tax elimination is $21 billion annually.
Value-added tax (VAT) exemptions	Farmers are exempt from a VAT of 13 percent for unprocessed agricultural products and 17 percent for manufactured products. “Leading” farmer cooperatives and agricultural enterprises are exempt from VAT on agricultural commodities purchased from farmers.
Stock policy	
Support for holding reserves	Grain depots hold rice reserves until the grain can be sold at a price that exceeds the purchase price plus storage costs. Government payments include provision of below-market interest rate loans taken by the depots and paying storage costs. More than 25 percent of all grains (including rice) produced from 2005 to 2012 were purchased with low-interest government loans from the Agricultural Development Bank of China.
Production policy	
Support for machinery purchases	Up to 30 percent off the purchase price of eligible agricultural machinery. The support is limited to approximately $7,800 for most types of machinery. The maximum discount for large rice transplantors is $18,750, and for large tractors (≥200 horsepower) it is $31,250. Approximate expenditures in 2011 totaled $2.7 billion for all sectors.
Direct payments	Grain producers receive a direct payment based on planted area or grain sales, depending on the province. Coverage became nationwide in 2007. Approximate expenditures in 2011 totaled $2.4 billion.
Large grain farms payments	Certain provinces provide fixed area payments of $9.50–$190 per acre to encourage production on large plots. Additionally, beginning in 2013, some provinces provide below-market interest rate loans or cash grants to large farms for investments in irrigation, storage, and drying equipment not covered by the machinery purchase policy.
General input payments (fuel/fertilizer)	A direct payment is made to grain producers based on changes in input and grain prices. The payment level is determined by local authorities. Approximate expenditures in 2011 totaled $13.4 billion.
Support for purchases of quality seed	Farmers growing superior rice varieties receive supports between $22 and $33 per ha. These are only provided in designated counties. The supports are either cash payments or fund transfers to seed companies to provide discounts. Approximate expenditures for rice in 2009 totaled $1 billion, the highest among all products.
Price support	The government sets minimum prices for paddy rice in certain provinces. These prices apply to 13 major grain-producing provinces in China: Heilongjiang, Jilin, Liaoning, Inner Mongolia, Shandong, Hebei, Henan, Anhui, Jiangsu, Shanxi, Hunan, Hubei, and Jiangxi. These provinces produce about 80 percent of China’s total grain supplies.
Trade policy	
Exports	Only state-owned enterprises (SOEs) are granted export permits.
Imports	An annual TRQ for rice imports of 5.3 million mt is split evenly between long grain rice and medium/short grain rice. State-owned enterprises and private entities are allocated 50 percent each. The in-quota tariff is 1 percent ad valorem and the over-quota tariff is 65 percent ad valorem.

Source: Tobias et al., *Handbook for Rice in Asia,* 2012, 11–13; Gale, *Growth and Evolution,* August 2013, 44–52.

priority on agricultural development compared with industrialization.[375] Government support to the agricultural sector government has increased substantially in recent years, and the government has indicated it will continue to increase this support.[376] This commitment is shown by the evolution of the value of major grain support policies during 2007–13 (table 6.4). Despite rising support prices, China's domestic rice prices, as well as international prices, have exceeded support levels during 2007–13.

Table 6.4: China: Select government grain support programs, 2007–13

Item	2007	2008	2009	2010	2011	2012	2013
Program				Billion $			
Fuel/fertilizer support	3.6	9.2	11.1	12.3	13.3	17.1	17.3
Machinery	0.3	0.6	1.9	2.1	2.7	3.2	3.5
Direct payment	2.0	2.2	2.2	2.2	2.3	2.4	2.4
Seed	0.9	1.7	2.9	3.0	3.4	0.0	0.0
Total	6.8	13.7	18.1	19.7	21.8	22.6	23.2
Minimum support prices (milled)				$/mt			
Early long grain	184	222	264	275	316	380	426
Middle-late long grain	189	227	269	287	331	396	435
Short grain	197	236	278	310	396	444	484

Source: USDA, FAS*, China: Grain and Feed Annual 2012,* March 2, 2012, 13; USDA, FAS, *China: Grain and Feed Annual 2014,* April 2, 2014, 10; Gale, *Growth and Evolution,* August 2013, 17.

China's government support programs have both direct and indirect effects on the rice sector. Direct effects include lowering production costs and providing income. The value of support payments for various rice crops in Hubei, Hunan, and Jiangsu was estimated at $25–$37 per mt in 2012, or 6–9 percent of the crop value.[377] However, the rise in support was outpaced by increasing production costs, limiting their effect.[378] Indirectly, although minimum support prices have been below market prices in recent years, the rising price supports are a signal to farmers that the government will not allow prices to decline, thus encouraging increased production.[379]

Factors Affecting Competitiveness

The competitiveness of China's rice industry has been affected by the country's long-term transformation from an agrarian to an industrial economy as well as the government's policies to maintain food self-sufficiency. Government development of transportation and irrigation infrastructure, sustained growth in yields and mechanization, and the modernization of the

[375] CAAS, "The First China Agricultural Outlook Opens," n.d. (accessed November 13, 2014). The conference referred to in this article took place April 20–21, 2014.
[376] Gale, *Growth and Evolution*, August, 2013, i.
[377] Ibid., 13.
[378] Ibid.
[379] Ibid., 18.

value chain to ensure a consistent, reliable supply of quality rice have all had major positive impacts on the rice sector. However, serious challenges remain in keeping and improving the sector's competitiveness and achieving the goal of self-sufficiency. Major threats include rising production costs and pressures on the availability of land and water. Other factors, such as food safety concerns and exchange rates, have undermined agricultural competitiveness more generally.

Production Costs Have Been Rising Rapidly

The most prominent factor affecting the competitiveness of the Chinese rice sector has been a substantial rise in production costs in recent years. This increase has eroded the competitiveness of Chinese rice producers and has prompted the Chinese government to react with policies to raise productivity and support prices. Total long grain paddy rice production costs rose from $139 per mt in 2007 to $372 per mt in 2013, an average annual increase of 18 percent (table 6.5). This rise was driven mainly by the cost of labor, as off-farm employment opportunities and urban migration drove up the implicit cost of family farm labor.[380] Total labor costs increased at an average annual rate of 20 percent during 2007–13 and more than doubled

Table 6.5: China: Cost of production of long grain paddy rice, 2007 and 2013

	2007		2013	
Input	COP	Share of COP	COP	Share of COP
	$/mt[a]	%	$/mt[a]	%
Seed	7.04	5	18.95	5
Fertilizer	22.34	16	41.27	11
Other chemical inputs	6.48	5	11.46	3
Labor[b]	62.46	45	189.89	51
Water/irrigation[c]	4.78	4	7.03	2
Fuel/electricity	0.03	[d]	1.46	[d]
Other variable costs[e]	8.12	6	9.32	3
Total variable costs	111.26	80	279.40	75
Land	13.21	10	48.35	13
Physical capital costs	12.08	9	39.01	11
Other fixed costs[f]	1.97	1	5.56	2
Total fixed costs	27.26	20	92.92	25
Total COP	138.52	100	372.31	100

Source: Government of China, National Development and Reform Commission, *Compilation of Materials on Agricultural Production Costs* (accessed February 11, 2015); IMF, IFS database: Exchange Rate Query, 2013 (accessed September 24, 2014).
Note: Data are for single season rice.
[a] Cost of production (COP) data were converted from RMB per mu using the following conversion factors: 2007—481.3 kg per mu and 7.61 RMB per dollar; 2013—495.3 kg per mu and 6.196 RMB per dollar. One mu equals 0.1647 acre.
[b] Includes hired labor and opportunity cost of unpaid labor.
[c] Includes purchases of water and irrigation fees.
[d] Less than 1 percent.
[e] Includes other inputs, repairs, and other expenses.
[f] Includes capital costs, depreciation, insurance, and other fees.

[380] Gale, *Growth and Evolution*, August 2013, 13–16.

during the period. Significant increases were also registered in the cost of seed (18 percent average annual increase) and physical capital costs (mainly machinery, 22 percent average annual increase). However, because of the government input supports, costs probably rose less than they otherwise would have. Labor accounted for the largest share of total production costs, rising from 45 percent of the total in 2007 to 51 percent in 2013.

Despite the rise in production costs, Chinese paddy rice producers experienced favorable returns each year during 2007–13, as market prices remained well above costs.[381] Profits ranged between 18 RMB and 42 RMB per 50 kilograms (kg) (6 cents and 13 cents per kg) annually during the period. This represented margins ranging from 13 percent to 37 percent of average annual prices.

Land and Water Constraints

The availability and quality of land and water for Chinese rice production have declined over time, leading to structural changes in the industry. The area planted with rice declined from 36 million ha (89 million acres) in 1976 to 27 million ha (67 million acres) in 2003 before recovering somewhat to 30 million ha (74 million acres) annually in recent years.[382] The decline was driven mainly by economic development, crop diversification, and urbanization.[383] The shortage of high-quality arable land has been a major long-term issue in Chinese agricultural production, and the Chinese government recently reported that nearly one-fifth of farmland has been contaminated by industrial waste and by irrigation using polluted water.[384] Unsafe levels of cadmium were found in Hunan-grown rice, prompting the provincial government of Guangdong to ban shipments from that province.[385] The government reportedly is considering shifting rice production out of such contaminated areas altogether.[386]

The availability and quality of water is another major concern for China's water-intensive rice industry. Agriculture, which is dominated by rice production, accounts for 60 percent of China's water use, and pressure is mounting from non-agricultural demand sources.[387] About 80 percent of China's irrigated land is fed by major canals, with shallow groundwater-sourced irrigation (tube wells) predominantly in the north. Water resources are declining in the north relative to cultivated land resources.[388] New irrigation techniques have been developed to

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[381] Government of China, NDRC, C*ompilation of Materials on Agricultural Production Costs* (accessed February 11, 2015). These data represent single season rice production. Substantial variations may exist depending on location and variety.
[382] NBS, *Crop Statistics* (accessed November 20, 2014).
[383] GRiSP, *Rice Almanac,* 2013, 106,107; Huang, Wang, and Qiu, "Small-scale Farmers in China," 2012, 16.
[384] *China Daily,* "China Alerted by Serious Soil Pollution," April 17, 2014.
[385] Pang, Gong, and Liu, "Confronting China's Cadmium-Laced Rice Crisis," May 6, 2013.
[386] Oryza,"China Halts Rice Production in Hunan," April 14, 2014.
[387] GWP, *Water and Food Security*, 2013, 33.
[388] GRiSP, *Rice Almanac,* 2013, 108.

mitigate the decline,[389] and the traditional irrigation regime of continuous deep flooding has shifted to more water-efficient approaches.[390] The most efficient of these include combining shallow water depth with alternate wetting and drying, and employing semi-dry cultivation.[391] China is also investing $600 billion over a 10-year period to upgrade its irrigation system.[392] In addition, a large-scale government initiative, the South-to-North Water Transfer Project, has been undertaken to redistribute China's water resources and link the Yangtze, Yellow, Huai, and Hai rivers.[393] The project is expected to mitigate the effects of a prolonged drought in northern China and improve the output of grain.[394]

Sustained Growth in Yields through Use of Improved Inputs and Mechanization

The Chinese rice sector has managed to sustain a long-term and substantial increase in yields, offsetting declines in available land. Widespread irrigation and the use of hybrid seeds and fertilizers have contributed to this increase, and China's paddy rice yields are among the highest in the world. The average yield for hybrid rice was 31 percent higher than that for inbred varieties in China during 1976–2008.[395]

Mechanization rose substantially in the Chinese rice industry in recent years, in line with an increase in government machinery support to farmers.[396] The mechanization level[397] for rice plowing rose from about 5 percent in 2002 to just under one-third in 2012, while the level for harvesting rose from 16 percent to 73 percent during the same years.[398] Tillage is the most highly mechanized aspect of Chinese rice farming, with about 82 percent of planted area tilled by machine.[399] On the other hand, planting is still labor intensive, with only 20 percent of acreage planted using machines. Rice production in northeastern China, which is characterized by larger farms, is the most highly mechanized, with mechanization accounting for 58 percent of planting, 96 percent of tillage, and 79 percent of harvesting.[400] Mechanization has mitigated the negative effects of labor migration (which both raises the cost of labor and makes it less available) and has enhanced the competitiveness of the Chinese rice sector.

[389] Lohmar et al., *China's Agricultural Water Policy Reforms*, March 2003, 20.
[390] Mao, "Water Efficient Irrigation," n.d., 1 (accessed November 12, 2014).
[391] Ibid.
[392] GWP, *Water and Food Security*, 2013, 33. The precise time period is unspecified.
[393] Freeman, "Quenching the Dragon's Thirst," n.d. (accessed November 13, 2014).
[394] Government of China, Ministry of Water Resources, "Water Diversion Project," November 4, 2014.
[395] Li et al., "Hybrid Rice Technology Development," November 2009, 3.
[396] Liu, "PRC Agricultural Mechanization," October 26–27, 2013, 5.
[397] The share of activity that is performed using machinery. Mechanized harvesting largely is done by independent combine service providers.
[398] Liu, "PRC Agricultural Mechanization," October 26–27, 2013, 7.
[399] Mao, "Mechanization of Rice Production," December 12–13, 2011, 18.
[400] Ibid., 19–20.

Government Programs Increase Reliability of Domestic Supply

As already discussed, various government assistance and price supports have been put in place to enable the Chinese government to meet its goal of self-sufficiency in rice production. Coupled with the increasing use of technology and the consolidation and modernization of the rice value chain, these measures have helped to ensure a consistent and reliable supply of quality rice to the domestic market. State procurement removes rice from the market when supplies are high and provides a buffer to stabilize prices during periods of short supply.[401] Import TRQs and the control of most trade through SOEs enhance the ability of the Chinese government to maintain prices favorable to rice producers.[402] The development of road infrastructure in China has contributed to the integration of rice markets, providing flexibility, lengthening value chains, lowering delivered costs, and offering a more reliable supply to a wider geographical area.[403] These developments, together with the government's market modernization incentives, have fostered major changes in marketing that have also helped to lower delivered costs and provide a more consistent supply of rice to domestic consumers.[404]

Despite the relative success of China's rice policies in meeting its goals, the government recently has indicated there are challenges to maintaining the status quo. These challenges were characterized as "three ceilings" (prices, government support, and inventories) and a "rising floor" (production costs).[405] The government is considering policies to address these challenges in the next five-year plan (2016–20).[406]

[401] China's stock management policy has resulted in lower price volatility compared with other regional producers. During 2006–12, the volatility (standard deviation of the logarithmic changes in monthly prices) of nominal wholesale prices in Heilongjiang was 1.3 percent compared with 5.4 percent in Indonesia, 7.4 percent for Thailand, and 8.7 percent for Vietnam. Zorya and Dawe, "Rice Stocks and Trade Policy," 2014, 111.
[402] In addition, the Chinese government is taking active measures to control gray-market imports, as discussed in the section on trade.
[403] Reardon et al., *The Quiet Revolution*, 2012, 23.
[404] The Chinese government also is encouraging the conversion of wet markets to supermarkets with investment policies. Reardon et al., *The Quiet Revolution*, 2012, 140; Reardon, Timmer, and Minten, "Supermarket Revolution in Asia," July 31, 2012, 12334.
[405] Wang, "In Winter and Spring Water Conservancy Construction," October 24, 2014.
[406] Ibid.

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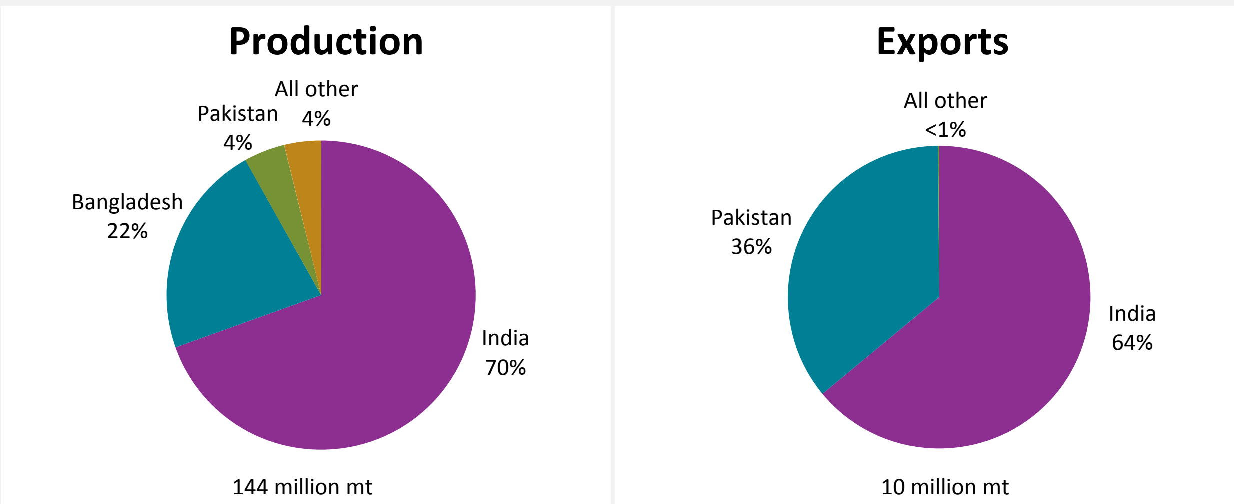
Chapter 7
South Asia

Of the eight countries in South Asia, India and Pakistan account for 74 percent of rice production and supply virtually all of the region's exports (figure 7.1).[407] While both countries are exporters, most rice produced in India is consumed domestically, while in Pakistan most is exported. India and Pakistan are the only major global suppliers of basmati rice, a variety of aromatic rice prized for its distinctive texture and aroma. In both countries, problems ensuring an adequate and timely supply of water constrain rice production; the countries differ in that India offers substantially more government support to its rice farmers than does Pakistan.

Figure 7.1: Production and export shares among South Asian countries, 2007/08–2013/14



Source: USDA, PSD Online (accessed January 20, 2015 and March 5, 2015).
Notes: Shares based on quantity. Both production and export quantities are based on marketing year. Totals are based on the period averages.

India

India is a major producer but an inconsistent exporter of rice. The majority of India's rice crop is long grain, largely for domestic consumption. India also produces aromatic basmati rice, about half of which is exported. About 60 percent of the rice produced in India is parboiled rice,[408]

[407] South Asia includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. See appendix D.
[408] Government of India, Ministry of Agriculture, Directorate of Rice Development, "Post-Harvesting Operations" (accessed October 27, 2014), *Rice in India: A Status Paper*.

which accounted for 39 percent of India's rice exports by volume in 2013.[409] Between 2007/08 and 2013/14, production of rice grew more rapidly than consumption. Much of the excess production went to government stockpiles for public distribution, but also to exports that increased substantially beginning in 2011/12, the same year that exports from Thailand declined.[410] Since 2011/12, India has become the world's largest exporter of rice, with no imports since 2008.[411] Rice grows across much of India and is the staple food for the majority of the population, supplying nearly 30 percent of the calories consumed.[412] The sector receives significant government support. Inputs, such as fertilizer, seed, and electricity, are subsidized, enabling farmers to purchase them at below market prices, and rice is purchased by a central government agency—the Food Corporation of India (FCI)—at a minimum support price calculated to assure an adequate rate of return to farmers.[413] The government distributes the rice it procures at below-market prices to consumers. Support programs, coupled with low labor costs, mean that India's farmers are globally competitive. However, poor milling and storage infrastructure lowers quality and raises milling costs, partly offsetting these advantages.

Production, Consumption, and Trade

Production

India is the second-largest rice producer in the world, accounting for about 22 percent of global production between 2007/08 and 2013/14.[414] During this period, production rose by an average of 1.6 percent annually, reaching a record high of 106.5 million metric tons (mt) in 2013/14 (table 7.1). This growth mirrored a steady rise in yields over this seven-year period, averaging 1.7 percent annually. Rice yields increased after the introduction of programs such as the central government's Special Program to Bring the Green Revolution to Eastern India, which began in 2010/11.[415] This umbrella program aims to increase yields through improvements in water management and other production techniques, combined with increased use of quality

[409] GTIS, Global Trade Atlas database (accessed October 21, 2014).
[410] India's marketing year is April 1–March 31.
[411] USDA, FAS, *India: Grain and Feed Annual*, February 14, 2014, 20. However, India is expected to import about 1 million metric tons (mt) of rice over the next two years, because rail repairs and construction likely will disrupt transportation from major growing regions to its northeastern states. All India Rice Export Association, "What Course Must India's Rice Import Take?" September 3, 2014.
[412] GRiSP, *Rice Almanac*, 2013, 112.
[413] India has identified to the World Trade Organization (WTO) Committee on Agriculture (COA) certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "India: Notification of Domestic Support Commitments," September 19, 2014.
[414] USDA, PSD Online (accessed July 16, 2014). Production, consumption, and stock data are for marketing year unless otherwise noted, and are on a milled rice equivalent basis.
[415] USDA, FAS, *India: Grain and Feed Annual*, February 14, 2014, 15.

Table 7.1: India: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	11,430	13,000	19,000	20,500	23,500	25,100	25,440
Production (milled) (1,000 mt)	96,690	99,180	89,090	95,980	105,310	105,240	106,540
Area harvested (1,000 ha)	43,770	45,400	41,850	42,860	44,100	42,410	43,940
Yield (paddy rice) (mt/ha)	3.3	3.3	3.2	3.4	3.6	3.7	3.6
Imports (1,000 mt)	0	0	0	0	0	0	0
Consumption and residual (1,000 mt)	90,466	91,090	85,508	90,206	93,334	94,031	99,180
Exports (1,000 mt)	4,654	2,090	2,082	2,774	10,376	10,869	10,300
Ending stocks (1,000 mt)	13,000	19,000	20,500	23,500	25,100	25,440	22,500
Exports-to-production ratio (%)	5	2	2	3	10	10	10
Ending stocks-to-use ratio (%)	14	20	23	25	24	24	21
Per capita consumption (kg)	78.0	77.5	71.8	74.8	76.4	76.0	79.2

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption is calculated as marketing year apparent consumption divided by calendar year population. All other data are for marketing year.

seed.[416] Between 2007/08 and 2013/14, the harvested area fluctuated, ranging from 41.8 million ha (103.3 million acres) to 45.4 million ha (112.2 million acres).[417] Long grain (non-aromatic) rice accounted for about 93 percent of India's rice production in 2013/14, and basmati rice accounted for the remainder. Production of basmati rice has increased since the introduction of higher-yielding varieties, and newer varieties have the potential to further increase yields.[418]

Consumption and Ending Stocks

India is the world's second-largest rice-consuming country, accounting for about 22 percent of global consumption during 2007/08–2013/14.[419] In this period, consumption increased over 1 percent annually, closely in line with population growth. Per capita consumption, however, varied annually, ranging from 71.8 kilogram (kg) in 2009/10 to 78 kg in 2007/08. Lower consumption in 2009/10 followed the drop in domestic production that year. During 2007/08–2013/14, India's ending stocks rose substantially (table 7.1). Between 2007/08 and 2008/09, stocks grew by 6 million mt (46 percent) owing to a series of government restrictions on rice exports aimed at increasing domestic stock levels in response to rising global prices. Ending stocks then grew almost 8 percent a year between 2008/09 and 2012/13, as the government continued its effort to build up stocks and as domestic production grew in response to plentiful

[416] Government of India, Ministry of Agriculture, "Guidelines for Extending the Green Revolution," March 2011, 1, 9–11.
[417] India has the potential to significantly increase rice production by continuing to raise yields, as its yields are still much lower than those of other countries in the region. All-India average yield for the three-year period ending with crop year 2011/12 was 3.4 mt per ha. This is approximately two-thirds of the yields achieved in Indonesia and Vietnam, and a little over half the average yield in China. Government of India, Ministry of Agriculture, Commission for Agricultural Costs and Prices, "Price Policy for Kharif Crops," March 2013, 52, 58.
[418] USDA, FAS, *India: Grain and Feed Annual*, February 14, 2014, 15; Kulkarni and Damodaran, "The Next Billion-dollar Basmati?" January 5, 2014.
[419] USDA, PSD Online (accessed January 21, 2015).

monsoon rains over the period. Government procurement of rice peaked in 2011/12 at just over 35 million mt, or one-third of production. During 2012/13–2013/14, ending stock levels fell 12 percent to 22.5 million mt, accounting at that point for about 23 percent of annual domestic consumption. Most rice stocks in India are held by the government, and government procurement accounted for about one-third of production throughout most of 2007/08–2013/14.[420]

Trade

In 2013, India was the world's largest rice-exporting country, as exports of 10.6 million mt ($7.5 billion) accounted for about one-quarter of global trade. This followed a four-year period between 2008 and 2011 when India's exports were significantly lower and more variable than in the mid-2000s (table 7.2). For example, between 2007 and 2009, exports fell from 6 million mt to just 2 million mt (almost two-thirds), primarily because of the introduction of government export restrictions on non-basmati rice that came into effect beginning in April 2008. In September 2011, the restrictions were lifted,[421] and trade surged in 2012, when India became the largest exporter of rice in the world.[422] Part of the reason India became the world's leading rice exporter was the drop in Thai rice exports over the same period (chapter 8).[423]

India exports basmati rice, parboiled long grain white rice, and long grain white rice (other than parboiled). The trends in these varieties are quite different largely because of export restrictions (figure 7.2). Basmati rice exports, which sell at a substantial premium to long grain (non-aromatic) rice,[424] rose steadily between 2007 and 2013, and accounted for about one-third of India's rice exports by volume in 2013.[425] Demand for basmati rice has been robust, and new varieties have increased yields, leading to an expansion in planted area.[426] Basmati rice exports were not subject to export restrictions during 2008–11. Major basmati markets during this period were the Middle East (Iran, Saudi Arabia, the United Arab Emirates, and Iraq), the European Union (EU), and the United States.[427]

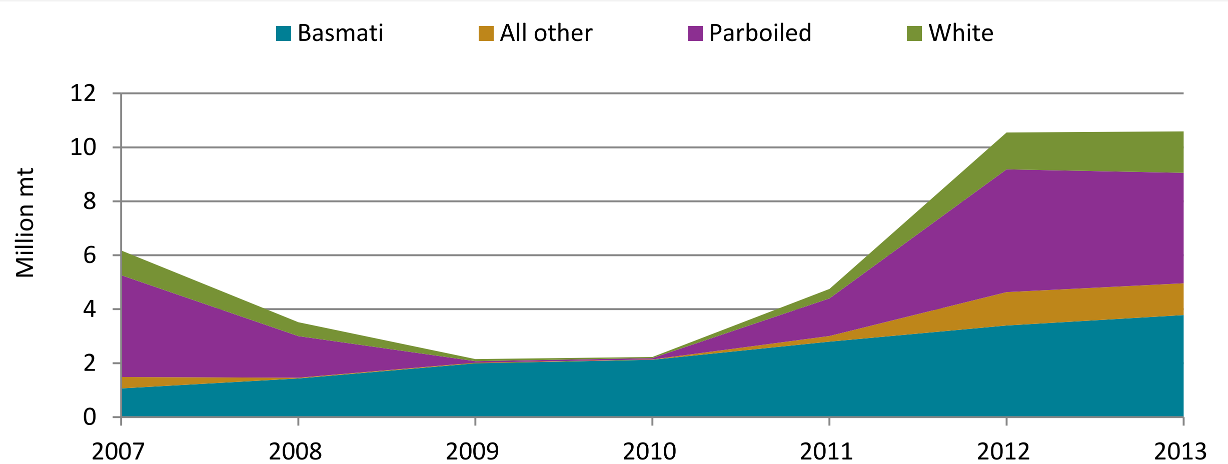
[420] USDA, FAS, *India: Grain and Feed Annual*, February 14, 2014, 17–18.
[421] Sharma, "Food Export Restrictions," May 2011, 29–30.
[422] GTIS, Global Trade Atlas database (accessed August 27, 2014); USDA, PSD Online (accessed October 3, 2014).
[423] Although Indian exports for 2014/15 are projected to remain above 2008–11 levels, USDA forecasts them to decline from those of the previous year, largely because of lower production. Consequently, India will likely lose its position of leading exporter to Thailand in 2015. USDA, PSD Online (accessed September 30, 2014).
[424] In 2013, the average unit value (AUV) of India's global milled basmati exports was $1.23 per kilogram (kg) compared to $0.42 per kg for parboiled white long grain rice and $0.46 for other long grain white rice. GTIS, Global Trade Atlas database, (accessed October 21, 2014).
[425] GTIS, Global Trade Atlas database (accessed October 21, 2014).
[426] USDA, FAS, *India: Grain and Feed Annual,* February 14, 2014, 15–16.
[427] GTIS, Global Trade Atlas database (accessed September 18, 2014).

Table 7.2: India: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
West Africa	1,642	148	28	3	872	3,832	3,268
Benin	129	15	5	1	86	470	1,347
Senegal	217	5	0	0	90	865	739
Côte d’Ivoire	705	13	5	1	124	683	293
Nigeria	239	66	0	0	456	1,172	69
Iran	4	68	419	374	557	875	1,671
Saudi Arabia	636	653	608	622	685	861	888
South Africa	329	31	6	25	132	386	451
United Arab Emirates	440	500	583	662	834	594	390
Nepal	206	59	21	32	65	337	378
Bangladesh	1,463	1,252	1	3	137	24	299
All other	1,457	808	485	508	1,470	3,642	3,245
Total	6,177	3,519	2,152	2,229	4,752	10,550	10,591
				Value (million $)			
West Africa	431	56	15	2	359	1,458	1,262
Benin	34	6	2	<1	37	195	565
Senegal	49	2	0	0	31	279	230
Côte d'Ivoire	189	5	2	0.3	46	253	112
Nigeria	66	22	0	0.4	199	492	30
Iran	4	89	492	369	560	882	2,037
Saudi Arabia	403	807	661	688	692	722	1,009
South Africa	96	19	7	13	64	157	195
United Arab Emirates	301	626	630	644	767	468	316
Nepal	50	23	6	22	22	91	110
Bangladesh	420	517	0.4	2	52	12	114
All other	658	752	580	558	1,340	2,339	2,433
Total	2,360	2,891	2,392	2,298	3,857	6,129	7,476

Source: GTIS, Global Trade Atlas database (accessed August 7, 2014).
Note: HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

Figure 7.2: India: Rice exports by type and form, 2007–13



Source: GTIS, Global Trade Atlas database (accessed September 18, 2014).
Note: Based on figures for basmati rice (HS 1006.30.20, 1006.30.02); parboiled white rice (HS 1006.30.10, 1006.30.01), white rice (HS 1006.30.90, 1006.30.09); and other rice (HS 1006.10, 1006.20, and 1006.40).

Iran is by far India's largest export market for basmati rice, and in 2013 accounted for 42 percent of India's basmati exports and 15 percent of India's total rice exports.[428] In 2013, parboiled white rice accounted for about 39 percent of India's rice exports, and long grain other than parboiled for 15 percent.[429] These market segments have grown significantly since the export restrictions were lifted, beginning from almost nothing in 2009 and 2010. Most non-basmati rice exports are to West Africa and likely destined for Nigeria, the second-largest importer of rice in the world, through both official and gray-market channels.[430]

Industry Structure

The leading rice-producing states in 2012/13 were West Bengal, Uttar Pradesh, Punjab, and Andhra Pradesh (figure 7.3).[431] Basmati rice is grown mostly in the states of Punjab, Haryana, and western Uttar Pradesh.[432] Most of India's rice is produced on farms of less than 2 ha (5 acres); only 6 percent is grown on farms of 10 ha (25 acres) and over.[433] Less than 60 percent of India's rice area is irrigated.[434] As a result, production varies considerably from year to year and is tied closely to the timing and volume of annual monsoon rainfall.[435] India experienced timely and well-distributed monsoon rains over most of 2007–13, leading to surplus production and growth in consumption, exports, and stocks.[436] Because of poor surface water irrigation infrastructure, such as dams and canals, individual farmers have invested in groundwater irrigation.[437] Most rice is planted in the *kharif* season (summer planted, fall/early winter harvested), after the start of the monsoon rains in June. A smaller crop is planted in the *rabi* season (winter planted, spring harvested).

[428] India buys oil from Iran, and as of January 2012, 45 percent of these sales are settled in Indian rupees, with which Iran purchases products from India, including rice. USDA, FAS, *India: Grain and Feed Annual,* February 14, 2014, 18; CRS, *Iran Sanctions,* August 19, 2014, 37.

[429] GTIS, Global Trade Atlas database (accessed March 5, 2015).

[430] U.S. government official, interview by USITC staff, Washington, DC, July 31, 2014. For further information on Nigeria, see chapter 11.

[431] Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, *Agricultural Statistics at a Glance, 2013*, December 2013, table 4.6(b).

[432] USDA, FAS, *India: Grain and Feed Annual 2013*, February 15, 2013, 16.

[433] Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, *Agricultural Statistics at a Glance: 2013,* December 2013, table 15.6.

[434] USDA, FAS, *India: Grain and Feed Annual*, February 14, 2014, 14.

[435] Rice cultivation is water-intensive. For the three years ending 2011/12, the all-India average volume of water required to grow 1 kg of paddy rice was 2,665 liters. However, water requirements vary widely by state, from 1,809 liters in West Bengal to 3,593 liters in Punjab, two of the leading rice-producing states. Government of India, Ministry of Agriculture, Commission for Agricultural Costs and Prices, "Price Policy for Kharif Crops," March 2013, 54.

[436] USDA, PSD Online (accessed October 20, 2014); USDA, FAS, *India: Grain and Feed Annual 2014*, February 14, 2014, 15.

[437] Narayanamoorthy, "India's Groundwater Irrigation Boom," 2010, 543–44.

Figure 7.3: India: Paddy rice production by state, 2012/13

Source: Government of India, Ministry of Agriculture, *Agricultural Statistics at a Glance: 2013,* table 4.6(b).
Note: The four districts labeled “Pondicherry” are part of the discontinuous Union Territory of Pondicherry. Andhra Pradesh was divided into two states in June 2014. Data are on a milled rice equivalent basis.

Close to three-quarters of rice production is sold commercially; the remainder is consumed as food on the farm, retained for seed, used as in-kind payment, lost through waste on-farm, or otherwise not marketed.[438] Traditionally, rice leaving the farm was dehusked in a local village mill and sold in the local village market. From there, the distribution system involved multiple intermediaries before reaching urban consumers.[439] More recently, distribution channels have become less fragmented and more efficient. Increasingly, farmers are either selling directly to mills or to wholesale markets, which then sell to a mill. Mills sell to urban wholesale markets and directly to retailers. In 2009, a survey of Indian rice farmers found that just over one-third of rice is sold first to village traders, with the majority sold to wholesalers.[440]

Government Support Programs

The Indian government intervenes heavily in the domestic rice market. Through the FCI,[441] the government procures and distributes grains. The FCI buys wheat, paddy rice, and milled rice at minimum support prices (MSPs) that have been announced well before the commencement of the *rabi* and *kharif* seasons.[442] All paddy rice and wheat that meet specifications provided by the government are eligible for purchase at the MSP.[443] The FCI buys paddy rice directly from farmers as well as white rice from millers, and maintains huge rice stocks at all times. These stocks are distributed throughout the country, where they are transferred from the central government to the state governments at the Central Issue Price (CIP). Rice is then distributed to certain poor consumers (ration-card holders) through "fair price shops"[444] under the Targeted Public Distribution System (TPDS).[445] Surplus stocks are either sold domestically or exported. In recent years, stocks have greatly exceeded levels considered necessary to supply the public

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[438] In 2011/12, the remainder accounted for about 23 percent of India's rice crop, down from about 48 percent in the three-year period 1996/97–1998/99. Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, *Agricultural Statistics at a Glance*, *2013,* December 2013, table 8.4, 190; Government of India, Ministry of Agriculture, Directorate of Marketing and Inspection, *Marketable Surplus and Post Harvest Losses of Paddy in India, 2002*, August 2004, table 42, 59.

[439] Reardon et al., "The Transformation of Rice Value Chains," September 2013, 4.

[440] Ibid.

[441] The FCI is within the Department of Food and Public Distribution, which is part of the Ministry of Consumer Affairs, Food, and Public Distribution.

[442] In 2013, 25 crops were supported by MSPs, but only rice and wheat are purchased by the FCI for distribution through welfare programs. Government of India, Ministry of Agriculture, Department of Food and Public Distribution, *Annual Report 2013/14*, Annexure 3.1.

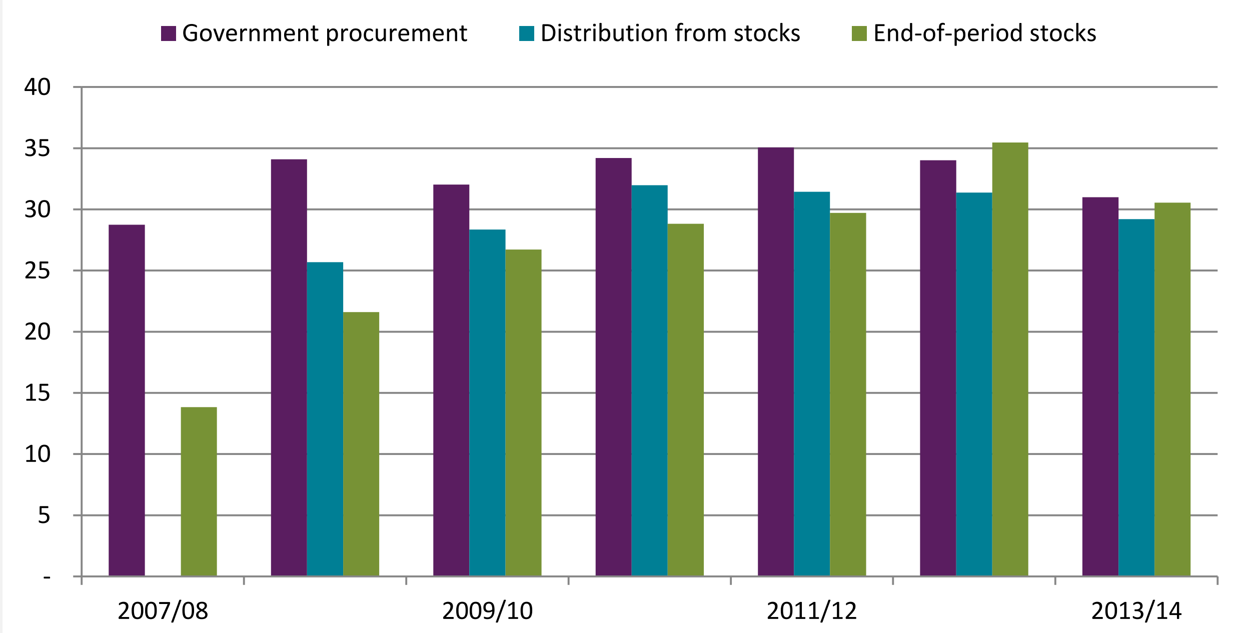
[443] Government of India, Department of Food and Public Distribution, *Annual Report 2013–14*, 26.

[444] Fair price shops sell to consumers at set prices, known as central issue prices (CIPs). CIPs of common rice per kg range from Rs 3.00 to Rs 7.95 based on means testing. CIP prices have not changed since 2002. Government of India, Department of Food and Public Distribution, *Annual Report 2012–13*, 29; Department of Food and Public Distribution, *Annual Report 2013–14,* 39.

[445] The TPDS provides basic commodities (predominately wheat and rice) at below-market prices to families that are below India's poverty line.

distribution programs and emergency needs, with procurement exceeding distributions every year during 2007/08–2013/14 (figure 7.4).[446]

Figure 7.4: India's government procurement, distribution from stocks, and end-of-period stocks of rice, 2007/08–2013/14



Source: Procurement and Central Pool offtake data from USDA, FAS, *India: Grain and Feed Annual,* 2014, 17–18. Stock data from Government of India, Department of Food and Public Distribution, *Annual Report 2011–12,* 48, and *Annual Report 2013–14,* 130.
Note: 2013/14 ending stocks include 10.3 million mt held by state agencies for the Central Pool. Distribution means drawdowns (offtakes) of Central Pool stocks.

The Indian government allocates rice for distribution to poor consumers, based on their poverty level under the TPDS. Food grains also are distributed under other welfare programs. Government support for consumer food purchases covers the difference between procurement, storage, and distribution costs for food grains and their sales at central issue prices (CIPs). The total expenditures of this system were Rs 897 billion ($15.6 billion) in fiscal year (FY) 2013/14.[447]

The government also provides farmers with input subsidies which lower farm costs and boost production.[448] Several types of payments for inputs, including fertilizer, irrigation, electricity, seeds, and machinery, are available. In FY 2013/14, the government fertilizer and fuel payments

[446] Government of India, Department of Food and Public Distribution, *Annual Report 2013–14*, 26, 130.
[447] Ibid., 39.
[448] India has identified to the WTO COA certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "India: Notification of Domestic Support Commitments," September 19, 2014.

were Rs 680 billion (about $11.2 billion) and Rs 854 billion ($14.1 billion), respectively.[449] Various types of seed (or payments to purchase these seeds) are provided under the National Food Security Mission Scheme.[450] The National Food Security Mission was established in 2007 to promote production of rice, wheat, and pulses through improved technology and outreach to farmers.[451]

Government payments to lower the prices of fertilizer and fuel support India's production, consumption, and exports of rice. Economic modeling conducted by Commission staff estimates that in the absence of these input subsidies, India's production of long grain rice in 2012/13 would have been lower by 4.2 million mt (about 4 percent), while production of basmati rice would have increased by 273,000 mt.[452] The lower production of long grain rice would have led to a decline in consumption and exports of 2.3 million mt and 1.9 million mt, respectively. Increased basmati production would have predominantly impacted exports. Exports of basmati rice would have been an estimated 253,000 mt higher, and consumption of basmati, 19,000 mt higher (all data are on a milled equivalent basis). Removing India's input subsidies would have had a very slight impact on U.S. production and exports of long grain rice (an increase of 46,000 mt and 39,000 mt, respectively), and almost no impact on U.S. imports of aromatic rice (a very slight increase of 230 mt).[453]

Factors Affecting Competitiveness

The growth of India's exports and share of world markets since the late 2000s reflects its global competitiveness in rice. This competitiveness is based on India's low costs of production, due in part to supportive government policies, as well as innovation in the development of new varieties and production methods. Constraints on Indian competitiveness include poor milling and storage infrastructure.

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[449] Government of India, Union Budget 2013–14, "Non-Plan Expenditure by Broad Categories" (accessed January 15, 2015).

[450] Rice farmers receive government payments of Rs 1,000 ($17) per quintal (100 kg) or 50 percent of the cost, whichever is less, for certified hybrid rice seed; Rs 2,000 ($34) per quintal or 50 percent of seed cost, whichever is less, for certified hybrid rice seed distribution; Rs 5 ($0.09) per kg or 50 percent of the cost, whichever is less, for seed distribution of certified high-yielding varieties; and full cost for seed minikits of high-yielding varieties. Assistance is provided also for the production and distribution of hybrid rice. A production payment of Rs 20 ($0.34) per kg and a distribution payment of Rs 25 ($0.43) per kg are given to various beneficiaries.

[451] Government of India, Ministry of Agriculture, Department of Agriculture and Cooperation, *Annual Report 2013–2014*, March 2014, 19.

[452] The simulation was the removal of government assistance for inputs to produce long grain rice only. India produced about 100 million mt of long grain rice and nearly 5 million mt of aromatic basmati rice (milled rice equivalent) in 2013. Its total rice exports were 10.3 million mt.

[453] U.S. imports of aromatic rice from India would have increased by an estimated 27,360 mt, displacing 27,190 mt of aromatic rice from other sources. USITC economic modeling simulation using the RiceFlow model (see appendix H). U.S. production and exports of long grain rice in 2013 were about 6.5 million mt and 2.4 million mt, respectively.

Low Cost of Production

The Ministry of Agriculture estimated that in 2013/14, the all-India average cost of production for paddy rice for the *kharif* crop was Rs 1,234 per quintal (100 kg), equivalent to about $210.59 per mt.[454] This is roughly 15 percent lower than the equivalent cost in the United States, which is $251.00 per mt.[455] Table 7.3 provides a more detailed breakdown of production costs in West Bengal (the largest rice-producing state) for 2010/11 (latest data available). The total cost was Rs 1,023 per quintal, or $224.40 per mt.[456] Labor accounted for almost one-half of production costs, compared with just 7 percent in the United States.[457] Agricultural labor wages in India rose about 20 percent per year in nominal terms over 2009–12, outstripping the depreciation of the rupee and the increase in MSP.[458] Without continued increases in yield, continued increases in the labor wage rate will undermine India's competitiveness in rice production.

Table 7.3: India: Cost of production of long grain paddy rice (West Bengal), 2010/11

Input	COP	Share of COP
	$/mt	%
Seed	6.55	3
Fertilizer	17.70	8
Other chemical inputs[a]	2.72	1
Labor[b]	102.27	46
Irrigation	9.70	4
Other variable costs[c]	22.79	10
Total variable costs	161.73	72
Land[d]	54.98	25
Physical capital cost	4.60	2
Other fixed costs[e]	3.08	1
Total fixed costs	62.66	28
Total COP	224.40	100

Source: Government of India, Directorate of Economics and Statistics, Estimates of Cost of Cultivation/Production and Related Data (accessed March 20, 2014); Reserve Bank of India, Database of the India Economy (accessed April 16, 2014).
Note: Exchange rate used is Rs 47.92/$. Fixed costs include the rental value of land, taxes, depreciation on implements and farm buildings, and interest on fixed capital.
[a] Includes insecticides.
[b] Includes the value of unpaid family labor, but does not include a rate of return for the farmer.
[c] Includes the value of animal labor, fuel, machine rental, and other variable costs.
[d] Includes the rental value of owned land.
[e] Includes taxes and depreciation of farm implements and buildings.

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[454] Based on the 2013 exchange rate of Rs 58.60/$. Government of India, Ministry of Agriculture, Commission for Agricultural Costs and Prices, *Price Policy for Kharif Crops*, March 2013, 44.
[455] Based on costs in the Arkansas Non-Delta region; USDA, ERS, *Rice Production Costs and Returns per Planted Acre,* (accessed January 20, 2015); chapter 5 of this report.
[456] Government of India, Directorate of Economics and Statistics, Estimates of Cost of Cultivation/Production and Related Data (accessed March 20, 2014). Note that the costs reported include production costs, including the imputed value of family labor and the rental value of land, but does not include a margin of return for the farmer.
[457] USDA, ERS, *U.S. Rice Production Costs and Returns per Planted Acre,* n.d. (accessed January 20, 2015).
[458] Government of India, Commission for Agricultural Costs and Prices, Ministry of Agriculture, *Price Policy for Kharif Crops*, March 2013, 41.

Supportive Government Policies

As described above, Indian rice producers benefit from price supports and government subsidies for inputs. These supportive government policies help to make India competitive in global rice markets by lowering delivered cost. As shown in table 7.3, seed, fertilizer, insecticide, and irrigation account for a relatively small share of production costs. The government subsidies on inputs assist in keeping the production costs of India's rice farmers competitive with the cost of production in competing rice-exporting countries. In addition, the MSP guarantees farmers high enough revenues and returns on investment to provide incentives for expanding production and exports.

Innovation Benefits Indian Rice Farmers

One of the sources of India's global competitiveness is innovation, both in seed varieties and production methods. Encouraged by the government's National Food Security Mission, between 2007/08 and 2012/13, the use of certified seed in rice production increased by 48 percent,[459] and rice production per ha by 12 percent.[460] The share of modern varieties in overall rice production increased from 65 percent in 1995 to 82 percent in 2006.[461] Indian researchers, working in conjunction with international institutions such as the International Rice Research Institute (IRRI), and at institutions across India, have continued to develop new varieties with earlier maturity and higher yields, adapted for specific locations and growing conditions. Researchers have also developed varieties that are resistant to submergence, drought, and salinity, such as Swarma-Sub 1, which was estimated to have been planted on 1 million ha in 2012.[462]

An improved variety of basmati rice, Pusa 1121, was introduced in 2003, and now accounts for the majority of both India's production and its exports of basmati rice. Research into new varieties has continued, and field trials of one of these varieties, Pusa 1509, began in 2012. Some Pusa 1509 was planted in the *kharif* season in 2013. It has a shorter maturity, yields more, and uses less water than Pusa 1121, and, reportedly, has better cooking quality as well.[463] Some hybrid rice varieties have been introduced, but account for a small share of

[459] Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, *Agricultural Statistics at a Glance, 2013*, December 2013, table 14.7, "Crop-wise Distribution of Certified/Quality Seeds."
[460] Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, *Agricultural Statistics at a Glance, 2013*, December 2013, table 4.1.1, "All-India Estimates of Yield of Major Crops." Certified seed is produced from "foundation" seed by public or private seed producers and must meet set standards.
[461] GRiSP, *Rice Almanac,* 2013, 113.
[462] IRRI, "India Research, Breeding of Stress-proof Rice"; CRRI, "High Yielding Rice Varieties Developed at CRRI."
[463] Oryza, "India Develops New High-yield Basmati Rice Variety," December 12, 2012.

overall production.[464] Both private seed companies and public institutions are continuing work on hybrid varieties to improve quality and yields. There is some research on transgenic rice varieties for improved resistance to pests, disease, and environmental factors, but commercialization of transgenic rice is not imminent.[465]

Another focus of research has been improvements in production methods. The System of Rice Intensification (SRI) has the potential to increase yields and lower input costs for participating smallholders and marginal farmers through improved management practices.[466] One advantage of the SRI is a reduction in water requirements, although the system is very labor-intensive. Participating farmers have reportedly nearly tripled yields while lowering seed and cultivation costs. To date, the program is still small, enrolling 142,000 farmers on nearly 37,000 ha in 2013.[467]

Poor Storage and Milling Infrastructure

Individual states in India have considerable leeway in how they support both rice growing and rice processing. Although capacity has increased, storage is generally inadequate for the volume of rice procured. Total storage capacity for food grains in the Central Pool is about 71.5 million mt. Storage peaked at about 82.3 million mt in January 2012 and was about 66.6 million mt at the beginning of 2013.[468]

About 9–10 percent of India's paddy rice production is lost in transport, storage, and handling, and on-farm losses were estimated at just below 4 percent.[469] Much of these losses are in drying and milling operations. Improvements in these operations could lead to both a decline in losses and improvements in quality.

Traditional mills in India tend to have a lower milling rate and produce lower-quality rice than modern mills.[470] About half of India's rice is milled in modern facilities, 40 percent in traditional

[464] Hybrid seeds are developed by mating or crossing parent lines that are produced through inbreeding. Pure lines are plants that 'breed true' or produce sexual offspring that closely resemble their parents. Hybrids do not breed true and must be reproduced or purchased for each planting. Fernandez-Cornejo, "Background: The Science of Seed," February 2004.
[465] USDA, FAS, *India: Grain and Feed Annual 2014*, February 14, 2014, 15.
[466] Marginal holdings are defined by the Indian government as less than 1 ha, and smallholdings are 1 to 2 ha. For example, see the definitions in a description of India's National Agricultural Insurance Scheme at http://www.aicofindia.com/AICEng/Pages/Product_Profile/Present_NAIS_Features_P4.aspx.
[467] National Bank for Agriculture and Rural Development, *Annual Report 2013–14,* June 16, 2014, 52.
[468] Additional storage capacity is met by short-term rental of warehouse space. Government of India, Department of Food and Public Distribution, *Annual Report 2012–13*, 2013, 60.
[469] Government of India. Ministry of Agriculture. Directorate of Marketing and Inspection (DMI), Agmarknet, "Post Harvest Profile of Paddy/Rice," n.d. (accessed January 15, 2015); Basavaraja, Mahajanashetti, and Udagatti, "Economic Analysis of Post-harvest Losses in Food Grains in India," 2013, 122.
[470] Singha, "Paddy Processing Mills in India: An Analysis," 2013.

mills, and 10 percent is processed by hand.[471] One source estimates the milling rate of traditional rice mills in India at 52–54 percent, compared to 62–64 percent for modern mills.[472] Another study of 442 rice mills across five Indian states during 2007/08–2009/10 found that the milling rate for modern mills was 64 percent; for traditional mills, 59 percent.[473]

Pakistan

Pakistan accounts for roughly 1 percent of world rice production, but supplies 10 percent of world rice exports. Pakistan produces and exports both basmati and long grain rice. Its basmati exports account for about one-third of global basmati exports, sent mostly to the Middle East, the EU, and the United States. Pakistan's rice production is largely irrigated. Despite this, it is highly vulnerable to both drought and flooding. Government intervention in the rice market consists mostly of agricultural input subsidies, including subsidies on fertilizer, electricity, and credit.[474] In addition to input subsidies, the Pakistani rice sector benefits from its location in the Indus Basin Irrigation System (IBIS), as well as recent investments in advanced processing technology that lowers costs and improves quality. Offsetting these advantages are a lack of innovation in new seed varieties, coupled with poor irrigation and transportation infrastructure.

Production, Consumption, and Trade

Production

Between 2007/08 and 2013/14, Pakistan accounted for about 1 percent of global rice production on average.[475] During this period annual production fluctuated, ranging from 5 million mt to almost 7 million mt, partly because of changing weather conditions that affected both harvested area and yields (table 7.4).[476] For instance, the sharp drop in production in 2010/11 followed widespread flooding that year. Pakistan is a net rice producer, with production at least double consumption in most years. Pakistan accounts for one-third of global basmati production.[477] It also produces long grain rice.

[471] Shwetha, Mahajanashetti, and Kerur, "Economics of Paddy Processing," 2011, 331.
[472] National Bank for Agriculture and Rural Development, "Rice Mill," n.d. (accessed October 30, 2014).
[473] Singha, "Paddy Processing Mills in India: An Analysis," 2013.
[474] Pakistan has identified to the WTO COA certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "Domestic Support: Pakistan," January 9, 2008, table DS:9.
[475] Pakistan was the 11th-largest rice producer globally in 2013/14. USDA, PSD Online (accessed January 21, 2015). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.
[476] USDA, FAS, *Pakistan: Grain and Feed Annual*, March 31, 2014, 8.
[477] Ibid., 7.

Table 7.4: Pakistan: Rice production, consumption, stocks, and trade 2007/08–2013/14

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	700	700	1,200	1,100	300	550	500
Production (milled) (1,000 mt)	5,700	6,900	6,800	5,000	6,200	5,800	6,700
Area harvested (1,000 ha)	2,550	2,912	2,800	2,100	2,750	2,400	2,760
Yield (paddy rice) (mt/ha)	3.35	3.55	3.64	3.57	3.38	3.63	3.59
Imports (1,000 mt)	0	0	16	32	54	45	30
Consumption and residual (1,000 mt)	2,718	3,490	2,916	2,447	2,548	2,317	2,630
Exports (1,000 mt)	2,982	2,910	4,000	3,385	3,456	3,578	3,900
Ending stocks (1,000 mt)	700	1,200	1,100	300	550	500	700
Exports-to-production ratio (%)	52	42	59	68	56	62	58
Ending stocks-to-use ratio (%)	12	19	16	5	9	8	11
Per capita consumption (kg)	16.6	20.9	17.1	14.1	14.5	12.9	14.4

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed May 8, 2014).
Note: Per capita consumption was calculated using marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year, which runs from November to October.

Consumption and Ending Stocks

Wheat is the primary staple food in Pakistan. Rice consumption is relatively low and accounted for less than 1 percent of global consumption between 2007/08 and 2013/14. In fact, Pakistan's per capita rice consumption has been falling and is now significantly lower than in other parts of Asia (chapter 2). During 2011/12–2013/14, it was only 14 kg annually, roughly one-quarter less than in 2007/08–2009/10. Pakistan's ending stocks were relatively high in 2008/09–2009/10 at 1.2 million mt, equivalent to 16–19 percent of annual rice use. Stocks fell by about two-thirds between 2009/10 and 2010/11 following a sharp drop in production that year. Then, between 2011/12 and 2013/14, stocks recovered to 700,000 mt, equivalent to about 11 percent of annual rice use.

Trade

During 2007–13, Pakistan supplied about 10 percent of global rice exports.[478] Its rice industry is highly export oriented: roughly 57 percent of production was exported during 2007–13, and rice accounted for 8.4 percent of the value of all Pakistan's exports in 2013.[479] With the exception of 2011, Pakistani exports grew steadily at about 6 percent annually, reaching 3.8 million mt ($2.1 billion) in 2013 (table 7.5). In 2010, exports spiked 31 percent higher following good harvests in the two previous years. In 2011, shipments fell by 19 percent as widespread floods led to lower production.[480]

[478] USDA, PSD online (accessed October 15, 2014).
[479] GTIS Global Trade Atlas database (accessed November 19, 2014).
[480] USDA, FAS, *Pakistan: Grain and Feed Annual*, March 31, 2014, 8.

Table 7.5: Pakistan: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
West Africa	276	368	438	587	463	452	680
Benin	3	22	82	76	51	62	160
Kenya	224	170	297	225	272	340	455
China	0	1	0	3	20	577	372
United Arab Emirates	457	364	320	446	356	215	218
Afghanistan	77	256	264	173	245	225	201
Madagascar	197	69	73	98	129	98	194
Tanzania	27	9	6	10	21	82	183
Saudi Arabia	85	144	172	207	127	137	172
Mozambique	149	98	108	175	127	111	166
All other	1,210	1,572	1,532	2,281	1,653	1,187	1,208
Total	2,702	3,050	3,210	4,205	3,414	3,424	3,849
				Value (million $)			
West Africa	76	183	163	235	210	179	254
Benin	1	11	30	33.1	26	28	65
Kenya	55	70	110	94	127	156	199
China	0	1	0	1.5	10	255	144
United Arab Emirates	284	383	242	315	287	187	189
Afghanistan	18	187	146	96	165	153	136
Madagascar	57	26	26	39	57	40	75
Tanzania	8	4	3	5	10	37	77
Saudi Arabia	47	136	126	138	95	99	125
Mozambique	39	42	39.2	74	61	53	74
All other	561	1,409	919	1,282	1,040	722	839
Total	1,146	2,440	1,774	2,277	2,062	1,882	2,111

Source: GTIS, Global Trade Atlas database (accessed August 8, 2014).
Note: HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

Pakistan exports both aromatic basmati rice and long grain white rice. Basmati occupies a lucrative market niche because of its characteristic aroma and cooking qualities, typically commanding a price two to three times the price of long grain rice. India supplies about 65 percent of international trade in basmati, while Pakistan accounts for the remainder.[481] Most basmati is exported to the Middle East (Iraq, Iran, and the United Arab Emirates), Malaysia, the United Kingdom, and the United States. In these countries there is demand for aromatic rice, but little to no local production. Long grain rice is also an important export commodity. In the 2013/14 marketing year, 78 percent of Pakistan's rice exports by volume consisted of long grain rice, of which 6 percent was parboiled. Long grain exports largely consist of lower- to medium-quality[482] rice that is exported globally to price-sensitive markets, including Afghanistan, China, West Africa, and Indonesia.[483]

[481] Mishra, "Rice Exports from India Climbing to Record," February 12, 2014.
[482] Basma, "Rice Standard Specifications and Export," n.d. (accessed October 17, 2014). Lower- to medium-quality rice refers to rice exports that include more than 10 percent broken rice.
[483] USDA, FAS, *Pakistan: Grain and Feed Annual*, March 31, 2014, 9.

Recently, some Pakistani rice exports have failed to meet certain global phytosanitary regulations and requirements. For example, in June 2013, Mexico found evidence of khapra beetle larvae in a shipment of Pakistani rice and subsequently removed Pakistan from its list of eligible importers. For this reason, countries in Central America also do not permit rice imports from Pakistan.[484] Similarly, an infestation of khapra beetle larvae was discovered in a shipment of rice from Pakistan at the port of Baltimore in September 2014, and the shipment was ordered to be re-exported or destroyed.[485]

Industry Structure

Rice is Pakistan's third most important crop by area planted, following wheat and cotton, and covers about 11 percent of Pakistan's total cultivated area.[486] In 2013/14, long grain rice accounted for 57 percent of rice area and 70 percent of rice production, while basmati accounted for the remainder.[487] Pakistan has two major rice-producing provinces, Punjab and Sindh, which together supply about 96 percent of the country's rice production (figure 7.5). Punjab, due to its agro-climatic and soil conditions, produces over 90 percent of the basmati rice, while long grain rice is grown in both provinces.[488]

Rice is produced in the summer (*kharif*) season under irrigation.[489] Rainfall and water flows from the Indus Basin and its tributaries are the major sources of irrigation water. In addition, groundwater, through the use of tube wells run by electric or diesel motors, supplements surface water supplies and accounts for about 37 percent of the water available at the farm level.[490] Basmati rice, which is late maturing, requires more water than long grain varieties. As a result, its production costs are higher and yields lower.[491]

[484] Global Analytics and Consulting, "Khapra Beetle Infestation Stops Rice Shipment," August 8, 2014.
[485] Ibid.
[486] USDA, FAS, *Pakistan: Grain and Feed; Annual*, March 31, 2014, 7.
[487] U.S. government official, email message to USITC staff, November 26, 2014.
[488] USDA, FAS, *Pakistan: Grain and Feed; Annual*, March 31, 2014, 7.
[489] Rice is traditionally planted in May through July and harvested from September to early December, although with the spread of hybrid long grain rice varieties, some rice is planted in March and April. USDA, FAS, *Pakistan: Grain and Feed; Annual*, March 21, 2013, 7.
[490] Salam, *Review of Input and Output Policies*, November 2012, 13.
[491] For example, in 2012/13, the average basmati yield in the Punjab was 1,767 kg per ha, compared to 2,316–2,607 kg per ha for non-basmati varieties. Government of Pakistan, MNFSR, *Agricultural Statistics of Pakistan 2012–13*, July 2014, table 7.

Figure 7.5: Pakistan: Paddy rice production by province, 2013/14

Source: Government official, email to USITC staff, November 26, 2014.

Government Support Programs

Rice marketing in Pakistan was liberalized in the 1990s. Up until the 2009/10 season, the government announced indicative or reference prices for basmati and long grain varieties, but has not done so since. Due to rising rice prices in early 2008, Pakistan imposed minimum export prices (MEPs) for basmati and non-basmati rice in April 2008. The MEP for basmati rice was eliminated in October 2008 and for non-basmati rice in August 2008.[492] In addition, Pakistan provides support to rice producers through general input payment programs that are available to all agricultural producers, including rice.[493]

The government subsidizes fertilizer purchases.[494] For urea, which is both produced domestically and imported, government payments are made to equalize import and domestic prices. In January 2014, the government announced that imported urea costing 2,527 Pakistani rupees (PKR) ($25) per 50-kg bag would be provided payments at PKR 741 ($7) per bag, totaling roughly 30 percent of the total cost.[495]

Surface irrigation water is also provided government assistance in Pakistan. A 2012 report noted that the canal irrigation system recovers only 24 percent of its operating and maintenance costs.[496] Canal water is supplied seasonally to farmers at a fixed rate per unit area and not allocated on the basis of specific crop water requirements. In contrast, the cost of groundwater extraction through wells varies with diesel and electricity costs, and was estimated to be about 30 times higher than the cost of surface water irrigation in 2007.[497] Some government assistance is also available for groundwater extraction equipment. Through the Tube Well Efficiency Improvement Program, Pakistani rice farmers can replace inefficient tube-well motor pump sets with more energy-efficient motor pumps at half the market cost.[498]

Shortages of electricity and gas also affect the 22 percent of Pakistani tube wells that are electric-powered.[499] To offset the high cost of electricity, the government announced assistance on electricity for powering tube wells in September 2013.[500] Under this program, electricity was provided at a flat rate of PKR 10.50 ($0.10) per kilowatt-hour (kWh) until June 30, 2014, with the difference between the cost of power generation and the rate for farmers, PKR 23 billion ($226 million), paid by the government. The government is currently considering an increase in the electricity rate for farmers to PKR 12.30 ($0.12) per kWh, compared to an average rate of PKR 16 ($0.16) per kWh paid by other consumers.[501]

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[492] Oryza, “Pakistan Removes MEP on Non-Basmati Rice,” August 24, 2008; FAO, GIEWS, “Policy Measures Taken by Governments to Reduce The Impact of Soaring Price,” December 15, 2008.
[493] Salam, *Review of Input and Output Policies*, November 2012.
[494] Pakistan has identified to the WTO COA certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "Domestic Support: Pakistan," January 9, 2008, table DS:9.
[495] Abbasi, “Imported Urea: Rs741 per Bag Subsidy Approved,” January 17, 2014.
[496] GOP, Planning Commission, *Canal Water Pricing for Irrigation in Pakistan*, June 2012, viii.
[497] Qureshi, “Conjunctive Water Management,” 2014, 1.
[498] Tobias et al., *Handbook on Rice Policy for Asia*, 2012, 9. This program is sponsored by the U.S. Agency for International Development.
[499] Government of Pakistan, MNFSR, *Agricultural Statistics of Pakistan 2012–13*, July 2014, table 107. The remaining tube wells are diesel powered.
[500] Rana, “New Electricity Rate: Farmers Win Power Subsidy,” September 6, 2013.
[501] Bhutta, “Power Tariff on Tube Wells,” July 22, 2014.

To increase the affordability of tractors, various programs, such as the Benazir Tractor program of the federal government, the Green Tractor Scheme of the Punjab government, and the Sindh Tractor Program, were implemented between 2009 and 2013. These programs provided a limited number of tractors at discounts of between PKR 200,000 ($1,968) to PKR 300,000 ($2,952) per tractor. In calendar years 2012 and 2013, government assistance in Punjab and Sindh amounted to about 25 percent of the price, depending on the size and cost of the tractor.[502]

Factors Affecting Competitiveness

Several factors strengthen the competitiveness of Pakistan's rice industry in world markets. Its location in the IBIS provides irrigation water to rice producers. Also, substantial investments by the private sector in rice milling have raised milling efficiency and rice quality. The sector also benefits from generally available government assistance for inputs, such as fertilizer, electricity, surface irrigation water, and farm machinery, which lowers producers' costs of delivery. These benefits are offset by low farm productivity due to poor agricultural practices and a lack of research and development in new varieties. Pakistan also suffers from both too little and too much water: with population growth, the country is becoming a water-stressed economy, yet when rainfall is heavy its dams and barrages along the Indus Basin are inadequate to prevent major flooding. Another major problem is energy shortages that affect the supply of electricity and natural gas needed to run the mills and to dry rice.[503]

Government Assistance for Inputs Lowers Production Costs

Costs of production for producing long grain paddy rice in Sindh province, the major long grain rice production area in Pakistan, is estimated at $171.52 per mt in the 2013/14 marketing year (table 7.6). These costs are for operations at the farm and do not include road transport, milling, or port costs. The largest costs are for land, followed by land preparation and fertilizer. Irrigation is a small cost relative to other inputs; its low cost reflects the government assistance for the water.

[502] Ali, "Subsidized Tractors: Growers Cry Foul," September 5, 2013; *Pakistan Today*, "Punjab Government to Re-Launch 'Green Tractor Scheme,'" May 26, 2012.
[503] USDA notes that while Pakistan's energy shortages are ongoing, the situation has steadily improved under Pakistan's new government, which took office in June 2013. USDA, FAS, *Pakistan: Grain and Feed Annual*, March 31, 2014, 8.

Table 7.6: Pakistan: Cost of production of long grain paddy rice (Sindh), 2013/14

Input	COP	Share of COP
	$/mt[a]	%
Fertilizer	29.98	17
Other chemical inputs	2.19	1
Irrigation	11.51	7
Other variable costs (including most labor costs)	77.59	45
Total variable costs	121.27	71
Land	38.61	23
Other fixed costs[b]	11.64	7
Total fixed costs	50.25	29
Total COP	171.52	100

Source: U.S. government official, email message to USITC staff, November 26, 2014.
Notes: Cost of production (COP) is for IR-6 variety rice grown in the Sindh province. Costs are for farm operations, including hired or family labor. Land is valued at its rental rate.
[a] Converted from PKR per acre using May–December 2013 average exchange rate of PKR 103.42 per U.S. dollar and average yield of 4.9 mt per ha.
[b] Includes mark-up, management, land tax, drainage cess, and expected escalation in the cost of selected items.

While benefiting from government assistance for inputs, rice producers have been hurt by the approximately 60 percent devaluation of the rupee against the U.S. dollar from 2007 to 2013. The devaluation pushed up prices of imported agricultural inputs, such as fertilizer and diesel. Average retail prices for the two most important fertilizers used in rice production, urea and diammonium phosphate (DAP), increased by 215 percent and 90 percent, respectively, between 2007/08 and 2013/14.[504] Similarly, diesel prices rose over 90 percent, from PKR 61.2 per liter in 2008 to PKR 117.0 per liter in 2013.[505]

Investment in Processing Facilities Improves Quality

Export growth has been supported by the industry's investment in state-of-the-art processing machinery that has improved rice quality.[506] The average milling rate for Pakistan's rice mills is 67 percent, suggesting relatively high efficiency.[507] Nonetheless, Pakistan's reliability as a rice supplier has been undermined by electricity shortages which reduce milling capacity.[508]

Lack of Innovation Keeps Crop Yields Low

Due to a lack of investment in research and development, particularly for new seeds, Pakistan's farm-level productivity in rice has not kept up with that of competitor countries, particularly India. This is true even though more Pakistani farmers are planting certified seed rather than

[504] Government of Pakistan, Ministry of Finance, *Economic Survey 2013–14*, 2014, table 2-10.
[505] Energypedia, "International Fuel Prices," n.d. (accessed October 12, 2014). Increases in fertilizer and diesel prices reflect international price movements and government payments to lower the market price for urea, as well as currency changes.
[506] USDA, FAS, *Pakistan: Grain and Feed Annual*, March 31, 2014, 9.
[507] USDA, PSD online (accessed October 15, 2014).
[508] *Agriculture Corner*, "Excessive Loadshedding," June 26, 2014.

seed saved from the previous crop.[509] According to one observer, basmati research is almost "nonexistent," and no new variety has been developed to replace the super basmati variety that was introduced in 1996. This is in contrast to India, which introduced its higher-yielding Pusa 1120 basmati variety in 2003 and the Pusa 1509 variety in 2013.[510] According to an industry official, the farm-level yield for India's top-quality basmati rice is 30 percent higher than that of Pakistan, while India's yields for lower-quality basmati are 14 percent higher than Pakistan's.[511] Similarly, Pakistan's long grain rice varieties are outdated and need to be replaced by new germplasm. For example, the IR-6 variety, which accounted for 86 percent of Pakistan's exports of long grain rice in FY 2012/13, was introduced over 40 years ago.[512] Despite the past stagnation in research, use of higher-yielding seeds has been facilitated by imports, and new country-focused research efforts facilitated by outside efforts could accelerate this trend. Hybrid long grain varieties from China were introduced in 2002, and the acreage planted to these varieties has expanded, particularly since 2005.[513] In the 2012/13 marketing year, hybrid rice accounted for about 13 percent of the area planted in rice. However, while farmers receive higher yields for hybrid rice compared to IR-6, millers pay them less for it due to increased brokens and variation in grain size.[514]

The International Rice Research Institute is currently providing Pakistani farmers with assistance in developing new rice varieties that can survive floods, droughts, and heat under a $1.0 million grant from the Asian Development Bank. The project, launched in August 2013 and led by the Punjab Agriculture Research Board, is in an experimental phase.[515]

Water

Extensive resources create favorable growing conditions . . .

Pakistani farming is sustained by the IBIS, the largest contiguous irrigation system in the world. This system supplies water to millions of acres of farmland upon which rice, wheat, fruits, vegetables, sugar cane, cotton, and other crops are grown. The IBIS comprises a system of dams, barrages, canals and tube wells, and is the largest infrastructure investment in Pakistan.[516]

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[509] The use of certified or "improved" seed increased 264 percent from 2005/06 to 2012/13. Government of Pakistan, MNFSR, *Agricultural Statistics of Pakistan 2012–13*, July 2014, table 74.
[510] *Dawn.com*, "Steep Fall in Basmati Exports," January 13, 2013.
[511] Farhan, "Rice Issues: Research Crucial," April 13, 2014.
[512] REAP, "Country-wise July 2012 to June 2012" (accessed November 12, 2014).
[513] Akhter, "Hybrid Rice Development in Pakistan" (accessed November 3, 2014).
[514] Akhter, "Hybrid Rice Development in Pakistan" (accessed November 13, 2014).
[515] Business Monitor International, *Pakistan Agribusiness Report*, 2014, 16.
[516] TBL Sustainable Advocacy, "Indus Basin Irrigation System of Pakistan," July 10, 2008.

. . . but poor water management raises delivered costs and reduces supply

The reliability of Pakistan's rice supply depends both on the availability of water and the effectiveness of the dams and barrages that are part of the IBIS flood control mechanisms. Pakistan's rice crop was reduced by flooding for three consecutive years, 2010/2011–2012/13, due to heavy monsoon rains, with the worst floods in Pakistan's history occurring in the summer of 2010. The 2010 flood reduced the area planted to long grain rice by 50 percent in the 2010/11 marketing year. Flooding also occurred in 2014 due to excessive rainfall.[517]

Pakistan's growing population is putting severe stress on the water supplies available for agriculture, while its irrigation system is in need of rehabilitation.[518] Owing to both age and neglect of its infrastructure, irrigation efficiency is low. Water storage capacity is limited, while climate change threatens to affect snowmelt and reduce water flows into the Indus River.[519] Waterlogging and soil salinity, due to seepage from canals, inadequate drainage, poor water management, insufficient water, and poor-quality groundwater, threaten the long-run sustainability of irrigated agriculture in Pakistan. Moreover, the widespread use of tube wells has lowered the water table in both Sindh and Punjab provinces, making these areas more susceptible to drought.[520] Farmers tend to overuse water whenever available, resulting in inefficiencies. Lack of modern irrigation techniques and agricultural practices adds to the waste of irrigation water.[521] Water stress is a long-term challenge to the industry: it is projected that Pakistan will face a 32 percent shortfall in water availability by 2025.[522]

According to the Asian Development Bank (ADB), agricultural productivity in Pakistan could be doubled with improved water management, storage, and pricing for irrigation water.[523] The RiceFlow model was used to simulate an increase of 25 percent in productivity for basmati and long-grain rice in Pakistan, assuming that the changes recommended by the ADB are made. The model results indicate that under these conditions, Pakistani rice production would increase 40 percent and that its rice exports would increase 100 percent. Pakistan's exports would be

[517] Water is particularly crucial during the May–August period when seedlings are transplanted. In years of low rainfall, water shortages toward the end of the cropping season in October may also adversely affect harvest size. Reduced water availability has a greater impact on long grain rice, as it is mostly grown in Sindh and largely dependent on canal irrigation, while basmati producers in Punjab have greater access to groundwater through large-scale tube wells. USDA, FAS, *Pakistan: Grain and Feed Annual*, March 21, 2013, 7.
[518] Qureshi, "Water Management in the Indus Basin," August 2011, 253. According to the ADB, Pakistan is becoming one of the most water-stressed countries in the world. *ADB, Asian Development Outlook 2013*, 2013, 208; Qureshi, "Water Management in the Indus Basin," August 2011, 254.
[519] Qureshi, "Water Management in the Indus Basin," August 2011, 254-256.
[520] Ibid. 255.
[521] ADB, *Asian Development Outlook 2013*, 2013, 208.
[522] Qureshi, "Water Management in the Indus Basin," August 2011, 253.
[523] ADB, *Asian Development Outlook 2013*, 2013, 208.

absorbed largely by countries outside the United States, and the United States would experience a small (1.2 percent) decline in rice exports.[524]

Road Infrastructure Also Hinders Competiveness

Roads are the most important mode of transportation in Pakistan, but their quality is poor, which reduces the competitiveness of the country's exports.[525] For example, Pakistan has a low road density (the ratio of the length of the total road network to total land area); its road density was 33 in 2011, compared to 143 for India. The result is congestion and concerns about road safety.[526] In addition, the roads are in poor condition due to vehicle overloading and Pakistani government budget constraints.[527]

[524] Of the decline in U.S. rice exports, roughly half would affect exports to Mexico. USITC economic modeling simulation using the RiceFlow model (see appendix H). Pakistan has been barred from shipping rice to Mexico since mid-2013 due to phytosanitary problems, a circumstance not accounted for in the model.
[525] World Bank, "Pakistan Transport Infrastructure," n.d. (accessed November 13, 2014).
[526] World Bank, World Development Indicators (accessed November 13, 2014).
[527] Sanchez-Triana et al., *Greening Growth in Pakistan*, 2013, 26.

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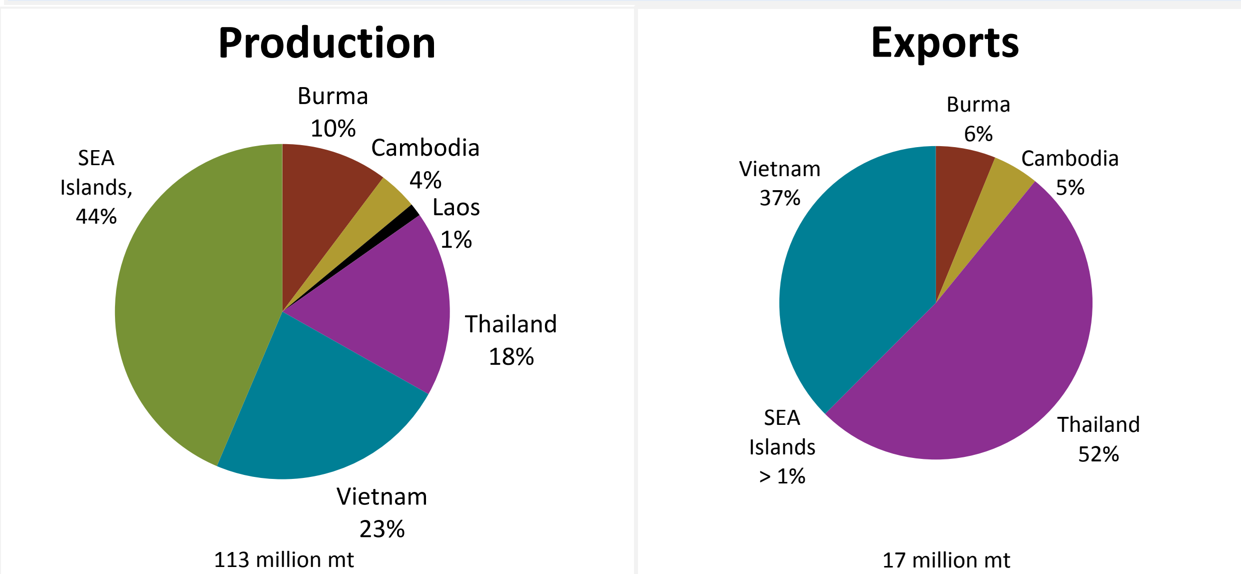
Chapter 8
Southeast Asia Mainland

Overview

Most mainland countries in Southeast Asia have historically had success as surplus rice growers and exporters. Four mainland countries—Burma, Cambodia, Thailand, and Vietnam—account for more than 50 percent of the rice production for the entire Southeast Asia region, including the Southeast Asian island nations, and for nearly all of the region's exports (figure 8.1). [528] Thailand and Vietnam alone account for about 41 percent of production and 89 percent of rice exports in Southeast Asia. Thailand has continued to build its reputation as the benchmark for the rice industry and in most years is the world's largest exporter.

Figure 8.1: Production and export shares among the mainland and island nations of Southeast Asia, 2007/08–2013/14



Source: USDA, PSD Online (accessed February 5, 2015).
Notes: Shares based on quantity. Both production and export quantities are based on marketing year. Totals are based on the period averages. Southeast Asia (SEA) islands include Brunei, Indonesia, Malaysia, and the Philippines.

[528] Laos did not report exports during 2007/08–2013/14. USDA, PSD Online (accessed January 26, 2015).

Nonetheless, 2007/08–2013/14 has been a time of change for all four of the mainland countries. An expanded rice price support program, along with increased competition from Indian rice exports, caused a decline in Thai exports at the end of the period. Meanwhile, Vietnam's production and exports have been increasing. During the same period, Burma and Cambodia returned to the global rice market after prolonged absences due to acute political instability. By 2013/14, they were among the top 10 global exporters; Thailand and Vietnam were in the top 3.

Thailand

Overview

Thailand is a net producer of rice and was the world's leading exporter until 2012. That year, Thailand lost its top spot when the now-suspended 2011 Paddy Pledging Program caused a decline in exports at the same time that India's exports surged to their highest levels in 15 years. Rice dominates Thailand's agricultural sector and is an important source of export earnings.[529] Thailand produces high-quality rice and has a recognizable global brand, thanks to a long history of a vibrant private industry. However, Thailand's high costs of production (relative to the rest of the region) and recent problems with export reliability present challenges to its rice industry.

Production, Consumption, and Trade

Production

Between 2007/08 and 2013/14, Thailand accounted for about 4 percent of global production, with fairly stable production of about 20 million metric tons (mt) annually (table 8.1).[530] Thailand mainly produces long grain white rice, parboiled long grain white rice, and aromatic jasmine rice.[531] It is a surplus producer of rice, and production was roughly double domestic consumption during this period. The country has the highest ratio of rice production to domestic rice consumption of any major producer belonging to the Association of Southeast Asian Nations (ASEAN).[532]

[529] Agri Benchmark, *Economics of Southeast Asian Rice Production*, January 2014, 7.
[530] USDA, PSD Online (accessed January 21, 2015). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.
[531] USDA, FAS, *Thailand: Grain and Feed Update*, December 4, 2014, 5–6; U.S. government official, email to USITC staff, October 16, 2014.
[532] Government of Thailand, Office of Agricultural Economics, *Agricultural Statistics of Thailand*, 2013, 194.

Table 8.1: Thailand: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	2,510	2,707	4,787	6,100	5,615	9,330	12,808
Production (milled) (1,000 mt)	19,800	19,850	20,260	20,262	20,460	20,200	20,460
Area harvested (1,000 ha)	10,830	10,800	10,940	10,667	11,000	10,837	10,920
Yield (paddy rice) (mt/ha)	2.8	2.8	2.8	2.9	2.8	2.8	2.8
Imports (1,000 mt)	8	300	300	200	600	600	300
Consumption and residual (1,000 mt)	9,600	9,500	10,200	10,300	10,400	10,600	10,875
Exports (1,000 mt)	10,011	8,570	9,047	10,647	6,945	6,722	10,300
Ending stocks (1,000 mt)	2,707	4,787	6,100	5,615	9,330	12,808	12,393
Ratio of exports-to-production (%)	51	43	45	53	34	33	50
Ending stocks-to-use ratio (%)	14	26	32	27	54	74	59
Per capita consumption (kg)	145.3	143.5	153.9	155.1	156.2	158.7	162.3

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption used marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

Stable production reflects harvested area and yields that have fluctuated little since 2007/08. While Thailand is a global leader in exports, its rice yields are low by both world and regional standards—an average of 2.8 mt per hectare (ha). These yields are lower than those of Vietnam and Indonesia,[533] and they place Thailand seventh among ASEAN countries in terms of rice productivity. Part of the reason Thai rice yields are so low is the prevalence of rain-fed farming systems and the continued use of low-yielding traditional varieties of rice.[534] Another factor is post-harvest losses caused by bottlenecks at peak harvest, as large areas tend to mature at the same time, stretching available labor and machinery.[535]

Consumption and Ending Stocks

During 2007/08–2013/14, Thailand's rice consumption rose at about 2 percent annually to reach a record 10.9 million mt in 2013/14. For almost two decades up to 2009/10, annual Thai per capita rice consumption fluctuated little at about 146 kilograms (kg). However, starting in 2009/10 apparent per capita consumption rose about 2 percent annually to reach 162 kg in 2013/14.[536] Per capita consumption varies by demographics, with the highest consumption in low-income households and the lowest in urban ones.[537] Reportedly, most of the recent

[533] Ibid., 192.
[534] Rice grown in irrigated areas of the Central Plains tends to have a higher average yield due to better water control. One survey of this area found a yield of 5.6 mt per ha, or nearly double the national average. GRiSP, *Rice Almanac,* 2013, 134; Agri Benchmark, *Economics of Southeast Asian Rice Production*, January 2014, 14.
[535] Further, if rice is harvested too late, overripe rice will be brittle and mill badly. Reportedly, this is a particularly acute challenge in the Northeast growing areas. Industry representative, telephone interview by USITC staff, January 9, 2015.
[536] USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
[537] Per capita consumption is 80 kg for urban households, 115 kg for rural households, and 125 kg for low-income households. USDA, FAS, *Thailand: Grain and Feed Annual*, March 7, 2014, 5.

increase in consumption is due to higher demand for broken rice for animal feed and food processing, which account for 15 to 20 percent of total rice consumption in Thailand.[538]

Ending stocks represented about 10 percent of rice use (domestic consumption plus exports) between the early 1990s and mid-2000s. However, starting in 2007/08 stock levels rose sharply, increasing by more than 29 percent annually between 2007/08 and 2013/14. By 2013/14, ending stocks reached 12.4 million mt, equivalent to roughly 59 percent of use. The sharp build-up in stocks over this period is chiefly attributed to the former government's 2011 Paddy Pledging Program, under which it promised to purchase paddy rice from farmers at a fixed, artificially high price (see "Government Support Programs" below). Stocks are expected to decline in 2014/15 as the government continues to sell off stocks acquired under the 2011 Paddy Pledging Program.[539]

Trade

The Thai rice industry is highly export oriented, with an average of 44 percent of production exported from 2007 to 2013 (table 8.2). Thailand exports roughly equal shares of long grain white rice, aromatic jasmine rice, and parboiled white rice.[540] Thailand had been the world's leading rice-exporting country since 1981, accounting for 29 percent share of global shipments in 2011.[541] Thai annual rice exports peaked in 2011 at 10.7 million mt, because of decreased competition following India's export ban on non-basmati rice.[542] However, they plummeted by about 37 percent in volume between 2011 and 2012 owing to the 2011 Paddy Pledging Program and competition with India in certain export markets. In 2013, Thailand exported just 6.6 million mt of rice, 38 percent less than in 2011.

Thailand's exports subsequently rebounded in 2014 and the country is expected to regain the position of the world's leading rice exporter in 2015. Not only is part of the record-volume government-held stocks slated for export, but competition from India is expected to fluctuate because of unstable Indian production and a volatile policy environment.[543] Sales from stocks were slow through most of 2014, as the government temporarily paused sales during July and August 2014 to evaluate quality and status of stocks amid allegations of corruption under the

[538] U.S. government official, email to USITC staff, October 16, 2014; USDA, FAS, *Thailand: Grain and Feed Annual*, March 7, 2014, 5.
[539] USDA, FAS, *Thailand: Grain and Feed Annual*, March 7, 2014, 7.
[540] Poapongskorn, "Rice in Thailand: Production, Consumption, Export and Policy," 2013; U.S. government official, email to USITC staff, December 4, 2014.
[541] Based on calendar year. USDA, PSD Online (accessed March 5, 2015).
[542] GTIS, Global Trade Atlas database (accessed July 11, 2014); Childs, *Rice Situation and Outlook Yearbook*, April 2012, 26.
[543] PSD Online data indicate that Thailand was once again the world's leading exporter in 2014. USDA, PSD Online (accessed February 9, 2015).

Table 8.2: Thailand: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
West Africa	2,584	3,314	3,142	3,065	3,196	2,256	1,904
Benin	758	763	619	460	200	335	919
Côte d'Ivoire	385	542	530	623	603	357	310
Nigeria	334	846	1038	1330	1512	1183	176
Iraq	323	542	268	507	629	779	704
South Africa	497	564	766	583	590	367	419
United States	390	383	444	388	394	362	387
China	453	247	344	292	304	176	328
Cameroon	103	157	172	209	207	278	283
Japan	140	196	271	284	292	197	268
All other	4,704	4,812	3,214	3,611	5,100	2,320	2,319
Total	9,193	10,216	8,620	8,940	10,712	6,734	6,612
				Value (million $)			
West Africa	915	1,821	1,632	1,531	1,671	1,370	1,084
Benin	267	404	337	238	103	189	460
Côte d'Ivoire	156	257	302	335	327	238	201
Nigeria	118	617	576	639	766	671	91
Iraq	116	264	122	231	307	429	344
South Africa	178	335	412	307	329	225	228
United States	237	329	378	441	413	404	450
China	232	164	210	222	234	152	247
Cameroon	36	67	83	104	98	140	134
Japan	50	91	133	153	155	109	137
All other	1,967	3,115	2,056	2,352	3,164	1,780	1,731
Total	3,732	6,186	5,026	5,340	6,370	4,608	4,355

Source: GTIS, Global Trade Atlas database (accessed July 11, 2014).
Note: HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

program.[544] However, Thai rice exports reached 11.0 million mt in 2014, returning Thailand to its status as the world's leading exporter.[545]

As noted, about two-thirds of Thailand's rice exports are of long grain white and parboiled long grain white rice. West African countries comprise Thailand's top markets for these forms, followed by Iraq and China. Thai exports to many African markets fell sharply in 2012; its shipments were displaced by rice from India owing to the aforementioned government policies and to higher Thai prices in these price-sensitive markets. [546] Premium jasmine rice—the remaining one-third of Thailand's rice export value[547]—is largely destined for the United States and Japan. Exports to those two countries remained relatively stable during 2007–13.

[544] Oryza, "Thailand Devises Strategy," December 7, 2014; Oryza, "Thai Government Issues $1.5 Billion," November 26, 2014.
[545] GTIS, Global Trade Atlas (accessed March 6, 2015).
[546] Imports of Indian rice by Côte d'Ivoire and South Africa in 2011/12 increased by 3,098 percent and 174 percent, respectively, from the previous year.
[547] Asia-Pacific Development Journal, *Challenges and Opportunities*, December 2012, 98.

Industry Structure

Rice paddy fields accounted for 47 percent of total agricultural land use in Thailand in 2012, or approximately 11.2 million ha (about 27.7 million acres).[548] The Northeastern region of Thailand accounted for about 60 percent of total rice-growing area that year (figure 8.2).[549] The Northern and Central region have smaller areas under rice cultivation, accounting for 23 and 15 percent, respectively, of total rice-growing area in 2012.[550]

The Northern and Northeastern growing areas are rain fed and normally produce just one crop a year of the well-known Thai or Hom Mali jasmine rice.[551] The Central region, on the other hand, normally has two and sometimes three crops annually, based on market price and reservoir levels; output consists mainly of long grain rice.[552] Thai rice farms are about 2.8 ha (6.9 acres) on average, although they tend to be larger in the Central region at about 3.8 ha (9.4 acres).[553] Reportedly, even in the Central region, only one-third to one-half of farms are irrigated.[554] Thailand's low rate of irrigation—compared to Vietnam, for example—means that growing areas are particularly vulnerable to changes in rainfall.[555]

Most Thai rice farming is mechanized, more so than for any other crops produced in Thailand. Rice farmers generally rent tractors and combines for planting and harvest, and employ contract labor during those times.[556] In addition, drying is highly mechanized: around 90 percent of the millers and traders own mechanical dryers.[557]

In 2013, there were roughly 37,000 mills in Thailand employing approximately 78,000 workers. The vast majority of mills are located in the Northeast of the country.[558] Reportedly, overcapacity in the milling sector gives the farmers a slight advantage, as mills have to compete

[548] In Thailand, roughly 11 million ha were planted in paddy rice fields in 2012. Government of Thailand, Office of Agricultural Economics, *Agricultural Statistics of Thailand, 2013*, 174.
[549] Government of Thailand, Office of Agricultural Economics, *Agricultural Statistics of Thailand, 2013*, 174.
[550] Ibid., 174.
[551] U.S. government official, telephone interview by USITC staff, October 16, 2014.
[552] U.S. government official, email to USITC staff, December 4, 2014.
[553] Based on marketing year 2011/12. U.S. government official, email to USITC staff, December 4, 2014.
[554] The Royal Irrigation Department of Thailand controls access to water in its irrigation canals. Recently, there have been government restrictions on the second rice crop due to low reservoir levels, caused by drought. Prateepchaikul, "Rice Farmers Must Help Themselves," September 29, 2014; U.S. government official, email to USITC staff, October 16, 2014.
[555] GRiSP, *Rice Almanac,* 2013, 136.
[556] Industry representative, telephone interview by USITC staff, January 9, 2015.
[557] U.S. government official, email to USITC staff, December 4, 2014.
[558] In total, Thai mills represent a capital investment of 103.3 billion baht ($3.4 billion). Data from Thailand's Department of Industrial Work, translated by U.S. Department of Agriculture (USDA). USDA, FAS, email to USITC staff, January 8, 2015; IMF, IFS database: Exchange Rate Query, annual 2013 (accessed September 24, 2014).

Figure 8.2: Thailand: Paddy rice production by region, 2013

Source: Government official, email to USITC staff, November 26, 2014.

to purchase paddy rice.[559] Thailand has a strong reputation as a milling industry leader among its regional producers, such as Vietnam and Indonesia,[560] because of its ability to produce polished, clean rice with a low percent of brokens. Efficient mills in Thailand attract small amounts of paddy rice imports from its neighbors with limited milling capacity, such as Burma and Cambodia.[561] Although Thailand's total average milling rate was 66 percent in 2013/14, and has been stable over the past several years,[562] industry representatives note that there remains room for improvement in particular regions. One example is the Northeast, where post-harvest losses are reportedly high.[563]

Government Support Programs

Paddy Pledging Program

Between 1981 and mid-2014, the Thai government's rice policy was primarily carried out through a series of "paddy pledging programs," which provided price support to rice producers. The aim of these programs was to allow farmers to avoid selling their crop immediately after harvest when seasonal prices are at their lowest. Under these programs, producers could either sell their rice to participating mills or store it on-farm. In either case, the producer obtained a loan from the government, equal to a government-announced paddy loan price times the volume of rice sold or stored. After three months, participants had a choice. They could either repay the loan with interest and gain possession of their rice, selling it in the open market, or they could forfeit their rice to the government as full repayment of the loan. Thus, the loan rate effectively became a floor price below which market prices could not fall.[564] In the 1990s, only about 7 percent of rice in the main crop was pledged annually to the programs, since the loan rates were typically below market prices.

But in 2001, the program was expanded to include rice grown in the dry season, and starting in 2003/04, loan rates began to rise. For example, loan rates were increased significantly in 2004/05 to 40 percent above market prices for aromatic paddy rice and 25–30 percent above market prices for long grain paddy rice, and between 2004/05 and 2008/09, loan rates for wet season long grain rice doubled from 6,600 baht/mt ($164/mt) to 12,000 baht/mt ($360/mt).[565]

[559] Industry representative, telephone interview by USITC staff, January 9, 2015.
[560] Industry representatives, interviews by USITC staff, Indonesia, November 19–20, 2014.
[561] Although official statistics show Thai imports of 600,000 mt or less annually during 2007–13, imports from Burma and Cambodia to Thailand were reportedly largely through gray market channels.
[562] USDA, FAS, *Thailand Grain and Feed Annual*, March 7, 2014, 3.
[563] Industry representative, telephone interview by USITC staff, January 9, 2015.
[564] Slayton, "Shinawatra Raises the Thai Price Umbrella Again," n.d. (accessed November 12, 2014).
[565] IMF, IFS database: Exchange Rate Query, annual (accessed September 24, 2014).

Owing to the high loan rates compared to market prices, farmers forfeited large volumes of rice to the government, leading to a massive buildup of government stocks during this period.[566]

In 2011, Prime Minister Yingluck Shinawatra established an expanded program (the "2011 Paddy Pledging Program") that reportedly had two objectives: (1) to raise the price paid to rice farmers by requiring government purchases at prices roughly 50 percent higher than the prevailing market price, and (2) to raise the international price for rice by reducing Thai exports.[567] As a leading producer and exporter, the Thai government appears to have believed that it could drive up the world price of rice by withholding supplies from the global market.[568] It anticipated this would allow it to sell its stockpiles at prices close to the levels at which they had been acquired.

Because rice was purchased at prices significantly above world prices, huge stockpiles developed, and exports of rice fell by one-third in the first full year of the 2011 program. Meanwhile, imports into Thailand surged in 2012 and 2013 because of the higher rice prices in Thailand.[569] Another consequence of the 2011 program was the movement of rice production out of high-value aromatic rice varieties to higher-yielding varieties of long grain rice, as farmers sought to maximize their support payments.[570] By 2013, because of the government's inability to sell the high-priced rice stocks and the significant storage costs (2 billion baht, or $65 million, per month), payments to farmers participating in the program were delayed.[571] In June 2014, the 2011 Paddy Pledging Program was suspended after a military council took control of the government in May 2014.[572] By that time, massive amounts of rice had been

[566] Slayton, "Shinawatra Raises the Thai Price Umbrella Again," n.d. (accessed November 12, 2014).
[567] Warr,"Thailand's Rice Subsidy Scheme Rotting Away," March 17, 2014. For 2011/12 and 2012/13, there was no limit on the quantity of rice eligible under the 2011 Paddy Pledging Program. Though a cap per household of 350,000 baht was enacted for 2013/14, it is unlikely that this cap was reached for many households because most Thai farms are small (2.8 to 3.8 ha) and yields are low (2.2 to 3.78 mt/ha). U.S. government official, email to USITC staff, December 4, 2014.
[568] See for example, Warr, "Thailand's Rice Subsidy Scheme Rotting Away," March 17, 2014; Orzya, "Fiscal Indiscipline," September 14, 2014.
[569] Allegations were made that cheaper, foreign rice was being sold to the government as "Thai rice" under the government's 2011 Paddy Pledging Program. *Telegraph*, "Burmese Smugglers Get Rich," February 2014.
[570] By 2014, long grain rice accounted for 80 percent of total government purchases under the program. Warr, "Thailand's Rice Subsidy Scheme Rotting Away," March 17, 2014; U.S. government official, email to USITC staff, December 4, 2014.
[571] Theparat, "Rice Stocks to Clear in 3 Years," December 20, 2014; Liese et al., "Economics of Southeast Asian Rice Production," 2014, 11; IMF, IFS database: Exchange Rate Query, annual 2013 (accessed September 24, 2014). Reportedly, many Thai rice farmers struggled financially until payments were finally made to them in June 2014. Oryza, "Thailand BAAC Completes Overdue Payments," June 16, 2014; Chaichalearmmongkol, "Thailand Introduces Loans to Help Struggling Farmers," August 26, 2014.
[572] BBC News, "Thailand Military Seizes Power in Coup," May 22, 2014.

stockpiled and losses under the program had reached 158 billion baht ($15.9 billion) (box 8.1).[573]

Box 8.1: Aftermath of the 2011 Paddy Pledging Program: Addressing accumulated stocks

Owing to the Paddy Pledging Program, by June 2014 the Thai government's rice stockpiles amounted to roughly 18 million mt, equivalent to roughly half of annual global trade in rice that year.[a] A survey of the government-owned rice inventory was published in October 2014, reporting that only 10 percent of rice stocks were in good condition. Traders indicated that by December 2014, about 2 million mt had been sold and another 10 million mt was being considered for reprocessing for domestic consumption or export, though the rice was reportedly below quality standards.[b] The remainder was deemed unfit for human consumption, and the government considered the sale of this rice for ethanol production.[c] Allegations of corruption under the program were made by industry sources, claiming some traders "borrowed" good-quality rice for export and replaced it with substandard rice. Sources also allege that other traders with political connections obtained low-cost rice through suspicious government-to-government deals.[d] The Thai Commerce Ministry estimates that it will take three years for the government to complete sales of rice stocks amassed under the Paddy Pledging Program.[e]

[a] *Economist*, "Thailand's Economy: The Rice Mountain," August 10, 2013.
[b] Reportedly, the government considered selling as much of the stocks as possible through government-to-government deals. Oryza, "Thailand Devises Strategy," December 7, 2014; U.S. government official, email to USITC staff, December 4, 2014.
[c] U.S. government official, email to USITC staff, December 4, 2014.
[d] Industry representative, telephone interview by USITC staff, January 9, 2015; *The Nation*, "TDRI Details Apparent Costs," August 23, 2014; *Shanghai Daily*, "Thai Populist Rice Program," September 10, 2014.
[e] Theparat, "Rice Stocks to Clear in 3 Years," December 20, 2014.

The 2011 Paddy Pledging Program significantly impacted Thai production and trade. The RiceFlow model was used to assess the effects on the Thai rice industry of ending government stock accumulation of 3.5 million mt and instead disposing of 3.5 million mt on the rice market.[574]

The model estimated that Thailand's production of long grain and aromatic paddy rice would have been lower by about 4.0 million and 1.9 million mt, respectively, in 2013 if the Paddy Pledging Program had not been in place. Lower production combined with rice stock reduction would have led to a net export gain of 677,500 mt of rice that year. The modeling simulation took into account the fact that, since Thailand is a major rice producer, its policies impact global rice production and exports. Consequently, model results also showed that with reversal of the 2011 Paddy Pledging Program, milled rice equivalent (MRE) exports from the rest of the world (excluding the United States) would have been 482,000 mt higher in 2013, and exports from the United States would have declined modestly, by about 9,000 mt.

[573] Oryza, "Thai Government Issues $1.5 Billion Worth," November 26, 2014; IMF, IFS database: Exchange Rate Query, 2014 (accessed March 30, 2015).
[574] For further information about the RiceFlow model see appendix H.

Post-Paddy Pledging Program

Government price support following the suspension of the 2011 Paddy Pledging Program remained in flux as of March 2015. However, several new policy initiatives were announced by the government following the suspension of the 2011 Paddy Pledging Program in June 2014 (table 8.3).

Instead of producer support prices, the new policies aim to lower producer production costs (through fertilizer and pesticide discounts) and improve on-farm storage. For example, the Bank for Agriculture and Agricultural Cooperatives pledged 20 billion baht (about $650 million) in loans specifically to help producers build on-farm storage facilities. The government also announced direct payments linked to farm size, but not production. As of January 2015, producer support continued to be in place for aromatic and glutinous paddy rice through the On-farm Paddy Pledging Program.

Factors Affecting Competitiveness

Thailand is a leading global exporter of rice and has historically produced a reliable surplus of high-quality product each year. Compared to other countries in the region, the supply chain for rice in Thailand is relatively well developed, encompassing a modern milling sector, infrastructure to support exports, and a private sector able to provide good customer service while meeting global market demand. However, Thai rice farmers have some of the lowest field yields in Southeast Asia, and costs of production are higher than those for major competitors in the region.[575] Historically, Thailand has a reputation as a highly reliable supplier, although this reputation has been damaged in recent years by market disruptions brought about by the 2011 Paddy Pledging Program.

[575] Yields are low and have stagnated over the past 10 years. GRiSP, *Rice Almanac,* 2013, 136; USDA, PSD Online (accessed January 21, 2015).

Table 8.3: Thailand: Rice sector policies following the 2011 Paddy Pledging Program

Policy	Date	Authorizing Government Agency	Details
Action plan to reduce prices for fertilizer and pesticides	7/2/14	Ministry of Commerce, Department of International Trade	Chemical fertilizer and pesticide manufacturers and distributors voluntarily agreed to provide:
			A 40-50 baht ($1.40) per 50 kg sack discount on fertilizer, and
			A 5-10 percent discount on pesticides.
Rice farmer assistance program	6/4/14	Government of Thailand	4.7 billion baht ($145 million) approved for:
			Soft loans to provide working capital for farmers (2.3 billion baht [$72 million]), and
			Soft loans for storage of paddy rice (2.4 billion baht [$75 million]), meant to control the amount of paddy rice on the market and to stabilize prices.
Economic stimulus package	10/1/14	Government of Thailand, administered by the Bank for Agriculture and Agricultural Cooperatives	One-off, direct payments to farmers totaling 40 billion baht ($1.2 billion) based on land holdings:
			1.8 million households farming less than 15 rai (2.4 hectares) will receive 1,000 baht per rai cultivated ($193/ha)
			1.6 million households farming more than 15 rai (2.5 hectares) will receive 15,000 baht ($475) each
On-farm paddy pledging program	11/25/14	Government of Thailand, administered by the Bank for Agriculture and Agricultural Cooperatives. Rice must be stored at least 30 days.	Set intervention prices for aromatic paddy rice and glutinous paddy rice.
			2 million mt are expected to be purchased under the program.

Sources: Chaichalearmmongkol, "Thailand Introduces Loans to Help Struggling Farmers," August 26, 2014; Oryza, "Thailand Intensifies Measures to Support Rice Prices," November 24, 2014; Pratruangkrai, "Govt Refuses Rice Price Guarantee," September 29, 2014; Chomchuen, "Thailand Plans Moves to Support Rice Prices," Oct. 6, 2014; USDA, FAS, *Thailand: Grain and Feed Update*, October 31, 2014, 2; USDA, FAS, *Thailand: Grain and Feed Update*, December 4, 2014, 3.

Regionally High Cost of Production

Though it is a medium-cost producer by global standards, Thailand's average cost of production (COP) is 50 percent higher than in Burma, and as much as double that of Vietnam.[576] The major components of Thailand's COP for long grain paddy rice are labor, fertilizer, and land (table 8.4). As a share of total COP, Thailand's labor costs are among the highest in Southeast Asia. This is owing, in part, to (1) long-term labor shortages, as urban and industrial employment attracts

[576] *Nation*, "Analysts Call for Sustainable Ways," December 30, 2014; DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 3–4, 2014.

Table 8.4: Thailand: Cost of production of long grain paddy rice (main crop), 2014

Input	COP	Share of COP
	\$/mt[a]	%
Seed	27.51	10
Fertilizer	51.90	19
Other chemical inputs[b]	12.20	5
Labor[c]	106.15	39
Water/irrigation	[d]	[d]
Fuel/electricity	16.72	6
Other variable cost[e]	8.61	3
Total variable cost	223.09	82
Land	48.48	18
Physical capital cost	[f]	[f]
Other fixed cost[g]	0.47	0
Total fixed cost	48.95	18
Total COP	272.04	100

Source: Industry representative, email to USITC staff, January 23, 2015.
[a] COP data based on information provided in dollars per ha. Converted costs based on an average yield of 3.78 mt/ha.
[b] Includes insecticide and herbicide.
[c] Includes labor for soil preparation, seeding and planting, farm management (irrigation, weed and pest control), and harvesting.
[d] Not available.
[e] Includes agricultural supplies, equipment maintenance, and interest on loans.
[f] Data not available.
[g] Includes equipment depreciation and interest for equipment financing.

workers away from farms,[577] (2) an increase in labor costs after the country established a minimum wage in 2013,[578] and (3) fewer migrant workers, as many left the country following the change in government in 2014.[579] Energy costs are above those in other Southeast Asian producing countries, reflecting higher levels of mechanization in Thailand compared with its neighbors.[580] Higher production costs in Thailand stem from the decision by farmers to produce higher-quality, lower-yielding varieties of rice. However, these costs are generally offset by the price premiums these varieties command in global markets.

[577] GRiSP, *Rice Almanac*, 2013, 136.
[578] Parker, "Thailand Introduces Nationwide Minimum Wage," January 11, 2013; Ono, "Thailand in turmoil over increase in minimum wage," October 3, 2013; Yuvejwattana, and Chen, "Thai Bankruptcies Rise as Minimum Wage Rolls Out: Southeast Asia," February 27, 2013.
[579] The labor shortage appears to have most directly affected rice exports, as many port workers returned home. However, the loss of migrant workers also likely contributed to increasing wages in the country overall as labor supply tightened. Michelle FlorCruz, "Thailand's Rice Prices Rise," June 19 2014; Oryza, "Thai Farm Sector Faces Critical Labor Shortage," September 25, 2014.
[580] U.S. government official, email to USITC staff, December 4, 2014; industry representative, telephone interview by USITC staff, January 9, 2015; GRiSP, *Rice Almanac*, 2013, 136.

Reputation for Premium Quality

Thailand is a consistent global supplier in the highest-quality long-grain white rice market segment: low-broken (less than 5 percent brokens).[581] Reflecting its high quality, Thai rice commands a price premium. For example, during 2009–13, Thai exporters sold 5 percent broken rice for roughly $100 per mt more than rice of the same grade from Vietnam.[582] Several factors contribute to Thailand's ability to produce high-quality long grain rice, including its modern milling sector and its history of growing desirable rice varieties.

Thailand's jasmine rice is also of high quality,[583] widely viewed as superior to that available from Vietnam and the United States.[584] The Thai industry attributes the superiority of its jasmine rice to its traditional seeds and unique growing conditions.[585] Additionally, the Thai government has established specific quality standards that Thai exports of aromatic rice must meet in order to preserve its reputation in the world market.[586] The Thai rice industry has also made efforts to differentiate its jasmine rice through branding. For example, in 2013 Thai jasmine rice, also known as "Khao Hom Mali Thung Kula Ronghai," became the first product in Southeast Asia to be registered under the European Union (EU) Protected Geographical Indication scheme.[587]

Reliability of Supply

Historically highly reliable...

Thailand has a long experience in exporting rice and has historically been viewed as a highly reliable supplier. Thai traders are experienced at meeting market demands and are able to rely on Thai farmers for steady supplies of rice. Thailand's 94-year-old private industry association has been able to promote the country as a reliable supplier responsive to global markets, disseminating market information and data to traders on the national and international market

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[581] Long grain white rice of 100 percent Grade B or 5 percent broken, as well as Grade A Hom Mali jasmine, discussed below, are widely considered to be high-quality rice. Oryza, "Thailand Tries to Restore Rice Quality Reputation," July 15, 2013. Industry observers, interviews by USITC staff, the Philippines, November 10–11, 2014.
[582] See chapter 3 for more information about rice grades, origins, and pricing. Thailand also commanded a price premium of about $95 over Vietnam 25 percent broken during 2009–13, indicating it is a quality leader in all segments.
[583] Thai Hom Mali jasmine rice is said to be particularly desirable due to its distinct aroma, combined with the fluffiness and white color obtained upon cooking. Oryza, "EU Awards Protected Geographical Indication Status," February 11, 2013.
[584] Industry representative, telephone interview by USITC staff, January 9, 2015; industry observer, interview by USITC staff, the Philippines, November 10, 2014.
[585] Industry representative, telephone interview by USITC staff, January 9, 2015; Government of Thailand, "EU to Certify GI Protection," February 6, 2013.
[586] Government of Thailand, DFT, OCS, "Rice Standards," n.d. (accessed January 15, 2015)
[587] Oryza, "EU Awards Protected Geographical Indication Status," February 11, 2013; Government of Thailand, "EU to Certify GI Protection," February 6, 2013.

while focusing its efforts on boosting quality and responsive customer service.[588] When compared with other suppliers in Southeast Asia, Thailand's supply chain for rice is well developed, including a modern milling sector and good export infrastructure. According to several indicators, Thailand's trade infrastructure compares favorably with other regional rice producers, including Vietnam, Indonesia, Cambodia, and Burma.[589]

… but recent problems with reliability

However, Thailand's reputation for reliability has been damaged in recent years by market disruptions brought about by the 2011 Paddy Pledging Program. This program harmed Thailand's reputation as a reliable supplier by (1) reducing the export supply of jasmine rice, as farmers gained higher support payments by producing higher yielding long-grain rice, and (2) reducing the level of Thai long-grain rice in the global market, because the government stored the majority of its purchases, rather than sell it on the world market at huge losses. As a result, in 2011/12–2012/13, the peak marketing years of the program, Thai rice exports were 30 percent below the average for the rest of the 2007/08–2013/14 period (table 8.1). In addition, the vast majority of stocks accumulated by the government under the program were assessed in 2014 to be in poor condition. The existence of large quantities of low-quality rice stocks are likely harmful to Thailand's reputation as a reliable supplier of high-quality rice, at least in the short term.[590]

Vietnam

Overview

Rice is an important staple crop in Vietnam and comprises a major economic activity for the country. Vietnam is now a leading exporter, particularly to other countries in East and Southeast Asia, and between one-third and one-half of Vietnam's rice production is exported in a given year. Vietnam's greatest competitive advantage in producing rice is its natural resource endowment, particularly the fertile growing area in the Mekong River Delta. This region is naturally replenished by annual floods and yields up to seven harvests from the same land in two years. Building on its natural resources endowment, Vietnam has increased its rice yields through government investments in seed research and through private sector initiatives for

[588] Thai Rice Exporters Association, "History of the Thai Rice Exporters Association," http://www.thairiceexporters.or.th/background.htm (accessed February 9, 2015).
[589] Thailand earns relatively favorable marks for efficiency in customs clearance, trade infrastructure, and logistics services. World Bank, "Trusting Trade and the Private Sector," 2012, 119; World Bank, LPI Online (accessed January 12, 2015); industry representative, telephone interview by USITC staff, January 9, 2015.
[590] In 2014, there were reports about importer concerns regarding the quality of Thai rice. See, for example, Chaichalearmmongkol, "Thai Rice Welcomed Back," April 10, 2014; Pratruangkrai, "Inspection Trips to Taiwan, China," June 20, 2014.

farm production improvements in recent years. Farmers are also shifting to higher-value aromatic and long grain varieties in the hope of satisfying consumer preferences and boosting profits. However, while its recent export performance demonstrates that Vietnam is a competitive producer of rice, the country still faces challenges in maintaining and growing its export market share. These include poor post-harvest management due to fragmented production,[591] heavy involvement of brokers and state traders in exporting, and threats from climate change, such as increased saltwater intrusion and rising sea levels in the Mekong River Delta.[592]

Production, Consumption, and Trade

Production

Vietnam accounted for almost 6 percent of global rice production between 2007/08 and 2013/14.[593] During that period, rice production rose over 2 percent a year on average to reach a record high of 28 million mt in 2013/14 (table 8.5). This was due partly to an almost 16 percent increase in yields over the same period. Industry sources attribute yield growth to on-farm innovations and government research investments, particularly those involving the adoption of new higher-yielding rice varieties.[594]

Table 8.5: Vietnam: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	1,392	2,018	1,961	1,470	1,941	1,826	863
Production (milled) (1,000 mt)	24,375	24,393	24,993	26,371	27,152	27,537	28,161
Area harvested (1,000 ha)	7,412	7,334	7,415	7,607	7,740	7,864	7,788
Yield (rough) (mt/ha)	5.0	5.3	5.4	5.6	5.6	5.6	5.8
Imports (1,000 mt)	300	500	400	500	100	100	300
Consumption and residual (1,000 mt)	19,400	19,000	19,150	19,400	19,650	21,900	22,000
Exports (1,000 mt)	4,649	5,950	6,734	7,000	7,717	6,700	6,500
Ending stocks (1,000 mt)	2,018	1,961	1,470	1,941	1,826	863	824
Exports-to-production ratio (%)	19	24	27	27	28	24	23
Ending stocks-to-use ratio (%)	8	8	6	7	7	3	3
Per capita consumption (kg)	230.3	223.2	222.6	223.2	223.7	246.7	245.2

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption used marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

[591] Rosen, "Why Can't Vietnam Grow Better Rice?" April 24, 2014.
[592] In addition to these challenges, farmers in the Mekong River Delta have also been shifting to aquaculture, which provides higher incomes for farmers. Government officials and industry observers, interviews by USITC staff, Vietnam, October 23–24, 2014.
[593] USDA, PSD Online (accessed January 21, 2015). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.
[594] Government officials and industry representatives, interviews by USITC staff, Vietnam, October 20–24, 2014.

On average, Vietnam's production exceeded domestic consumption by almost 30 percent during 2007/08–2013/14. The rice sector mainly produces long grain white rice, but it also grows small, though increasing, amounts of glutinous rice and aromatic varieties (such as jasmine) in the Mekong River Delta for export. Most of the rice grown in the north of Vietnam—that is, in the Red River Delta—is consumed domestically, while some is a special aromatic variety with a longer growing season.[595]

Vietnamese mills also import, process, and re-export aromatic Kaodok Mali rice grown in the Mekong River areas of Cambodia.[596] One industry source estimated that 80,000 mt of Kaodok Mali enters Vietnam for milling each year, as Cambodian farmers lack the necessary milling capacity. This rice is typically sold to higher-income markets such as the EU.[597]

Consumption and Ending Stocks

During 2007/08–2013/14, Vietnam accounted for over 4 percent of global rice consumption. Vietnam's per capita consumption of rice is high by world standards. During 2008/09–2011/12, per capita consumption was relatively stable at about 223 kg annually, rising to 245 kg in 2013/14.[598] In addition to household consumption, rice is also in demand for animal and aquaculture feeds, as well as for processing into food products, such as noodles, beer, and rice wine.[599]

Ending stocks in Vietnam fluctuated throughout 2007/08–2013/14, but were notably lower in the last two years of the period. One industry source speculated that the low stocks were a result of large government-to-government (G2G) sales for foreign tenders that had been based on inaccurate government stock data (see discussion below).[600] From 2007/08 to 2011/12, Vietnam accounted for about 2 percent of global stocks, and its ending stocks represented about 7 percent of the country's rice use. However, during 2012/13–2013/14, lower Vietnamese stocks accounted for just 1 percent of the global total and about 3 percent of Vietnam's rice use.

[595] Industry representative, interview by USITC staff, Vietnam, October 23, 2014.
[596] Industry representative, interview by USITC staff, Vietnam, October 22, 2014.
[597] Ibid.
[598] However, according to the USDA, the MARD reported per capita consumption of rice at 137 kg for 2013. One explanation for this discrepancy could be the large volume of gray-market exports from Vietnam: underreporting of exports to China could make domestic consumption appear higher. USDA, FAS, *Vietnam: Grain and Feed Annual*, April 8, 2014.
[599] USDA, FAS, *Vietnam: Grain and Feed Annual*, April 8, 2014.
[600] Industry representative, interview by USITC staff, Vietnam, October 22, 2014.

Trade

The government of Vietnam reports almost no official data on the rice industry, including foreign trade numbers.[601] Exports are difficult to trace or estimate, especially exports to other markets where data availability is also poor (box 8.2). Published trade data from private and U.S. government sources likely underestimate the volume of Vietnam's rice exports.[602]

During 2007–13, Vietnam was the second- or third-largest exporter of rice globally.[603] Between 2007 and 2012, Vietnamese exports grew 12 percent annually because of rising production, a result of increasing rice yields (table 8.6).[604] In 2013, however, exports declined 14 percent to 6.7 million mt because of heavier competition in Vietnam's export markets from India, Thailand, and Pakistan—and, increasingly, from lower-cost producers Burma and Cambodia.[605] Despite overall volume growth, Vietnam's share of global exports declined for most of the period, from 21 percent in 2010 to 17 percent in 2013.[606] However, some industry representatives believe that this decline reflects only reported trade and not the significant amount of unreported rice Vietnam ships to China across their common land border.[607]

Vietnam exports mostly long grain white rice; its exports of aromatic jasmine rice, however, grew 87 percent annually between 2007 and 2013, and in 2013, aromatic rice accounted for 14 percent of Vietnam's rice exports.[608] Exports of aromatic rice are expected to reach 700,000 mt in 2014, an increase of 31 percent from the previous year.[609] Industry observers

[601] The Vietnamese government reports some data on exports by world region.
[602] According to industry sources, China is the largest recipient of Vietnam's gray-market exports, but reportedly there are also unofficial shipments of rice to Indonesia and the Philippines. Government officials, interviews by USITC staff, Vietnam, October 20 and 23, 2014.
[603] USDA, PSD Online (accessed October 3, 2014).
[604] USDA, FAS, *Vietnam: Rice, Milled, Grain and Feed*, monthly GAIN reports from March 7, 2012–March 3, 2014, and USDA, FAS, *Vietnam: Grain and Feed Annual*, annual GAIN reports from 2008–2012. Vietnam's export data are not included in the Global Trade Atlas (GTA) database. GTA mirror data (i.e., data based on imports from reporting countries) were also not comprehensive because GTA does not contain data for some of Vietnam's important trading partners or gray-market exports. In the absence of better sources, GTA mirror data were used to determine Vietnam's trading partners and estimate the value of Vietnam's exports.
[605] The Commission estimates the value of Vietnamese exports in 2013 to be about $3 billion. GTIS, Global Trade Atlas database (accessed October 3, 2014); USDA, FAS, *Vietnam: Rice, Milled, Grain and Feed*, monthly GAIN reports, March 2012–March 2014; USDA, FAS, *Vietnam: Grain and Feed Annual*, annual GAIN reports, 2008–2012.
[606] USDA, PSD Online (accessed March 5, 2015).
[607] Reportedly, cross-border trade with China accounted for over 30 percent of Vietnam's total rice exports during January to August, 2014. Tuoi Tre News, "China's Refusal of Cross-Border Rice Shipments," August 12, 2014; industry representative, interview by USITC staff, Vietnam, October 20, 2014.
[608] USDA, FAS, *Vietnam: Rice, Milled, Grain and Feed*, monthly GAIN reports, March 7, 2012–March 3, 2014; USDA, FAS, *Vietnam: Grain and Feed Annual*, annual GAIN reports, 2008–2012.
[609] SGGP Newspaper, "Fragrant Rice Comes to Throne," August 6, 2014.

Box 8.2: Data on the Vietnamese rice industry: Funding, collection, and transparency

Official data for Vietnam's rice industry, where available, can be unreliable and lack transparency across the supply chain. This makes it difficult to calculate such key indicators as consumption and trade statistics. Poor industry data hobbles Vietnam's ongoing efforts to improve rice yields and quality, to invest in the milling sector, and to modernize rice distribution infrastructure. Without reliable and regular public data, farmers, entrepreneurs, and investors are challenged to make sound business planning and purchasing decisions.

Commission staff collected anecdotal information suggesting that the lack of public rice data in Vietnam is a widespread problem. On travel to Vietnam in October 2014, staff interviewed government officials, mill owners, private traders, and researchers from nongovernment organizations. The consensus was that there is almost no public expenditure on collecting, compiling, and analyzing agricultural data. Many noted that data reported to the Vietnam Food Association (VFA), the Ministry of Agriculture and Rural Development (MARD), and the Ministry of Industry and Trade were often incorrect or not released to the public. But data problems go beyond trade statistics: government data are also lacking on rice production and consumption (especially by type), as well as farm-level costs, yields, and regional rice prices.

Certain cross-border rice exports to China are not properly accounted for, skewing government estimates of rice stockpiles in private warehouses and total estimates of trade. For example, when Vinafood 2, the primary facilitator of Vietnam's G2G rice export contracts, signed large-volume contracts to provide rice to the Philippines and Indonesia in 2012 and 2013, the quantities it agreed to were reportedly based on inaccurate rice stockpile calculations that did not account for rice that had already been shipped via unofficial channels to China. Vietnamese rice traders were able, with difficulty, to obtain enough rice to fill their contract requirements, but the volumes led to losses for many of them.

Vietnamese policy makers are said to recognize that good-quality data for the domestic rice industry is important, but collection efforts require government funding. Officials at the Institute of Policy and Strategy for Agricultural and Rural Development (IpSard) reported that they were collecting household data from 2,000 rice farmers in southern Vietnam. The primary focus was on costs during the autumn growing season, and they hoped to expand the survey to include farmers all over Vietnam. But funding for data collection for the first 150 farmers came from the International Rice Research Institute (IRRI) in the Philippines rather than IpSard's own budget. Observers state that many agencies in the Vietnamese government have grown accustomed to using grants from international organizations to fund basic data gathering; when the funding runs out, data collection stops.

Sources: Government officials, industry representatives, and industry observers, interviews by USITC staff, Vietnam, October 20–24, 2014.

Table 8.6: Vietnam: Rice exports (HS 1006), 2007–13

Region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Asia	3,156	2,744	3,283	4,391	4,733	5,853	4,109
Africa	718	1,266	1,903	1,530	1,580	1,522	1,898
Americas	430	505	469	562	523	333	480
Europe and CIS[a]	85	124	188	192	133	90	211
Australia	36	8	29	57	30	48	20
Unknown	81	5	79	0	0	0	0
Total	4,506	4,653	5,950	6,730	6,999	7,846	6,719

Source: USDA, FAS, *Vietnam: Rice, Milled, Grain and Feed*, monthly GAIN reports, March 2012–March 2014; USDA, FAS, *Vietnam: Grain and Feed Annual,* annual GAIN reports, 2008–2012.
Notes: Country-specific trade data are not available. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.
[a] CIS stands for Commonwealth of Independent States.

estimate that exports of aromatic rice will account for 20 to 25 percent of total rice exports from Vietnam in the next few years.[610]

During 2007–13, about two-thirds of Vietnam's exports were to other Asian countries, including China, Indonesia, the Philippines, and Malaysia. China became Vietnam's largest market in 2012 because of growth in both official and unofficial trade.[611] However, as noted earlier, Vietnam is reportedly facing increasing competition in these four traditional export markets.

As a region, Africa was Vietnam's second-largest market after Asia, accounting for about one-quarter of total exports by volume. Exports to Africa were primarily destined for West Africa (Côte d'Ivoire, Ghana, and Cameroon).[612] During 2007–13, Vietnamese exports to the Americas accounted for up to one-tenth of total Vietnamese rice exports. Exports increasingly shifted from Cuba to other Caribbean countries and Central American markets, where Vietnamese rice competes with U.S. rice.[613]

As Vietnam aims to increase its rice exports into higher-quality and aromatic varieties, firms are increasingly targeting the EU (mainly France, the United Kingdom, and Germany) and U.S. markets. Several firms noted that there are strict barriers to exporting to the U.S. market.[614] Consistently, these exporters noted that certain fertilizers and pesticides used in Vietnam are not used in the United States, and that the United States has set no maximum residue levels

[610] Industry representative, interview by USITC staff, Vietnam, October 20, 2014.
[611] In August 2014, China announced that it would prohibit cross-border rice imports from Vietnam, reportedly in an effort to tighten control over tax revenue owed by Chinese importers. Tuoi Tre News, "China's Refusal of Cross-Border Rice Shipments," August 12, 2014.
[612] GTIS, Global Trade Atlas database (accessed August 14, 2014).
[613] Ibid.
[614] In 2013, the United States imported $23.5 million of long grain white rice and $3.8 million of broken rice from Vietnam. USITC DataWeb/USDOC (accessed December 8, 2014).

(MRLs) for the chemicals in these inputs.[615] In the absence of an established MRL for a particular chemical, imported rice with traces of the chemical is prohibited from entering the U.S. market.[616] Vietnam experienced similar issues with Japan in 2008, when Japan stopped importing rice from Vietnam after discovering significant amounts of pesticide residue in rice from Vietnam.[617]

Industry Structure

The Mekong River Delta in the south and the Red River Delta in the north are the two largest rice-growing regions in Vietnam, with rice-growing areas totaling 4.1 million and 1.1 million ha, (10.2 million and 2.7 million acres) respectively[618] (figure 8.3). Rice production employs over 60 percent of the country's labor force.[619] Rice is grown in Vietnam on small, fragmented farms. Average farm sizes in the Mekong River Delta range from 1 ha to 1.5 ha (2.5 to 3.7 acres) per household, while 96 percent of the farms in the Red River Delta are under 0.5 ha (1.2 acres).[620] Land ownership is not permitted under Vietnam's communist government; however, farmers maintain land-use rights through leases.[621] While the Mekong River Delta accounts for 50 to 60 percent of rice production in Vietnam, it accounts for nearly 90 percent of rice exports (figure 8.4).

MARD is encouraging farmers to pool their land to create larger farms,[622] with the aim of decreasing costs of production, including irrigation, planting, and harvesting expenses.[623] Increasingly, traders and millers work directly with farmers on seed-planting decisions in order to better anticipate market demands, though this phenomenon still affects only a small share of total production.[624] Vietnam also has an active domestic seed research industry, which includes public and private research and development of new varieties suited to local growing conditions.[625]

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[615] For example, one exporter reported problems with chemical residues from tebuconazole, isoprothiolane, acetamiprid, and hexaconazole. Industry representative, email to USITC staff, December 19, 2014; industry representatives, interviews by USITC staff, Vietnam, October 20–22, 2014.
[616] Reportedly, where no MRL exists, the de facto MRL is zero. U.S. government official, interview by USITC staff, Vietnam, October 23, 2014.
[617] Rosen, "Why Can't Vietnam Grow Better Rice?" April 24, 2014.
[618] Vietnam Trade Promotion Agency, "Strengths of Vietnam's Rice Industry," April 22, 2014.
[619] Ibid.
[620] Government official, interview by USITC staff, Vietnam, October 23, 2014.
[621] Embassy of Vietnam, Land Regulations, http://vietnamembassy-usa.org/basic-page/land-regulations (accessed February 11, 2015).
[622] Industry representative, interview by USITC staff, Vietnam, October 24, 2014.
[623] USDA, FAS, *Vietnam: Grain and Feed Annual Report*, 2014, April 8, 2014.
[624] Industry representatives and government officials, interviews by USITC staff, Vietnam, October 20–24, 2014.
[625] Ibid.

Figure 8.3: Vietnam: Major paddy rice producing areas

Source: Compiled by USITC staff.

Figure 8.4: Rice farmers in the Mekong River Delta

Source: USITC staff.

Before selling their paddy rice, most farmers air-dry it. This is not only inefficient compared to commercial drying, it leads to losses from fungus and deterioration.[626] It is estimated that 9 to 11 percent of the total paddy rice harvested is lost at the drying, storage, and milling stages. The government is encouraging firms to build additional storage capacity in order to reduce these losses.[627]

The post-harvest value chain in the Vietnamese rice sector (drying, milling, trading, marketing, and exporting) is fragmented. Reportedly, up to 90 percent of rice grown in Vietnam passes through various traders before reaching the final customer.[628] Traders and mills buy paddy rice from farmers either on the spot market or under three-month contracts. Many firms and traders store brown, or "half-processed," rice in inventory and mill it to order. According to

[626] Government official, interview by USITC staff, Vietnam, October 23, 2014.
[627] Government of Vietnam, MARD, ISG, "Policy Reforms Associated with Vietnam's Rice Production," May 2011.
[628] *SGGP Newspaper*, "Rice Prices Increase Not Benefit Farmers," July 15, 2014; industry representatives, interviews by USITC staff, Vietnam, October 20 and 22, 2014.

government and industry sources, a relatively low "total yield" milling efficiency rate of approximately 50 percent is standard in Vietnam for long grain white rice.[629] The milling technology used varies, based on the end customer. Rice for domestic consumption or low-quality exports is often milled using older, less efficient equipment, while higher-quality exports are milled using modern processing equipment, including color-sorting machines which remove chalky, red, or black grains of rice during processing (figure 8.5).[630]

Figure 8.5: Specialized machinery sorts out chalky rice (left) to ensure a consistent color and quality for export markets

Source: USITC staff.

Government Support Programs

Government policies for the rice sector in Vietnam focus on supporting the rural population by stabilizing farmer incomes, increasing yields, cultivating higher-value rice varieties, and promoting rice exports.[631] Government support to the sector is largely in the form of funding for seed research institutes, rice purchases and storage of national reserves, and large irrigation and lock projects benefiting rice-growing regions (table 8.7). In addition to these budgetary outlays, the Vietnamese government influences the rice sector by setting production and land-

[629] Industry representatives and government officials, interviews by USITC staff, Vietnam, October 20–24, 2014.
[630] Industry representative, interview by USITC staff, Vietnam, October 20, 2014.
[631] Government officials, interviews by USITC staff, Vietnam, October 20–24, 2014.

area targets, minimum support prices during peak harvest seasons, minimum export prices, and other export requirements.[632] The government is also actively involved in exporting rice; two major state-owned enterprises (SOEs) handle roughly half of Vietnam's rice exports.[633] With limited funds to support farmers, the government encourages help from private sources, such as storage aid, production improvements, and improved inputs (e.g., seeds and fertilizers) from seed companies or mills.[634]

In addition to its policies and programs, the government also intervenes in rice sector activity through the VFA, a powerful trade organization that helps the government implement policies,[635] and two major SOEs, Vinafood 1 and Vinafood 2. The VFA directs rice companies to act in the market in various ways, including supplying rice for G2G contracts.[636]

It is estimated that 40 to 60 percent of Vietnam's total rice exports are sold under G2G contracts.[637] These are typically negotiated by Vinafood 1 and Vinafood 2 and are administered by the VFA, which allocates the total contract volume to affiliated companies, both private and state-owned.[638] Most Vietnamese sales to the Philippines, Cuba, and Haiti, for example, are through G2G contracts. Reportedly, G2G sales are typically of lower- to medium-quality rice.[639]

Although the stated intention of the government is to guarantee income to farmers and to boost export sales, overall these policies appear to produce mixed results for the sector. According to private and government sources, MSPs may not be actually paid to farmers because of the existence of large numbers of middlemen trading rice in the industry.[640] In addition, millers and exporters have balked at paying MSPs when they have been set above

[632] USDA, FAS, *Vietnam: Grain and Feed Annual*, April 8, 2014.
[633] Government officials, interviews with USITC staff, Vietnam, October 20–24, 2014.
[634] Government officials, interviews with USITC staff, Vietnam, October 20–24, 2014. USDA, FAS, *Vietnam: Grain and Feed Annual*, April 8, 2014.
[635] While officially a nongovernmental organization, VFA was, until recently, part of the Prime Minister's office. One of its functions is to boost the country's rice production. USDA, FAS, *Vietnam: Grain and Feed Annual*, April 16, 2012. VFA member companies process and trade food and agricultural products, including rice.
[636] Government officials, interviews with USITC staff, Vietnam, October 20–24, 2014.
[637] Khiem, "Vietnam Rice Trade, Policy, and Future Outlook," March 19–22, 2013.
[638] These companies supply the rice for the G2G contracts and must pay the Vietnamese government a fee per ton supplied. This fee was $0.50/mt in 2014. Government officials, interviews with USITC staff, Vietnam, October 20–24, 2014.
[639] Government officials, interviews by USITC staff, Vietnam, October 20–24, 2014.
[640] Government officials, interviews by USITC staff, Vietnam, October 20–24, 2014. The efficacy of the government purchase program alone to support farmers has been openly questioned by Vietnamese government officials. Reportedly, short-term stockpiling is viewed as a short-term support measure, and in the long run the government plans to create incentives for rice export and consumption. *Vietnam Breaking News,* "Stockpiling Helps Boost Rice Farmers' Profits," June 12, 2014; *SGGP Newspaper*, "Rice Prices Increase Not Benefit Farmers," July 15, 2014; BaoMoi.com, "Farmers Concerned about Demand," March 2013.

Table 8.7: Vietnam: Rice sector policies

Policy	Comments
Production policy	
Production targets	The government sets volume and area targets for paddy rice production through land designation. Land legally registered for rice production cannot be used to grow other crops due to a national land quota. 7.75 million ha (19.2 million acres) was dedicated to rice in 2014. Vietnam announced that it will convert 260,000 ha (642,474 acres) of rice area to corn in 2015.
Seed research	The government spent an estimated VND 30 billion ($1.5 million) in 2013 on specific rice seed research projects carried out at rice research institutes throughout the country. These government-supported institutes produce roughly 45 percent of the new rice seed varieties developed and used in Vietnam.
Price support	The VFA has historically set minimum support prices for paddy rice (MSPs) for specific seasonal crops at peak harvest seasons, reportedly based on costs of production plus a 30 percent profit margin. During 2007–11, MSPs ranged from VND 3,500/kg ($0.21/kg) in 2008 to VND 5,000/kg ($0.24/kg) in 2010/11. There was no minimum price announced for the spring 2011/12 crop. The program also called for traders to purchase specified volumes for temporary stockpiles (total eligible volume for the spring 2012 harvest was 1 million mt). At times, traders were eligible for interest-free loans from commercial lenders for storage expenses. Paddy rice purchased under this program was designated for export, usually within 3 to 6 months.
Infrastructure improvements	The government has improved infrastructure through programs such as irrigation and lock projects, including on marginal land that came into rice production under its land designation policy.
Stock policy	
Public stocks for holding reserves	The government maintains national reserves for food security. In 2014, the government stored 250,000 mt of 15 percent broken rice (500,000 mt of paddy rice equivalent) in warehouses throughout the country. To accommodate these stocks, the government has made investments in warehouses, including a 2009 investment to upgrade a 4 million mt rice storage facility and construction of a new 2.8 million mt storage facility.
Trade policy	
Minimum export prices (MEPs)	MEPs are set by the VFA during peak harvest periods to stabilize prices. Reportedly, recent MEPs have not been binding.
Export requirements	In 2011, the government declared that exporters must maintain certified storage facilities for 5,000 mt of paddy rice and own husking facilities with a minimum capacity of 10 mt of paddy rice per hour in order to be eligible to export. This decree is enforced by the VFA, which maintains authority to clear rice exports. Each purchase order contract for rice exports must be approved and signed by VFA officials.
State trading	SOEs Vinafood I and Vinafood II negotiate G2G sales for export. Once negotiated, the VFA allocates the total contract volume to affiliated companies, both private and state-owned.

Source: Tobias et al., *Handbook for Rice in Asia*, 2012, 32–36; USDA, FAS, *Vietnam: Grain and Feed Annual*, April 8, 2014; industry and government officials, interviews with USITC staff, Vietnam, October 2014; Government of Vietnam, Decree 109/2010/ND-CP, November 4, 2010; IMF, IFS database: Exchange Rate Query, annual 2008–13 (accessed September 24, 2014).

market prices, a practice which could result in losses on their sales of milled rice.[641] Anecdotal evidence also suggests that the government-backed no- or low-interest bank loans for storage stipulated in the government support program have not been widely available to millers.[642]

In addition, although G2G sales boost Vietnamese exports, they may harm Vietnam's competitiveness in the long term. Vietnamese exporters have claimed that in the past, Vinafood 1 and Vinafood 2 agreed to long-term contract prices below prevailing local prices, exposing the firms supplying the rice to potential losses, yet keeping them from benefiting if market prices moved higher.[643] Further, VFA reportedly discourages exporters from conducting private rice sales to countries where G2G contracts exist, including Indonesia, Malaysia, and the Philippines.[644] In this way government involvement, in the form of G2G contracts, may have acted to depress prices and limit market access.[645] Several rice traders noted that they prefer commercial sales to G2G sales because selling commercially allows them to enter high-quality rice markets, including through sales of higher-value glutinous or jasmine rice. Large-scale government control of rice sales is thus likely discouraging private sector investment, hampering expansion into new export markets, and, by depressing prices, reducing the profitability of rice production.

Factors Affecting Competitiveness

Vietnam's greatest competitive advantage in producing rice is its natural resource endowment. Areas such as the Mekong River Delta and the Red River Delta have fertile soils and adequate water for irrigation. In addition, the sector benefits from higher crop yields, owing to large government investments in seed research and private sector initiatives for farm production improvements. Farmers are also shifting to higher-value aromatic and long grain varieties in the hope of satisfying consumer preferences and boosting profits. However, Vietnam faces challenges in maintaining and growing its export market share. These include poor post-harvest management due to fragmented production; heavy involvement of brokers and state traders in the export process; and threats from climate change, such as increased saltwater intrusion and rising sea levels in the Mekong River Delta. Another serious challenge for business planning and investment, as noted earlier, is the lack of transparent data on international trade flows and national stocks. Finally, Vietnam needs to address certain phytosanitary issues, including levels of chemical residue in its rice exports, if it is to diversify its exports into high-income markets such as the United States.

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[641] Government officials, interviews with USITC staff, Vietnam, October 20–24, 2014. Vietnam.net, "Rice Prices in Free Fall," March 6, 2013.
[642] Government officials and industry representatives, interviews by USITC staff, Vietnam, October 20–24, 2014.
[643] Oryza, "VFA Not Acting as Good Facilitator," July 17, 2014.
[644] Ibid.
[645] Government officials, interviews by USITC staff, Vietnam, October 20–24, 2014.

Low Cost of Production

Vietnam's cost of long grain paddy rice production, at $157/mt in 2012, is low by global standards (table 8.8). Vietnam has significantly lower COP at the farm level than most major producing countries, such as Thailand and India. The largest share of costs is for fertilizer, reflecting the high costs for fertilizer in Vietnam relative to other producers in Southeast Asia.[646] Labor costs also account for a large share of COP for paddy rice in Vietnam, though they are comparable to those in the rest of the region. As noted, data on rice production and processing costs are not readily available in Vietnam since the government of Vietnam does not collect household data, and there are no privately funded rice trade associations that maintain such information. COP data presented here are based on several provincial surveys and regional comparative estimates.[647]

Table 8.8: Vietnam: Cost of production of long grain paddy rice, 2012

Input	**COP**	**Share of COP**
	$/mt[a]	%
Seed	10.26	7
Fertilizer	35.79	23
Other chemical inputs	20.73	13
Labor	30.47	19
Water/irrigation	2.36	2
Fuel/electricity[b]	19.96	13
Other variable costs[c]	5.98	4
Total variable costs	125.55	80
Land rent	31.83	20
Physical capital costs	[d]	[d]
Other fixed costs	[d]	[d]
Total fixed costs	31.83	20
Total COP	157.38	100

Source: Estimated by USITC staff based on DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 2014; IMF, IFS database: Exchange Rate Query, 2013 (accessed September 24, 2014).

[a] COP data were converted from Philippine pesos (PHP) per hectare, taken from an IRRI/PhilRice study. The conversion factors were 6.81 mt per hectare and PHP 42.5 per dollar.

[b] Includes animal and machine rent, and fuel and oil except those used for irrigation.

[c] Includes interest on operating capital and all other variable costs not listed above.

[d] Not available.

[646] See, for example, tables 7.4, 7.11, and 7.14; DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 3–4, 2014. This survey found that, at 23 percent of total costs, Vietnam's fertilizer costs were the highest among those of six Southeast Asian countries.

[647] See, for example, Ing, "Rice Production in Vietnam," Thailand, March 18-22, 2013; Agri Benchmark, *Economics of Southeast Asian Rice Production*, January 2014, 26–27; *Nation*, "Analysts Call for Sustainable Ways to Help," December 30, 2014; Keyser et al., "Vietnam—Support for Agricultural Restructuring Project," January 2013; DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 3–4, 2014.

Natural Resource Endowments

The Mekong River Delta provides a fertile, productive growing area naturally replenished by annual floods, yielding up to seven rice harvests over two years. The Mekong River Delta's waterways, most notably the extensive system of canals, also provide a cost-effective and convenient transport alternative to Vietnam's roads. Most firms have warehouses and processing facilities on rivers or canals to load cargo ships directly from storage (figure 8.6).[648] Most of the rice cargo is then shipped to ports around Ho Chi Minh City for export.

Figure 8.6: Barges for transporting rice along canals in the Mekong River Delta are commonly used to move paddy rice to mills, to consolidate milled rice for storage, and to move rice to Ho Chi Minh City for export or the domestic market

Source: USITC staff.

While growing conditions in the Mekong River Delta now give Vietnam's rice industry a significant competitive advantage, many industry sources express concern about the Mekong River Delta's future potential to produce large volumes of high-quality rice. Upstream dams proposed in China, Laos, and Cambodia could jeopardize water levels, while increased salinization from rising sea levels may depress rice yields. Moreover, pollution from the overuse of fertilizers and pesticides may render certain rice paddies unusable.[649] International donors and research institutions, such as the IRRI, are assessing climate change and other production risks on rice plots throughout the Mekong River Delta.[650]

[648] Industry official, interview by USITC staff, Vietnam, October 20, 2014.
[649] Government officials, interviews by USITC staff, Vietnam, October 23–24, 2014.
[650] Industry representative, interview by USITC staff, Vietnam, October 24, 2014.

Better Seed Varieties and Crop Management Increase Yields and Quality

Vietnam already has some of the highest yields in Asia, and its yields are improving.[651] The increases in rice yields in Vietnam over the past 10 years can be credited to investments in research for new varieties of long grain rice, adoption of better seeds by farmers, and training programs that have equipped farmers with better crop management techniques. The government gives direct funding to seed facilities, such as the Cuu Long Rice Research Institute, but private (non-SOE) companies also invest heavily in seed development.[652] These companies have built a close partnership with farmers, who purchase their seeds and learn better crop management practices from company employees working as agricultural extension agents.[653] Seed research in Vietnam is focused on both commercial varieties for domestic consumption and high-quality varieties for export.[654]

In addition, in the Mekong River Delta province of Soc Trang, scientists have developed new aromatic rice varieties, with consistent yields and disease resistance, that farmers have increasingly adopted.[655] Aromatics are generally considered a premium quality product and can increase farmers' incomes.[656] Vietnam exports mostly long grain white rice, but its exports of premium aromatic rice have grown over the past three years. Overall, the Mekong River Delta has roughly 200,000 ha growing aromatic rice, with most grown in cooperatives.[657]

Many domestic traders and seed researchers consider Vietnamese rice to be of much better quality than 10 years ago, but the memory of poor-quality harvests in the past continue to damage Vietnam's reputation among foreign buyers.[658] Improved seed, diversification into aromatic rice, and availability of extension services should result in higher quality and quantity of production, benefiting Vietnam's competitiveness.

The Commission modeled the effects of a 10 and 20 percent increase in paddy rice productivity for 2013 production of long grain white rice and aromatic rice, respectively.[659] Modeling results estimate that productivity increases of those magnitudes would have raised Vietnam's 2013

[651] USDA, PSD Online (accessed December 29, 2014); see also chapter 2 of this report.
[652] Industry representatives and government officials, interviews with USITC staff, Vietnam, October 21–23, 2014.
[653] Industry representative, interview by USITC staff, Vietnam, October 21, 2014.
[654] Government officials, interviews by USITC staff, Vietnam, October 23, 2014.
[655] *Viet Nam News,* "Mekong Farmers Cash In on Fragrant Rice," August 30, 2014. Half of the rice now grown in the Soc Trang Mekong River Delta province is of an aromatic rice variety created by local scientists.
[656] Reportedly, these varieties sell for VND 700–2,000 ($.03—$.10) per kg more than normal long grain varieties. *Viet Nam News*, "Mekong Farmers Cash In on Fragrant Rice," August 30, 2014; *SGGP Newspaper*, "Fragrant Rice Comes to Throne," August 6, 2014.
[657] Vietnamnet, "Business in Brief 11/8," August 11, 2014.
[658] Industry representative, interview by USITC staff, Vietnam, October 24, 2014
[659] For further information on the RiceFlow model see appendix H.

production of milled long grain white rice by 2.2 million mt and would have raised its 2013 production of aromatic rice by 359,000 mt. Almost 83 percent of the additional long grain white rice and over 99 percent of the additional aromatic rice would likely have been exported in that year. According to the model simulation, Vietnam's productivity boost would have resulted in a decrease in U.S. milled rice equivalent exports of an estimated 29,000 mt in 2013.

Poor Government Data and Lack of Market Information

As discussed earlier (box 8.2), Vietnam lacks reliable government data related to rice production, costs, investments, and trade. As a consequence, the rice industry is not getting the clear market signals it needs to make investments for the industry's future viability, and the government is unable to properly monitor Vietnam's food supply. In the case of trade data, for example, the relevant information is acquired by the government, but not disseminated. But in most cases, data are never collected.[660] The government's inadequate monitoring of rice stocks in private warehouses during 2012 and 2013 created a situation in which the government was unaware that inventories in private storage facilities were being sold to China and would be unavailable for G2G sales.[661] In addition, industry observers have stated that a market-based rice value chain, linking farmers, distribution, and export markets, is needed for price transparency[662] and to ensure that traders and farmers are aware of consumer tastes and preferences in foreign markets.[663]

Burma

In the early 1960s, Burma was a major global rice-producing and -exporting country,[664] but international isolation after that time meant that little rice was exported for several decades. Recently, political change in Burma has opened the economy and rice exports have resumed. In 2013/14 Burma's rice exports reached 1.6 million mt, the highest level in 40 years.[665] Favoring its global competitiveness, Burma has abundant land and water, as well as inexpensive labor, making it a cost-competitive exporter. However, an inefficient milling industry hurts the quality of the rice it produces and exports, while poor transportation infrastructure and export procedures increase delivery costs.

[660] Industry representative, interview by USITC staff, Vietnam, October 22, 2014.
[661] Industry representative, interview by USITC staff, Vietnam, October 22, 2014.
[662] Oryza, "Vietnam Rice Experts," July 15, 2014.
[663] Industry representative, interview by USITC staff, Vietnam, October 22, 2014.
[664] In 1961/62, Burma accounted for 28 percent of global rice exports. USDA, PSD Online (accessed December 24, 2014).
[665] Exports based on marketing year. USDA, PSD Online (accessed December 29, 2014).

Production, Consumption, and Trade

Production

Rice is the major crop produced in Burma—roughly two-thirds of Burma's arable land is used for its production.[666] During 2007/08–2013/14, annual rice production fluctuated between 11 and 12 million mt, equivalent to almost 3 percent of global production (table 8.9).[667] The fluctuations were mostly caused by seasonal weather patterns that affected harvested area. For example, the drop in production in 2008/09 came in the wake of Cyclone Nargis, one of Asia's deadliest storms, which hit Burma in May 2008, while the rise in production during 2011/12–2013/14 was a response to more favorable weather and higher prices. Yields were stable for most of the period, averaging 2.6 mt/ha, but they are low by global standards, owing to Burma's inefficient farm practices and lack of infrastructure. About 60 percent of rice planted is long grain rice, and another 30 percent is short grain rice (which includes an aromatic rice, Paw San).[668]

Table 8.9: Burma: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	601	1,200	548	600	485	401	553
Production (milled) (1,000 mt)	11,840	11,200	11,642	11,060	11,473	11,715	11,957
Area harvested (1,000 ha)	7,085	6,700	7,000	7,050	7,030	7,040	7,050
Yield (paddy rice) (mt/ha)	2.6	2.6	2.6	2.5	2.6	2.6	2.7
Imports (1,000 mt)	50	0	0	0	0	0	0
Consumption and residual (1,000 mt)	10,750	10,800	10,890	10,100	10,200	10,400	10,450
Exports (1,000 mt)	541	1,052	700	1,075	1,357	1,163	1,550
Ending stocks (1,000 mt)	1,200	548	600	485	401	553	510
Exports-to-production ratio (%)	5	9	6	10	12	10	13
Ending stocks-to-use ratio (%)	11	5	5	4	3	5	4
Per capita consumption (kg)	211.5	211.0	211.3	194.5	194.8	197.0	196.2

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed May 8, 2014).
Note: Calculations for per capita consumption used marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

Consumption and Ending Stocks

Burma accounted for about 2 percent of global consumption during 2007/08–2013/14. In the first three years of the period, apparent consumption was relatively flat, averaging 10.8 million mt annually. It then fell in 2010/11 to 10.1 million mt, the lowest point of the period, but started to rise in 2011/12 by over 1 percent annually to reach 10.5 million mt in 2013/14. Per

[666] USAID, "Burma Food Security," 2013.
[667] USDA, PSD Online (accessed January 21, 2015). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.
[668] World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 18.

capita consumption followed a similar trend. During 2012/13–2013/14, it averaged 197 kg annually, a 7 percent decline from the 2007/08–2009/10 average of 211 kg.[669]

During 2007/08–2013/14, Burma accounted for about one-half of 1 percent of global ending stocks. Between 2008/09 and 2013/14, ending stocks fluctuated, ranging between 401,000 mt and 600,000 mt; on average, they represented about 4 percent of Burma's rice use. In 2008/09, stocks were roughly twice as high as any other year during the period (and represented about 11 percent of rice use), partly because of delays in processing export licenses.

Trade

After four decades of isolation, Burma is again becoming a major rice exporter.[670] In 2007, Burma re-emerged onto the world rice market, and its exports grew 83 percent annually through 2008/09, when they reached 1.2 million mt (table 8.10).[671] Exports rose as Burma's rice production and acreage increased during this period. However, in 2010 Burma's exports fell by one-third to 700,000 mt, mostly because of government export restrictions in response to a shortfall in the supplies needed to feed Burma's population following Cyclone Nargis.[672] Between 2011 and 2013, exports rebounded and stabilized, averaging about 1.2 million mt annually as the country recovered from the cyclone, favorable weather returned, and export prices rose.

Burma's exports include substantial official exports and even more substantial unofficial ones. Burma's largest official export markets during 2007–13 were West Africa (including Côte d'Ivoire and Mali) and Bangladesh (table 8.10). Burma also exported to Russia, the EU, and other parts of Asia through official channels. In June 2012, Burma qualified for the EU Generalised System of Preferences Everything But Arms (EBA) program. [673] Currently its official exports consist largely of low-quality rice, with over 25 percent brokens.[674] However, Burma

[669] USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed May 8, 2014). Another estimate put 2014 per capita consumption at 180 kg, high by global standards but significantly below a 2012 estimate of 250 kg. USDA, FAS, *Burma—Union of: Grain and Feed; Annual*, April 1, 2014, 2; USDA, FAS, *Burma—Union of: Grain and Feed; Annual*, March 9, 2012, 3.
[670] During 1960–65, rice exports averaged 1.6 million mt, and Burma was among the top three global exporters of rice annually. USDA, PSD Online (accessed October 2, 2014).
[671] Volume figures from USDA's PSD online database are used for discussing Burmese exports because GTA data do not include substantial gray market trade flows.
[672] *DVB News*, "Burma Rice Exports Plummet 60%," July 20, 2010.
[673] Burmese exporters have, however, been slow to access the EU market, as some exporters have had difficulty meeting EU certification requirements for genetic modification, heavy metals, microbiological testing, and aflatoxin. Gaung, "Myanmar's Rice Bowl Potential," June 1, 2014.
[674] Burma's informal rice exports to China also consist of 25 percent broken rice. Reportedly, China buys lower-quality, poorly milled rice from Burma at low prices to compensate for the cost of having to further mill or sort the rice after it reaches China. San, "Chinese Demand Offers New Opportunities," July 12, 2014.

Table 8.10: Burma: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
West Africa	0	40	213	233	240	173	85
Côte d’Ivoire	0	20	176	76	118	119	26
Mali	0	0	0	76	61	51	[a]
Bangladesh	4	375	113	111	204	[a]	[a]
Russia	0	0	[b]	9	17	45	44
Philippines	0	0	13	0	4	30	0
EU	0	1	[b]	[b]	12	26	40
Madagascar	0	0	2	1	31	23	[a]
Thailand	0	0	65	[b]	0	20	10
Singapore	5	5	5	3	10	15	9
Indonesia	0	0	0	0	1	12	18
All other	4	36	75	23	260	23	27
Total (GTA)	9	457	486	380	575	366	260
Total (PSD Online)	31	541	1,052	700	1,075	1,357	1,163
				Value (million $)			
West Africa	0	26	64	46	74	62	14
Côte d’Ivoire	0	12	63	30	59	52	11
Mali	0	0	0	14	13	10	[a]
Bangladesh	1	101	28	45	88	[a]	[a]
Russia	0	0	[b]	5	10	25	24
Philippines	0	0	5	0	2	11	0
EU	0	[b]	[b]	[b]	5	9	16
Madagascar	0	0	1	[b]	14	10	[a]
Thailand	0	0	10	[b]	[b]	6	4
Singapore	1	2	2	1	4	6	4
Indonesia	0	0	0	0	[b]	5	6
All other	[b]	21	39	27	43	9	32
Total (GTA)	3	149	149	126	240	144	99

Source: GTIS, Global Trade Atlas database, (accessed March 9, 2015); USDA, PSD Online (accessed March 9, 2015).
Notes: GTIS's GTA mirror data was used. USDA included estimated gray-market trade in its calculation of Burmese exports in PSD Online. PSD Online data is for trade year (TY) exports with TY 2006/2007 equivalent to calendar year 2007. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.
[a] Not available.
[b] Less than 1,000 mt or $1 million.

exported more rice through unofficial or gray market channels—55 percent on average—during 2007–13.[675] Major markets for gray-market exports included China, Vietnam, Indonesia, Singapore, and the Philippines. A large portion of Burmese exports reportedly go through

[675] USDA's Production Supply and Distribution (PSD) Online data estimates of unofficial trade compared to Global Trade Information Services' (GTIS) GTA data on official trade. USDA, PSD Online (accessed March 9, 2015 28, 2014); GTIS, Global Trade Atlas database (accessed March 9, 2015).

unofficial channels to China (although from Burma's standpoint these are legal sales), with total exports to China accounting for an estimated one-half of Burmese rice exports in 2013.[676]

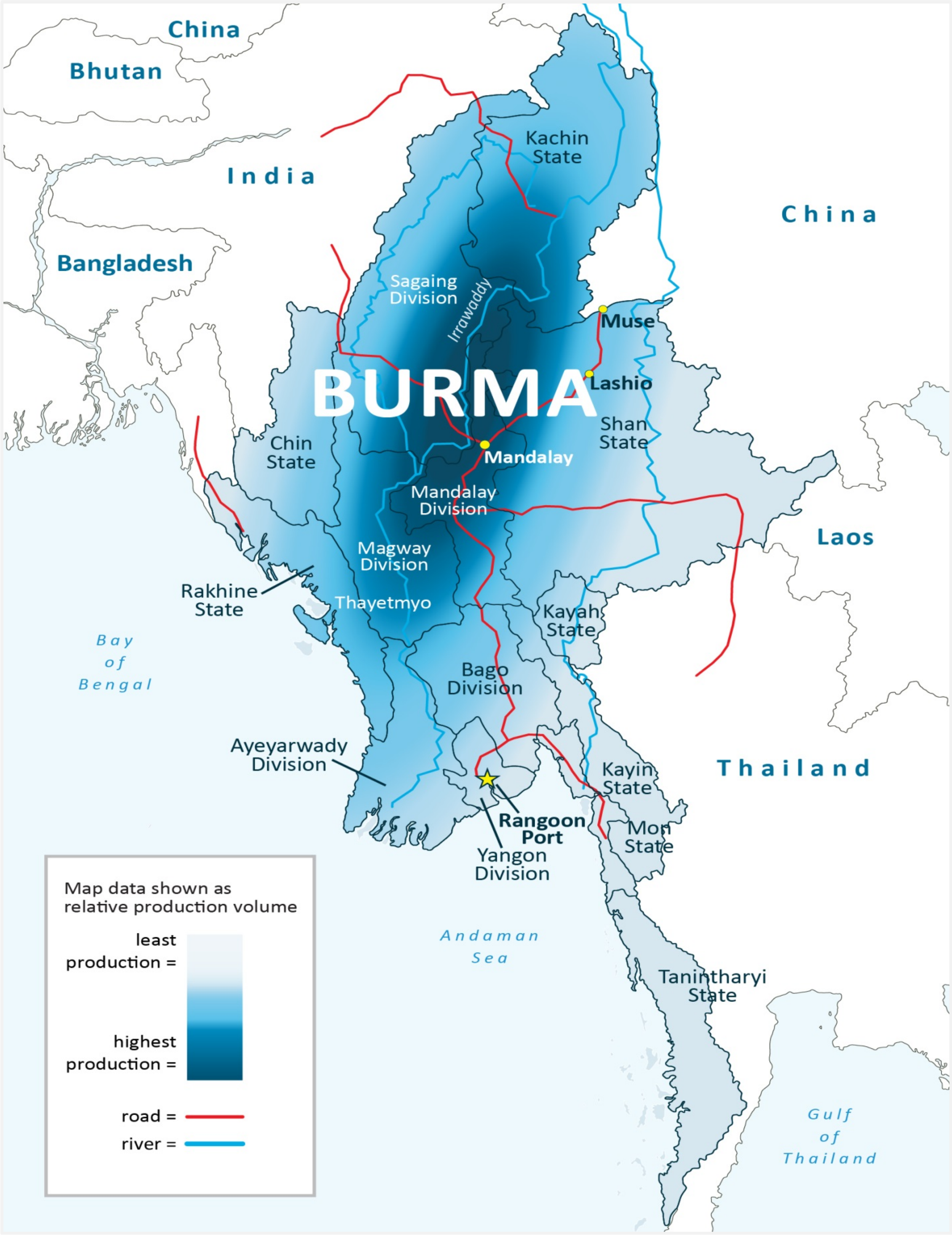
Industry Structure

Rice is mostly produced by small family farms, although Burma's farms are large by Southeast Asian standards. Of the 5.8 million farms in Burma, average farm size is about 2.5 ha (6.2 acres).[677] The country's major rice ecosystems are rain-fed lowland rice, deepwater submerged rice, irrigated lowland rice, and rain-fed upland rice.[678] About one-quarter of planted area is classified as irrigated.[679] Burma has two seasons of rice production. Rice planted from May to September is referred to as "wet season" or "monsoon" paddy rice, and rice planted from October to April is referred to as "dry season" or "summer" paddy rice. Due to a lack of efficient irrigation, more than 70 percent of the crop is produced in the wet season and harvested in just two months—November and December.[680] However, summer paddy rice production has been growing since 1992/93 with the increasing provision of irrigation facilities.[681] The major rice-producing regions are in Burma's delta, including Ayeyarwady, Bago, Yangon, and Mon states, which together produce more than half of the monsoon crop (figure 8.7).[682] Rice moves from various surplus regions to Rangoon and Mandalay and is then redistributed to the surrounding deficit regions.

Burma's rice-processing sector includes small village rice mills, commercial mills, and modern mills that are involved in exporting. In 2012/13, there were approximately 15,500 small huller mills (each less than 2 mt/day capacity), mostly performing contract milling for home and community consumption, and 1,362 commercial rice mills (total milling capacity of

[676] Burma is currently in negotiations with China to sign trade agreements that will legalize rice trade between the two countries. A memorandum of understanding on agricultural standards was signed by members of the ASEAN, including Burma and China, during an ASEAN ministerial meeting on September 25, 2014. This agreement paves the way for Burma to negotiate a G2G agreement with China on phytosanitary issues and specific quotas that will permit formal rice trade with China. Legal rice trade with China is expected to result in export volumes that are at least as large as unofficial exports to China in previous years. It is also likely to lead to higher prices, as periodic seizures by Chinese officials have resulted in sharp declines in prices in the border areas. Htike, "First Step for a Legal Rice Trade," September 29, 2014; Htwe, "China Inspects Burma's Rice," August 28, 2014.
[677] ADB, *Myanmar: Unlocking the Potential Country Diagnostic Study,* August 2014, 63. In contrast, about 70 percent of Vietnamese households have landholdings below 0.5 ha.
[678] Baroña-Edra,"Myanmar Rises," 2014, 28.
[679] If areas with nonfunctioning irrigation systems are included, this classification would include 40 percent to 50 percent of planted area. World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 19.
[680] World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 19.
[681] Yields are higher in the summer crop due to 100 percent adoption of high-yielding varieties in the irrigated areas, but COP is higher as well. Despite higher costs, farmer's profit margins are reportedly higher on summer season rice than monsoon rice. Wong and Wai, *Rapid Value Chain Assessment*, March 2013, 33.
[682] Baroña-Edra, "Myanmar Rises," 2014.

Figure 8.7: Burma: Major rice producing areas



Source: Compiled by USITC staff.

34,600 mt/day).[683] Most of the rice mills operate with obsolete processing equipment, leading to poor-quality milled rice and quantity losses of up to 20 percent during milling. Estimates on average milling rates range from 60 to 64 percent, which is low by global standards.[684]

Within the milling sector, some mills have installed modern milling equipment and are capable of producing high-quality rice for export. However, the number of such mills is small.[685] Burma has recently built a number of parboiled rice mills geared to the export market, and is now constructing more, with total milling capacity of 300,000 mt per year.[686] In 2012, 8 percent of Burma's rice exports were parboiled.[687]

Government Support Programs

Apart from restricting exports during periods of domestic shortage, Burma provides minimal domestic support to its rice producers and processors. The only significant exception is the provision of low-interest loans to farmers through the government-owned Agricultural Development Bank (MADB).[688] In 2013/14, the available credit from MADB was increased from MMK (Burmese kyat) 50,000 ($55)[689] per acre to MMK 100,000 ($110) per acre of paddy rice for up to 10 acres per farmer. Since 2012, the interest rate for MADB credit has been 8.5 percent, compared with market rates of 12 to 13 percent. Farmers must pay back the crop loan at the end of the season.[690] Another government program that provides low-interest loans of up to MMK 55,023 ($56) per acre is available to all low-income farmers in the Mandalay Division region.[691]

As mentioned earlier, most government involvement in the rice market is through export regulations. Burma has liberalized its rice export regulations since 2003, when export quotas were abolished.[692] Further trade liberalization measures implemented in 2011 helped to increase rice exports. These measures included allowing private firms to freely trade rice, thereby eliminating the role of the country's Rice Industry Association (MRIA); abolishing

[683] Wong and Wai, *Rapid Value Chain Assessment*, March 2013, 29; World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, table 31.
[684] World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 20: USDA, PSD Online (October 2, 2014)
[685] In 2012/13, mills with color sorters, wet polishers, and whiteners accounted for about 6 percent, 7 percent, and 17 percent of total milling capacity, respectively. World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 59–60.
[686] Oryza, "Myanmar Strengthens Parboiling Rice Milling Capacity," May 27, 2014.
[687] World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 5.
[688] De Luna-Martinez and Anantavrasilpa, *Myanmar Agricultural Development Bank*, 2014, 7.
[689] MMK/dollar exchange rates are from the IMF, IFS database: Exchange Rate Query (accessed January 15, 2015).
[690] Luna-Martinez and Anantavrasilpa, *Myanmar Agricultural Development Bank*, 2014, 24.
[691] Tobias et al., *Handbook on Rice Policy for Asia*, 2012, 26.
[692] Ksoll, Myint, and Lwin, *Business Process Analysis*, December 2013, 7; World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 4.

minimum export prices; and dropping the requirement for a permit to transport rice to areas near the border.[693] Additionally, export taxes were reduced from 10 percent to 2 percent.[694]

Notwithstanding trade liberalization, the government closely monitors domestic rice prices, production, and consumption, and periodically imposes export controls. In addition to a temporary ban on rice exports in 2008 following Cyclone Nargis, the government temporarily restricted exports from February to May 2011 in order to regulate domestic supplies and keep local prices from rising.[695] Burma also temporarily restricted rice exports in 2013 to supply the domestic market.[696] Observers assert that these sporadic export controls harm Burma's reputation as a reliable supplier among importers.[697]

Factors Affecting Competitiveness

Burma's abundant available land and water, along with its inexpensive labor, give it the potential to substantially expand rice production. However, its inefficient milling industry and comingling of different varieties lowers the quality of rice produced and exported. Poor transportation infrastructure and inefficient export procedures increase export costs. Also, many exporters have not been able to meet phytosanitary requirements of major destination markets. These factors have kept Burma from achieving its full export potential.

Abundant Natural Resources Favor Rice Production

Burma has abundant land resources for agriculture, including rice production. Using fallow areas has the potential to expand cultivated land area by nearly 50 percent.[698] As noted earlier, the size of the average farm is about 2.5 ha (6.2 acres)—small by Western standards, but larger than farms in the Philippines, India, and Laos, and much larger than in China.[699] Burma also has considerable water and labor resources for agriculture. Its river systems annually supply about 9 times the fresh water available in China and 16 times that of India, yet less than 10 percent of these resources are currently used, giving Burma a significant potential to increase rice production and exports.[700] Labor is also plentiful and inexpensive compared with other Asian

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[693] Ksoll, Myint, and Lwin, *Business Process Analysis*, December 2013, 7; *Myanmar: Capitalizing on Export Opportunities*, February 28, 2014, 4.
[694] Burma's export tax consisted of a commercial tax of 8 percent and an income tax of 2 percent. The commercial tax was eliminated but the income tax remains in effect. Mizzima, "Exporters to Pay 2 Percent Profit Tax," August 16, 2011.
[695] Tobias et al., *Handbook on Rice Policy for Asia*, 2012, 26.
[696] World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 29.
[697] Ksoll, Myint, and Lwin, *Business Process Analysis*, December 2013, 7.
[698] ADB, *Myanmar: Unlocking the Potential Country Diagnostic Study*, August 2014, 63.
[699] Ibid.
[700] Ibid., 64.

countries,[701] keeping production costs low despite the very limited role of mechanization in Burma's agriculture.[702]

The government has emphasized the importance of investments in infrastructure, including construction of dams and renovation of drainage canals, in order to expand dry-season rice acreage and increase yields. The government has set a target of increasing yields to 5.2 mt/ha for paddy rice, double the current USDA-estimated yields.[703]

Commission staff used the RiceFlow model to analyze the effect of Burma expanding dry-season irrigated rice acreage by 10 percent and having this acreage yield 25 percent more than non-irrigated acreage.[704] Model results indicate that Burma's rice production in 2013 would have been higher by 8 percent and exports would have expanded by 59 percent. Burma's exports would be absorbed largely by traditional markets in Africa and Asia, including a 67 percent increase in exports to China. There would be little impact on the United States, because Burma's exports generally do not directly compete with U.S. rice.[705]

Low Cost of Production

The cost of production for "wet season" paddy rice for a typical farm in Burma was MMK 124,261 per mt ($137 per mt) in 2012. Costs include seed, fertilizer, labor (contract, hired, and family), and depreciation on fixed capital (machinery and buildings), but exclude interest on credit and land rent, as these data are not available (table 8.11). The largest cost component is fertilizer, which accounted for 50 percent of farm costs in the typical farm budget, reflecting limited use of other purchased inputs; labor accounted for 46 percent. The market price for wet-season Burmese paddy rice in 2012 was MMK 182,000 per mt ($200 per mt), and net revenue, including depreciation, was MMK 57,739 per mt ($63 per mt). Fertilizer prices in Burma reportedly are not supported by the government, so prices depend on international prices, transportation costs, and the kyat/U.S. dollar exchange rate (box 8.3). Industry sources report that the fertilizer/paddy rice price ratio is unfavorable to farmers, and that high prices for fertilizers discourage use.[706]

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[701] Ibid.
[702] Ibid.
[703] USDA, PSD Online (accessed January 21, 2015); Denning, Baroang, and Sandar, *Rice Productivity in Myanmar*, March 2013, 7– 8. Yields for dry-season rice, which is grown under irrigated conditions, are approximately 11–50 percent higher than monsoon or wet season crop yields.
[704] For further information on the RiceFlow model, see appendix H.
[705] The RiceFlow model shows a -0.2 percent change in U.S. exports under this scenario.
[706] Lwin et al., "Role of Fertilizer Policy," October 7, 2013, 6, 14, 22.

Table 8.11: Burma: Cost of production of long grain paddy rice (wet season), 2012

Input	COP	Share of COP
	$/ mt[a]	%
Seed	0.71	[b]
Fertilizer	68.24	50
Other chemical inputs	[c]	[c]
Labor[d]	62.15	46
Irrigation	[c]	[c]
Other variable costs	[c]	[c]
Total variable costs	131.10	96
Land	[c]	[c]
Depreciation	5.45	4
Other fixed costs	[c]	[c]
Total fixed costs	5.45	4
Total COP	136.55	100

Source: Liese et al., "Economics of Southeast Asian Rice Production," 2014, 43, 55.
[a] COP converted from MMK per acre using exchange rate of MMK 910 per U.S. dollar and yield of 3.5 mt/ha. Costs exclude family labor and return to land.
[b] Less than 1 percent.
[c] Not available.
[d] Includes contract, hired, and family labor. Contract labor is used with machinery services. Hired and family labor use is estimated assuming it is divided equally between rice and mung bean production, based on a 12-acre farm. Labor is valued at $0.25 per hour.

Box 8.3: Burma's Exchange Rate Policy

The Burmese kyat was tied to the dollar until April 2012, when the value was set at MMK 818 to the dollar and allowed to float. Previously, there was a dual exchange rate system with a fixed "official rate" for the kyat that was valued higher against the dollar than the unofficial "street" rate. The value set in April was reportedly close to the prevailing street rate. After it began floating, the kyat depreciated by 33 percent to its value of MMK 1088/$ in November 2014, which has raised the price of fertilizer in terms of MMK.[a]

[a] Lwin et. al., "Role of Fertilizer Policy," October 7, 2013, 6, 14, 22; Frangos and Barta, "Myanmar Will Release Its Currency," March 28, 2012.

Inefficient Milling Infrastructure and Poor Quality

Burma's rice milling facilities are mostly small and lack investment in modern technology. Poor milling infrastructure has led Burma's rice to be generally viewed as low quality. For example, during 2010–12, 92 percent of Burma's rice exports were 25 percent brokens.[707]

In addition to a lack of sophisticated mills, Burma's rice exports face other quality impediments. Its rice exports are of groups of varieties unique to Burma (Emata, Letywezin), with varying grain lengths among the varieties exported. The lack of classification standards makes it difficult to provide rice with uniform grain lengths to customers, depressing prices.[708] The lack of

[707] World Bank. *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 5.
[708] Gaung, "Myanmar's Rice Bowl Potential," June 1, 2014.

uniform varieties is exacerbated by the lack of a proper seed distribution system in Burma. Small quantities of high-quality rice (5 percent broken rice) are exported to Japan and the EU.[709]

However, millers report that volumes are limited because too few mills have the sophisticated equipment, such as polishers and color-sorter machines, needed to produce high-quality rice.[710]

Poor Road and Port Infrastructure

Poor roads and port infrastructure raise the cost of delivering Burmese rice to global markets. Burma depends heavily on its road network to transport rice in-country.[711] But the poor condition of this network leads to high transport costs and long travel times that increase the costs of getting rice to mills and consumers.[712] The road network is also very sparse, consisting of only 6 km of road per 100 square km of land compared to the regional average of 80 km. In addition, Burma has the lowest motor vehicle penetration rate in Southeast Asia (7 vehicles per 1,000 people).[713] Poor roads also lead to transportation bottlenecks that force farmers to store paddy rice on their land after it is harvested, contributing to the low quality of paddy rice delivered to mills. The state of Burma's road network pushes trucking costs for agricultural products three to five times higher than in other Southeast Asian countries.[714]

Burma's port at Rangoon is the largest in the country, handling 90 percent of seaborne trade. However, because of sandbars, the port cannot accommodate vessels of more than 15,000 deadweight tonnage. This means larger ships load at the deep-sea port of Thilawa, 25 km south of Rangoon, raising inland transportation costs.[715] The government's freight authority owns several of the wharves at Rangoon and sets certain fees and procedures; as a result, Rangoon is one of the most expensive ports in the world.[716]

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[709] In 2011, Burma's Paw San rice, a short grain, aromatic rice, was selected as the world's best rice at the World Rice Conference held in Vietnam in 2011. The quantities of Paw San rice available for export are limited due to the low on-farm yields, which are further reduced by high post-harvest losses. Additionally, Paw San rice is in high demand for local consumption. Kohler, "Rice Revival," February 2, 2014.
[710] Oryza, "Burma Needs Modernized Rice Mills," June 5, 2014.
[711] Kohler, "Rice Revival," February 2, 2014. Some observers have suggested that internal transport costs could be lowered by developing waterways for transport.
[712] ADB, *Myanmar: Unlocking the Potential*, August 2014, 77.
[713] Ibid.
[714] Ibid.
[715] World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 27.
[716] Export procedures also add to exporters' expenses. These procedures (license, inspection fee, certificate of origin, and export tax) are estimated to cost $8.49 per mt, compared to $0.05 in Vietnam and $0.10 in Thailand. World Bank, *Myanmar: Capitalizing on Rice Export Opportunities*, February 2014, 25.

Cambodia

After three decades without exports, Cambodia reentered the global rice market in 2003. Between 2007/08 and 2013/14, Cambodia substantially increased and broadened the reach of its rice exports. By the end of the period, the EU was Cambodia's main destination for official exports of rice. However, insufficient domestic milling capacity and porous borders between Thailand and Vietnam have led a majority of Cambodian paddy rice to be sold to other countries on the gray market, rather than adding value through milling in Cambodia. While Cambodia has made strides in agricultural productivity, it still has some of the lowest yields in the region. Cambodia has weak supply chains for rice inputs and deficient infrastructure that limit its ability to produce and process a reliable supply of quality rice.

Production, Consumption, and Trade

Production

During 2007/08–2013/14, Cambodia accounted for about 1 percent of global rice production.[717] Cambodian production rose over 6 percent annually during this period, reaching 4.7 million mt in 2013/14 (table 8.12). Production growth stemmed mostly from increased harvested area, due, in part, to a rise in double- and triple-cropping. It also came from higher yields due to wider use of modern equipment, fertilizer, and some improved seeds (especially for dry-season production).[718] Overall, Cambodia is a net exporter of rice; it grew about 1 million mt more rice than it consumed every year between 2011/12 and 2013/14. Cambodia mainly produces long grain and aromatic jasmine rice for export,[719] while Cambodian consumers prefer medium grain rice varieties.[720]

[717] USDA, PSD Online (accessed January 21, 2015). In 2013/14, Cambodia was the 14th-largest rice producer in the world.

[718] ADB, *Improving Rice Production and Commercialization in Cambodia*, 2014, 8; Pech, "Rice Production in Cambodia," March 18–22, 2013, 33–35; Wang et al., *Patterns of Varietal Adoption*, 2012, 25; Yu and Diao, "Cambodia's Agricultural Strategy: Future Development Options," 2011, 9. Yields rose 24 percent (about 4 percent per year) from 2007/08 to 2013/14. However, Cambodia's yields are still less than 60 percent of the global average. The relatively low yield of 2.0 mt/ha in 2007/08 is consistent with the average yield (2.04 mt/ha) from 2000/01–2007/08; USDA, PSD Online (accessed July 16, 2014, and January 21, 2015).

[719] Cambodian Rice Exports Association, "Market" (accessed October 7, 2014).

[720] Agrifood Consulting International, *Rice Value Chain Study: Cambodia*, 2002, 63–68; First Cambodian Rice Festival 2013, "About Rice" (accessed October 6, 2014); Sophea, *The Rice Situation in Cambodia*, January 2012, 8. Cambodian farmers produce long grain, medium grain, and aromatic rice varieties. However, rice is often marketed as "mixed," with several varieties comingled at the collection stage.

Table 8.12: Cambodia: Rice production, consumption, stocks, and trade, 2007/08–2013/14

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	67	107	109	150	158	136	221
Production (milled) (1,000 mt)	3,305	3,992	4,056	4,233	4,268	4,670	4,725
Area harvested (1,000 ha)	2,567	2,613	2,675	2,777	2,767	2,980	2,970
Yield (paddy rice) (mt/ha)	2.0	2.4	2.4	2.4	2.4	2.5	2.5
Imports (1,000 mt)	50	50	5	5	10	40	5
Consumption and residual (1,000 mt)	3,000	3,220	3,270	3,370	3,400	3,550	3,650
Exports (1,000 mt)	315	820	750	860	900	1,075	1,000
Ending stocks (1,000 mt)	107	109	150	158	136	221	301
Exports-to-production ratio (%)	10	21	18	20	21	23	21
Ending stocks-to-use ratio (%)	3	3	4	4	3	5	6
Per capita consumption (kg)	218.2	231.0	231.2	234.6	232.8	238.8	241.2

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption was calculated using marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

Consumption and Ending Stocks

Cambodia accounted for about 1 percent of global consumption during 2007/08–2013/14.[721] Throughout the period, total domestic consumption increased by over 3 percent annually and reached 3.7 million mt in 2013/14. This was driven by an average annual growth in population of 1.9 percent, and a rise in average annual per capita rice consumption of 1.7 percent.[722] Per capita rice consumption grew because of increasing incomes: per capita income rose from about $560 in 2007/08 to $709 in 2013/14.[723] During the same period, Cambodia's ending stocks almost tripled to just over 300,000 mt, roughly 6 percent of the rice used in the country. Higher stocks reflect, in part, the government policy of maintaining stockpiles of rice to address concerns over the food security of Cambodia's low-income population.[724]

Trade

Cambodia's exports have increased since it reentered the global market in 2003, after three decades without exports because of civil war and the Khmer Rouge's agricultural policy.[725] During 2007–13, Cambodia became an increasingly important rice exporter: its total exports

[721] In 2013/14, Cambodia was the world's 16th-largest rice consuming country. USDA, PSD Online (accessed March 15, 2015).
[722] World Bank, World Development Indicator database: Population, Total (accessed August 5, 2014).
[723] World Bank, World Development Indicator database: GNI per Capita (constant 2005 US$) (accessed July 23, 2014).
[724] FAO, "Country Fact Sheet on Food and Agriculture Policy Trends," April 2014, 4.
[725] The Khmer Rouge regime (1975–79) tried to promote rice production, but failed in part because of a severe reduction in the labor force due to mass exterminations of Cambodians by the regime and a lack of technical expertise. USGS, "Earthshots: Satellite Images of Environmental Change, Cambodia" (accessed October 27, 2014).

grew 15 percent per year, reaching a period high of 1.1 million mt in 2013 (table 8.13).[726] That year, Cambodia was the world's seventh-largest rice exporter, accounting for about 3 percent of global exports. In 2013, Cambodia's rice exports were predominately long grain (51 percent) and aromatic jasmine rice (41 percent).[727] Cambodia has become an important supplier of jasmine rice globally; it was the world's second-largest exporter of jasmine rice in 2013.[728]

Table 8.13: Cambodia: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
EU	2	3	12	45	129	134	239
West Africa	0	0	0	0	2	7	12
Senegal	0	0	0	0	0	1	3
Malaysia	1	2	1	1	14	25	52
China	0	0	0	0	0	7	28
Gabon	0	0	0	0	0	7	13
All other	1	1	3	5	29	18	17
Total (GTA)	4	6	16	51	175	197	361
Total (PSD Online)	460	315	820	750	860	900	1,075
				Value (million $)			
EU	1	1	9	31	75	87	153
West Africa	0	0	0	0.2	1	5	6
Senegal	0	0	0	0	0	1	2
Malaysia	1	1	1	0.8	12	22	46
China	0	0	0	0	0	6	25
Gabon	0	0	0	0	0	7	14
All other	0	0	1	3	18	13	14
Total (GTA)	2	2	11	35	106	139	258

Sources: GTIS, Global Trade Atlas database (accessed August 19, 2014); USDA, PSD Online (accessed August 21, 2014).
Notes: The GTA database reflects officially reported statistics. USDA includes estimated gray-market trade in its calculation of Philippine imports in PSD Online. PSD Online data are for trade year (TY) exports, with TY 2006/2007 equivalent to CY 2007. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

The EU is Cambodia's largest official export market. In 2013, Cambodia was the largest source of EU milled rice imports by volume and the second largest by value (behind Thailand).[729] Cambodian rice enters the EU duty-free under the EU's EBA arrangement, which was implemented for rice in October 2009.[730] Exports to the EU before 2009 were minimal. Between 2009 and 2011, they increased 10-fold and nearly doubled again over the next two years to 239,000 mt in 2013. Exports to the EU are estimated to be evenly split between long

[726] USDA's PSD Online data for the calendar year is used for discussing Cambodian exports because of significant gray-market trade that is not included in GTA data. Estimated value of 2013 total exports was about $800 million based on PSD volume figures and GTA unit values.
[727] Cambodian Rice Exports Association, "Market" (accessed October 7, 2014).
[728] Hunt, "Cambodia Looks to Put Its Rice," July 29, 2014.
[729] GTIS, Global Trade Atlas database (accessed December 3, 2014), HS 1006.30 for milled rice. A more detailed breakdown is unavailable for Cambodia.
[730] EU Web site, Trade and Private Sector Development, http://eeas.europa.eu/delegations/cambodia/eu_cambodia/development_cooperation/sectors_of_cooperation/trade_and_private_sector_development/index_en.htm (accessed April 3, 2015).

grain and aromatic jasmine rice.[731] Italy has reportedly submitted an official request to the EU to remove the EBA arrangement for rice, claiming that the low-cost imports from Cambodia and Burma harm Italian producers.[732] The EU has stated that it is carefully monitoring rice trade under the EBA.[733]

As much as 75 percent of Cambodia's exports left the country through gray-market channels annually during 2011–13. Most of this unofficial trade is estimated to be paddy rice sold to Vietnam or China, where it is milled and in some cases re-imported for Cambodian consumption.[734] policy is geared toward reducing paddy rice exports in favor of exports of white rice. [735] There are also reports of Cambodian rice being smuggled into Thailand in 2012 and 2013 and sold as Thai rice under the Paddy Pledging Program.[736]

Industry Structure

Rice occupies almost 85 percent of Cambodia's cultivated land, and planted area is expanding.[737] The main rice-growing areas in Cambodia surround Lake Tonle Sap, the southern portion of the Mekong River, and the Tonle Sap River (figure 8.8). The country has distinct wet and dry seasons, and the majority of the national crop is cultivated during the summer wet season (monsoon).

With less than 4 ha of land per farm, most farmers produce mainly for their own consumption, and only about one-third have surpluses available for commercial sale.[738] They use few purchased inputs (such as improved seed varieties, fertilizer, and irrigation equipment), and rain-fed farming systems predominate, although there is a gradual shift to modern commercial farming practices.[739] Typically, Cambodian rice growers produce one crop per year, although about one-quarter of farmers grow more than one crop per year.[740]

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[731] Slayton and Muniroth, *A More Detailed Road Map*, 2011, 5.
[732] *Phenom Penh Post*, "Italy Demands Fairer Rice Deal," July 21, 2014. Some milled rice reportedly enters Cambodia from Thailand and Vietnam and complicates the rules of origin determination for Cambodian rice exported to the EU. *Phenom Penh Post*, "Exporters of Rice Now Subject to Origin Test," February 17, 2014.
[733] EU Parliament, "Parliamentary Questions" (accessed October 1, 2014).
[734] World Bank, *Cambodia Agribusiness Access*, December 16, 2010.
[735] WTO, "The Expansion and Diversification of Cambodia's Exports of Milled Rice," 2011.
[736] Phoonphongphiphat and Thukral, "Insight: Smuggling Rice to Thailand," July 14, 2013; Schearf, "Controversial Rice Scheme Risks," February 6, 2014.
[737] USDA, FAS, "Cambodia: Seasonal Flooding Impacts Wet Season Rice," November 21, 2013.
[738] Sophal, "The Impact of High Food Prices in Cambodia," 2008, 2; Johnston, Try, and de Silva, "Agricultural Water Management Planning in Cambodia," June 2013, 5.
[739] WFP, "Agricultural Production," 3 (accessed December 2, 2014).
[740] ADB, *Improving Rice Production and Commercialization in Cambodia*, 2014, 9. This compares to 3.5 crops per year in Vietnam. Inserey, "Cambodia Must Up Its Game," May 1, 2013.

Figure 8.8: Cambodia: Paddy rice production by province, 2013/14

Source: Cambodia Ministry of Agriculture, Forestry and Fisheries, Annual Conference 2013–2014, Annex 5, "Rice Balance Sheet by Province, 2013-2014."

Most Cambodian mills that process paddy rice are small village mills (about 96 percent) that mill only for the farmers' own consumption, while the rest (about 4 percent) are commercial mills.[741] Most commercial mills obtain rice through traders, although some mills contract directly with producers.[742] The commercial sector is growing through expansion of existing capacity and new investments: average mill capacity rose from 100 mt per hour in 2009 to approximately 325 mt per hour in 2012 and was expected to double in 2013/14.[743] Cambodia's average milling rate was about 64 percent during 2007/08–2013/14.[744]

Government Support Programs

During 2007/08–2013/14, the Cambodian government maintained policies to protect consumers against rising rice prices and emergencies, to support production, and to influence trade.[745] In 2007/08, additional action was inspired by the Cambodian food crisis (a period when prices for both Cambodian and global staple foods spiked). The government, in collaboration with the Asian Development Bank (ADB), introduced the Emergency Food and Assistance Project to provide emergency food deliveries, food assistance, and farm input support (specifically, a 50 percent payment for seed and fertilizer purchases, payable upon rice harvest).[746] The project was intended to provide three years of short-term assistance, but it was extended and additional funding was provided under the Global Agriculture and Food Security Program. The long-term goal is to create the Cambodian Food Reserve System (CFRS) as a permanent safety net program.[747]

Also in response to the food crisis, the government increased funding to the state-owned Green Trade Company and the private Rice Millers Association to build national rice reserves.[748] The Green Trade Company now works as a member of the CFRS to procure and manage public and private food stocks. Similarly, the Rural Development Bank funds private millers at market rates to encourage domestic rice milling and provide for additional domestic rice reserves. Since

[741] Small village millers mill rice for a fee or in exchange for rice bran to be used as animal feed. Sophea, *The Rice Situation in Cambodia*, January 2012, 11–13.
[742] Agrifood Consulting International, *Rice Value Chain Study: Cambodia*, September 2002, 51. About 67 percent of farmers sell their surplus rice to village traders, versus about 20 percent that sell it directly to mills.
[743] Kann, "Cambodia: The Rice Kingdom of White Gold," November 19–21, 2013, 9.
[744] USDA, PSD Online (accessed October 2, 2014). For comparison, the 2013/14 average milling rates for Burma, Vietnam, Thailand, and the United States were 64 percent, 62.5 percent, 66 percent, and 71 percent, respectively.
[745] FAO, "Country Fact Sheet on Food and Agriculture Policy Trends," 2014, 6.
[746] The target groups for the support are farmers that own or lease less than one hectare of land. Ministry of Economy and Finance, *Emergency Food Assistance Project*, 2010, 3.
[747] Emergency Food Assistance Project, "About: Project Description" (accessed December 3, 2014).
[748] The Green Trade Company is a public enterprise that manages 10,000 mt of rice reserves (7,000 mt of government reserves and 3,000 mt of stocks held by private partner companies). The Ministry of Economy and Finance also holds cash reserves equivalent to 6,000 mt of rice under the Cambodian Food Reserve System. FAO, "Country Fact Sheet on Food and Agriculture Policy Trends," 2014, 4; Government of Cambodia, "Sub-decree on the Establishment," June 11, 2012, 4.

2012, the CFRS has also stockpiled rice seed (2,000 mt) for distribution to farmers in case of emergencies.[749]

In July 2010, the government issued a major policy document, *Promotion of Paddy Rice Production and Export of Milled Rice,* that outlines Cambodia's strategy—known as the Rice Export Policy—for becoming a major white rice exporter by 2015. The goals of the Rice Export Policy are to achieve (1) a surplus of paddy rice of more than 4 million mt; (2) milled rice exports of at least 1 million mt; and (3) international recognition of Cambodian rice. Support for rice production under this policy includes loan provisions, investments in irrigation, and tax and duty breaks for farmers. The government instituted a commercial bank lending guarantee that covers 50 percent of loans made to rice farmers in the event of default.[750] The government also announced that it would allocate $310 million to improve rice irrigation systems and double its investment in the Rural Development Bank to support agricultural-sector investments, most of which will be available to the rice sector.[751] By 2012, the Ministry of Water, Resources, and Meteorology reported planned investments in irrigation totaling $260 million.[752] In addition, the Export Policy continued the value-added tax exemption for rice production inputs (such as fertilizer) and duty-free status for imported agricultural machinery used for milling.[753]

Regarding exports, the Cambodian government removed export license requirements for Cambodian exporters and, as of May 1, 2014, export taxes were eliminated as well.[754] However, the newly formed Cambodian Rice Federation voted on February 2, 2015, to enact an export fee of $0.50 per mt of long grain white rice and $1 per mt on aromatic rice.[755]

Factors Affecting Competitiveness

While there has been significant progress in the quantity of official rice exports, there is room to further improve yields and reliability of supply. Cambodia's average rice crop yields are the

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[749] FAO, "Country Fact Sheet on Food and Agriculture Policy Trends," 2014, 4; Government of Cambodia, "Sub-decree on the Establishment," June 11, 2012, 4.
[750] Tobias et al., *Handbook on Rice Policy for Asia*, 21.
[751] Of the $310 million, $240 million was from a loan from China. *Cambodia Mirror,* "China Signed Three Commercial Agreements with Cambodia," March 19, 2010.
[752] Johnston, Try, and de Silva, "Agricultural Water Management Planning in Cambodia," 2013, 3.
[753] FAO, "Country Fact Sheet on Food and Agriculture Policy Trends," 2014, 3.
[754] Sophea notes that exporters are still required to obtain a permit through the Green Trade Company. This permit allows the Green Trade Company to monitor rice exports for food security purposes. However, other news sources use the terms license and permit interchangeably and state that the license/permit was removed. Sophal and Kunmakara, "PM Scraps Rice-Export Licenses to Boost Trade," April 28, 2010; Orzya, "Cambodia to End Customs Fees," April 27, 2014. Formal and informal export fees were estimated at $11/mt. World Bank, "Turning Cambodia into a Leading Rice Exporter," September 2013, 1; Sophea, *The Rice Situation in Cambodia*, January 2012, 32.
[755] The Cambodian Rice Federation expects to use 25–30 percent of the revenue from the fee for federation operations, while the rest is intended for development of export markets for Cambodian rice. Sothear, "Rice Federation Votes, Approves Export Fee," February 3, 2015.

lowest among its neighbors and regional competitors.[756] Major competitiveness constraints in Cambodia include the low skill levels of farmers, underdeveloped domestic supply chains for inputs, a lack of irrigation and storage facilities, expensive electricity and transportation, and low levels of processing technology.[757] Infrastructure constraints, both on and off farm, create higher costs for the producers and processers, reduce the quality of rice, and decrease the reliability of supply for export markets. Many of these constraints hurt Cambodia's ability to supply product.

Low Cost of Production

Cambodia's cost of paddy rice production, at $89/mt in 2010, is low by global standards (table 8.14). The largest share of total costs for Cambodian paddy rice farmers is accounted for by fertilizer (39 percent). Farmers face high fertilizer and chemical input costs because most inputs are imported, and supply chains for imported inputs are not well developed. The second-largest cost for farmers is labor (33 percent). The high level of hired labor use in Cambodia is likely related to relatively low levels of mechanization. Two farm activities, crop establishment via transplanting and harvesting/threshing, require the most person days/ha.[758] Costs for physical capital account for 19 percent of total costs and include the equipment used in Cambodia for paddy rice production: animal traction, harvesters, and threshers.[759] Seed costs are the smallest component of paddy rice COP; most surveyed Cambodian farmers planted traditional or improved traditional seed varieties, which can be saved at harvest time to use for the next crop, rather than purchasing seed for each crop.[760]

[756] In 2012/13, estimated yields in Southeast Asia were Cambodia, 2.5 mt/ha; Indonesia, 4.7 mt/ha; the Philippines, 3.9 mt/ha; Thailand, 2.8 mt/ha, and; Vietnam, 5.6 mt/ha. USDA, PSD Online database (accessed January 14, 2015).
[757] ADB, *Improving Rice Production and Commercialization in Cambodia*, 2014, 31–35; World Bank, "Turning Cambodia into a Leading Rice Exporter," September 2013, 1.
[758] Wang et al., *Patterns of Varietal Adoption,* 2012.
[759] These costs are referred to as "power source" in the source document. Wang et al., *Patterns of Varietal Adoption,* 2012. Animal traction is the use of animals to assist with farming tasks, such as plowing, planting, and harvesting.
[760] In 2010, 59 percent of rice area was planted with traditional varieties (33 percent of area, 1.4–2.4 mt/ha average yield). Wang et al., *Patterns of Varietal Adoption,* 2012, 35–36. In a more recent survey, 76 percent of farmers reported using traditional seeds, 13 percent reported using old high-yielding seeds saved from a previous harvest, and 41 percent reported using new high-yielding seeds. ADB, *Improving Rice Production and Commercialization in Cambodia*, 2014, 5.

Table 8.14: Cambodia: Cost of production of long grain paddy rice, 2010

Input	COP	Share of COP
	$/mt[a]	%
Seed	0.85	1
Fertilizer	34.79	39
Chemical inputs	1.27	1
Labor[b]	29.44	33
Irrigation and fuel	3.39	4
Total, variable costs	69.74	78
Land	2.12	2
Physical capital[c]	17.32	19
Total, fixed costs	19.44	22
Total, COP	89.17	100

Source: USITC estimates from Wang et al., *Patterns of Varietal Adoption,* 2012, tables 20 and 25.
Note: This source reports cost of production (COP) data for Cambodia are based on a household survey conducted in 2010.
[a] COP values were originally reported in $/ha, values were divided by an average yield of 2.31 mt/ha to convert values to $/mt.
[b] Includes hired labor only.
[c] Includes cash costs for animal traction, harvesters, and threshers, but not imputed costs for these items.

Poor Irrigation, Utility, and Transportation Infrastructure Are Major Challenges

The Cambodian rice industry is at a disadvantage in relation to its competitors because decades of war destroyed the country's irrigation, storage, energy, and transportation infrastructure. Despite the clear yield advantages of irrigated production, less than one-quarter of Cambodia's total rice area is irrigated, and many of the existing irrigation systems are in disrepair.[761] For the majority of Cambodian paddy production, storage facilities are either nonexistent or inadequate; it is estimated that 11 percent of post-harvest losses in Cambodia occur during storage, [762] while other estimates put grain losses from harvest to storage at 17–52 percent.[763] These constraints feed into Cambodia's reputation as an unreliable exporter of milled rice.[764]

The country has serious deficits in other infrastructure as well. Cambodia's insufficient and unreliable electric grid and poor road and port system create higher costs for rice producers and processors and decrease the reliability of supply for export markets.[765] Cambodia has the lowest per capita consumption of electricity in Asia, and only about one-third of Cambodians

[761] In a 2009 government inventory of 2,252 irrigation systems, 62 percent were not functioning well due to poor design, as well as lack of maintenance, financial, and technical support. Johnston, Try, and de Silva, "Agricultural Water Management Planning in Cambodia," June 2013; Pech, "Rice Production in Cambodia," March 18–22, 2013; Inserey, "Cambodia Must Up Its Game," May 1, 2013.
[762] Sophea, *The Rice Situation in Cambodia*, January 2012, 13; Rickman and Gummert, "Rice Storage Systems" (accessed December 2, 2014).
[763] Sophea, *The Rice Situation in Cambodia*, January 2012, 13.
[764] ADB, *Improving Rice Production and Commercialization in Cambodia*, 2014, 14. According to ADB, "70 percent of farmers believe that 25 percent of their crop will be destroyed in the next cropping season."
[765] World Bank, "Turning Cambodia into a Leading Rice Exporter," 2013; Inserey, "Cambodia Must Up Its Game," May 1, 2013.

have access to electricity.[766] Cambodia also has a relatively low-density road network compared with other Southeast Asian countries—approximately 21 km of road for every 100 square km of land, compared with an average of 80 km for the other Southeast Asian countries.[767] Of Cambodia's three main ports that are connected to road networks (Sihanoukville, Phnom Penh, and Koh Kong), Sihanoukville is the only deepwater port.[768] Container shipping is also challenging because Cambodia faces a deficit of available transportation containers, raising transportation costs and reducing reliability of supply.

Inadequate storage and logistics infrastructure inhibit the Cambodian rice industry from making large sales, as evidenced by the concerns expressed by the Cambodian Federation of Rice Exporters in 2014. At that time, Cambodian exporters expressed doubts about meeting the technical conditions of a bid to supply 200,000 mt of rice to the Philippines, owing to the large volume and requirement for delivery to 14 different Philippine ports. Cambodian exporters expressed concerns about the inadequacy of their production and logistics management to fulfill the tender, and the lack of adequate storage, which would keep them from supplying the large volume within the stipulated time.[769]

The Inefficient Milling Sector Reduces Quality and Reliability of Supply

Cambodia's rice milling sector is mostly inefficient, relying on obsolete milling equipment and suffering from insufficient capacity. The deficiencies in this sector contribute to the large share of paddy rice that is exported from Cambodia to neighboring countries to be milled.

Constraints on the Cambodian milling sector include poor quality and high input costs, coupled with significant yield losses in the milling process and limited access to capital. Quality problems stem from two different sources. First, the rice received from farmers at the mills is often of poor quality and combines several different varieties in the same load. Without segregation, milling results in high levels of brokens, since efficient operation requires rice with similar milling specifications to be milled together.[770] High milling costs caused by the high cost of electricity—more than twice that of neighboring Thailand and Vietnam[771]—are exacerbated by the heavy mill losses due to brokens. In addition, mills have limited access to investment capital

[766] Kunthy, "Status of Sustainable Energy Related Technology and Policy in Cambodia," 2012, 2.
[767] World Bank, World Development Indicators database: Road Density (km of road per 100 sq. km of land area), latest available figures from 2003–11 (accessed November 21, 2014).
[768] World Bank, World Development Indicators database: Container Port Traffic (TEU: 20 foot equivalent units) (accessed November 21, 2014). The data for Southeast Asia include Brunei, Burma, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam; data are not available for Laos.
[769] Oryza.com, "Philippines Bid Opens Doorway," September 11, 2014.
[770] Sophea, *The Rice Situation in Cambodia*, 2012, 11.
[771] Slayton and Muniroth, *A More Detailed Road Map*, 2011, 3.

for mill improvements[772] and often have too little working capital to make paddy rice purchases, which can halt mill operations.[773]

Efforts to Improve Quality and Reliability

The Cambodian government is actively trying to improve the rice sector. One area of focus has been the rice input supply chain. Since 2010, the Australian and the Cambodian governments have worked via the Cambodian Agricultural Value Chain program to develop input markets (seeds, fertilizer, pesticides, and herbicides) for farmers.[774] In addition, in 2012/13 the Cambodian Agricultural Development Research Institute began actively promoting and distributing 10 varieties of improved rice seed,[775] although its distribution has met only 20–25 percent of seed demand.[776] Such steps can improve the reliability of supply and rice quality, despite increased input costs.

To better serve export markets, Cambodia has also made substantial improvements in rice quality and brand recognition. As a result, certain segments of the industry have made great strides in quality. In 2012, Cambodia's aromatic jasmine rice was awarded the Rice Trader World Rice Conference's top prize, based on its texture, shape, flavor, and aroma.[777] At the same time, recent foreign direct investment in the milling sector is likely to lead to improved quality and reliability. In June 2014, Cambodian and Thai investors signed an agreement to invest $50 million in a rice mill in Kampong Speu province.[778]

Tariff Preferences Benefit the Export Sector

Preferential treatment for Cambodia's exports under the EU's EBA expands the market for Cambodian rice through official channels. This arrangement has had a significant impact on Cambodia's ability to expand its rice exports. Using the RiceFlow model, it is estimated that if the EBA preferences for Cambodia had not been in place in 2013, Cambodia would not have exported rice to the EU.[779] The model simulation shows that Cambodia's rice exports to the EU

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[772] Sophea, *The Rice Situation in Cambodia*, January 2012, 11.
[773] Agrifood Consulting International, *Rice Value Chain Study: Cambodia*, September 2002, 55–58, 156.
[774] CAVAC, "Working with the Private Sector" (accessed December 12, 2014).
[775] These varieties included three non-seasonal varieties, four mid-seasonal varieties, and three late-season varieties. Government of Cambodia, Ministry of Agriculture, Fisheries and Forestry, "Annex," 2013, 10.
[776] De Carteret, "Demand for Quality Rice Seed Development," 2013.
[777] In 2013, Cambodia was the world's second-largest exporter of premium jasmine rice; Hunt, "Cambodia Looks to Put Its Rice on the World's Plate," July 29, 2014.
[778] *Cambodian Herald,* "Cambodian, Thai Companies Invest US$50 Millions," June 19, 2014.
[779] For further information about the RiceFlow model see appendix H. In this scenario, tariffs on rice from Cambodia revert to the most-favored-nation status (211 percent for paddy rice, 30 percent for brown rice, and 175 percent for long grain rice). In order to facilitate comparison among countries in the model, quantities are reported in mt of MRE calculated by multiplying raw mt of paddy rice by the milling rate, which in the case of Cambodia is 64 percent.

that year would have been 210,000 mt lower (68,000 fewer mt of long grain white rice and 142,000 fewer mt of aromatic white rice). According to the modeling simulation, the absence of Cambodian exports in the EU market would have been made up for by additional exports from other global suppliers, including the United States. Imports from the United States would have been higher by 3,020 mt (a 5.8 percent increase in total U.S. exports to the EU and 0.1 percent of overall U.S. exports), while imports from the rest of the world would have been 205,000 mt higher (a 9.8 percent increase). The largest portion of these additional exports would have come from India, which in 2013 was the EU’s largest rice import supplier.

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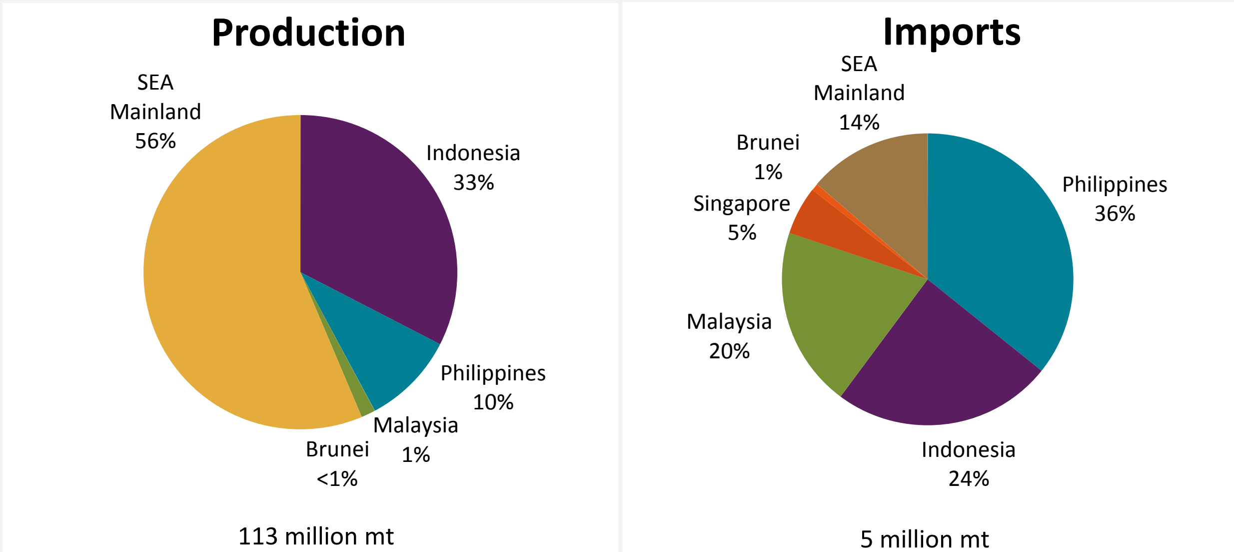
Chapter 9
Southeast Asia Islands

Overview

The Southeast Asia islands are a major rice-producing region. However, they are also a rice-deficit region, and thus must import rice regularly to meet their needs. These islands accounted for about 44 percent of the rice production for the entire Southeast Asia region and for over 86 percent of the region's imports of rice (figure 9.1) during 2007/08–2013/14.[780] The two largest island nations of this group—Indonesia and the Philippines—are leading global rice producers, ranking third and eighth globally during 2013/14. However, these two countries are also Southeast Asia's largest importers, together absorbing about 60 percent of the region's total, although their imports vary widely from year to year.[781] Government policies in both countries focus on achieving food security through rice self-sufficiency and on limiting imports. Both are also subject to volatile weather that affects rice production and import needs. Between 2007/08 and 2013/14, imports supplied between 10 and 20 percent of Philippine rice consumption, and 1 percent to 8 percent of Indonesian consumption.[782]

[780] Southeast Asia's islands include Brunei Darussalam (Brunei), the Philippines, Indonesia, Singapore, and, for purposes of this report, Malaysia. Data are based on marketing year unless otherwise indicated. USDA, PSD Online (accessed January 26, 2015). See chapter 7 for South East Asian mainland countries.
[781] While Malaysia, Brunei, and Singapore are all heavily dependent on rice imports (nearly 100 percent in the case of Brunei and Singapore, which have little to no production), they are all minor importers in global terms. Malaysia was the largest importer of these three countries, ranking 21st globally in 2013/14. USDA, PSD Online (accessed January 26, 2015).
[782] USDA, PSD Online (accessed December 29, 2014).

Figure 9.1: Production and import shares among the mainland and island nations of Southeast Asia, 2007/08–2013/14



Source: USDA, PSD Online (accessed January 26, 2015).
Notes: Shares based on quantity. Both production and import quantities are based on marketing year. Totals are based on the period averages. Southeast Asia (SEA) mainland includes Cambodia, Burma, Laos, Thailand, and Vietnam. See chapter 8.

Indonesia

Overview

Indonesia ranks third among global rice markets in terms of both production and consumption. As is the case with other Asian markets, rice historically has been the primary staple food in Indonesia and is an important economic driver and cultural symbol. The use of high-yield variety seeds, fertilizers and pesticides, and irrigation has contributed to a long-term increase in the productivity and competitiveness of the Indonesian rice sector.[783] In addition, government policies to control stocks and imports have kept prices above world price levels and enhanced the ability of farmers and millers to provide a reliable supply of rice in recent years. However, the sector faces challenges from rising production costs, the migration of farm labor to other sectors of the economy, a decline in the average farm size, the conversion of agricultural land to other uses, deteriorating and inadequate irrigation infrastructure, and stagnant yield growth. These factors threaten the ability of the Indonesian rice industry to grow enough to meet the goal of self-sufficiency in the future as population continues to expand.

[783] Brennan and Malabayabas, *International Rice Research Institute's Contribution*, 2011, 46.

Production, Consumption, and Trade

Production

Indonesia is consistently the third-largest producer of rice in the world, accounting for about 8 percent of global production during 2007/08–2013/14.[784] Indonesian production was, however, relatively flat during the period, ranging between 35.5 million and 38.3 million metric tons (mt) annually (table 9.1). Production growth has been limited in recent years, primarily by stagnant yields and land constraints.[785] Indonesia mainly produces long grain rice.[786]

Consumption and Ending Stocks

Indonesia is also the world's third-largest consumer of rice, accounting for 8 percent of global consumption during 2007/08–2013/14. In that period, the country's total apparent consumption grew at a relatively consistent rate of about 1 percent annually, driven mainly by population growth (table 9.1).[787] As a result of rising consumption in the face of stagnant production, Indonesia's apparent consumption of rice began to exceed its domestic production in 2009/10. Per capita consumption increased slightly between 2007/08 and 2009/10, but declined through 2013/14.[788]

During 2007/08–2013/14, Indonesia's ending stocks represented about 18 percent of rice use. In 2008/09, ending stocks rose by more than 25 percent from the year prior, as production outpaced consumption. For the rest of the period, ending stocks fluctuated between 5.5 million and 7.4 million mt annually, reflecting shifts in production, consumption, and imports. The Indonesian government manages supplies to ensure food security and maintain minimum prices.[789]

[784] USDA, PSD Online (accessed July 16, 2014). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.
[785] Shean, "Indonesia: Stagnating Rice Production," March 19, 2012.
[786] The major rice varieties in Indonesia, Ciherang and IR-64, are long grain and account for more than half of planted area.
[787] USDA, FAS, *Indonesia: Grain and Feed Annual Report 2014*, April 1, 2014, 12.
[788] Trends in per capita consumption may be affected by factors such as residuals and the different time bases for consumption and population that were used in the calculations.
[789] USDA, FAS, *Indonesia: Grain and Feed Annual Report 2014*, April 1, 2014, 10–11.

Table 9.1: Indonesia: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	4,607	5,607	7,057	6,577	7,131	7,403	6,476
Production (milled) (1,000 mt)	37,000	38,310	36,370	35,500	36,500	36,550	36,300
Area harvested (1,000 ha)	11,900	12,170	12,100	12,075	12,160	12,190	12,100
Yield (rough) (mt/ha)	4.8	4.9	4.7	4.7	4.7	4.7	4.7
Imports (1,000 mt)	350	250	1,150	3,098	1,960	650	1,225
Consumption and residual (1,000 mt)	36,350	37,100	38,000	38,044	38,188	38,127	38,500
Exports (1,000 mt)	0	10	0	0	0	0	0
Ending stocks (1,000 mt)	5,607	7,057	6,577	7,131	7,403	6,476	5,501
Exports-to-production ratio (%)	0	[a]	0	0	0	0	0
Ending stocks-to-use ratio (%)	15	19	17	19	19	17	14
Per capita consumption (kg)	157.4	158.4	160	158.1	156.6	154.4	154.1

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption was calculated using marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.
[a] Less than 0.5 percent.

Trade

Indonesia's rice imports during 2007–13 were erratic, ranging from 1 percent of global imports in 2008–09 to 9 percent in 2011.[790] Imports fell precipitously in 2008, remained low in 2009, ramped up in 2010 and 2011, fell moderately in 2012, and dropped sharply in 2013 (table 9.2), having peaked at 3.1 million mt in 2011.[791] This inconsistency reflects the Indonesian government's efforts to maintain self-sufficiency in rice and to strictly control imports to fill domestic shortfalls (see the "Government Support Programs" section of this chapter). Import volumes thus depend both on domestic production levels and government procurement targets, which fluctuate annually.[792]

[790] For example, in 2013 Indonesia was the world's 17th-largest importer, but was the fourth largest in 2012. USDA, PSD Online (accessed October 15, 2014). Between 2007 and 2013, Indonesia's rice exports were negligible (table 8.1). Indonesia's rice exports are controlled by the government and are limited to surplus supplies. Government official, interview by USITC staff, Jakarta, Indonesia, November 18, 2014. Indonesian rice exports include a small amount of specialty rice, such as organic rice and heirloom varieties. Industry official, interview by USITC staff, Jakarta, Indonesia, November 21, 2014.
[791] Volumes are based on U.S. Department of Agriculture's (USDA) Production Supply and Distribution (PSD) Online data, which account for unofficial trade from neighboring countries that is not included in the GTIS Global Trade Atlas (GTA) database. The 2013 estimated value of rice imports was $340 million, based on USDA PSD volumes and unit values from GTIS.
[792] USDA, FAS, *Indonesia: Grain and Feed Annual Report 2014*, April 1, 2014, 10–11.

Table 9.2: Indonesia: Rice imports (HS 1006), 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Vietnam	1,023	125	21	467	1,778	1,085	171
India	4	0	0	1	4	259	108
Thailand	364	157	221	209	939	315	95
Pakistan	5	1	1	5	14	133	76
Burma	0	0	0	0	1	12	18
United States	1	1	1	2	2	2	3
Taiwan	1	0	0	0	5	0	1
China	1	3	5	4	5	3	1
All other	10	2	1	0	2	1	0
Total (GTA)	1,407	290	250	688	2,750	1,810	473
Total (PSD Online)	2,000	350	250	1,150	3,098	1,960	650
				Value (million $)			
Vietnam	336	47	8	233	946	565	97
India	2	0	1	2	6	122	45
Thailand	122	65	82	109	533	186	62
Pakistan	1	0	0	2	6	52	30
Burma	0	0	0	0	0	5	6
United States	1	2	2	2	2	3	3
Taiwan	0	0	0	0	1	0	0
China	2	7	14	13	15	11	2
All other	4	3	2	1	2	1	0
Total (GTA)	468	124	108	361	1,513	946	246

Source: GTIS, Global Trade Atlas database (accessed August 8, 2014); USDA, PSD Online (accessed August 21, 2014).
Note: The Global Trade Atlas (GTA) database reflects officially reported statistics. USDA included estimated gray-market trade in its calculation of Indonesian imports in PSD Online. PSD Online data is for trade year (TY) exports with TY 2006/2007 equivalent to calendar year 2007. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

The Indonesian National Logistics Agency (BULOG) is the only legal importer of "medium-quality long grain white rice," the most common type consumed.[793] Private importers are permitted to procure premium-quality[794] specialty rice, including glutinous and basmati rice, as well as 100 percent broken rice for manufacturing. Import levels are determined by BULOG based on specific factors related to food security, including stocks and prices. Domestic and world prices are major indicators in determining import timing and levels.[795]

Gray-market imports, such as those from Vietnam, have been a concern in recent years. They are estimated to have ranged between 0 and 67 percent of total official imports between 2007

[793] USDA, FAS, *Indonesia: Food and Agricultural Import Regulations*, October 21, 2014, 26–27. The medium-quality grade permits a maximum of 25 percent broken grains. USDA, FAS, *Indonesia: Grain and Feed Update*, November 28, 2014, 9.
[794] The premium-quality grade allows a maximum of 5 percent broken grains. USDA, FAS, *GOI New Regulations on Rice Exports and Imports*, May 6, 2014, 2.
[795] BULOG, the Ministry of Trade, and the Ministry of Agriculture monitor daily domestic prices in consideration of the need for imports. Government official, interview by USITC staff, Jakarta, Indonesia, November 18, 2014. BULOG considers international prices, usually for Thai and Vietnamese rice, as the reference in negotiating terms for government purchases. Government official, interview by USITC staff, Jakarta, Indonesia, November 14, 2014.

and 2013 (table 9.2).[796] The government recently issued new regulations to more strictly control the distribution of imported rice.[797] Indonesia's primary suppliers during 2007–13 were Vietnam and Thailand, with India and Pakistan becoming significant suppliers in 2012 and 2013. In 2013, a year with relatively low imports, Indonesia imported mainly specialty glutinous rice from Vietnam and Thailand, and broken rice from India and Pakistan.[798] In years with relatively high import levels (from Vietnam and Thailand), purchases consisted mainly of milled rice other than aromatic or glutinous varieties.[799]

Industry Structure

Rice is Indonesian agriculture's major crop. The Indonesian rice industry comprises a large number of small-scale household farms, traders, mills, and distribution outlets, and it is not vertically integrated. In 2013, rice was grown by 54 percent of Indonesian households.[800] The major rice-growing areas are Java (61 percent of total production) and Sumatra (18 percent) (figure 9.2). Indonesian rice farms are relatively small—0.67 hectare (ha) on average in 2013.[801] Irrigated rice-growing farms are smaller, on average, than dryland farms.[802] The majority of farms (84 percent in 2013) are irrigated and grow lowland rice. Most Indonesian rice farmers are organized into one of more than 100,000 regional groups,[803] which provide members with technical and marketing assistance and help them obtain credit and inputs (such as seeds, fertilizers, and pesticides).[804] Farmers sell their paddy rice mainly through private channels (e.g., traders, millers, wholesalers, and retailers), with a small share (generally less than 10 percent) sold to BULOG.

[796] This represents the difference between GTA and PSD Online total imports. Gray-market imports are likely attracted by government import restrictions, coupled with demand for imported rice.
[797] USDA, FAS, *GOI New Regulation on Rice Exports and Imports*, May 6, 2014, 1–3.
[798] Based on disaggregated data from GTIS (accessed December 29, 2014).
[799] Ibid.
[800] BPS, "Hasil Pencacahan Lengkap Sensus Pertanian 2013 [Complete enumeration results, agricultural census 2013]," July 1, 2014, 2–3. Farms are referred to as "household food crop enterprises."
[801] BPS, "Hasil Pencacahan Lengkap Sensus Pertanian 2013 [Complete enumeration results, agricultural census 2013]," July 1, 2014, 3. This represents a slight increase from 2003, when the average farm was 0.56 hectare. The increase resulted from the migration of smaller-scale farmers with less than 0.1 hectare to other sectors of the economy rather than from land consolidation.
[802] OECD, *OECD Review of Agricultural Policies: Indonesia 2012*, 2012, 112. In 2007, irrigated farms on Java averaged 0.36 hectare; farms in other regions averaged 1.35 hectares.
[803] Indonesia consists of more than 17,500 islands, of which 6,000 are inhabited. CIA, The World Factbook: Indonesia, June 22, 2014.
[804] Hadimuliono, "Readiness Agriculture Infrastructure in Indonesia," November 17, 2014, 9.

Figure 9.2: Indonesia: Paddy rice production by province, 2013

Source: BPS, "Food Crops," http://www.bps.go.id/eng/tnmn_pgn.php?kat=3 (March 9, 2015).

The geographic distribution of rice mills is similar to that of rice farms.[805] Most rice mills in Indonesia are privately owned, although BULOG operates 132 rice mills spread throughout Indonesia.[806] Milling rates are relatively low on average (about 63.5 percent), but can be as high as 69 percent for dry paddy rice at efficient mills.[807] Mills mainly market rice through private channels (traders and wholesalers), which account for 90 percent of the rice market, selling smaller amounts to BULOG and directly to retailers.[808]

The milling sector in Indonesia is highly fragmented, with approximately 110,000 rice mills.[809] The bulk of these (about 93,500) are small mills with husker-polishers and a capacity of less than 1 mt per hour. There are also approximately 5,500 “modern” mills with facilities to dry, clean, mill, polish, and sort rice: their capacity is over 2 mt per hour. However, many of these mills are aging and inefficient.[810] New, large mills have entered the sector in recent years, some with a capacity of 30 mt per hour.[811] These mills operate on a business model referred to as “paddy to rice,” whereby they aim to mainly source wet paddy rice directly from farmers, dry and store the paddy rice, and control the processing chain to maximize yields and quality.[812] They can supply all markets but are targeting higher-quality segments, mainly premium branded and packaged rice distributed through modern outlets in urban areas.[813] According to one Indonesian rice miller, a polarization is occurring in the Indonesian milling sector, as small mills continue to enter the market along with the large mills, while medium-sized mills exit.[814] This phenomenon was attributed to the lack of entry barriers for small mills, high overhead for medium-sized mills, and the role of BULOG purchases in local markets.[815]

[805] As of 2010, 56 percent of mills were in Java and 22 percent were in Sumatra. Trijono, “Development of Sustainable Agricultural Mechanization in Indonesia,” October 17–18, 2013, 11.
[806] USITC calculation using USDA, PSD Online (accessed October 2, 2014); government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; industry officials, interviews by USITC staff, Indonesia, November 19–21, 2014.
[807] Government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; industry officials, interviews by USITC staff, Indonesia, November 19–21, 2014.
[808] OECD, *OECD Review of Agricultural Policies: Indonesia 2012*, 2012, 117; industry official, interview by USITC staff, Jakarta, Indonesia, November 19, 2014.
[809] Suryana, “Post-Harvest Loss within the Food Chain,” May 18, 2011, 5.
[810] There was a government policy shift towards small-scale and home-level agricultural industries in the 1990s to stimulate agricultural development. The shift resulted in an increase in small-scale and mobile rice mills, which still predominate today. Damardjati, “Food Processing in Indonesia,” September 1, 1995; Budiharti, “Assessment of Milling Ratio,” November 3–5, 2003, 106.
[811] Industry officials, interviews by USITC staff, Indonesia, November 19–20, 2014.
[812] Industry officials, interviews by USITC staff, Indonesia, November 19–20, 2014. Drying is a key factor affecting quality and yields, and newer, modern mills generally have dryers.
[813] Industry officials, interview by USITC staff, Jakarta, Indonesia, November19, 2014; industry officials, interview by USITC staff, East Java, Indonesia, November 20, 2014.
[814] Industry official, interview by USITC staff, East Java, Indonesia, November 20, 2014.
[815] Industry official, interview by USITC staff, East Java, Indonesia, November 20, 2014. This miller also stated that large mills are not a viable business model, given high capital costs and the fragmentation of paddy rice sources and distribution outlets.

Government Support Programs

The Indonesian government's agricultural policies are generally guided by development goals set forth in the National Long-Term Development Plan (RPJPN 2005–25).[816] This plan is being implemented via medium-term plans, the most recent of which was the National Medium-Term Development Plan (RPJMN 2010–14).[817] Rice self-sufficiency has been a primary focus of recent Indonesian agricultural policy.[818] Rice is the main staple food in Indonesia, a vital cultural symbol, and a major source of employment.[819] Thus the government views support for the rice sector as both an economic and a sociopolitical responsibility.[820] In order to achieve self-sufficiency, the Indonesian government is pursuing policies to increase the competitiveness of the industry, to diversify demand away from a reliance on carbohydrates (including rice), and to increase income levels of farmers. The government also aims to provide rice to lower-income consumers as part of a "twin track strategy."[821]

Government policies for the rice sector include price supports, input subsidies, and import and export controls.[822] Policy measures to facilitate self-sufficiency include (1) increasing the productivity and output of farmers through extension services and input and interest subsidies; and (2) encouraging a shift away from the consumption of rice.[823] Support prices are maintained by BULOG's purchases of paddy rice and milled rice, as well as BULOG's maintenance of stocks and control of imports. Access to capital at below-market rates is mainly through three programs: the Food Security and Energy Credit (KKP_E);[824] the People's Business Credit (KUR);[825] and the Rural Agribusiness Development Program (PUAP).[826] During 2006–10, producer support for rice, as measured by the Organisation for Economic Co-operation and

[816] Government of Indonesia, *Indonesia's Structural Reform Policies*, August 10–12, 2011, 4.
[817] Ibid.
[818] Government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; Sudaryanto, "The Frame of Agricultural Policy," 6 (accessed September 17, 2014).
[819] Natawidjaja and Rum, "Food Security Situation and Policy in Indonesia," June 26–27, 2013, 3.
[820] Natawidjaja and Rum, "Rice Self-Sufficiency," June 4–5, 2013, 1; OECD, *OECD Review of Agricultural Policies: Indonesia 2012*, 2012, 15–16; Natawidjaja and Rum, "Food Security Situation and Policy in Indonesia," June 26–27, 2013, 5.
[821] Government of Indonesia, MOA, FSA, "Agency for Food Security at a Glance," 2013, 19. The "twin track strategy" refers to the policy of considering consumers as well as producers when developing and administering policies.
[822] Indonesia has identified to the World Trade Organization (WTO) Committee on Agriculture (COA) certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "Indonesia: Notification of Domestic Support," April 9, 2013, table DS:2.
[823] Government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; industry observer, interview by USITC staff, Bogor, Indonesia, November 18, 2014.
[824] For more information, see Bank BJB, "bjb KKPE," 2014, http://www.bankbjb.co.id/en/4/117/155/259/bjb-KKPE.html (accessed January 3, 2014).
[825] For more information, see TNP2K, "Credit for Businesses Program (KUR)" (accessed January 3, 2015).
[826] Government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; OECD, *OECD Review of Agricultural Policies: Indonesia 2012*, 2012, 162.

Development (OECD), fluctuated widely, reaching a low of −40 percent in 2008 and a high of 30 percent in 2010.[827]

In addition, the government is attempting to expand agricultural land area by opening new land, minimizing the conversion of agricultural land to urban uses, optimizing the management of existing land and water resources, and increasing mechanization.[828] The self-sufficiency production target for 2014 was 75.7 million mt of paddy rice, with a goal of a 10 million mt rice surplus.[829] Finally, the government provides rice for purchase at below-market prices for low-income households under the Raskin program administered by BULOG.[830] The domestic market is insulated from the international market for rice, and the government's rice policies have resulted in higher and more stable domestic prices than international prices.[831] Major Indonesian rice policies are presented in table 9.3.

Factors Affecting Competitiveness

Indonesia does not seek to be an exporter in the global rice market; rather, it is trying to achieve domestic self-sufficiency. Indonesia's climate provides a competitive advantage by enabling an extended growing season with most farmers able to produce two rice crops per year. The competitiveness of Indonesia's rice sector has been enhanced by the use of high-yield variety seeds, fertilizers and pesticides, and irrigation, which have contributed to a long-term growth in yields. New private investment in large, modern mills is also improving the competitiveness of Indonesia's rice sector. In addition, a depreciating currency makes domestic rice less expensive than imports.[832] However, the growth in yields has leveled off in recent

[827] OECD, *OECD Review of Agricultural Policies: Indonesia 2012*, 2012, 201. Based on "single commodity transfers. " This measure represents the value of transfers from consumers to producers as a share of gross farm receipts. Negative values, which were recorded in 2008 and 2009, resulted from policies that insulated the domestic market from unusually high world rice prices those years.
[828] Government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014.
[829] Government of Indonesia, MOA, FSA, "Rice Self-Sufficiency in Indonesia," June 4–5, 2013, 11.
[830] For detailed information on the Raskin program, see TNP2K, "Raskin—Subsidised Rice for the Poor Programme" (accessed January 3, 2015).
[831] Natawidjaja and Rum, "Food Security Situation and Policy in Indonesia," June 26–27, 2013, 22.
[832] Indonesia's currency depreciated irregularly against the U.S dollar during 2007–13, moving from about 9,141/$ in 2007 to 10,461/$ in 2013. IMF, IFS database: Exchange Rate Query (accessed October 21, 2014).

Table 9.3: Indonesia: Rice sector policies

Policy	Comments
Price stabilization and food security	BULOG is responsible for maintaining domestic stocks equivalent to 3–6 months of domestic demand. BULOG generally buys paddy rice and milled rice during the peak seasons and sells during off-season periods when prices rise.
Fertilizer	Fertilizer is provided at below-market prices to farmers with less than 2 hectares of land. Under the program, state-owned fertilizer companies are required to sell certain fertilizers at set prices to eligible farmers. Direct fertilizer aid is provided to some smallholders in field trials and to organic farmers.
Seed	The government provides assistance for seeds under three programs: (1) payments to two state-owned seed companies in order to lower seed prices to farmers; (2) the National Seed Reserve (CBN), which provides free certified seeds to farmers who are in demonstration projects or are affected by national disasters; and (3) the Direct Superior Seed Aid (BLBU) program, which provides free seeds to qualified farmers.
Credit	The government provides credit at below-market rates through the KKP_E, KUR, and PUAP programs. The KKP_E provides loan rates of 6 percent for rice farmers; the KUR guarantees up to 70 percent of market-rate loans; and the PUAP provides capital through farmers' groups (gapoktan), which are given grants by the government.
Disaster assistance	The government provides disaster assistance to farmers affected by pests, disease, drought, or flood through the Puso Rice Alleviation Aid program (BP3). BP3 funding totaled about $27 million in 2011.
Consumer policy	BULOG provides rice at below-market prices to poor households under the Raskin program. The program is scheduled to provide 2.795 million mt of rice to 15.6 million households in 2013/14.
Exports	Rice can be exported only when there is a surplus. Exports of medium-quality rice are restricted to BULOG. Private exporters may export premium rice after obtaining an export license from the Ministry of Agriculture.
Imports	Imports of medium-quality rice are restricted to BULOG. Private importers may import high-quality, specialty, and 100 percent broken rice under permit. Indonesia's applied most-favored-nation (MFN) import duty on rice is 450 rupiahs per kilogram (kg) (approximately $36 per mt), and its bound MFN rate is 160 percent of the rice's value (ad valorem). Indonesia's duty on rice under the Association of Southeast Asian Nations (ASEAN) Trade in Goods Agreement was 25 percent ad valorem as of January 1, 2015.

Source: Sakaya and Pasaribu, "Risk Management in Rice Farming in Indonesia," 2014; USDA, FAS, *Indonesia: Grain and Feed Annual Report 2014*, April 1, 2014, 9–14;USDA, FAS, *Indonesia: Grain and Feed Update*, November 28, 2014, 9–10; OECD, *OECD Review of Agricultural Policies: Indonesia 2012,* 2012; government officials, interviews by USITC staff, Jakarta, Indonesia, November 17–19, 2014; ASEAN, "Annex 2 Tariffs Under the ASEAN Trade in Goods Agreement" (accessed September 17, 2014); WTO, Tariff Download Facility, (accessed September 24, 2014).

years, and relatively high production costs, pressure on land and water resources, post-harvest losses, and variable weather have eroded the sector's competitiveness. Competitiveness has also been limited by an inadequate logistics infrastructure.[833]

Costs of Production Are Relatively High

Indonesian paddy rice production costs are high relative to those of other regional producers, particularly the major exporters (India, Thailand, and Vietnam).[834] According to a recent survey, paddy rice production costs totaled about $294 per mt in 2013 (table 9.4).[835] Land was the largest cost item; rising demand for land for non-agricultural use has increased land values, and many rice farmers have sold their land and rented it back, increasing their costs.[836] Labor was the second most expensive item; competition for labor from non-agricultural activities has pushed up wages, and many farmers have employed hired labor, as they and their families shift to other employment.[837] Fertilizer and other chemical input costs together accounted for 14 percent of total costs; this share likely would have been higher in the absence of the government fertilizer subsidy.[838] Despite relatively high costs, survey participants reported a positive average net income of $631 per ha.[839]

Reportedly, milling costs are also high relative to those for other regional producers and have been rising.[840] Mills that buy wet paddy rice generally calculate costs based on paddy rice prices and a milling rate of 55–56 percent.[841] Millers also report profits that are generally between 100–200 rupiah ($0.01–$0.02) per kg.[842]

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[833] Indonesia's logistics infrastructure lagged other regional rice producers such as Thailand and Malaysia, and was rated fair to poor in most categories (roads, ports, rail, inland water). Alavi et al., *Trusting Trade and the Private Sector*, 2012, 119.
[834] Although high costs potentially place Indonesian rice farmers at a competitive disadvantage, minimum prices and import controls offset the adverse effect of such costs.
[835] DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 3–4, 2014, 20. Converted from Philippine pesos (₱) using an exchange rate of ₱42.446/$. IMF, IFS database: Exchange Rate Query (accessed October 21, 2014). The survey included 100 farm households in West Java, a major rice-producing area.
[836] Government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; industry observer, interview by USITC staff, Bogor, Indonesia, November 18, 2014.
[837] Ibid.
[838] Indonesia has identified to the WTO COA certain agricultural input subsidies that are generally available to low-income or resource-poor producers. WTO, COA, "Indonesia: Notification of Domestic Support," April 9, 2013, table DS:2.
[839] DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 3–4, 2014, 20.
[840] Industry official, interview by USITC staff, East Java, Indonesia, November 20, 2014.
[841] Industry official, interview by USITC staff, Jakarta, Indonesia, November 21, 2014.
[842] Ibid.

Table 9.4: Indonesia: Costs of production of long grain paddy rice, 2013

Input	COP	Share of COP
	$/mt[a]	%
Seed	2.65	[b]
Fertilizer	21.13	7
Other chemical inputs	21.90	7
Labor	98.45	33
Water/irrigation	1.21	[b]
Fuel/electricity[c]	9.75	3
Other variable costs[d]	6.22	2
Total variable costs	161.31	55
Land	117.88	40
Physical capital costs	[e]	[e]
Other fixed costs	15.17	5
Total fixed costs	133.05	45
Total COP	294.36	100

Source: Estimated by USITC staff based on DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 2014; IMF, IFS database: Exchange Rate Query, 2013 (accessed September 24, 2014).

[a] Cost of production (COP) data were converted from Philippine pesos (₱) per hectare, taken from an IRRI/PhilRice study. The conversion factors were 6.67 mt per hectare and ₱42.5 per dollar.

[b] Less than 1 percent.

[c] Includes animal and machine rent, and fuel and oil except those used for irrigation.

[d] Includes interest on operating capital and all other variable costs not listed above.

[e] Not available.

Yield Growth Is Slowing Because of High Input Costs

Growth in yields has slowed in recent years and faces constraints. The principal constraints are the widespread use of non-certified seeds and farmers' reluctance to use hybrid varieties.[843] Although early in the period there was an increase in the use of certified seeds, from 40 percent of total seed use in 2005 to 63 percent in 2010,[844] this share retreated to 42 percent in 2013.[845] Hybrid seed accounts for only a small share of the market, representing about 8 percent of total certified seed demand in 2013.[846] Resistance to the use of certified and hybrid seeds results from their relatively high cost and the common requirement that they be purchased as part of a "package" that includes other inputs and adherence to prescribed agricultural practices.[847] However, higher yields are expected in marketing year 2013/14, resulting, in part, from the wider use of newer high-yield varieties, such as Ciherang.[848] Ciherang seed has a potential yield

[843] Industry official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014. Hybrid varieties can produce yields of up to 10 mt per ha.

[844] OECD, *OECD Review of Agricultural Policies: Indonesia 2012*, 2012, 159.

[845] Susilowati, "Situation on Breeding and Production of Rice," 2014, 8.

[846] Industry official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014. This share is based on seeds provided by state-owned companies.

[847] Industry official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014; industry official, interview by USITC staff, Jakarta, Indonesia, November 21, 2014.

[848] USDA, FAS, *Indonesia: Grain and Feed Annual Report 2014*, April 1, 2014, 9.

as high as 8.5 mt per ha in test plots and is more resistant to pests than previous high-yield varieties.[849] Thus farmers are now switching to this variety from older varieties, such as IR-64.

Pressures Continue on Land and Water Resources

The conversion of agricultural land to non-agricultural uses and the fragmentation of individual farm holdings present challenges to maintaining and modernizing the area of land devoted to rice production (see figure 9.3). This threatens future food security, given rising demand fueled by population growth, and increases costs because of small-scale production. Land conversion has been occurring at a rate of about 100,000 ha annually in recent years, and the average farm size has remained relatively small.[850] To preserve land for growing rice, the Indonesian government has responded with initiatives to diversify production to new areas, accelerate land registration, and improve enforcement of laws regulating land conversion.[851] However, these initiatives have had limited effect to date.[852]

Figure 9.3: Transplanting rice on Indonesian small farm plots in West Java

Source: USITC staff.

[849] USDA, FAS, *Rice and Corn Update*, April 23, 2010, 2–3.
[850] Academic, government, and industry officials, interviews by USITC staff, Indonesia, November 17–21, 2014.
[851] Government officials, interviews by USITC staff, Indonesia, November 17–21, 2014.
[852] Ibid.

Irrigation infrastructure has been deteriorating, depressing yields and eroding the reliability of rice supply.[853] A recent survey revealed that only about 54 percent of Indonesia's irrigation systems are in good condition.[854] The Indonesian government has prioritized the rehabilitation and expansion of irrigation infrastructure, with plans to build 47 new dams and expand irrigable agricultural land by one million hectares, mostly for paddy rice fields.[855]

Post-harvest Losses Reduce Quality and Reliability of Supply

Post-harvest loss is a major concern of the Indonesian rice industry and government, as such losses increase costs, reduce the reliability of supply, and result in lower quality. In 2010, the post-harvest loss was estimated at about 10 percent, with an economic value of $2.16 billion.[856]

The principal source of losses was milling, with a loss of 3.3 percent, followed by drying at 2.7 percent. A major factor in milling loss is the age of the machinery. Another factor is the widespread practice of sun-drying, which results in inconsistent moisture content and increased breakage during milling, leading to poorer-quality rice.[857] The government has recommended expanding the use of field dryers as a measure to lower post-harvest losses; however, this has yet to occur.[858]

Adverse Weather Can Make Supply Less Reliable and Increase Costs

Weather is a significant factor affecting the productivity and competitiveness of the Indonesian rice industry. Rich in water resources, Indonesia has a tropical climate with a dry season from March through August and a wet season from September to March.[859] These seasons define the cycle of Indonesian rice production, with the potential for three harvests annually in many areas. Indonesia is also affected by several major climate cycles that can affect the productivity of rice production.[860] The El Niño cycle has the greatest impact, sometimes delaying the rainy season or causing a full-fledged drought. Both of these can adversely affect production, reliability of supply, and costs. An El Niño episode in 2010 resulted in a production decline of

[853] Vermillion, Lengkong, and Atmanto, "Time for Innovation in Indonesia's Irrigation Sector," 13 (accessed October 20, 2014); USDA, FAS, *Indonesia: Grain and Feed Annual Report 2013*, April 11, 2013, 4.
[854] USDA, FAS, *Indonesia: Grain and Feed Annual Report 2013*, April 11, 2013, 4; government official, interview by USITC staff, Jakarta, Indonesia, November 19, 2014.
[855] Government official, interview by USITC staff, Jakarta, Indonesia, November 19, 2014.
[856] Suryana, "Post-Harvest Lost within the Food Chain," May 18, 2011, 3.
[857] Alavi et al., *Trusting Trade and the Private Sector*, 2012, 102.
[858] Suryana, "Post-Harvest Lost within the Food Chain," May 18, 2011, 7; government official, interview by USITC staff, Jakarta, Indonesia, November 17, 2014.
[859] FAO, Aquastat, "Indonesia," 2014.
[860] USDA, FAS, *Indonesia: Rice Update*, February 2, 2010, 2.

nearly 2 million mt.[861] However, the extensive use of irrigation has helped mitigate El Niño's effects on the timing and amount of water available for paddy rice production.

Given the susceptibility of Indonesia to weather events such as El Niño, the Commission modeled a 5 percent decline in productivity in paddy rice production. This would result in a substantial increase in Indonesian rice imports. Such imports would rise by 111,000 mt (milled-rice-equivalent basis) over a baseline level of 494 thousand mt, or by 22 percent. However, the effect on U.S. and global trade would be negligible.[862]

Philippines

Overview

Rice remains the staple food for most Philippine households, accounting for 45 percent of calories consumed in 2011.[863] Supporting rice production is among the government's top agricultural policy goals, and between 2010/11 and 2013/14, harvested area and production increased every year. But several factors—such as increasing land constraints, rising farm labor costs, and recurring severe-weather events—harmed competitiveness and the sector's progress toward self-sufficiency. To protect its rice farmers from foreign competition, the government imposes quantitative restrictions on imports. However, these restrictions encourage gray-market trading of rice, while poor transportation infrastructure complicates the distribution of available rice supplies. Rice shortages often compel the government to allow more imports of rice, mainly supplied by Vietnam and Thailand.

Production, Consumption, and Trade

Production

During 2007/08–2013/14, the Philippines accounted for about 2 percent of global rice production.[864] Since 2010/11, production has increased about 4 percent annually, mostly because of expanded harvested area (table 9.5). However, Philippine production is variable

[861] Baldwin et al., *Southeast Asia's Rice Surplus*, December 2012, 21.
[862] Commission economic modeling simulation using the RiceFlow model (see appendix H). The increase is equivalent to about 0.3 percent of global trade in 2013. The United States exported less than 1,000 mt of rice to Indonesia that year.
[863] USDA, PSD Online (accessed December 29, 2014); FAO, Food Balance Sheet: Philippines, 2011. In 2014, rice accounted for 25 percent of household spending on food and beverages. EIU ViewsWire, "Philippines Economy: Quick View—Rice Policy Reversal," October 9, 2014.
[864] USDA, PSD Online (accessed December 29, 2014). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.

because of weather events that drive down yields. For instance, during 2009/10–2011/12, yields averaged only 3.6 mt/ha because of multiple typhoons and an abnormally dry period.[865]

Table 9.5: Philippines: Rice production, consumption, stocks, stocks and trade, 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	4,868	4,418	4,673	3,520	2,459	1,509	1,487
Production (milled) (1,000 mt)	10,479	10,755	9,772	10,539	10,710	11,428	11,858
Area harvested (1,000 ha)	4,346	4,528	4,405	4,528	4,579	4,698	4,803
Yield (rough) (mt/ha)	3.8	3.8	3.5	3.7	3.7	3.9	3.9
Imports (1,000 mt)	2,570	2,600	2,200	1,300	1,200	1,400	1,450
Consumption and residual (1,000 mt)	13,499	13,100	13,125	12,900	12,860	12,850	12,850
Exports (1,000 mt)	0	0	0	0	0	0	0
Ending stocks (1,000 mt)	4,418	4,673	3,520	2,459	1,509	1,487	1,900
Exports-to-production ratio (%)	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Ending stocks-to-use ratio (%)	33	36	27	19	12	12	15
Per capita consumption (kg)	151.9	145	142.8	138.1	135.3	132.9	130.6

Sources: USDA, PSD Online, (accessed January 21, 2015); World Bank, Data: Population (January 21, 2015).
Note: Per capita consumption was calculated using marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.
[a] Not applicable.

Over the next two seasons, yields rose to 3.9 mt/ha as better weather returned, with production reaching a record high of 11.9 million mt in 2013/14.[866] Despite generally improved production levels, production consistently fell short of consumption during the period. Domestic production was almost exclusively of long grain rice.

Consumption and Ending Stocks

The Philippines accounted for about 3 percent of global consumption during 2007/08–2013/14. Between 2007/08 and 2011/12, consumption in the Philippines declined just over 1 percent annually, before stabilizing at about 12.9 million mt through 2013/14. During 2007/08–2013/14, per capita consumption declined about 2.5 percent annually to a period low of 130.6 kg in 2013/14.[867]

[865] USDA, FAS, *Philippines: Grain Situation and Outlook*, February 5, 2010, 2; USDA, FAS, *Philippines: Milled Rice PSD Update*, October 27, 2010, 2; USDA, FAS, *Philippines: Grain and Feed Annual*, March 2, 2012, 3.
[866] Government officials have stated that yields have currently plateaued. Government official, interview with USITC staff, November 11, 2014. USDA, FAS, *Philippines: Grain Situation and Outlook*, February 5, 2010, 2; USDA, FAS, *Philippines: Grain and Feed Update*, October 11, 2013, 3–4.
[867] The Philippines' Bureau of Agricultural Statistics (BAS) data reflect lower per capita consumption rates than the PSD Online, although they also show a downward trend in consumption. BAS data, which are obtained from household surveys, show average per capita consumption of 119 kg in 2008–09 and 114 kg in 2012. BAS, CountryStat Philippines database, *Annual Per Capita Consumption of Agricultural Commodities by Socio-Economic Class of Households* (accessed October 6, 2014).

Lower per capita consumption is attributed to rising prices (due to tighter supplies) and reduced incomes in rural areas damaged by typhoons.[868] At the same time, rising urban incomes and more frequent dining out in urban areas also likely reduced consumption of rice.[869]

During 2008/09–2012/13, stocks declined 25 percent per year as the government drew down its rice holdings in an attempt to maintain self-sufficiency and limit imports.[870] However, in 2013/14, ending stocks rose almost 28 percent to 1.9 million mt. This level still represents only 15 percent of domestic use—roughly half the annual levels of 2007/08–2008/09. The government holds stocks through the National Food Authority (NFA).[871]

Trade

During 2007–13, the Philippines was one the world's largest rice importers, accounting for between 3 percent and 9 percent of global imports.[872] During this period, imports fluctuated annually, but trended downward overall, especially in 2011–13 (table 9.6).[873] Philippine import levels largely depend on shifts in domestic production and government policy, driven by a goal of self-sufficiency in rice and other staple crops. As a result, the NFA often acts to restrict trade by limiting import permits. At the same time, because the price and availability of rice is politically important, the government occasionally facilitates large rice imports when domestic supplies are tight or prices are high.[874]

Philippine imports consist mostly of long grain white rice, along with small amounts of aromatic rice from Vietnam and Thailand. Throughout 2007–13, there were unofficial, or gray-market, imports into the Philippines.[875] During 2007–10, quantifiable gray-market imports made up a fairly small share of apparent imports (1 to 12 percent). However, they grew significantly in the

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[868] USDA, FAS, *Philippines: Grain and Feed Annual*, March 2, 2012, 6; USDA, FAS, *Philippines: Grain and Feed Update*, July 16, 2014, 3; USDA, FAS, *Philippines: Grain and Feed Annual*, March 2, 2012, 2, 6; USDA, FAS, *Philippines: Grain and Feed Annual*, February 5, 2010, 2.
[869] World Bank, World Development Indicators database (accessed December 9, 2014); Neilsen, "Filipinos Flock to Fastfood Restaurants," December 18, 2014.
[870] USDA, FAS, *Philippines: Grain and Feed Annual*, March 2, 2012, 13.
[871] The National Food Authority is an agency of the Philippine national government vested with the functions of ensuring the food security of the country and the stability of both the supply and price of rice. It performs these functions through procurement of paddy rice from individual farmers and their organizations, buffer stocking, processing activities, and distribution of rice to various outlets. NFA, "NFA, In Retrospect" (accessed December 10, 2014).
[872] USDA, PSD Online (accessed October 15, 2014).
[873] Volumes are based on USDA PSD Online database, which accounts for quantifiable gray-market (or "unofficial") trade that is not included in GTA data. The 2013 estimated value of rice imports was $390 million, based on USDA PSD volumes and unit values from GTA.
[874] EIU ViewsWire, "Philippines Economy: Quick View—Rice Policy Reversal," October 9, 2014.
[875] Quantifiable gray-market rice imports into the Philippines equal the difference between GTA total imports and PSD Online total imports provided shown in table 9.6.

following years, accounting for between one-third and two-thirds of total apparent imports during 2011–13 (table 9.6). A number of factors created conditions that encouraged imports through gray-market channels, most notably high tariff rates on in-quota and out-of-quota rice

Table 9.6: Philippines: Rice imports (HS 1006), 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Vietnam	1,381	1,662	1,674	1,775	582	823	217
Thailand	405	584	54	445	118	21	165
India	1	1	1	2	2	102	14
Pakistan	18	69	11	151	0	43	0
United States	0	117	0	11	0	0	0
All other	6	5	23	3	7	34	9
Total (GTA)	1,810	2,439	1,763	2,386	710	1,023	405
Total (PSD Online)	1,900	2,500	2,000	2,400	1,200	1,500	1,000
				Value (million $)			
Vietnam	449	1,176	899	1,104	283	319	93
Thailand	137	461	25	282	59	6	51
India	1	1	3	5	5	36	10
Pakistan	6	61	5	99	0	12	0
United States	0	79	0	6	0	0	0
All other	1	4	12	4	8	18	5
Total (GTA)	594	1,782	944	1,499	354	391	158

Source: GTIS, Global Trade Atlas database (accessed August 8, 2014); USDA, PSD Online (accessed August 21, 2014).
Note: The Global Trade Atlas (GTA) database reflects officially reported statistics. USDA includes estimated gray-market trade in its calculation of Philippine imports in PSD Online. PSD Online data is for trade year (TY) exports with TY 2006/2007 equivalent to calendar year 2007. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

imports.[876] In late 2013, the Philippine government announced changes in the Bureau of Customs' procedures in an effort to crack down on unofficial imports and corruption.[877]

Industry Structure

The Philippine rice industry is highly fragmented at all levels. Paddy rice production is fragmented because of the Philippines' archipelago geography and small farm size.[878] Farms average between 1.5 and 2 ha (3.7–5 acres); moreover, the maximum farm size is restricted to

[876] The Philippines reached an agreement with the WTO to retain its quantitative restriction on imports of rice from 1994 to 2005 in exchange for lowering its tariff rates on other agricultural products, as well as increased minimum access for rice imports. *Handbook on Rice Policy for Asia*, 2012, 26–29; government officials, interviews with USITC staff, Manila, Philippines, November 11–12, 2014.
[877] Government of the Philippines, "Reforming the Bureau of Customs," http://www.gov.ph/featured/customs-reform/ (accessed October 15, 2014).
[878] The Philippines consists of more than 7,000 islands, although 11 constitute 94 percent of the country's land mass. CIA, *The World Factbook: Philippines*, June 20, 2014; IRRI, "Mapping Rice in the Philippines—Where" (accessed June 24, 2014).

5 ha (12 acres) by the Philippines Agrarian Reform Law 2010.[879] The supply chain for rice encompasses farmers, input dealers, traders, commission agents (also known as contractors), millers, *viajeros* (who mill on the farm), wholesalers, retailers, and consumers. Certain segments of the industry are vertically integrated, typically among family groups acting as input dealers, traders, and millers.[880]

The Philippines' primary rice ecosystem is irrigated lowlands (68 percent of production in 2013), although there is also rain-fed lowland and upland production.[881] The three main producing regions are Central Luzon (18 percent of total paddy rice production), Cagayan Valley (13 percent), and Western Visayas (11 percent) (figure 9.4).[882] There are wet and dry production seasons, with about 56 percent produced in the wet season spanning July to December.

The country has an estimated 10,000 mills and an overcapacity in milling.[883] In 2013/14, the estimated average milling rate was low relative to many other rice-producing countries at 63 percent.[884] There are numerous older mills in the country that use outdated milling equipment and have low milling rates.[885] In contrast, modern mills have milling rates of 65 percent or more.[886] However, large amounts of paddy rice are delivered to the mills undried ("wet"), and the estimated milling recovery rate for wet paddy rice is only 58 percent.[887]

Government Support Programs

The importance of rice in the Philippine diet makes it politically important; it is the focal point for government policies targeting food security through self-sufficiency. In April 2011, the Philippine government's Department of Agriculture released its Food Staples Self-sufficiency Roadmap, 2011–2016 (FSSR). The FSSR targeted rice self-sufficiency by 2013, to be maintained through 2016.[888] Budget allocations for the FSSR are estimated to be $2.4 billion over the five-

[879] Government official, interview with USITC staff, Manila, Philippines, November 11, 2014; Park et al., "Current Situation and Improvement Strategies," 2012. Most farmers own the land they cultivate. Brennan and Malabayabas, *International Rice Research Institute's Contribution*, 2011, 26.
[880] Alavi et al., *Trusting Trade and the Private Sector*, 2012, 216; government official, interview with USITC staff, Manila, Philippines, November 11, 2014.
[881] BAS, CountryStat Philippines database, Palay and Corn: Ecosystem/Croptype (accessed December 5, 2014).
[882] BAS, CountryStat Philippines database, Palay and Corn: Volume of Production by Region, 2013 (accessed December 5, 2014).
[883] Alavi et al., *Trusting Trade and the Private Sector*, 2012, 220.
[884] USDA, PSD Online (accessed October 2, 2014).
[885] Alavi et al., *Trusting Trade and the Private Sector*, 2012, 215.
[886] Government officials, interviews with USITC staff, Manila, Philippines, November 11–12, 2014.
[887] Alavi et al., *Trusting Trade and the Private Sector*, 2012, 215.
[888] Government of Philippines, "Briefer on the Food Staples Self-Sufficiency Roadmap," April 12, 2011.

Figure 9.4: Philippines: Paddy rice production by region, 2013

Source: Government of the Philippines, Bureau of Agricultural Statistics, “Palay and Corn: Volume of Production by Ecosystem/Croptype,” 2013.
Note: Based on revised data for April–June 2013; latest update January 22, 2015.

year period.[889] The policy's original focus on rice self-sufficiency has been expanded to include other commodities; thus, the revised distribution of staple crops is 85 percent rice, and 10 to 15 percent corn and root crops.[890]

In the FSSR, the Philippine government set goals to raise paddy rice production to 20.04 million mt in 2013 and 22.5 million mt by 2016, primarily by increasing harvest area, along with a slight increase in yields.[891] The area goal was met by 2013, but the tonnage goal was not, because too few hectares were irrigated.[892] The FSSR continues to focus on the use of technology (e.g., irrigation systems, mechanization, improved seeds, and sustainable farming practices), as well as farmer education and extension services.

The NFA serves a pivotal role in implementing the Philippine government's goal of food security through self-sufficiency in rice production. Through various policy mechanisms, the agency promotes domestic rice production, provides rice to low-income consumers at affordable prices, maintains adequate stockpiles in case of disasters or emergencies, and controls rice imports. [893] For example, NFA is required to supply rice to areas of the country experiencing disasters within 48 hours and to restore prices to pre-emergency levels within two weeks. [894]

Implementation of rice policies by NFA is often very inefficient. Notably, some of the economic literature shows that the costs of the NFA rice policies are greater than the beneficial impact on prices for consumers.[895] Legal reforms for the NFA, such as separating its marketing and regulatory functions, are currently being discussed at the highest levels of the Philippine government.[896] But the pertinent government policies—encouraging domestic production, assuring affordable prices for consumers, stockpiling, and import control—are likely to remain intact.

[889] De la Peña, *The Philippine Rice Situation*, January 2012.
[890] Government official, interview by USITC staff, November 11, 2014.
[891] Yields are expected to increase 7 percent based on this scenario. Government of the Philippines, *Food Staples Sufficiency Program*, 2011, 26.
[892] Only 50 percent of irrigable land was irrigated by the end of 2013. Government official, interview with USITC staff, Manila, Philippines, November 11, 2014.
[893] NFA, "NFA, in Retrospect" (accessed December 10, 2014); government officials, interview by USITC staff, Manila, Philippines, November 11–12, 2014.
[894] NFA "NFA, in Retrospect"; government officials, interviews with USITC staff, Manila, Philippines, November 11–12, 2014.
[895] In 2008, economists at the ADB released an analysis of the NFA rice procurement and distribution program. They found that 48 percent of the consumers of NFA rice were non-poor (in urban areas, 68 percent were non-poor). Oryza, "Philippines Mulls Replacing Direct Price Support," July 15, 2014; Jha and Mehta, "Effectiveness of Public Spending," December 2008, 20.
[896] Government official, interview with USITC staff, November 12, 2014. The Governance Act of the Philippines (10149) promotes fiscal discipline in government-owned or -controlled entities and has proposed to separate the marketing and regulatory functions of the NFA. While the Governance Act has indeed been passed, it has apparently not been implemented. In addition, there are congressional representatives proposing other legislation to keep the NFA functions together.

To encourage Philippine rice production, the NFA seeks to influence prices at the farm level; producers who sell their paddy rice to the NFA currently receive a payment to cover production costs totaling ₱17.00–₱17.70/kg ($0.40–$0.42/kg).[897] In practice, few farmers sell to the NFA because traders reportedly pay farmers higher prices for paddy rice.[898] In 2013, NFA procured only about 2 percent of total paddy rice production in 2013.[899]

NFA is also required to make rice available to consumers at affordable prices, and it does this in two ways: providing rice to low-income segments of the population at below-market prices, and price interventions at the consumer level. NFA licenses retailers, which are then permitted to sell rice at a below-market rate of ₱27 per kg ($0.64/kg) for regular milled rice (25 percent broken content) and ₱32 ($0.75/kg) for well-milled rice (15 percent broken content).[900] Sales of rice from NFA stocks typically accounted for between 10 to 17 percent of domestic consumption annually during 2000–09.[901] Because farmers are reluctant to sell to the NFA, the agency supplements rice procured from farmers with imports to meet its obligations to poor consumers.[902] Government officials report that in practice, NFA prices for rice are available to consumers at all income levels, not just the poor. The Philippine marketing system does not have a fail-safe means of targeting sales only to low-income households.[903]

In order to carry out its procurement and distribution responsibilities, the NFA is required to hold three types of buffer stocks: the Strategic Rice Reserve (SRR), the Government Rice Buffer Stock (GRBS), and the ASEAN Plus Three Emergency Rice Reserve (APTERR). The law establishing the SRR requires NFA to have a minimum of 15 days' worth of national level rice consumption. The requirements for the GRBS, which includes the SRR, are 30 days of national-level rice consumption. The Philippines also pledges 12,000 mt of rice stocks for the APTERR reserves for use by any ASEAN countries.[904]

The Philippine government also controls rice imports with the goal of influencing domestic prices and encouraging local production. Under its accession agreement to the WTO, the

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[897] Exchange rate for 2013, $1 = ₱42.446. IMF, IFS database: Exchange Rate Query (accessed September 24, 2014); NFA, "Procurement" (accessed December 5, 2014). The base price for paddy rice is ₱17.00/kg, but NFA provides up to ₱0.70/kg ($0.02 per kg) in incentives to farmers who (1) belong to a cooperative, and/or (2) bring dried rice to the NFA, and/or (3) deliver rice directly to NFA warehouses. This purchase price has been in effect since February 1, 2009.

[898] Industry observer, interview by USITC staff, Manila, Philippines, November 12, 2014. A government official also reported that the farm gate price for paddy rice is ₱22–₱25/kg ($0.52–$0.59); government official, interview with USITC staff, Manila, Philippines, November 12, 2014.

[899] Government officials, interview by USITC staff, Manila, Philippines, November 12, 1014.

[900] These rates went into effect in 2009 and, as of December 2014, remained unchanged. NFA, "Summary of Existing NFA Prices," 2014.

[901] De la Peña, *The Philippine Rice Situation*, January 2012, 8.

[902] Government official, interview by USITC staff, Manila, Philippines, November 12, 2014.

[903] Ibid.

[904] Total stocks pledged for APTERR from all countries are 787,000 mt.

Philippines negotiated a quantitative restriction on imports of rice from 1994 to 2005 in exchange for lowering tariff rates on other agricultural products. The quantitative restriction was extended in 2005 and again in 2014. The current agreement extends the quantitative restriction through June 2017, and in return, the Philippine government agreed to increase its minimum market access (MMA) for imported rice from 350,000 mt to 805,000 mt per year. The import tariff rate for MMA rice stands at 35 percent, while rice outside the minimum access volume faces a 50 percent import duty.[905]

Commission economic modeling simulations estimate that the removal of the entire MMA would have resulted in a decrease in Philippine long grain paddy rice production of 746,000 mt MRE (7 percent) in 2013. Philippine net imports of long grain rice would have increased by 912,000 mt (116 percent); of aromatic rice, by less than 1,000 mt (8 percent). The United States would have increased its net exports of long grain rice to the Philippines by 9,900 mt, while the rest of the world would have increased net exports of long grain and aromatic rice to the country by 913,000 mt.[906]

Factors Affecting Competitiveness

The government does not aspire for the Philippines to be a rice exporter in global markets; instead, the goal is to achieve and maintain domestic self-sufficiency. Multiple government policies are aimed at attaining this goal by expanding the local rice supply and discouraging demand. A well-developed seed supply chain (covering both research and commercialization) serves as a reliable and affordable source of modern seeds for farmers. However, the rice industry still faces many challenges. The current marketing system incentivizes farmers and millers to focus on quantity rather than quality, and the limited availability of arable land makes it difficult to expand acreage for growing rice. Weather events routinely lower production levels, lessening the reliability of supply. Investments in new and updated irrigation systems for the rice industry continue, but any gains are offset by the deterioration of existing systems. Rice-growing areas also lack good roads, raising transportation costs and hindering the distribution of rice throughout the supply chain.

High Labor Costs Raise the Cost of Production

The total cost of paddy rice production in the Philippines is $262 per mt (table 9.7). Compared to other countries in Asia, the Philippines' high labor costs are somewhat offset by relatively

[905] Tobias et al., *Handbook on Rice Policy for Asia*, 2012, 26–29; government official, interview with USITC staff, Manila, Philippines, November 11, 2014.
[906] Commission economic modeling simulation using the RiceFlow model (see appendix H).

Table 9.7: Philippines: Cost of production of long grain paddy rice, 2012/13

Input	COP	Share of COP
	$/mt[a]	%
Seed	12.94	5
Fertilizer	31.09	12
Chemical inputs	9.00	3
Labor[b]	120.96	46
Other operational[c]	36.20	14
Total variable costs	210.19	80
Land[d]	36.13	14
Physical capital[e]	11.66	4
Other fixed costs	3.60	1
Total fixed costs	51.39	20
Total COP	261.58	100

Sources: Bureau of Agricultural Statistics, "Palay and Corn: Updated Average Production Costs," Year, 2012; IMF, IFS database: Exchange Rate Query, (accessed September 24, 2014).

[a] Exchange rate for ₱ to $ is 42.229; costs of production (COP) were converted from $/ha to $/mt by dividing $/ha by the Philippine average yield rate of 3.85 for 2012.

[b] Includes hired labor, labor paid in kind, family labor, and exchange labor, as well as the harvester, thresher, and operator shares of the harvest (in monetary value).

[c] Includes fuel and oil paid in cash, in kind or imputed, transportation costs, irrigation costs in cash or in kind, food expenses, repairs, other costs paid in cash, in kind, or imputed.

[d] Includes land taxes, the landowner's share of harvest, and the rental value of owned land.

[e] Includes rental of farm equipment, lease of farm equipment, depreciation, interest on operating capital, as well as some land expenses.

low seed, power, and pesticide costs.[907] Labor accounts for the largest share (46 percent) of total costs of paddy rice production in 2012/13.[908] Labor cost increases are attributed to an aging farm workforce and urban migration; the urban population represented about one-half of total population in 2013.[909] In the Central Luzon region, mechanical harvesting reportedly has increased over the past two years owing to labor shortages.[910] Fertilizer is the second-largest cost for rice farmers in the Philippines. They reportedly use less fertilizer than neighboring countries, likely because of the high cost of imported fertilizers combined with the country's nutrient-rich soils.[911] In 2012, imports comprised about 84 percent of the total Philippine fertilizer supply.[912]

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[907] DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 2014, slides 10, 13, 14, and 16. The Philippines uses much less pesticide than China, Indonesia, Thailand, and Vietnam. DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 2014, slide 13.

[908] BAS, CountryStat, "Palay and Corn: Updated Average Production Costs, 2014" (accessed December 30, 2014).

[909] Cariño, "Shortage of Farm Labor Seen," July 31, 2014; World Bank, Data: Population (accessed December 30, 2014).

[910] Industry observer, interview with USITC staff, Philippines, November 13, 2014.

[911] Industry observer, interview by USITC staff, Philippines, November 12, 2014. Farmers sampled in the Philippines use 185kg/ha, while Thailand farmers use 138 kg/ha and Vietnam farmers use 212 kg/ha. Fertilizer costs in the Philippines are higher than in Thailand, but lower than in Vietnam. DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 2014, slide 12.

[912] BAS, CountryStat Philippines database, Fertilizer: Supply and Disposition by Year and Item (accessed December 30, 2014).

Vulnerability to Weather Events

Extreme weather events, such as typhoons and droughts, jeopardize the ability of domestic supplies to reliably meet the requirements of Philippine rice consumption. Every year the country experiences about 25 storms, which damage or destroy crops and lower yields.[913] Meanwhile, rainwater for irrigated rice production is threatened by drought. Small canals and irrigation systems in major rice-producing provinces were all reportedly affected by recent dry spells.[914] In addition, local hydroelectric dams may run short of water for generating electricity used in some irrigation, mechanized drying, and milling.[915]

Research and an Efficient Seed Industry Results in Widespread Availability of Modern Varietals

The Philippines is a regional leader in rice research. It is the headquarters for the International Rice Research Institute (IRRI) and hosts other well-respected rice research institutions, including the Philippines Rice Research Institute (PhilRice). Seed varieties are developed for Philippine growing conditions, and local farmers are poised to take advantage of innovations. In addition, the Philippines has developed an efficient seed supply chain that also provides extension services, which results in access to high-quality seeds and lower prices than in neighboring countries (thus lowering delivered costs).[916] Two main varieties used in the Philippines today are IR-64 and PSB rc-18—long grain modern varieties with good potential yields. In addition, the Philippines signed an agreement with IRRI to cooperate in developing high-yielding, pest/disease-resistant, and climate-change-resilient varieties for both inbred and hybrid rice.[917] Such seeds would likely improve the reliability of supply in the Philippines, improving overall competitiveness.

Poor Infrastructure

Infrastructure for rice production is costly and difficult to maintain in the Philippines, partly because the country is an archipelago. Irrigation infrastructure is severely limited, as only half of irrigable land is irrigated, and systems are not maintained for peak efficiency, reducing productivity gains. While the government continually invests in irrigation upgrades, in some years the net change in irrigated land is negative because older irrigation systems are deteriorating more rapidly than new systems are being installed. Between 3 and 5 percent of

[913] Government official, interview with USITC staff, Manila, Philippines, November 12, 2014.
[914] Diaz, "Government Urged to Prepare," May 26, 2014.
[915] Ibid.
[916] DA, PhilRice, and IRRI, "Benchmarking Philippine Rice Economy," September 2014, slide 10. By the 1990s, over 90 percent of the total rice area planted was planted with modern varieties. Brennan and Malabayabas, *International Rice Research Institute's Contribution*, 2011, 29.
[917] Republic of the Philippines, Department of Agriculture, "DA Inks MOA with IRRI," December 7, 2012.

the country's irrigation systems deteriorate annually.[918] The government is looking for ways to improve the reliability of rice production by constructing smaller "impounding" dams to trap excess rainwater and by using deep wells for irrigation.[919]

Philippine road infrastructure is also poor, raising transport costs and slowing the movement of rice throughout the country, particularly during natural disasters and other periods of need.[920] Few analysts believe that total self-sufficiency in rice production is possible in the Philippines because of these infrastructure constraints.[921] However, the government is increasing its spending on infrastructure in an attempt to increase the amount of irrigated land and improve market access for agricultural products.[922]

Philippine Drying and Milling Practices Result in Poor-Quality Rice

Despite widespread adoption of high-yield modern varieties, rice in the Philippines is considered to be low quality. In 2011, the World Bank found that 80 percent of the rice in large retail markets did not comply with grading criteria. Post-harvest losses in the Philippines are high because farmers deliver paddy rice wet or rely on traditional drying methods, such as drying on roads and graves (figure 9.5).[923]

Although many factors can contribute to the quality of rice, a lack of incentives is a widespread obstacle to improvement. Currently, there is little reason to apply post-harvest treatments to improve quality, as many rice purchasers are price sensitive. Paddy rice is commonly delivered for milling with high moisture and debris content because farmers do not receive a premium from the mills for dryer, cleaner output. Similarly, most mills are not focused on improving rice quality because wholesalers and retailers do not pay more for quality. There is a small market for high-quality rice in supermarkets catering to the upper classes, but a large amount of rice is sold with 30–40 percent brokens.[924]

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[918] Government official, interview by USITC staff, Manila, Philippines, November 11, 2014.

[919] Diaz, "Government Urged to Prepare," May 26, 2014.

[920] IRRI, "Why Does the Philippines Import Rice?" (accessed June 19, 2014).

[921] USDA, FAS, *Philippines: Grain and Feed Annual*, March 15, 2013, 6.

[922] Spending on infrastructure in the 2014 budget from the Philippine government totals ₱404.3 billion ($9.4 billion), or 3.1 percent of the country's GDP, up 37 percent from ₱294.7 billion ($6.9 billion) in 2013. Spending on infrastructure targeting farm production totals ₱21.1 billion ($490 million) for irrigation projects and ₱12 billion ($279 million) for paving 1,000 kilometers of farm-to-market roads. Oxford Business Group, "The Road to Self-Sufficiency," 2012, 194; Republic of the Philippines, People's Budget 2014, March 2014, 40.

[923] Alavi et al., *Trusting Trade and the Private Sector*, 2012, 214. Such rice often is unevenly dried, leading to a higher percentage of broken kernels.

[924] Alavi et al., *Trusting Trade and the Private Sector for Food Security in Southeast Asia*, 2012.

Figure 9.5: Rice drying in the sunshine on the side of the road in the Philippines

Source: USITC staff.

The Philippine marketing system for paddy rice after it leaves the field is inefficient compared with major rice exporters in the region, such as Vietnam and Thailand. The result is that wholesale milled prices in the Philippines are far higher than world market prices for 5 percent broken rice.[925] Marketing inefficiencies include a lack of sorting facilities for rice farmers and few packing and storage facilities close to mills and farms.

[925] During 2007–09, the price for 5 percent broken long grain rice from domestic sources in the Philippines averaged 22 percent higher than the world price, but Philippine wholesale 5 percent broken rice was below the world price in 2008 (when world prices spiked in response to trade bans threatened by several exporting countries). Park et al., “Current Situation and Improvement Strategies,” 2012, table 12, 102.

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Chapter 10
South America

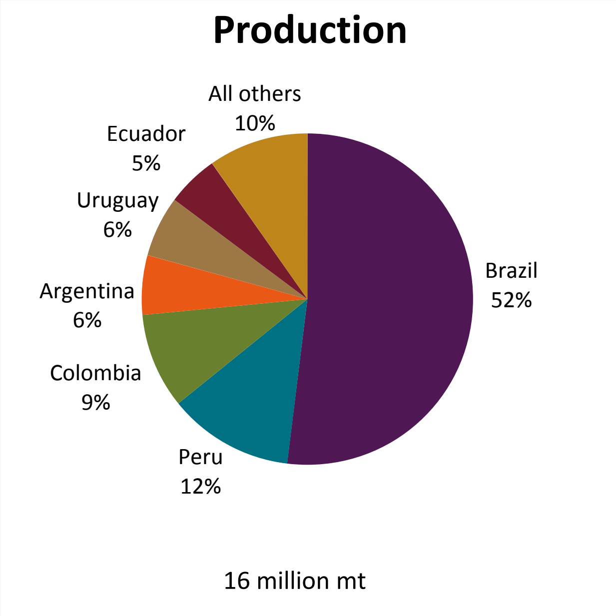
Overview

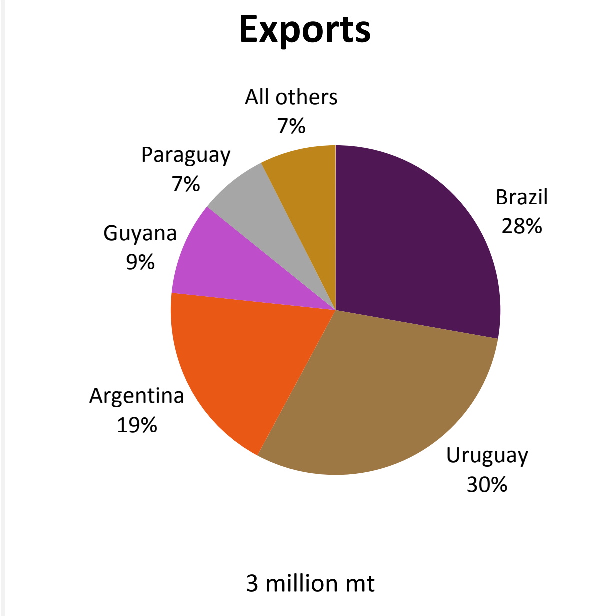
Rice is an important crop in South America, and production and exports from the region have increased in recent years. Between 2007/08 and 2013/14, South America's share of global exports grew slightly, averaging 7.8 percent between 2007/08 and 2009/10, and 8.4 percent between 2011/12 and 2013/14.[926] While several countries in the region produce rice, exports (particularly to countries outside the region) come mostly from Brazil and Uruguay (figure 10.1). The vast majority of rice produced in these two countries is long grain (non-aromatic) rice. Brazil is the region's largest producer, but its share of production is much higher than its share of exports. By contrast, Uruguay matches Brazil's export volumes, despite much lower production, because nearly all of the rice it produces is exported. In recent years, both Brazil and Uruguay have diversified their export markets.

After Brazil and Uruguay, the third-largest exporter is Argentina, but most of its exports are to Brazil; it exports little rice outside the region. Other South American producers, such as Peru and Colombia, grow rice primarily for their domestic markets. Competitive factors affecting rice production and trade in Brazil and Uruguay are the focus of this chapter. While Brazil and Uruguay have both become more competitive in export markets recently, the two countries have very different production systems, policies, and factors affecting their international competitiveness.

[926] USDA, PSD Online (accessed November 18, 2015). South America's share of world rice exports reached a record high of almost 11 percent in 2010/11 due to very high Brazilian production in that year.

Figure 10.1: Production and export shares among South American countries, 2007/08–2013/14





Source: USDA, PSD Online (accessed January 21, 2015).

Note: Shares based on quantity. Both production and export quantities are based on marketing year. Totals are based on the period averages.

Brazil

Since the mid-2000s, Brazil has expanded its export presence throughout Latin America and the Caribbean, and has also increased its exports to West Africa. It has become a more efficient producer, as yields have improved and production has consolidated. However, cost constraints limit Brazil's ability to grow its rice industry more quickly. Factors favoring Brazil's competitiveness include particularly suitable land and climate for growing rice, and the country's ability to compete in the global paddy rice market. These assets are offset by high production costs, partly because of high taxes and poor infrastructure, and competition from other crops.

Production, Consumption, and Trade

Production

In 2013/14, Brazil was the world's ninth-largest rice-producing country and South America's largest. During 2007/08–2013/14, it accounted for about 2 percent of global rice production. Brazilian production mostly ranged between 8 million and 8.5 million metric tons (mt), although it reached 9.3 million mt in 2010/11 (table 10.1). This spike was primarily due to favorable

Table 10.1: Brazil: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	915	636	912	550	803	540	528
Production (milled) (1,000 mt)	8,199	8,570	7,929	9,300	7,888	8,037	8,300
Area harvested (1,000 ha)	2,874	2,909	2,765	2,833	2,427	2,390	2,400
Yield (rough) (mt/ha)	4.2	4.3	4.2	4.8	4.8	5.0	5.1
Imports (1,000 mt)	422	675	688	632	730	641	700
Consumption and residual (1,000 mt)	8,350	8,400	8,477	8,200	7,928	7,850	7,900
Exports (1,000 mt)	550	569	502	1,479	953	840	900
Ending stocks (1,000 mt)	636	912	550	803	540	528	728
Exports-to-production ratio (%)	7	7	6	16	12	10	11
Ending stocks-to-use ratio (%)	7	10	6	8	6	6	8
Per capita consumption (kg)	43.9	43.8	43.8	42.0	40.3	39.5	39.4

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption was calculated using marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

weather caused by a La Niña pattern, which led to higher yields in the main growing regions.[927] Between 2007/08 and 2013/14, Brazil's yields rose by 21 percent to 5.1 mt/ha (a level higher than the global average),[928] part of a long-term trend of improved yields owing to better technology and the consolidation of rice production in the most favorable regions of the country. Brazil mostly produces long grain rice, which is exported in both paddy and milled forms.[929]

Consumption and Ending Stocks

During 2007/08–2013/14, Brazil accounted for about 2 percent of global consumption. In 2013/14, it was the 10th-largest rice consumer globally and the largest outside of Asia. However, total Brazilian consumption declined by almost 1 percent annually between 2007/08 and 2011/12 before stabilizing at about 7.9 million mt annually in 2012/13 and 2013/14. During 2011/12–2013/14, annual per capita consumption was about 40 kilograms (kg), an almost 9 percent drop from the average of 2007/08–2009/10. The drop in Brazilian rice consumption may reflect the substantial growth of incomes during 2007–11,[930] as consumers diversified their diets to include more meat, dairy, and other higher-priced food items.[931]

Brazil's stocks accounted for just over one-half of 1 percent of global stocks during 2007/08–2013/14. In that period Brazil's stock levels ranged between 528,000 mt and 912,000 mt, representing 6–10 percent of total rice use. In years when prices are low, Brazilian government policies allow both public purchases of rice and assistance to private purchasers to guarantee a

[927] USDA, FAS, *Brazil Feed and Grain Annual*, March 16, 2011, 15.
[928] As a result of higher yields, in 2013/14 Brazilian production was 4 percent higher than in 2007/08, despite a 16 percent decline in harvested area.
[929] U.S. government official, telephone interview by USITC staff, December 2, 2014.
[930] World Bank, WDI: GNI per capita (constant 2005 US$) (accessed July 22, 2014).
[931] Valdes et al., "Brazil's Changing Food Demand," 2009.

minimum price. These policies can result in higher stock levels in years when those support programs are active. These policies are described in greater detail in the "Government Support Programs" section below. Some of the rice purchased by the Brazilian government provides public stocks for food security purposes or for government programs such as school lunches.[932]

Trade

Between 2007 and 2013, Brazil transitioned from being a net importer of rice to being a net exporter (table 10.1). During most years between 2007 and 2011, Brazil's rice export volume increased rapidly (table 10.2), although this growth was somewhat erratic.[933] Overall growth in exports was facilitated by lower Brazilian consumption and higher production as yields improved. Brazil became a net exporter in 2011, with record-high exports of 1.4 million mt ($613 million) (table 10.2), because of an especially large harvest that year. While exports declined by 18 percent in both 2012 and 2013 from the previous year as production volumes returned to more typical levels, they remained above their long-term trend. During 2011–13, Brazil accounted for 2 percent of global exports.[934]

During 2007–13, white rice accounted for almost half of Brazilian rice exports.[935] Between 2007 and 2012, over half of these exports were sent to West Africa, though West Africa's share dropped to only 27 percent in 2013.[936] This decrease was largely due to the fact that Brazil shipped more paddy rice that year, and the West African market primarily imports milled rice.[937] As detailed in chapter 11, price competition in the West African market has intensified in recent years, particularly from Asian suppliers, and this has partially displaced rice exports from countries such as the United States and Brazil. During 2007–13, the share of Brazilian exports shipped to individual West African countries (Nigeria, Senegal, Sierra Leone, and Benin) fluctuated greatly. However, over 80 percent of Brazil's white rice exports to the region were parboiled rice and likely ultimately destined for Nigeria.[938] Unlike the rest of the region, Nigeria is a large market for parboiled rice, with substantial gray-market imports since 2012.[939] During

[932] USDA, FAS, *Brazil Grain and Feed Update*, October 11, 2012, 10.
[933] Brazil banned exports from government stocks for a brief period in 2008 (during the global rice price crisis), although this does not seem to have had a major effect on export volumes in that year.
[934] USDA, PSD Online (accessed October 6, 2014).
[935] GTIS, Global Trade Atlas database (accessed October 14, 2014).
[936] Ibid.
[937] USDA, FAS, *Brazil Feed and Grain Annual*, March 21, 2014, 12.
[938] GTIS Global Trade Atlas (accessed October 20, 2014). Brazil also shipped a large but varying amount of 100 percent broken rice to West Africa during 2007–13. This ranged from 38 percent of all of its total rice exports to West Africa in 2012 to 73 percent in both 2007 and 2013.
[939] Trade into Nigeria has been largely indirect (i.e., through gray-market channels, mostly transshipped through Benin) since 2012 due to restrictive import policies.

Table 10.2: Brazil: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
West Africa	126	274	330	334	718	614	318
Senegal	67	84	96	141	119	116	95
Sierra Leone	0	0	0	12	77	99	75
Benin	37	118	110	40	31	85	74
Gambia	22	21	31	73	96	50	70
Nigeria	0	14	81	54	318	222	0
Venezuela	1	47	38	0	66	103	148
Cuba	0	58	2	0	42	116	107
Nicaragua	0	0	0	0	50	47	105
Netherlands	2	9	1	0	31	20	56
Panama	0	18	2	1	4	10	28
All other	72	112	229	94	440	243	155
Total	201	518	602	430	1,351	1,153	918
				Value (million $)			
West Africa	32	152	143	124	327	289	124
Senegal	15	41	26	42	45	41	32
Sierra Leone	0	0	0	4	32	37	26
Benin	12	71	60	21	16	48	41
Gambia	5	9	9	23	38	17	24
Nigeria	0	13	44	29	163	126	0
Venezuela	1	32	16	0	24	36	53
Cuba	0	48	1	0	23	65	65
Nicaragua	0	0	0	0	14	15	37
Netherlands	1	2	0	0	12	8	22
Panama	0	9	1	1	2	6	17
All other	20	69	105	38	211	128	83
Total	53	312	268	163	613	546	401

Source: GTIS, Global Trade Atlas database (accessed August 7, 2014).
Note: HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

2007–13, other significant and growing markets for Brazilian white rice were Cuba, Panama, Bolivia, and Peru. Venezuela was also a large, albeit sporadic, market. Venezuela is a particularly important market for Brazilian paddy rice.

Brazilian exports of paddy rice began to expand starting in 2008, although they accounted for only 3 percent of exports that year. Between 2007 and 2013, paddy rice exports grew an average 262 percent annually and accounted for about one-quarter of Brazil's rice exports in 2013. Virtually all Brazilian paddy rice exports were to Central and South America (Venezuela, Nicaragua, Costa Rica, and Guatemala), where they competed directly with U.S. paddy rice, as further discussed below and in chapter 11. Part of the reason Brazil has been able to expand its paddy rice exports so quickly is because paddy rice shipments from the United States to Central American markets have declined due to perceived quality problems with U.S. rice (especially the 2010/11 crop; see chapter 5). In May 2014, Mexico, a leading paddy rice market of the United States, approved paddy rice imports from Brazil. While Brazilian exports to Mexico between May and December 2014 were limited to a single, small shipment, these exports could pose future competition to U.S. rice in the Mexican market.[940]

Industry Structure

During the 1990s and 2000s, Brazil's rice industry consolidated in the most profitable growing regions (generally located in southern Brazil), which greatly improved productivity. Between 1991 and 2011, production rose 42 percent, while land area devoted to rice fell 34 percent.[941] Despite this dramatic improvement in yields, they are still much lower than in Uruguay, at around 5.1 mt per ha, compared to 8.1 in Uruguay in 2013. Nonetheless, Brazil's yields are above the world average of 4.3 mt per ha, and better than those in all of the Southeast Asian rice-producing countries except Vietnam.[942]

About 80 percent of production is in the southern part of the country, which is the area growing rice most competitively and on a commercial scale. Production in the northern regions, by contrast, is largely subsistence farming.[943] There is also some rice production in the Center-West. As corn and soybean production has expanded in that region, it has become common practice to plant rice there as a first crop, to prepare the soil for the other crops.[944] In some cases, this has replaced the traditional double-cropping system in which corn was planted after soybeans. The favorable climate in Brazil allows for this system of double-cropping.[945]

Production in the southern states of Brazil, where rice is an important crop, benefits from large-scale operations, mechanization, and reliable access to irrigation. In this region, most farmers belong to cooperatives.[946] The biggest rice-producing state is Rio Grande do Sul, which accounts for well over 60 percent of production. Farms in this state are highly mechanized and usually over 200 ha in size. The second largest, Santa Catarina, accounts for 8 to 9 percent (figure 10.2). Rice farms in Santa Catarina tend to be smaller than in Rio Grande do Sul, but larger and more efficient than those in other areas of Brazil. Rice is rotated with pasture for grazing in these states, which preserves soil quality.

Most farms in the main growing regions of the country are irrigated. Irrigated rice fields make up 50 percent of Brazil's total rice-growing area, but close to 80 percent of production.[947] Some

[940] GTIS, Global Trade Atlas database (accessed January 13, 2015).
[941] GRiSP, *Rice Almanac*, 2013, 159.
[942] USDA, PSD online (accessed June 10, 2014).
[943] GRiSP, *Rice Almanac*, 2013, 160.
[944] U.S. government official, telephone interview by USITC staff, December 2, 2014.
[945] USITC, *Brazil: Competitive Factors*, 2012, 4-4.
[946] U.S. government official, telephone interview by USITC staff, December 2, 2014.
[947] GRiSP, *Rice Almanac*, 2013, 159.

Figure 10.2: Brazil: Paddy rice production by state, 2013/14

Source: CONAB, "Acomp, Safra Bras. Grãos, v. 2" [Monitoring of Brazilian grain harvest, v. 2], December 2014, 49.

rice growers in Brazil have struggled with weed infestations in recent years. For example, a weed called "red rice" is prevalent in the main commercial growing areas, and it is difficult to combat because it is genetically similar to the rice crop. In 2011, a hybrid rice variety was developed to help resist red rice.

The milling industry in Brazil consists of mills of many sizes, spread throughout the growing areas. Many mills in the southern states are owned by cooperatives and tend to be modern, with competitive conversion rates, while mills in the northern regions tend to be less competitive. Nationwide, the average mill conversion rate is a relatively efficient 68 percent.[948] On this measure, Brazil outperforms South Asian and Southeast Asian rice-producing countries, as mills in other in those countries have average conversion rates between 62 and 67 percent. Brazil does not have the same historical ties to small, village rice mills that limit the efficiency of the milling sector in many Asian rice-producing countries.[949] Rice mills in Santa Catarina formed a union in 2008 to help promote exports. The mills in that state specialize in producing parboiled rice for export, much of it to Africa.[950]

Government Support Programs

Government price support programs for rice in Brazil are administered by the National Food Supply Company (CONAB) and are aimed at providing a minimum guaranteed price, aiding less competitive growing regions in getting their product to market, and shifting supply from surplus to deficit areas.[951] During 2007–13, the Brazilian government used various policies to ensure that producers received such minimum support prices (MSPs). The most notable of these is the Premium for Product Flow (also called PEP for its Portuguese acronym) program described below, which is intended to help producers sell rice outside the state where it was grown. Brazil has sought to reduce its reliance on direct government purchases, preferring instead to use benefit programs such as the PEP. In most of the period, government support programs played a minor role. However, in years when world prices are very low, government programs can make an important contribution to Brazilian producers' competitiveness. For instance, in 2010, about 22 percent of rice production was sold through a government support program, with about half of that share sold through the PEP program. In the other years between 2008 and 2013, however, government support programs covered 1 percent or less of Brazilian rice production.[952]

Under the PEP program, the government provides a payment to commercial buyers that makes up the difference between the market price and the MSP. The private sector purchasers of the rice must agree to pay the MSP to the producers. The support payment is conditional on moving the product either to regions of the country with short supply or to export markets.[953] The PEP program was active in 2010 and 2011 when prices were very low, and U.S. producers

[948] U.S. government official, telephone interview by USITC staff, December 2, 2014.
[949] GAIN, "In the Spotlight," 25 (accessed February 18, 2015).
[950] Moore, "Brazil Competes," July 28, 2011.
[951] USITC, *Brazil: Competitive Factors*, 2012, 3-29.
[952] USDA, FAS, *Brazil Feed and Grain Annual*, March 21, 2014, 12.
[953] USITC, *Brazil: Competitive Factors*, 2012, 3-30.

alleged that most of the rice covered by the program was exported and not sold domestically.[954] For this reason, the PEP faced substantial opposition from trading partners for providing what some U.S. observers considered a “clear export subsidy.”[955] Prices have since increased to well above the minimum needed to trigger the program, and it has not been used since 2011.

While all of its support programs have seen limited use in recent years due to market prices above the MSP, the Brazilian government maintains a few other programs intended to ensure that producers receive the MSP that are worth noting. For example, the government sometimes buys rice at the MSP, or it may offer public or private option contracts.[956] The government also runs another program similar to the PEP, called PEPRO. The only difference between PEP and PEPRO is that in the latter, the government payment to cover the difference between market price and MSP goes to the producers rather than the buyers.[957] The most recently updated MSPs, in effect through January 2015, range from about $159 to $247 per mt, depending on the quality of the rice and the region in which it was grown. Because part of the aim of the policy is to reduce reliance on the main producing states of Rio Grande do Sul and Santa Catarina, MSPs are generally higher for other states than for those two.[958] By way of comparison, the 2013 Brazilian market price was around $330 per mt.[959]

Factors Affecting Competitiveness

The keys to Brazil’s competiveness are its improving yields, efficient mills, and the fact that it is one of the few countries able to reliably supply paddy rice to the global market. These advantages are tempered by high production costs, especially when compared with Uruguay, and by the competition rice faces from other crops, such as soybeans, which can be grown more profitably. Brazilian rice is of medium quality on the whole (chapter 4), although it is often below average in Brazil’s northern regions, where the use of technology is low.[960] Although Brazilian agricultural products generally face high transportation costs, this is less of a problem for rice than for other crops, because most rice is grown in the areas that have better transportation infrastructure.

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[954] USA Rice Federation, written submission to the USITC, November 25, 2014.
[955] DTB Associates, *Brazil’s PEP Program*, December 17, 2012, 8.
[956] Public option contracts, which are the more common type of option contract for rice, offer producers or cooperatives guaranteed sale of their rice to the government at a predetermined price (MSP plus storage and financial costs) at a future date of their choice. (USA Rice Federation, written submission to the USITC, November 25, 2014.)
[957] USA Rice Federation, written submission to the USITC, November 25, 2014.
[958] FAO, *FAO Rice Market Monitor,* July 2013, 25–26.
[959] FAO, Global Information and Early Warning System (GIEWS) database (accessed December 5, 2014).
[960] U.S. government official, telephone interview by USITC staff, December 2, 2014.

The exchange rate for the Brazilian *real* has fluctuated throughout the period. Since foreign purchases of rice are denominated in U.S. dollars, the exchange rate instability has affected the price of rice exports (and thereby Brazil's competitiveness) variously in different years. For example, when Brazil produced a record-high crop in 2011, the *real* was at its strongest (per U.S. dollar) of any year in the 2007–13 period. The strong *real* hurt Brazilian producers. Brazilian exporters are typically price takers in global markets, where they receive U.S. dollars for their rice, and a strong *real* meant that the U.S. dollars exporters received for their rice were worth fewer *reais* at home.

High Cost of Production

Brazil is a high-cost producer of rice (chapter 4). In 2011/12, production costs were estimated at about $413 per mt (compared with $235 per mt in Uruguay). High costs per metric ton result primarily from the high transportation costs and taxes that are unique to the Brazilian system and raise costs along the supply chain.[961] This is especially true for rice grown outside of the major rice-producing areas. As in most rice-producing countries, the largest cost components in Brazil were fertilizer, fuel, and electricity (table 10.3). Brazil resembles the United States, however, in that labor accounts for a small share of total cost, by contrast with many rice producers in Asia.[962]

The cost of getting rice to market can be high in some parts of Brazil because of poor transportation infrastructure. But the shift of production from the Center-West to the South helped to ease those constraints: producers in the South have easy access to ports and are well served by paved roads to major cities.[963] Even so, Brazilian internal freight costs are among the highest in the world, even over the relatively short distances to ports in the southern region.[964]

An additional factor behind high production costs is the tax system, which includes federal, state, and municipal taxes. On-farm taxes alone made up about 4 percent of the cost of paddy rice production in Brazil, compared with about 2 percent for taxes and insurance in the United States (Arkansas). The Brazilian tax system is said to be complex, imposing "significant administrative burdens and economic costs on agricultural producers and transactions within states."[965] Particularly burdensome for rice producers are the internal taxes imposed on

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[961] USITC, *Brazil: Competitive Factors*, 2012, 4-5.
[962] For those countries, including Burma and India, for which the value of unpaid labor is known. Some countries, including Cambodia, report only the value of hired labor, which is generally much lower. See chapters 5-9.
[963] USITC, *Brazil: Competitive Factors*, 3-8.
[964] U.S. government official, telephone interview by USITC staff, December 2, 2014; USITC, *Brazil: Competitive Factors*, 2012, 4-5.
[965] USITC, Brazil: Competitive Factors, 2012, 3-36.

Table 10.3: Brazil: Cost of production of long grain paddy rice (Rio Grande do Sul) 2013/14

Products	COP	Share of COP
	$/mt	%
Seed	17.33	4
Fertilizer	48.30	12
Chemical inputs	33.54	8
Labor	30.57	7
Fuel and electricity	44.83	11
Taxes (on-farm)	16.91	4
Other operational	98.28	24
Total, variable costs	289.76	70
Land	33.70	8
Physical capital	35.94	9
Other fixed costs	53.65	13
Total, fixed costs	123.29	30
Total COP	413.05	100
Farm to mill freight	25.33	
Total cost to mill	438.38	
Drying	17.33	

Source: IRGA, “Custo de Produção do Arroz Irrigado” [Cost of production for irrigated rice], 2013/14.
Note: Source gives cost of production (COP) in U.S. dollars per ha for Rio Grande do Sul. Cost per mt calculated by USITC staff using yields shown in table 10.1.

transactions within states.[966] This state-level value-added tax is charged at all stages of the supply chain.[967]

Improved Yields

Brazilian rice farming has become more efficient in recent years. As mentioned previously, Brazil’s rice yields have improved rapidly, rising from 4.2 mt/ha in 2007/08 to 5.1 mt/ha in 2013/14. Higher yields are due to a combination of factors, including the effective transfer of new technologies from research to production and the consolidation of rice growing in the efficient, irrigated areas of the south.[968] Brazil has an effective system of agricultural research and development involving collaboration between government entities and universities. A prior USITC study identified the effectiveness of these agricultural research programs as a key positive factor in Brazil’s competitiveness, including in export markets.[969] The rice research program, headed by the Brazilian Agricultural Research Corporation (Embrapa) has resulted in 85 new rice varieties introduced to farmers.[970] An example of recent innovation made available through the program is a hybrid rice variety yielding up to 13 mt per ha (although hybrid

[966] U.S. government official, telephone interview by USITC staff, December 2, 2014.
[967] USITC, *Brazil: Competitive Factors*, 2012, 3-37.
[968] Fischer, “Yield Increase Prospects for Rice to 2050,” July–September 2014; GRiSP, *Rice Almanac*, 2013, 159.
[969] USITC, *Brazil: Competitive Factors*, 2012, 3-26.
[970] Embrapa, “Embrapa Rice and Beans,” http://www.cnpaf.embrapa.br/languages/ricebeans.php (accessed March 5, 2015).

adoption in Brazil remains low).[971] In addition, as mentioned, rice production has consolidated in southern Brazil, where rice production is irrigated and modern, and yields (at around 7 mt per ha[972]) approach those of the United States and Uruguay. Taken together, improvement in seed varieties and technology and the consolidation of rice growing in the most efficient areas have contributed to the higher yields Brazil has achieved in the last several years.

Yield improvement has helped Brazil compete with its lower-cost competitors, such as those in Asia. Brazil's average yields are much higher than those in Burma, Cambodia, India, Pakistan, the Philippines, and Thailand—in some cases, Brazilian farmers produce nearly twice as much rice on an acre of land as do farmers in these competing countries.[973] Because Brazilian producers compete with many of these Asian rice-producing countries in certain export markets, the higher yields have helped Brazilian rice compete even given its high per-acre farming costs. Still, Brazilian yields remain below those in the United States and Uruguay (and slightly below those in Vietnam), which makes it more difficult for Brazil to compete with those countries in terms of cost per mt produced.

Participation in Paddy Rice Market

One of Brazil's advantages in the global market is that it is one of the only countries besides the United States that exports paddy rice. During 2007–13, Brazil expanded its participation in this segment of the market. Because importing paddy rice is attractive to countries that want to mill it themselves, Brazil's ability to ship unmilled rice has opened up new export markets. Many such markets are located in Central and South America, giving Brazil a geographic advantage over Asian suppliers. Roughly one-quarter of Brazil's rice exports were of paddy rice in 2013, up from less than 3 percent in 2008—the year Brazil began to ship paddy rice in notable volumes. Brazilian exports of paddy rice to Central and South American markets began increasing in 2011 and compete directly with U.S. rice in those markets (chapter 11). In 2014, Brazil also attained access for paddy rice exports to Mexico, the United States' top rice market, although only 50 mt of trade was reported through December 2014.

Competition from Other Crops

Increasingly, Brazilian rice production faces competition for land from soybeans, which is often a more profitable crop. Soybeans are also grown in Rio Grande do Sul, and some producers there grow both rice and soybeans as a hedge against swings in the prices and production of both crops. Competition from soybean production was also a major factor in the shift of rice

[971] Coutinho and Chaves, "The Perfect Marriage," July–September 2011.
[972] Ibid.
[973] Brazil's yields are similar to those in Indonesia, but Indonesian yields have remained essentially flat since 2007. The only Asian competitor with similar yields and a similar improvement since 2007 is Vietnam, which improved yields from 5.0 mt/ha in 2007/08 to 5.8 mt/ha in 2013/14.

growing out of the Center-West region of Brazil to the South during the 2000s.[974] Rice production can also be affected by the presence of other crops indirectly. For instance, in Rio Grande do Sul, farmers recently had to use pesticides on their rice crops for the first time, because production practices for corn and soybeans grown in adjacent fields led to higher pest infestations in the rice fields and lowered the population of their natural predators.[975] According to the U.S. Department of Agriculture, the cost of using more inputs such as pesticides could drive some growers out of production, weakening Brazil's competitiveness as a reliable supplier to the world market.[976]

Uruguay

The rice industry in Uruguay is entirely export-oriented, and in recent years the industry has reduced its dependence on the Brazilian market, expanding into the Middle East and Europe. Despite constraints on expanding its rice-producing capacity, Uruguay enjoys a competitive advantage from the high-quality rice it produces and its ability to meet the demands of certain prominent export markets, such as those in Europe. Uruguay's costs of production are also relatively low for the quality of rice it produces, with no government assistance for producers.

Production, Consumption, and Trade

Production

Uruguay is a small producer of rice, accounting for less than one-half of 1 percent of global production during 2007/08–2013/14.[977] In that period, Uruguay produced slightly less than 1 million mt annually (table 10.4). However, Uruguay is a highly efficient rice-producing country: its yields during the period were close to 8 mt/ha, the fourth highest in the world. Uruguay's rice production is geared mostly toward exports of long grain white rice.

Consumption and Ending Stocks

Rice is not a traditional staple of the Uruguayan diet, and the rice industry developed to serve export markets rather than domestic consumers. Uruguay's rice consumption was only 60,000 mt annually during 2007/08–2012/13, and fell to 55,000 mt in 2013/14 (table 10.4). Per capita consumption is not only relatively low, it is declining: between 2007/08 and 2013/14 it fell about 11 percent to 16 kg. Ending stocks throughout the period were very low (the stocks-

[974] GRiSP, *Rice Almanac*, 2013, 160.
[975] USDA FAS, *Brazil Feed and Grain Annual*, March 21, 2014, 11.
[976] Ibid.
[977] USDA, PSD Online (accessed July 16, 2014). Data in the production, consumption, and stock sections are based on marketing year unless otherwise noted.

Table 10.4: Uruguay: Rice production, consumption, stocks, and trade 2007/08–2013/14

Attribute	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Beginning stocks (1,000 mt)	71	164	18	51	175	141	21
Production (milled) (1,000 mt)	931	901	804	1,150	997	952	944
Area harvested (1,000 ha)	168	161	162	196	181	173	167
Yield (rough) (mt/ha)	7.9	8.0	7.1	8.4	7.9	7.9	8.1
Imports (1,000 mt)	0	0	0	0	0	0	0
Consumption and residual (1,000 mt)	60	60	60	60	60	60	55
Exports (1,000mt)	778	987	711	966	971	1,012	890
Ending stocks (1,000 mt)	164	18	51	175	141	21	20
Exports-to-production ratio (%)	84	110	88	84	97	106	94
Ending stocks-to-use ratio (%)	20	2	7	17	14	2	2
Per capita consumption (kg)	18.0	17.9	17.9	17.8	17.7	17.7	16.1

Sources: USDA, PSD Online (accessed January 21, 2015); World Bank, Data: Population (accessed January 21, 2015).
Note: Per capita consumption was calculated using marketing year apparent consumption divided by calendar year population. All other data, including imports and exports, are based on the marketing year.

to-use ratio was only 2 percent in 2013/14) and fluctuated greatly from year to year. Unlike most of the other countries highlighted in this report, Uruguay's ending stocks fell substantially (89 percent) between 2007/08 and 2008/09. Stocks also fell 85 percent between 2011/12 and 2012/13, after a substantial increase in 2010/11. Uruguay does not maintain large stocks for domestic consumption: its stocks tend to build during high production years and ease over the following year or two as they are exported.

Trade

Uruguay does not import rice, as it is not a traditionally consumed staple food, and Uruguay is a surplus producer. During 2007–13, Uruguay contributed about 3 percent of global rice exports.[978] Its rice industry is among the most export dependent in the world, with exports accounting for 93 percent of its production during this period.[979] Although exports fluctuated, there was a slight upward trend: during 2007–09 exports averaged about 852,000 mt annually ($396 million), compared with 972,000 mt ($513 million) in 2011–13 (table 10.5).

Uruguay has diversified its export markets in recent years, reflecting a long-term trend toward reduced reliance on the Brazilian market, which accounted for 95 percent of Uruguayan rice exports in the 1990s and only 13 percent by 2013.[980] Between 2008 and 2013, the leading regions for Uruguayan rice exports were South America (Brazil, Peru, and Venezuela) and the Middle East (Iraq and Iran).[981] Combined exports to the two regions were stable, averaging

[978] USDA, PSD Online (accessed September 17, 2014).
[979] USDA, PSD Online (accessed September 17, 2014).
[980] Embassy of Uruguay, written submission to the USITC, December 8, 2014.
[981] GTIS, GTA database (accessed August 8, 2014).

Table 10.5: Uruguay: Rice exports (HS 1006), 2007–13

Country/region	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Iraq	31	32	256	51	141	219	185
Brazil	368	188	324	371	173	236	174
Peru	71	89	78	91	152	204	149
Iran	69	126	33	63	88	0	75
Venezuela	0	19	0	0	0	76	62
West Africa	57	74	87	91	106	104	61
Sierra Leone	0	0	2	3	7	6	51
Senegal	29	47	27	58	54	59	0
Mexico	1	0	5	1	38	41	48
Belgium and Luxembourg	16	13	19	18	36	33	27
United Kingdom	26	29	37	12	17	27	16
All other	169	175	163	93	179	140	111
Total	809	745	1,003	792	929	1,079	907
				Value (million $)			
Iraq	12	18	122	26	74	121	109
Brazil	126	92	131	182	79	116	91
Peru	29	60	41	52	87	122	92
Iran	25	97	24	33	46	0	45
Venezuela	0	15	0	0	0	34	34
West Africa	18	33	32	32	47	41	22
Sierra Leone	0	0	1	1	3	2	17
Senegal	7	20	9	180	23	22	0
Mexico	0	0	3	1	20	23	28
Belgium and Luxembourg	5	8	7	6	16	15	12
United Kingdom	9	17	18	5	9	14	8
All other	59	104	84	49	94	78	65
Total	284	444	461	387	471	564	505

Source: GTIS, Global Trade Atlas database (accessed August 8, 2014 and February 20, 2015).
Note: HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

about 70 percent of Uruguay's total exports during 2007–13.[982] Exports to South America were primarily white rice, ranging from 87 percent of total exports in 2007 to 69 percent in 2009.[983] In 2012 and 2013, Uruguay exported larger volumes of paddy rice—primarily to Venezuela, where it competed directly with U.S. and Brazilian paddy rice. Exports to the Middle East consist almost entirely of white rice.

Other important markets for Uruguayan rice exports were West Africa (Sierra Leone and Senegal) and the European Union (EU) (Belgium, Luxembourg, and the United Kingdom). Between 2007 and 2012, exports to West Africa (predominantly broken rice) grew by 13 percent annually and accounted for 10 percent of exports. However, in 2013 exports to West Africa fell by 41 percent, and West Africa's share of total Uruguayan exports fell to

[982] GTIS, GTA database (accessed October 16, 2014).
[983] GTIS, GTA database (accessed October 16, 2014).

7 percent.[984] This was perhaps due to the increase in Uruguayan paddy rice exports in that year, as paddy rice is usually not shipped to West African markets. During 2007–08, exports of mostly brown rice to the EU accounted for nearly 20 percent of Uruguay's rice exports, partly reflecting EU restrictions on rice imports from the United States.[985] Between 2009 and 2013, however, exports to the EU fell about 24 percent annually. They accounted for only 5 percent of Uruguay's rice exports by 2013,[986] owing to increased competition from other suppliers to the EU market.

Industry Structure

Rice production in Uruguay is characterized by large, efficient farms and mills. There are only 580 rice farmers on 180,000 ha in the country, resulting in an average rice farm size of 310 hectares (766 acres).[987] This is much larger than the typical size in most other rice-producing countries. Uruguay has 32 rice mills, most of which are large and employ the most advanced technology.[988] About 87 percent of rice production is concentrated in just 5 of the mills.[989]

Most rice farms are located in the eastern part of the country, which has easy access to coastal ports, but some rice is also grown in the northern regions (figure 10.3). About 74 percent of rice-growing land is leased, and the rest is owned by the farmer.[990] Mills are scattered throughout the growing areas.[991]

Rice growing in Uruguay is focused on producing a high-quality crop as efficiently as possible. In addition to the scale advantages that come from the larger farm size in Uruguay, production is highly mechanized and entirely irrigated. The vast majority of the rice grown is long grain, and about 70 percent is a single variety of indica called El Paso 144.[992] The rice is planted under a carefully planned system which minimizes tillage and allows planting in October (mid-spring), which maximizes the sun it gets during the flowering stage and lowers the risk of freezing at key stages.[993] In order to conserve soil fertility, rice is rotated with pasture, in a two-years-rice, three-years-pasture cycle.[994]

[984] Based on quantity. GTIS, GTA database (accessed October 16, 2014).
[985] The EU limited U.S. market access in 2006 because of the detection of genetically modified rice in a shipment. See chapter 11 for additional details.
[986] GTIS, GTA database (accessed October 16, 2014).
[987] Palmer, "Uruguay," July–September 2012.
[988] Farming Uruguay, "Agriculture in Uruguay," (accessed October 21, 2014).
[989] Embassy of Uruguay, written submission to the USITC, December 8, 2014.
[990] Ibid.
[991] Ibid.
[992] Mayer, "U.S. Long Grain Rice Industry," n.d., (accessed July 23, 2014), 3.
[993] Palmer, "Uruguay," July–September 2012.
[994] Ibid.

Figure 10.3: Uruguay: Paddy rice acreage by department

Source: Ricepedia, "Uruguay" (accessed January 5, 2015).
Notes: A department is equivalent to a province. No year was given for acreage data.

All rice production in Uruguay is irrigated, with much of the water coming from rainwater reservoirs or rainwater collection dams.[995] While much of this water is delivered by gravity irrigation systems,[996] electric pumps are sometimes used to get the water to the field, although the cost of electricity is high.[997] Both the cost and availability of water and the cost of electricity

[995] Palmer, "Uruguay," July–September 2012.
[996] Embassy of Uruguay, written submission to the USITC, December 8, 2014.
[997] Durand-Morat, "Rice in the MERCOSUR," May 9, 2014.

drive up total costs of production, while the efficiency of Uruguayan producers helps moderate production costs when measured on a metric ton basis.

Ownership of farms and mills is entirely separate, and Uruguayan growers do not participate in cooperatives.[998] Most farmers belong to the Rice Growers Association, which works closely with the milling association, called the Union of Rice Mills.[999] In this way, farmers have close connections to mills, which are large and relatively few in number. Typically, farmers enter into annual contracts with mills, and the price the mill pays for the rice is established in the contract. Mills provide credit and other inputs to the farmers, and coordinate crop insurance for them as well.[1000] Growers and millers also cooperate to support rice research programs, with farmers paying a 0.4 percent tax to fund private rice research institutes in Uruguay, and millers providing the rest of the funding.[1001]

Factors Affecting Competitiveness

Uruguay produces cost-competitive, high-quality rice. Its cost per metric ton of rice is only a little over half of that in Brazil (table 10.6), and Uruguayan rice has a reputation in export markets for being of very good quality. This is due in part to a favorable industry structure in which mills provide support services for growers as well as access to high-quality inputs and technological innovations. Also, as a small country with a large coastline, Uruguay enjoys easier transportation and port access than many other rice-producing countries. These factors enable the Uruguayan rice industry to increase its presence in export markets without government support. Moderating these advantages are constraints on production growth.

High Quality

Uruguay has a reputation for supplying high-quality, cost-competitive rice that is on a par with that produced in the United States. In fact, some sources regard Uruguayan rice as superior to U.S. rice, because Uruguay typically grows single-variety, non-hybrid rice, which results in less commingling.[1002] From the 1970s onward, the Uruguayan rice industry recognized that such uniformity in their rice crop would be an advantage, and implemented a rice seed certification program to enhance this attribute.[1003] In addition, the collaboration between rice producers

[998] Industry representative, interview by USITC staff, Arlington, VA, July 29, 2014.
[999] Embassy of Uruguay, written submission to the USITC, December 8, 2014.
[1000] Palmer, "Uruguay," July–September 2012; Childs and Baldwin, "Rice Outlook," August 13, 2010, 24.
[1001] Palmer, "Uruguay," July–September 2012.
[1002] Mayer, "U.S. Long Grain Rice Industry," n.d., (accessed July 23, 2014), 3.
[1003] Embassy of Uruguay, written submission to the USITC, December 8, 2014.

Table 10.6: Uruguay: Cost of production of long grain paddy rice (projected), 2014/15

Products	COP	Share of COP
	$/mt	%
Seed	9.06	4
Fertilizer	14.40	6
Chemical inputs	8.78	4
Labor	18.23	8
Repairs/maintenance	13.59	6
Other operational	83.00	35
Total, variable costs	147.06	63
Land	21.52	9
Contracted irrigation	36.91	16
Other fixed costs	29.04	12
Total, fixed costs	87.47	37
Total COP	234.53	100
Farm to mill freight	26.00	
Total cost to mill	260.53	
Drying	13.59	

Source: U.S. government official, correspondence with USITC staff, February 4, 2015.
Note: Source gives cost of production (COP) in U.S. dollars per ha. Cost per mt calculated by USITC using yields shown in table 10.4.

and mills has resulted in research that has improved both yields and quality to among the highest levels in the world.[1004] There has been a concerted effort in the industry to produce better-quality varieties, improve mill performance, and make needed investments "for the purposes of gaining access to more demanding [export] markets."[1005] These efforts have largely paid off, as described in the next section.

Product Well Suited to Certain Export Markets

Uruguayan rice has gained a reputation for high quality in certain key export markets, especially the EU and the Middle East. This reputation enabled Uruguay to reduce its dependence on the Brazilian market during the 2000s.[1006] Uruguay entered the EU market in 2006, the same year that rice from the United States was temporarily banned from that market due to contamination from genetically modified rice.[1007] Uruguay was well poised to take advantage of the opportunity since it grows exclusively long grain, non-genetically modified rice, mostly of high quality—all attributes that are well matched to the demands of the EU market. Uruguay has expanded into Iraq (which was its largest export destination in 2013), Iran, and some countries in West Africa as well. Iraq and West Africa are markets in which the United States also competes.

[1004] Embassy of Uruguay, written submission to the USITC, December 8, 2014.
[1005] Ibid.
[1006] Childs and Baldwin, "Rice Outlook," August 13, 2010, 24.
[1007] Delta Farm Press, "GM Rice Case Reportedly Settled," July 1, 2011.

Part of the success of Uruguayan rice producers is their ability to tailor products to the high-quality segment of the export market. The mills consult extensively with international traders to ensure that the characteristics of their rice conform to market demand, and they work with the farmers to make adjustments when necessary.[1008] This responsiveness reinforces the reputation for quality that Uruguay has built.

The reputation of Uruguayan rice in export markets is likely further strengthened by the fact that mills promote the country-of-origin of their rice, all of which is sold as “Uruguayan.” To reinforce this, mills do not put their own brand on the rice they produce. This serves to simplify the purchase decision for consumers abroad, since they do not need to decide how to choose among different brands of Uruguayan rice. This form of product differentiation provides a helpful marketing strategy for Uruguay, which has a limited supply of rice.[1009]

Constraints on Expanding Capacity

Although able to produce high-quality, competitively-priced rice, there are limits on how far the Uruguayan industry can expand. Yields are already high, very little suitable rice-growing land remains unplanted, and the scarcity of water in Uruguay would limit further plantings even if land were available.[1010] The Uruguayan government reports that land area planted to rice has been stagnant since about 2000 due to these factors.[1011] As a result, Uruguay faces serious obstacles to increasing the scale of production any further without a major technological breakthrough.[1012]

[1008] Palmer, “Uruguay,” *Rice Today*, July–September 2012.
[1009] Ibid.
[1010] Childs and Baldwin, “Rice Outlook,” August 13, 2010, 25.
[1011] Embassy of Uruguay, written submission to the USITC, December 8, 2014.
[1012] Durand-Morat, “Rice in the MERCOSUR,” May 9, 2014.

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Chapter 11
Impact of Foreign Exports on the U.S. Rice Industry

Overview

U.S. rice of all types and forms competes with foreign-produced rice both in the U.S. market and abroad. The United States is a surplus rice producer, supplying the majority of its domestic rice consumption.[1013] In the domestic market, the U.S. rice industry faces little direct competition from imports, since the vast majority are not strictly substitutable for U.S. rice. Most U.S. imports are of aromatic rice, which the United States does not produce in large volumes.

The United States rice industry depends on exports, which account for about half of the U.S. rice crop each year. U.S. exports of long grain rice go mainly to the Western Hemisphere, particularly Mexico and Central America, where they have traditionally faced little competition. The United States is the world's largest exporter of paddy rice, for which most markets are large, are near to the United States, and have shown a preference for milling paddy. U.S. exports of medium grain refined rice are shipped mainly to Japan, but also to Taiwan and South Korea, where trade agreements give U.S. rice guaranteed minimum access.

For U.S. rice, the main competition is in its export markets, not domestically. The United States exports to a large number of markets which generally have been consistent purchasers over time. However, in recent years U.S. exports have shown declining competitiveness and have lost market share in a few key U.S. export markets, mainly for long grain rice (both white and paddy)—particularly during the period 2007–13. Each of these markets has its own competitive dynamics and unique set of competitors. But broadly, the United States' new competition in several traditional markets comes from low-priced Asian suppliers of long grain white rice of increasing quality and South American suppliers of higher-quality paddy and white rice that have a growing exportable surplus.[1014]

[1013] See chapter 5 for a discussion of the U.S. rice industry; trends in U.S. production, consumption, and trade; government support programs; and factors affecting U.S. competitiveness.
[1014] In this chapter, "traditional" U.S. export markets are considered the top U.S. markets during the 13-year period (1994–2006) leading up to the period covered in this report (2007–2013).

Competitiveness of U.S. Rice in the U.S. Market

Competition between U.S. rice and imported rice in the U.S. market is limited because of the nature of U.S. rice imports, which are primarily imported aromatic rice. This is because the vast majority of domestic production is non-aromatic long grain or medium grain rice.

Domestic Production and Consumption

The United States is a surplus rice producer, and U.S. rice consumption is largely supplied by domestic production. U.S. per capita consumption of rice is low, averaging only 12 kilograms (kg) a year during 2011/12–2013/14, compared to 107 kg in China and 77 kg in India (figure 2.7). The reason for this is that rice competes with other carbohydrates in the American diet; higher U.S. incomes relative to other countries allow U.S. consumers to choose from a wide variety of food products. However, Hispanic and Asian American communities in the United States consume more rice than the average, and this market segment is growing rapidly in the United States. Rice consumers in these segments are also more discerning, with established preferences for rice types. For example, Puerto Rican consumers generally prefer medium grain rice, while certain Asian consumers prefer long grain white rice, both aromatic and non-aromatic.

U.S. Imports

U.S. imports of rice have represented a small but growing share of U.S. consumption in recent decades. However, their level remained relatively steady during 2007–13, generally reflecting the lower domestic production (table 11.1). The majority of imported rice—about two-thirds of the total volume in 2013—is of aromatic and long grain white rice. U.S. imports are largely driven by demand for aromatic varieties, primarily jasmine and basmati rice, traditionally imported from Thailand, India, and Pakistan, as well as more recently from Vietnam. U.S. aromatic rice varieties are produced in very small volumes and are not as well established as Asian varieties. Medium grain was the next largest category, although imports declined during the period. Parboiled imports grew, as their quality has become comparable to U.S. supplies at competitive prices.[1015] Imports of brown rice, both basmati and long grain, also rose over this period, likely reflecting the growing U.S. trend toward whole grain consumption.

[1015] Industry representatives, interviews by USITC staff, Little Rock, AR, December 11, 2014; industry representative, telephone interview by USITC staff, November 14, 2014.

Table 11.1: U.S. rice imports, by product, 2007–13 (1,000 mt)

	2007	2008	2009	2010	2011	2012	2013
Aromatic and long grain white	348	369	396	383	419	403	430
Medium grain white	187	116	98	62	57	55	53
Brokens	72	72	86	12	10	47	45
Brown basmati	20	21	32	31	41	42	41
Parboiled long white	7	9	11	7	8	18	24
Organic white[a]	0	0	0	0	21	20	23
White short grain	18	17	19	19	21	16	18
Brown long grain	4	5	4	7	9	7	8
Parboiled medium/short white	5	6	6	10	9	10	7
White mixtures	16	16	8	8	5	4	6
Brown mixtures	2	1	1	2	1	1	2
Brown medium grain	[b]	[b]	1	1	2	2	2
Brown short grain	2	1	1	1	[b]	[b]	[b]
Paddy	[b]	[b]	[b]	[b]	[b]	[b]	[b]
Total	683	633	664	543	603	626	659

Source: USITC, DataWeb/USDOC (accessed October 7, 2014).

[a] Organic white rice did not have its own code in the Harmonized Tariff Schedule of the United States before 2011. Previously, organic white rice would have been included in white long, medium, and short grain categories.

[b] Less than 1,000 metric tons (mt).

Aromatic and Long Grain White Rice Imports

As a category, aromatic and non-aromatic long grain white rice, classified in the U.S. Harmonized Tariff Schedule (HTSUS) as 1006.30.9055, dominates U.S. rice imports.[1016] These imports increased a total of 24 percent by volume during 2007–13. U.S. consumers' growing interest in aromatic rice is a main driver of the trend, evidenced by imports from Thailand, India, and Pakistan. However, imports of long grain white rice (from Vietnam, Uruguay, and Brazil) have also risen.

Domestically, U.S. long grain white rice competes with imported aromatic and long grain white rice in certain key market channels. U.S. long grain white rice is sold mainly through retail grocery stores (including warehouse clubs) and to industrial food processors. Imported aromatic and long grain white rice is also sold through these channels, but aromatic rice is more likely to also be sold through ethnic food distributors. Competition from imports is mainly with aromatic rice in the retail sector and to a lesser extent in food service and restaurants, where there is low but increasing demand for the flavor attributes of aromatic rice.[1017]

[1016] For purposes of this report, white long grain and white aromatic are different types of rice. However, they both fall under HTSUS 1006.30.9055. Before 2011 they were both classified under HTSUS 1006.30.9010.

[1017] Industry representative, telephone interview by USITC staff, August 4, 2014.

U.S. imports of aromatic and long grain white rice in 2012 accounted for roughly one-quarter of total U.S. domestic long grain rice consumption by volume.[1018] Thailand is the largest supplier by far, accounting for 77 percent of total U.S. import volume in this HTSUS category during 2007–13, while India and Pakistan supplied another 14 percent over the same period (table 11.2). Although U.S. trade data do not break out aromatic and long grain white rice imports, data on partner country exports to the United States suggest that, in 2013, nearly all reported U.S. imports under HTSUS 1006.30.9055 from Thailand, India, and Pakistan were aromatic rice.[1019] The high unit values of imports from these countries are also consistent with the higher prices of aromatic rice, particularly from Thailand, often considered the "gold standard" of aromatic rice, owing to its pleasing, nutty aroma and superior taste.[1020]

Imports from several other suppliers increased as well during 2007–13. Starting from virtually no imports in 2007, Vietnamese long grain white rice imports more than doubled during 2009–13, albeit from a very low base. Similarly, imports from Uruguay and Brazil—exclusively non-aromatic long grain white rice—increased notably in 2011 from very low levels. While those imports declined in 2012 and 2013, they remained higher than pre-2011 levels. Uruguay and Brazil appear to have benefited from low relative average unit values ($584/mt and $574/mt in 2011, respectively) in the 2011–13 period. Between 2010 and 2011, Uruguayan and Brazilian unit values fell 18 and 16 percent, respectively, and remained below their respective 2010 values through 2013. Imports from Cambodia, which were nonexistent in 2009, also peaked in 2011 and fell 36 percent by 2013.

In general, imported aromatic rice does not directly compete with U.S. long grain white rice because it is largely a separate market segment: consumers of aromatics are generally willing to pay more for rice that they view as different from and superior to non-aromatic long grain rice.

In this way, aromatic imports serve to expand the consumption market. In some cases, however, purchases of aromatic rice may displace purchases of long grain white rice in the U.S. market, impacting U.S. producers insofar as aromatics win over long grain white rice customers. Further, demand for aromatic rice is increasing rapidly, and some observers feel that U.S. rice producers are missing out on the chance to serve this growing demand.

[1018] Imports of aromatic and long grain white rice in 2012 were 402,957 mt, compared to 1,133,034 mt of domestic long grain white rice shipments (not including U.S. long grain rice in parboiled, instant/precooked, or processed forms). USITC DataWeb/USDOC (accessed November 3, 2014). USA Rice Federation, "U.S. Rice Domestic Usage Report Milling Year 2011/12," 2012.

[1019] Thailand and India reported 356,279 mt and 101,389 mt, respectively, of aromatic long grain exports to the United States in 2013. GTIS, Global Trade Atlas database (accessed November 24, 2014). The sum of these reported exports exceeds the total imports of aromatic and long grain white rice reported by the United States.

[1020] Industry representatives, interviews by USITC staff, various locations, September–December 2014.

Table 11.2: U.S. imports of long grain white rice, by source, 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Thailand	284	301	316	313	310	300	303
India	48	51	45	44	44	65	64
Vietnam	[a]	1	19	8	10	20	43
Pakistan	6	8	4	5	5	3	8
Uruguay	0	[a]	2	1	18	3	3
Italy	4	4	4	4	5	5	3
Brazil	1	1	1	[a]	21	3	2
Cambodia	0	0	0	1	1	1	1
Spain	[a]	[a]	[a]	[a]	[a]	[a]	1
Canada	[a]	[a]	[a]	1	[a]	1	1
All other	4	3	5	6	3	2	2
Total	348	369	396	383	419	403	430
				Value (1,000 $)			
Thailand	170,229	256,231	284,931	321,583	328,147	339,029	361,416
India	38,741	75,917	58,366	52,053	55,243	73,249	83,058
Vietnam	112	550	9,840	5,252	6,921	12,428	23,533
Pakistan	5,698	12,390	5,393	4,537	6,023	4,308	11,959
Uruguay	0	320	1,597	499	10,406	2,027	2,116
Italy	5,819	5,995	5,558	6,079	8,043	6,103	4,168
Brazil	692	469	450	185	12,060	2,035	1,012
Cambodia	0	0	0	428	1,232	1,056	893
Spain	280	295	562	186	200	421	547
Canada	97	155	88	855	385	760	853
All other	2,525	2,821	5,943	7,582	4,656	2,434	3,196
Total	224,191	355,142	372,728	399,238	433,314	443,850	492,752
				Unit values ($/mt)			
Thailand	599	852	902	1,027	1,059	1,130	1,192
India	799	1,477	1,299	1,170	1,254	1,125	1,302
Vietnam	391	813	513	619	665	628	551
Pakistan	905	1,518	1,219	1,004	1,133	1,265	1,451
Uruguay	[b]	847	807	714	584	682	668
Italy	1,414	1,505	1,569	1,473	1,631	1,343	1,399
Brazil	529	714	678	687	574	620	642
Cambodia	[b]	[b]	[b]	680	830	942	937
Spain	981	1,706	1,643	1,631	1,801	968	692
Canada	759	1,090	1,378	853	932	961	1,180
All other	716	1,086	1,176	1,289	1,425	1,452	1,519
Total	643	963	941	1,041	1,035	1,101	1,145

Source: GTIS, Global Trade Atlas database (accessed October 6, 2014).
Note: Long grain white rice appears under HTSUS 1006.30.9055 (1006.30.9010 before 2011).
[a] Less than 1,000 mt.
[b] Not applicable.

Medium Grain White Rice Imports

The United States is not a significant importer of medium grain white rice (HTSUS 1006.30.9065); imports accounted for 11 percent of total U.S. medium grain rice consumption in 2012.[1021] Domestically, U.S. medium grain rice is sold mainly through ethnic food distributors, while other common channels are industrial food processors and retail grocery stores.[1022] U.S. rice competes with imported medium grain rice in these same market segments. However, imports of medium grain rice do not have a significant impact on U.S. medium grain rice producers owing to their low volumes.

Medium grain imports fell significantly during 2007–13 (72 percent by volume) as aggregate import prices rose considerably (table 11.3). High import levels in 2007 and 2008, which were mainly sourced from China, were likely a result of low U.S. medium grain production and attractive Chinese prices. Chinese imports had average unit values (AUVs) of less than $400/mt in 2007 and 2008 before rising to levels well above the AUV for total U.S. imports during the rest of the period.

Thailand has been a more consistent supplier of medium grain white rice to the U.S. market, though its imports dropped 31 percent over 2007–13. Thailand led U.S. import suppliers by a wide margin for most of the period, in 2013 supplying 73 percent of U.S. imports of medium grain white rice. Other notable changes in medium grain imports have been increases from India and Australia in 2013, likely because these two countries offered lower relative prices.

Competitiveness of U.S. Rice in Export Markets

The U.S. rice industry is dependent on export markets, as exports absorb about half of the U.S. rice crop each year. Traditionally, U.S. rice exports have targeted countries in the Western Hemisphere, as well as East Asia, the European Union (EU), and less price-sensitive countries in Africa and the Middle East.[1023] In recent years, the U.S. industry has faced increasing competition in particular markets—West Africa, Mexico, and the Central American region—from Asian suppliers (including Thailand, India, and Vietnam), as well as other Western

[1021] Imports of medium grain white rice in 2012 were 55,132 mt, compared to 480,470 mt of domestic medium grain rice shipments. USITC DataWeb/USDOC (accessed November 3, 2014); USA Rice Federation, "U.S. Rice Domestic Usage Report" (accessed September 12, 2014).
[1022] USA Rice Federation, "U.S. Rice Domestic Usage Report" (accessed September 12, 2014).
[1023] The United States does not typically compete in Southeast Asia, where large rice producers supply domestic needs and international trade is regulated by government policies. Nor does high-quality/high-cost U.S. rice compete in certain large rice-importing countries in Africa and the Middle East because of their price sensitivity.

Table 11.3: U.S. medium grain white rice imports, by source, 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Thailand	56	56	57	55	42	43	39
India	1	1	1	1	3	6	8
Australia	0	0	0	[a]	0	0	2
Vietnam	[a]	[a]	[a]	2	4	2	2
Spain	[a]	[a]	[a]	1	4	2	1
Mexico	1	1	1	1	1	1	1
Italy	1	1	1	[a]	1	1	1
Pakistan	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Turkey	[a]	[a]	[a]	[a]	[a]	[a]	[a]
China	107	54	[a]	[a]	[a]	[a]	[a]
All other	20	3	38	1	1	[a]	[a]
Total	187	116	98	62	57	55	53
				Value (1,000 $)			
Thailand	31,935	46,134	50,506	55,609	43,562	47,792	45,868
India	828	826	1,351	1,597	2,805	4,385	7,567
Australia	0	0	0	111	0	0	1,121
Vietnam	19	4	43	1,188	2,716	1,552	1,330
Spain	57	124	96	934	3,854	1,911	858
Mexico	819	838	738	667	698	769	803
Italy	966	1,368	1,202	865	2,178	1,752	1,139
Pakistan	167	75	31	26	15	3	285
Turkey	35	83	46	60	112	133	149
China	39,037	21,373	300	260	367	189	154
All other	9,091	2,999	32,933	1,343	743	303	224
Total	82,954	73,824	87,247	62,661	57,049	58,788	59,498
				Unit values ($/ mt)			
Thailand	568	819	881	1,005	1,037	1,102	1,186
India	611	1,024	1,366	1,322	894	778	927
Australia	n/a	n/a	n/a	5,202	n/a	n/a	585
Vietnam	455	765	533	633	636	765	767
Spain	1,365	1,975	1,801	892	859	881	935
Mexico	693	1,012	1,244	1,212	1,138	1,254	1,250
Italy	1,628	1,667	1,955	2,011	2,040	2,136	1,986
Pakistan	989	1,257	1,580	1,128	2,746	979	1,417
Turkey	1,658	2,307	2,225	2,378	1,879	1,461	1,626
China	364	395	1,202	1,883	1,386	1,772	1,785
All other	460	910	862	1,162	1,033	1,099	1,068
Total	444	635	889	1,014	1,007	1,066	1,118

Source: GTIS, Global Trade Atlas database (accessed October 10, 2014).
Note: Medium grain white rice appears under HTSUS 1006.30.9065 (1006.30.9020 before 2011).
[a] Less than 1,000 mt.

Hemisphere suppliers (Brazil and Uruguay). This was because these suppliers offered lower prices and, in some cases, improved rice quality.

Beginning in 2013, the price premium that existed for U.S. long grain rice over rice of other origins, mainly from Asia, was a factor affecting competition in U.S. export markets. As indicated in chapter 3, U.S. prices leveled off in 2013 following a slight rising trend beginning the year before; however, 2013 prices for key competitors Thailand and Vietnam dropped markedly. In general, before 2013, higher ocean transportation costs for Asian rice meant that Asian suppliers were not price competitive with the United States in the Western Hemisphere. However, in 2013 Asian rice prices fell far enough that even with transport costs added, the final price was typically lower than that for U.S. long grain rice.[1024]

U.S. Competitiveness Overview by Rice Type

U.S. rice exports include paddy, parboiled, brown, and white rice (table 11.4). U.S. competitiveness in export markets varies significantly by rice form and type. Globally, some U.S. rice producers benefit from their ability to ship types and forms of rice for which there are few international competitors. This is particularly true for medium grain and paddy rice. However, competition for paddy rice is complicated by the fact that in some import markets, buyers have become willing to substitute long grain white rice for paddy rice as prices of long grain rice have fallen. Although the United States exports both long and medium grain paddy rice, medium grain paddy rice exports have made up only a small share of total paddy rice exports in recent years (11 and 16 percent in 2012 and 2013, respectively).[1025]

Table 11.4: U.S. rice exports, by type, 2007–13 (1,000 mt)

	2007	2008	2009	2010	2011	2012	2013
Paddy	1,451	1,801	1,450	1,972	1,377	1,533	1,517
Long grain white (incl. aromatic)	897	772	692	993	717	852	876
Medium grain white	375	588	718	751	860	735	637
Parboiled long white	319	262	220	277	278	258	281
Brown medium grain	178	228	100	175	160	127	196
White short grain	42	38	36	31	35	40	82
Brokens	66	101	73	58	78	45	67
Brown long grain	88	82	99	161	117	117	50
Parboiled medium/short white	32	23	20	16	25	39	17
White mixtures	24	14	15	12	29	13	17
Brown mixtures	10	19	12	13	10	11	9
Brown short grain	7	8	2	4	10	2	3
Brown basmati	1	1	1	1	1	2	2
Total	3,491	3,937	3,439	4,464	3,695	3,775	3,753

Source: USITC DataWeb/USDOC (accessed October 7, 2014).

Of the main types of rice that the United States exports, U.S. medium grain rice faces the least competition owing to limited competition: only Australia, China, and Egypt are significant exporters.[1026] In most markets, long grain and parboiled rice are not considered a substitute for

[1024] GTIS, Global Trade Atlas database (accessed various dates); industry representative, telephone interview by USITC staff, July 31, 2014.
[1025] USDA, FAS, “Export Sales Query System” (accessed November 2, 2014).
[1026] Although Thailand is the leading supplier of U.S. medium grain rice imports, it is not a major competitor of the United States in global markets.

medium grain rice, regardless of price. Californian medium grain rice producers have an additional advantage in that the main medium grain variety grown there, CalRose, is well known and has been popular globally for decades. This variety makes up approximately 80 percent of California medium grain production.[1027] Although medium grain rice grown in Arkansas is generally considered lower quality than that from California, it has been accepted in certain export markets, such as Turkey. According to Arkansas growers, they are aware that the market for their medium grain is small, so they limit its production. Some growers believe that by limiting Arkansas production of medium grain to 20 percent of the state total, they guarantee a market for it.[1028]

U.S. paddy rice exports are encountering increasing competition from white rice exporters. The United States is the world's largest export supplier of paddy rice; few other global rice producers export rice in paddy form. This gives the United States an advantage in shipping paddy rice to markets where people prefer to mill rice themselves, thereby capturing the added value locally. However, in recent years, some U.S. long grain markets that traditionally preferred paddy rice are now buying cheaper white rice from other sources. In Central America particularly, increases in imports of lower-priced white rice from other origins coincided with decreases in imports of U.S. long grain paddy rice.

Of all the U.S. rice types, long grain rice exports face the most competition internationally. Low-priced Asian rice, particularly from India and Vietnam, has gained market share in several traditional U.S. export markets. Owing to the structure of U.S. rice production and its growing regions, producers in the southern growing region are disproportionately affected by this competition. As noted in chapter 5, the majority of U.S. long grain rice is produced in the southern growing region, with 76 percent originating in Arkansas and Louisiana.

U.S. Rice Competitiveness by Market

Mexico has been by far the largest market for U.S. long grain paddy rice for several decades (table 11.5). During the 20-year period between 1994 and 2013, the United States shipped on average 40 percent of its annual paddy rice exports to Mexico. Other important markets for U.S. long grain paddy rice are in Central America, which collectively was the second-largest export destination for U.S. long grain paddy rice in the last two decades. Important U.S. markets for medium grain paddy rice have been Turkey and Libya.

[1027] Industry representatives, interviews by USITC staff, Arlington, VA, July 29, 2014.
[1028] Ibid.

Table 11.5: U.S. paddy rice exports, by market, 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Mexico	738	670	751	732	770	704	710
Venezuela	0	324	44	340	53	226	295
Honduras	94	124	122	111	132	130	103
Libya	0	0	0	18	0	0	100
Turkey	6	62	44	345	73	117	88
El Salvador	89	85	99	76	86	75	69
Guatemala	67	63	57	57	69	66	64
Costa Rica	183	109	110	78	59	85	57
All other	405	383	230	220	152	130	32
Total	1,581	1,819	1,456	1,978	1,393	1,533	1,517
				Value (1,000 $)			
Mexico	202,829	281,338	284,968	256,730	266,085	271,851	297,897
Venezuela	0	174,793	17,094	121,915	17,133	85,062	134,678
Honduras	25,478	52,233	48,552	39,731	41,860	44,903	38,408
Libya	0	0	0	6,900	0	0	40,137
Turkey	1,295	25,806	18,122	141,054	29,475	44,099	36,992
El Salvador	23,030	28,165	32,613	24,467	27,103	25,696	25,482
Guatemala	16,878	23,479	19,111	18,434	20,689	22,355	22,961
Costa Rica	57,618	47,756	40,765	27,699	18,600	30,437	21,482
All other	135,050	196,395	86,410	77,295	54,150	48,028	14,386
Total	462,178	829,964	547,636	714,225	475,094	572,432	632,422

Source: USITC Dataweb/USDOC (accessed October 6, 2014).
Note: HS 1006.10. HS = the international Harmonized Commodity Description and Coding System used for classifying traded goods.

Haiti has been the top export market for U.S. white long grain rice exports for several decades (table 11.6).[1029] Haiti accounted for between 24 and 36 percent of total U.S. long grain rice exports during 2007–13. Iran emerged as a significant new U.S. rice export market in 2013. Other top destinations for white long grain rice since 2007 have been Mexico, Canada, and Ghana.

[1029] Data in this section include both white and brown long grain rice.

Table 11.6: U.S. long grain rice exports, by market, 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Haiti	229	231	256	317	287	353	321
Iran	0	31	0	[a]	0	3	126
Mexico	44	69	60	47	94	88	96
Canada	98	92	92	97	88	80	82
Ghana	86	59	37	93	92	98	69
Colombia	[a]	2	2	6	2	67	65
Iraq	223	30	121	208	41	0	40
Pakistan	0	0	0	8	38	52	26
All other	276	339	226	382	194	230	108
Total	955	854	794	1158	836	972	932
				Value (1,000 $)			
Haiti	91,083	157,686	135,785	158,215	156,945	193,378	192,591
Iran	0	23,869	0	24	0	1,945	77,710
Mexico	19,186	45,067	36,119	26,747	55,291	51,840	60,868
Canada	49,576	62,910	70,532	73,057	64,591	58,239	59,921
Ghana	35,342	31,785	20,696	42,790	53,583	56,027	46,935
Colombia	105	1,144	1,140	3,367	1,266	43,516	46,019
Iraq	87,389	12,340	65,245	104,865	17,626	0	28,829
Pakistan	0	0	0	4,947	17,857	27,113	16,454
All other	123,847	236,475	138,114	190,426	119,040	127,815	74,742
Total	406,528	571,277	467,632	604,438	486,198	559,873	604,070

Source: USITC Dataweb/USDOC (accessed October 6, 2014).
Note: Data include brown (HS 1006.20) and white rice (HS 1006.30).
[a] Less than 1,000 mt.

Japan has been the top export market for U.S. medium grain white rice for virtually all of the last two decades, and in the most recent period (2007–13) received, on average, 35 percent of U.S. medium grain exports annually (table 11.7).[1030] Japan has a global tariff-rate quota (TRQ) for rice imports, and its imports from the United States averaged 49 percent of the total in-quota volume between 2007 and 2013.[1031] South Korea was the second largest market for U.S. medium grain exports for most of 2007–13, and imported rice under its WTO Minimum Market Access (MMA) Agreement during this period.[1032] Other important U.S. medium grain export markets since 2007 were Jordan, Taiwan, and Canada.

[1030] Data in this section include both white and brown medium grain rice.
[1031] The total in-quota volume for Japan's rice TRQ is 682,000 mt annually, with an in-quota tariff rate of zero and an over-quota tariff of ¥341/kg (486 percent in 2013). USDA, FAS, *Japan Grain and Feed Annual 2014*, March 12, 2014, 11–12.
[1032] U.S. access under South Korea's MMA for rice during 2007–13 consisted of a U.S. specific allotment of 50,076 mt and access to a global quota which expanded each year of the period and reached 388,353 mt in 2013. The in-quota tariff was 5 percent, and there was no provision for imports above the quota. However, as of January 1, 2015, South Korean rice imports became subject to tariffs under a TRQ regime. South Korea agreed to continue to import the mandatory import volume of 408,700 metric tons under a global TRQ, with an in-quota tariff of 5 percent and an over-quota tariff of 513 percent. USDA, FAS, *South Korea: Market Access and Domestic Policies for Rice* (accessed March 19, 2015); USDA, FAS, *Korea: Grain and Feed Annual*, January 28, 2015, 11.

Table 11.7: U.S. medium grain rice exports, by market, 2007–13

Country	2007	2008	2009	2010	2011	2012	2013
				Quantity (1,000 mt)			
Japan	216	236	349	300	351	321	265
South Korea	72	107	41	103	161	69	156
Jordan	64	71	81	73	69	98	84
Taiwan	72	27	31	82	21	73	65
Canada	67	67	53	55	56	54	60
Turkey	1	63	[a]	42	24	34	53
Saudi Arabia	0	15	34	15	36	23	26
Israel	12	36	32	47	23	21	20
All other	65	180	199	210	280	171	105
Total	569	802	818	926	1,020	864	834
				Value (1,000 $)			
Japan	118,611	142,471	369,476	218,259	284,912	212,106	171,459
South Korea	42,635	74,590	39,253	72,121	122,717	47,729	108,568
Jordan	37,952	54,885	82,217	61,178	59,114	70,711	60,526
Taiwan	34,849	13,945	23,952	54,360	14,601	45,516	41,215
Canada	34,404	48,697	50,867	45,075	47,002	43,201	44,741
Turkey	983	40,798	156	27,388	15,468	14,511	24,782
Saudi Arabia	0	13,758	38,047	16,246	34,318	16,653	20,642
Israel	7,118	27,090	33,675	44,635	21,470	15,609	14,388
All other	39,804	146,055	195,464	192,884	250,227	141,180	89,718
Total	316,354	562,287	833,106	732,144	849,829	607,215	576,038

Source: USITC DataWeb/USDOC (accessed October 6, 2014).
Note: Data include brown (HS 1006.20) and white rice (HS 1006.30).
[a] Less than 1,000 mt.

Between 1994 and 2013, the United States exported large volumes of rice to a number of traditional markets which have typically imported the same types and forms of U.S. rice over time. However, 2007–08 was a pivotal period in global rice trade. A spike in world rice prices led several major rice-producing and -consuming countries to impose restrictions on production and trade in order to assure supplies and stabilize prices for their own rice consumers. As a result, the dynamics of world trade changed, affecting many exporters—including the United States. This can be seen in U.S. trade with its traditional markets (i.e., its top markets between 1994 and 2006) as well as other large import markets. Top U.S. export markets for rice during 2007–13 are largely the same as those during 1994–2006. However, there are a few notable exceptions. Certain markets—the EU and South Africa—dropped out of the top ranking in the more recent period, while others, such as Venezuela and Iraq, have moved up.[1033]

For purposes of the analysis that follows, U.S. traditional markets are subdivided into three categories (figure 11.1): (1) those where the United States faces competition from major

[1033] The level of U.S. exports to these countries can often be tied more to the prevailing political environment than to market conditions.

Figure 11.1: U.S. competitiveness in rice export markets

	Traditional U.S. markets	Nontraditional U.S. markets	
Declining U.S. competitiveness	**Box A** Mexico Central America European Union Haiti Ghana	**Box B** China Nigeria	U.S. potentially competitive
U.S. competitive, open trade	**Box C** Canada Jordan Saudi Arabia	**Box D** Iran Iraq Venezuela	U.S. occasionally competitive
U.S. competitive, restricted trade	**Box E** Japan South Korea Taiwan	**Box F** Senegal Philippines Malaysia South Africa	U.S. limited competitiveness

Source: USITC staff.

producers,[1034] as indicated by declining market share over the period 2007–13 (box A); (2) markets where rice trades freely and U.S. market share is steady or rising (box C); and (3) markets where the United States maintains market share by virtue of minimum access requirements for rice (box E). There are also three categories of nontraditional U.S. markets: (1) globally important markets to which the United States does not currently ship large volumes—or any at all—but may have the potential to be competitive (box B); (2) markets where the United States has recently made significant sales, but does not sell consistently (box D); and (3) other markets that are large rice importers but where the United States does not typically ship rice because its rice is not price competitive (box F).

The remainder of this chapter will focus on U.S. traditional markets where the United States experienced declining market share over the period 2007–13 (Mexico, Central America, the EU, Haiti, and Ghana), as well as two nontraditional markets with potential for U.S. exports (Nigeria and China).

[1034] Highlighted competitor countries from the request letter for this investigation are China, India, Indonesia, Thailand, Vietnam, Uruguay, and Brazil. This report also highlights Cambodia, Burma, and the Philippines.

Traditional U.S. Export Markets with Declining U.S. Competitiveness

Mexico

Mexico relies on imports for most of its rice consumption. Historically, imports have been mainly in paddy form, and almost exclusively from the United States. Smaller imports of white rice (HS 1006.30) were also mostly from the United States. Two important trends have recently become apparent: Mexico is importing more white rice, mostly from non-U.S. suppliers. The U.S. share of total Mexican rice imports fell from virtually 100 percent in 2007 to 91 percent in 2013.[1035] The driver of this market share loss was white rice. Even though imports of white rice have grown considerably, tripling in volume from 2007–13, the U.S. share of these imports fell from 99 percent in 2007 to 55 percent in 2013. Reportedly, questions about the consistency of U.S. rice quality contributed to the decline in U.S. market share.[1036] Another factor is the rising availability of low-cost, reasonable-quality long grain white rice from other origins. During 2007–13, imports of U.S. white rice in Mexico faced competition from Uruguayan high-quality rice and increasing price competition from newer suppliers, such as Pakistan and Vietnam.

Mexico is a small but stable producer of rice, but the domestic industry has been unable to meet increasing consumer demand.[1037] The industry suffers from deteriorating agricultural infrastructure, land degradation, rising input costs, and low yields, along with the downward pressure that low international prices put on Mexican producer prices. Although Mexico's per capita rice consumption is low (7.8 kg) compared with other countries in Latin America, it has been growing slightly faster than the population.[1038]

Mexican imports consist primarily of U.S. long grain paddy rice for the Mexican milling industry. The United States supplies virtually all Mexican paddy rice imports (table 11.8). Long-standing U.S competitiveness in Mexico is strengthened by the United States' proximity and good transportation links to the Mexican market, as well as an important tariff advantage over other suppliers.

[1035] GTIS, Global Trade Atlas database (accessed February 12, 2015).
[1036] USA Rice Federation, "U.S. Rice Fighting Off Competition in Mexico," April 30, 2014.
[1037] Top Mexican rice-producing states are Nayarit, Michoacán, Campeche, Colima, and Veracruz, which account for about 80 percent of total national production. USDA, FAS, *Mexico: Grain and Feed Annual 2014*, March 14, 2014, 14.
[1038] USDA, FAS, *Mexico: Grain and Feed Annual 2014*, March 14, 2014, 14.

Table 11.8: Mexico: Paddy rice imports, 2007–13 (1,000 mt)

Country	2007	2008	2009	2010	2011	2012	2013
United States	756	716	739	772	800	698	738
Italy	0	0	0	0	0	[a]	0
Total	756	716	739	772	800	698	738

Source: GTIS, Global Trade Atlas database (accessed November 12, 2014).
Note: HS 1006.10
[a] Less than 1,000 mt.

While Mexico's imports of U.S. paddy rice remained relatively steady during 2007–13, its imports of white rice imports grew threefold. In 2011 alone, the level of Mexican imports of white rice doubled over the year before, with pronounced increases in rice imports from Uruguay, Pakistan, and Vietnam (table 11.9).[1039] Several factors likely contributed to this trend. Before 2008, Mexican import duties were 9 percent on paddy rice and 20 percent on brown and white rice, while U.S. rice enters Mexico duty free under the North American Free Trade Agreement (NAFTA). However, this U.S. advantage was lost in 2008 when, responding to high global rice prices, the Mexican government eliminated import duties on rice from all sources, opening its market to rice suppliers globally. Between 2008 and 2013, the share of Mexican imports of white rice, primarily from non-U.S. sources, grew from 10 percent of its total rice imports to 20 percent.

Table 11.9: Mexico: White rice imports, by source, 2007–13 (1,000 mt)

Country	2007	2008	2009	2010	2011	2012	2013
United States	63	78	75	66	113	100	102
Uruguay	1	[a]	5	2	31	42	47
Pakistan	0	0	0	[a]	1	2	22
Vietnam	0	0	0	0	0	0	12
India	0	0	0	0	0	[a]	2
Thailand	[a]	[a]	[a]	[a]	[a]	[a]	[a]
Italy	[a]	[a]	[a]	[a]	[a]	[a]	[a]
South Korea	0	0	0	0	0	0	[a]
Argentina	[a]	[a]	[a]	[a]	[a]	1	0
China	0	0	0	0	[a]	0	0
Total	64	78	80	68	144	145	186

Source: GTIS, Global Trade Atlas database (accessed November 12, 2014).
Note: White rice is HS 1006.30.
[a] Less than 1,000 mt.

In addition, U.S. quality has come under scrutiny by Mexican buyers, who report that the consistency of U.S. high quality has diminished in recent years.[1040] These buyers report that Uruguayan rice is consistently high quality and is now considered the quality leader in Mexico, a position long held by the United States.[1041] Mexican buyers cite increased chalk, lack of kernel

[1039] Pakistani imports were suspended by the Mexican government in June 2013 when khapra beetle larvae were found in some rice shipments in Mexico. USDA, FAS, *Mexico: Grain and Feed Update*, July 19, 2013.
[1040] USA Rice Federation, "U.S. Rice Fighting Off Competition in Mexico," April 30, 2014.
[1041] Ibid.

uniformity, and overall diminished appearance in U.S. rice supplies (see also chapter 5).[1042] Some Mexican buyers view Vietnamese and Thai rice as having the same quality as U.S. rice, but at a significant discount (17 percent in April 2014).[1043] In response, U.S. industry representatives stated that as a result of the higher-quality U.S. rice crop in 2013/14, the United States could compete successfully with Uruguayan imports in Mexico, but low-priced Asian rice will continue to threaten the U.S. share in the Mexican import market.[1044] As noted earlier, low-priced imported Asian white rice in Mexico has put downward price pressure on paddy rice there. In addition, industry sources indicate that Mexican millers have begun to look at non-U.S. paddy sources, including Brazil, which recently secured a phytosanitary protocol for paddy rice in Mexico.[1045]

Price dynamics have influenced Mexican buyers of both high- and medium-quality rice. In 2010 and 2011, Uruguayan AUVs for the year were slightly below U.S. AUVs ($590/mt versus $660/mt for U.S. white rice), but by 2012 the gap narrowed as Mexican consumers grew accustomed to Uruguayan taste and quality.[1046] By 2013, other competitors were undercutting the prices of both suppliers. Lower-priced, albeit lower-quality, rice from Pakistan and Vietnam was imported in large volumes as the gap widened between Pakistani and Vietnamese rice prices and the prices offered by the United States and Uruguay, even taking differences in product quality into account.[1047]

In 2014, white rice imports from non-U.S. sources continued to compete with all types of U.S. rice in the Mexican market, particularly the paddy rice segment. U.S. paddy exports decreased 19 percent from 2013 levels,[1048] which likely reflects a shift by Mexican rice purchasers to white long grain rice, since Mexican imports of white rice increased by about 39 percent during this same period.[1049] AUVs also diverged considerably in 2014—$710 per mt on average from the United States, compared with $490 per mt from Vietnam.[1050]

[1042] USA Rice Federation, "U.S. Rice Fighting Off Competition in Mexico," April 30, 2014.
[1043] Ibid.
[1044] Industry representatives, interview by USITC staff, Little Rock, Arkansas, December 10, 2014.
[1045] USDA, FAS, *Mexico: Grain and Feed Annual 2014*, March 14, 2014, 14; Moran, "Mexican Market under Siege," Winter 2014.
[1046] GTIS, Global Trade Atlas database (accessed February 12, 2015).
[1047] USA Rice Federation, "U.S. Rice Fighting Off Competition in Mexico," April 30, 2014. In the Mexican market, the price difference between Pakistani and Vietnamese rice on one hand and U.S. and Uruguayan rice on the other averaged more than $100 per mt for white long grain rice during 2013. The U.S. rice industry notes that at times during that year, the difference between U.S. rice prices and comparable rice produced in Asian countries such as Vietnam was nearly $250 per mt.
[1048] USITC DataWeb/USDOC (accessed March 18, 2015).
[1049] GTIS, Global Trade Atlas database (accessed March 18, 2015); Moran, "Mexican Market under Siege," Winter 2014.
[1050] GTIS, Global Trade Atlas database (accessed February 13, 2015).

In December 2014, the Mexican government announced the reimposition of import duties on rice from non-NAFTA and other free trade agreement sources, to take effect in January 2015, returning to the market access policy that existed pre-2008.[1051] Considering the level of the tariff (20 percent on white rice), this development is likely to make imported rice from non-U.S. origins more costly than U.S. rice in Mexico. If this happens, rice imports from the United States could be expected to regain the market share lost as a result of the original 2008 policy change. The Commission conducted an economic modeling exercise simulating the reimposition of tariffs on Mexican imports (for suppliers other than the United States) in 2013. The results show that this policy reversal would have increased the market share of long grain white rice from the United States from 59 percent to 78 percent, while the U.S. market share of all rice (by volume) would have risen to 94 percent (compared to the baseline of 88 percent). The simulation results also show that total import volume in Mexico would have risen modestly, driven by a shift from white rice to U.S. paddy rice as a result of the policy change.[1052]

Central America

Although countries in Central America are individually small markets for U.S. rice exports, collectively the region is the second-largest U.S. export market after Mexico for long grain paddy rice.[1053] Several countries in the region grow substantial amounts of rice and have government policies designed to support domestic rice industries,[1054] while other countries depend much more heavily on imports. Although total imports in the region have been steady, exports of U.S. rice to Central America have been on the decline since 2007. This decline has been attributed to poor-quality U.S. crops in recent years, which have damaged the reputation of U.S. rice in several Central American countries and encouraged importers to look for other suppliers.[1055] In addition, Brazil has recently emerged as an exporter of long grain paddy rice in the Western Hemisphere. Brazil's exports of paddy rice to Central American countries have risen from zero in 2010 to 132,629 mt in 2013, mainly to Nicaragua, Costa Rica, and Guatemala.[1056]

Rice is grown in all Central American countries, though in limited quantities. For the three northern Central America countries (El Salvador, Honduras, and Guatemala), local production

[1051] Chávez, "México pierde 150 mdd" [Mexico loses $150 million], December 16, 2014.
[1052] Commission economic modeling simulation using the RiceFlow model (see appendix H).
[1053] See appendix D for a Central American country list. Except for Panama, which has its own free trade agreement with the United States, and Belize, the listed countries are members of the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR).
[1054] For example, Costa Rica's Rice Corporation (Conarroz) is the only private entity allowed to import rice into the country, so local rice producers effectively control the volume and price of imported rice in the domestic market.
[1055] Fecarroz, "Fecarroz," December 8, 2014.
[1056] GTIS, Global Trade Atlas database (accessed February 12, 2015).

supplies 15–30 percent of domestic consumption.[1057] Of the southern Central American countries (Costa Rica, Nicaragua, and Panama), domestic production covers 65–70 percent of consumption in Nicaragua; 50 percent in Costa Rica; and 80–90 percent in Panama. The majority of rice produced in Central America is grown without irrigation, leaving output largely dependent on rainfall. Production is also limited by arable land, so in the long term, any increases in local rice consumption will need to be covered by imports.[1058]

As in Mexico, most rice imports in Central America are of long grain paddy rice, although that share has fallen over time—from 87 percent of total rice imports in 2007 to 76 percent in 2013. Given that the United States is the primary exporter of paddy rice in the world and the closest major rice exporter to the region, U.S. rice producers have traditionally captured a significant share of the rice market in Central America. Brazil is the only other supplier of paddy rice to the region, and only since 2011 (table 11.10). The U.S. share of the paddy rice market fell from 99 percent in 2010 to 72 percent in 2013.

Table 11.10: Central America: Paddy rice imports, by source, 2007–13 (1,000 mt)

Country	2007	2008	2009	2010	2011	2012	2013
United States	546	587	488	534	453	456	344
Brazil	0	0	0	0	50	47	133
All other	2	2	1	6	1	2	2
Total	547	589	489	540	504	505	478

Source: GTIS, Global Trade Atlas database (accessed November 4, 2014).
Note: Paddy rice is HS 1006.10.

White rice imports in Central America make up a small, but growing, share of total rice imports. U.S. share of the white rice import segment fell from 74 percent in 2007 to 30 percent in 2013 (table 11.11). U.S. white rice export volumes remained steady, in the 40,000 mt range, while white rice import demand in Central America more than doubled in the same period.

Table 11.11: Central America: White rice imports, 2007–13 (1,000 mt)

Country	2007	2008	2009	2010	2011	2012	2013
Brazil	0	0	1	1	2	17	41
United States	41	39	37	43	43	63	38
Uruguay	0	1	1	1	2	2	19
All other	14	21	12	11	17	32	30
Total	55	61	51	56	63	114	128

Source: GTIS, Global Trade Atlas database (accessed November 4, 2014).
Note: White rice is HS 1006.30.

Central American rice importers have shifted away from the United States to other suppliers for both paddy rice and white rice imports. In some cases, the shift has been from paddy rice to white rice. For example, Panama began buying large volumes of white rice in 2012, initially

[1057] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 145.
[1058] Ibid.

from the United States and the Dominican Republic. But in 2013 and 2014, it imported even larger volumes of white rice from the United States, but also large volumes from Brazil and Uruguay as well. In 2013, Panamanian imports from Brazil totaled 25,400 mt, nearly half of Panama's total white rice imports, while imports from the United States and Uruguay were lower, at 16,000 mt and 11,000 mt, respectively.[1059] Meanwhile, paddy rice imports by Panama, nearly all from the United States, declined by more than 50 percent in 2013, from 46,300 mt to 22,700 mt.

According to rice buyers in Central America, deteriorating quality is the main reason for the decrease in imports of U.S. rice. These buyers particularly note poor milling yields, grain appearance, and cooking quality since the 2010/11 U.S. crop (see chapter 5).[1060] For decades, the United States was competitive in the region owing to its proximity and its reputation for excellent rice quality. Central American importers indicate that, despite the tariff advantage afforded to imports of U.S. paddy rice,[1061] they have had difficulties in some cases selling U.S. rice to consumers in the last year owing to complaints of chalky appearance and diminished cooking quality. These importers indicate that despite the significant U.S. tariff advantage and excellent sea freight connections, they have begun to import both long grain paddy rice and white long grain rice from other sources, particularly Brazil, Argentina, and Uruguay.[1062]

In sum, the loss of traditionally preferred characteristics of U.S. rice, coupled with the growing availability of high-quality South American supplies, has created significant competition for the United States in Central America.[1063] Some of the more price-sensitive markets, such as Nicaragua, have switched to other suppliers for nearly all of their rice imports.[1064] Others, such as Costa Rica and Panama, are importing more rice from Brazil and Uruguay to diversify their suppliers as a hedge against poor-quality U.S. rice or rising prices in the future. However, based on geographic proximity, historical commercial ties to the U.S. rice industry, and the continued willingness of U.S. suppliers to ship large volumes of paddy, Central America is expected to remain an important market for U.S. rice.

[1059] GTIS, Global Trade Atlas database (accessed March 18, 2015)
[1060] Fecarroz, "Fecarroz," December 8, 2014; Bennett, "Quality Paramount to U.S. Rice Importers," August 30, 2013.
[1061] U.S. rice imports enter duty free—compared to MFN tariffs ranging from 29–45 percent—under free trade agreements with the United States (the CAFTA-DR and the U.S.-Panama Trade Promotion Agreement).
[1062] Fecarroz, "Fecarroz," December 8, 2014; Bennett, "Quality Paramount to U.S. Rice Importers," August 30, 2013; industry representatives, interviews by USITC staff, Little Rock, AR, December 8–9, 2014.
[1063] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 13.
[1064] Beginning in 2011, AUVs for Brazilian rice imports in Nicaragua were consistently below those for U.S. rice imports there. GTIS, Global Trade Atlas database (accessed February 17, 2015).

European Union

The EU is a net rice importer; imports typically account for one-third to one-half of EU consumption.[1065] The EU was a major export market for U.S. rice up to 2006, when the U.S. long grain rice supply was accidentally contaminated with genetically modified (GM) traits known as "LibertyLink," despite the long-standing practice of not growing GM rice seed in the United States.[1066] U.S. long grain exports to the EU fell sharply as a result and have never fully recovered; the U.S. share of the EU rice import market fell from 24 percent in 2005 to 4 percent in 2013.[1067] Despite the elimination of the GM rice from the U.S. crop, EU consumers' antipathy to biotechnology continues to limit access for U.S. long grain rice.[1068] More recently, EU rice imports from certain least-developed countries have been rising—particularly those from Cambodia and Burma, which receive duty-free treatment for unlimited volumes.[1069]

Domestic production in the EU has supplied roughly 70 percent of annual EU consumption in recent years.[1070] The principal domestic sources, Italy and Spain, account for 50 and 30 percent, respectively, of EU rice production.[1071] Greece and Portugal together contribute an additional 12 percent.[1072] The EU is a stable market for rice, with demand for a range of rice products, including high-quality products. Total EU rice import volumes were steady during 2007–13 (table 11.12). India, Thailand, and Pakistan have traditionally served the EU rice market for imports, mainly with aromatic jasmine and basmati varieties. Indian and Pakistani basmati rice receive duty-free treatment in the EU market.[1073] Imports from Cambodia, which receive duty-free treatment under the EU Generalised Scheme of Preferences' Everything but Arms (EBA) program, increased exponentially during this period; Cambodia rose from an insignificant supplier to the EU's second-largest source of imports in 2013.[1074]

[1065] See appendix D for a list of EU countries.
[1066] In 2006, residues of LibertyLink 62 and LibertyLink 601 (LL62, LL601), which are illegal in both animal feed and human food in the EU, were found in the U.S. rice supply. The U.S. industry subsequently removed the traits from commercial rice supplies and reports that no trace of the traits have been found in the 2009–13 rice harvests. Testing by the U.S. industry of its rice seeds for biotech traits will likely continue. USDA, ERS, *Rice Backgrounder*, December 2006, 9; USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014.
[1067] GTIS, Global Trade Atlas database (accessed November 14, 2014).
[1068] Industry representatives, interviews by USITC staff, Washington, DC, July 29, 2014.
[1069] Cambodia and Burma were granted duty-free status under EBA for rice in October 2009 and June 2013, respectively.
[1070] IRRI, "Europe" (accessed December 5, 2014).
[1071] European Commission, "EU Rice Market Developments and Prospects," April 22, 2013.
[1072] IRRI, "Europe" (accessed December 5, 2014).
[1073] USA Rice Federation, written statement to the United States Trade Representative, May 10, 2013.
[1074] Major suppliers of rice to the EU market that benefit from EBA preferences are Cambodia and Burma. European Commission, "Everything But Arms (EBA)–Who Benefits?" April 30, 2013.

Table 11.12: EU: Rice imports, by source, 2007–13 (1,000 mt)

Country	2007	2008	2009	2010	2011	2012	2013
India	371	306	253	247	243	491	366
Cambodia	2	3	12	39	123	120	227
Thailand	439	510	486	368	403	221	210
Pakistan	126	204	144	193	215	84	138
Egypt	129	62	52	92	52	54	95
Uruguay	145	125	139	63	127	101	82
Vietnam	12	47	71	25	28	39	75
Guyana	134	120	146	147	76	43	64
United States	44	127	74	81	126	61	52
Brazil	8	37	36	10	97	39	49
All other	52	105	73	50	126	140	91
Total	1,461	1,646	1,484	1,315	1,615	1,393	1,448

Source: GTIS, Global Trade Atlas database (accessed November 12, 2014).
Note: Rice imports in general are under HS 1006.

The EU Commission has stated that rice imports from countries eligible for duty-free treatment under EBA primarily impact sales of rice from other foreign suppliers, not those of rice grown in Europe.[1075] But some EU rice producers, particularly in Italy, have asked the EU Commission to institute a safeguard clause against rice imports from EBA countries.[1076] Italian officials contend that EU rice imports from Cambodia and Burma are directly impacting prices for rice in Italy and other EU countries.[1077]

For countries outside the EBA program, the EU has a series of import regimes and TRQs for white, brown, and broken rice, with prohibitive duties on imports over the quota amounts.[1078] The United States has duty preferences for fixed volumes of rice exported to the EU market through this system. Imports from the United States, which averaged over 280,000 mt annually from 1995 to 2006, averaged only 80,500 mt between 2007 and 2013.[1079] The decline in U.S. rice shipments to the EU is almost entirely in the long grain segment. Since 2006, EU rice imports from the United States have mainly been white medium grain, followed by white long grain rice in much lower quantities than previously shipped.

The significant loss of U.S. share in the EU rice import market over 2006–13 is in large part attributable to the LibertyLink contamination. However, the landscape for import competition also intensified considerably during 2007–13, owing to new suppliers and intense price competition. EU imports of long grain rice from Uruguay, Cambodia, and Vietnam had lower

[1075] European Commission, “Answers to Questions” (accessed December 19, 2014).
[1076] A safeguard clause temporarily restricts or prohibits the import of a product once certain conditions are met.
[1077] Oryza, “Italy Reiterates Need for Safeguard Clause,” November 30, 2014.
[1078] EU in-quota duty rates for rice range from zero to €88/mt, and over-quota applied duty rates range from €30/mt to €211/mt. USA Rice Federation, written statement to the United States Trade Representative, May 10, 2013.
[1079] GTIS, Global Trade Atlas database (accessed October 10, 2014).

AUVs than U.S. rice during this period.[1080] While imports from Uruguay have fallen from their high in 2011, imports from Vietnam and Cambodia are increasing.[1081] However, not all EU rice imports from Vietnam and Cambodia compete directly with U.S. rice. Some imports are likely aromatic Kaodok Mali rice grown in the Mekong River areas of Cambodia, which is milled in Vietnam.[1082] Direct Cambodian exports to the EU are estimated to be evenly split between long grain and aromatic jasmine rice (see chapter 8).[1083]

Haiti

Haiti has traditionally been a very important export market for U.S. rice: it was the top overseas market for U.S. long grain white rice for 16 out of the last 20 years. Haiti's rice production deficit has existed since the 1980s and has expanded due to stagnant local production and an increasing population. Haitian rice production, 78,000 mt in 2013/14, supplied only about 10–15 percent of domestic consumption during 2008/09–2013/14. Haiti's rice sector faces many challenges, including poor access to capital, low field and milling yields, poor infrastructure, and inefficiencies throughout the supply chain.[1084] Post-harvest losses in the supply chain (e.g., warehousing and distribution) are reportedly as high as 25 percent of production volumes.[1085] Over the last three decades, however, Haitian consumption has risen steadily—by 26 percent just in the last five years[1086]—to 48 kg per capita annually, as rice replaced other staples, such as cassava, sweet potatoes, sorghum, and corn.[1087]

Haiti's rice supply deficit is met by imports, obtained almost exclusively from the United States, which had a 97 percent import market share in 2012.[1088] Much smaller volumes of rice have been occasionally purchased from Guyana, Suriname, Brazil, and the Dominican Republic.[1089] The United States enjoys several key advantages in supplying the Haitian market. Close geographic proximity allows U.S. shippers to keep a transportation cost advantage over other global rice producers. U.S. exporters can also offer just-in-time delivery, as Haitian importers often prefer to hold only small quantities of rice in Haitian warehouses because of the risk of

[1080] In 2013, AUVs for U.S. imports of white rice (HS 1006.30) in the EU were $885/mt, compared with Uruguay ($734/mt), Cambodia ($740/mt), and Vietnam ($567/mt). GTIS, Global Trade Atlas database (accessed March 5, 2015).
[1081] *Saigon GP Daily,* "Vietnam Cuts Rice Export Prices," December 1, 2014.
[1082] Industry representatives, interview by USITC staff, November 10, 2014.
[1083] Slayton and Muniroth, *A More Detailed Road Map*, 2011.
[1084] USDA, FAS, *Haiti Rice Production and Trade Update*, November 7, 2013, 2.
[1085] Ibid.
[1086] USDA, PSD (accessed October 27, 2014).
[1087] *Economist*, "Feeding Haiti: A New Menu," June 22, 2013; USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 125.
[1088] USDA, FAS, *Haiti Rice Production and Trade Update*, November 7, 2013, 4.
[1089] Ibid.

looting during food riots.[1090] In addition, Haiti's importers have strong business relationships with U.S. exporters.[1091] Imported rice used to enter Haiti duty free; however, after the 2010 earthquake, the Haitian government raised its tariff on rice to 3.5 percent.[1092]

In late 2012, as a result of rapidly increasing rice prices in Haiti, a poor Haitian rice crop, and shipping delays impacting both the prices and delivery times of U.S. rice, Haitian government officials agreed to import up to 300,000 mt of rice from Vietnam.[1093] Despite its extremely low cost—reportedly, the price of the Vietnamese rice was about $200 per mt lower than U.S. supplies at the time[1094]—Haiti reportedly ended up importing only 60,000 mt of white long grain Vietnamese rice in 2013, and a further 18,000 mt in February in 2014.[1095] According to industry representatives familiar with the trade, Haitian consumers found the Vietnamese rice to be harder and stickier than U.S. rice[1096] and, except for the poorest, most price-sensitive, consumers, most Haitians refused to buy the Vietnamese product.[1097] Nevertheless, the Vietnamese sales in Haiti were one of several instances of growing Vietnamese competition with the United States that year.

Ghana

In West Africa,[1098] only Ghana currently offers the United States an important market for rice. Ghana imports between 70 and 95 percent of the rice it consumes each year, and total demand is on the rise.[1099] Domestic rice production is also rising, but it is not keeping pace with consumption growth, which is driven by population increase and rising incomes (see also chapter 2).[1100] Most Ghanaians prefer imported long grain rice over local production, because of perceived higher quality and affordability. In the Ghanaian market, Vietnam and Thailand have been the United States' main competitors (table 11.13). According to official Ghanaian

[1090] Ibid.
[1091] USDA, FAS, *Haiti Rice Production and Trade Update*, November 7, 2013, 4.
[1092] Georges, "Trade and the Disappearance of Haitian Rice," June 2004; USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 124.
[1093] USDA, FAS, *Haiti Rice Production and Trade Update*, November 7, 2013, 5.
[1094] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 125.
[1095] USA Rice Federation, "Competition in the Western Hemisphere," n.d.
[1096] USDA, FAS, *Haiti Rice Production and Trade Update*, November 7, 2013, 5.
[1097] Industry representative, telephone interview by USITC staff, July 28, 2014.
[1098] West African countries are large rice importers owing to rapidly growing consumption and insufficient domestic production. In the last decade, the largest, though sporadic, West African market for U.S. rice exports was Ghana. U.S. exports to other West African countries, such as Senegal, Côte d'Ivoire, and Nigeria, have been lower and even more sporadic. Many West African countries actively strive for rice self-sufficiency, at times enacting policies to prohibit or restrict rice imports.
[1099] Official Ghanaian statistics report imported rice at 70 percent of consumption, but other estimates put the figure closer to 90–95 percent. USAID, "The Market for Maize, Rice, Soy, and Warehousing," January 2012, 19.
[1100] Raina, "Factors Affecting Middle East and African Markets," October 29, 2014.

Table 11.13: Ghana: Rice imports, by source, 2007–13 (1,000 mt)

Country	2007	2008	2009	2010	2011	2012	2013
Vietnam	128	76	118	121	149	166	335
Thailand	186	205	130	100	247	153	127
United States	82	74	61	63	114	120	106
India	11	7	15	[a]	[a]	38	62
Pakistan	5	7	5	20	10	8	8
Burma	0	0	[a]	0	4	[a]	3
All other	30	27	54	15	20	36	3
Total	442	395	384	320	543	521	644

Source: GTIS, Global Trade Atlas database (accessed November 12, 2014).
Note: Rice imports in general are under HS 1006.
[a] Less than 1,000 mt.

trade statistics, imports increased 46 percent during 2007–13, yet U.S. imports rose only 29 percent over the same period. While U.S. imports fell slightly in 2013 over previous year levels, imports from Vietnam spiked, ending up with a 52 percent import market share in 2013.[1101]

Despite its higher price, aromatic rice is also in demand in Ghana. Thai aromatic rice is highly preferred, but expensive. In 2011, U.S. producers began exporting a jasmine-type aromatic rice to Ghana with some success.[1102] However, in 2013, Vietnam introduced its aromatic rice to the Ghanaian market with a lower price point than the U.S. and Thai products.[1103] As a result of increased competition in aromatic rice and declining purchasing power in Ghana that year due to rising inflation, U.S. aromatic rice sales have fallen.

Nontraditional Markets with Export Potential

Nigeria

Nigeria was the second-largest importer of rice in the world during 2007–13.[1104] Nigerians consume about 6 million mt annually, primarily parboiled white rice,[1105] but Nigerian production provides only about half of that amount. The government of Nigeria set a target to be self-sufficient in rice by the end of 2015, when it planned to ban all imports.[1106] In 2012, the government announced high tariffs on imported white rice—a 100 percent levy in addition to the 10 percent duty (for a total import tariff of 110 percent)—hoping to increase production

[1101] GTIS, Global Trade Atlas database (accessed February 12, 2015).
[1102] Industry representatives, interviews by USITC staff, September–December, 2014.
[1103] In March 2013, Vietnamese aromatic rice was $485–$495 per mt versus $960–$970 per mt for Thai Hom Mali 92 percent and $1,515–$1,525 per mt for India basmati 2 percent broken. Nguyen, "Rice Sector Restructuring in the Mekong Delta," October 28, 2014.
[1104] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 22.
[1105] U.S. government official, interview by USITC staff, Washington, DC, June 17, 2014. Nigeria's preference for parboiled rice is unique in West Africa.
[1106] USDA, FAS, *Nigeria: Grain and Feed Annual Report 2014*, March 13, 2014, 12.

and consumption of local rice.[1107] However, poor infrastructure in Nigeria keeps its domestic rice from competing with imported rice in urban areas near the coast. Inefficient distribution pushes domestic rice prices 20–30 percent higher than prices for imported rice, except when sold locally in rice-producing communities.[1108] During 2007–13, the majority of direct Nigerian imports were supplied by Thailand, India, and Brazil.

In 2013, the high Nigerian import tariffs encouraged large volumes of informal cross-border (i.e., gray market) trade.[1109] It is estimated that in 2013 alone, nearly 3 million mt of parboiled rice entered Nigeria through Benin.[1110] In November 2013, the government of Nigeria approved a reduction of the import duty, hoping to reduce the smuggling of rice over the Benin border. The new lower duty of 30 percent for millers and 70 percent for full-time traders was effective May 26, 2014. But Benin imports rice free of duty, so traders still have a financial incentive to illegally transship rice through Benin to Nigerian consumers.[1111]

In 2010, the U.S. exported 74,541 mt to Nigeria, but sales have swung widely since then: they plummeted to 259 mt in 2011, rose again in 2012 to 25,646 mt, then fell even further to 98 mt and 113 mt in 2013 and 2014, respectively.[1112] These recent low levels are the result of considerable price competition for imports in Nigeria. The bulk of Nigerian rice imports traditionally came from Thailand, followed by India. However, since India's removal of its export ban on non-basmati rice, its relatively low price rice in the Nigerian market has gained it the top spot. In addition, Brazilian and Chinese imports have recently entered the Nigerian market. In comparison, U.S. rice is currently too high priced to compete with these other suppliers in the Nigerian market.[1113]

China

China is the world's largest rice producer and consumer (see chapter 6). Virtually all of Chinese rice consumption is supplied by domestic production, although imports have risen rapidly since 2012. Official imports are in bulk and mainly from Vietnam, with much smaller volumes from Thailand and Pakistan, as well as gray-market imports from Burma, Vietnam, and Cambodia. More than three-quarters of China's rice imports are of white long grain rice, of medium to low

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[1107] USDA, FAS, *Nigeria: Grain and Feed Annual Report 2013*, May 23, 2013, 12.
[1108] USDA, FAS, *Nigeria: Grain and Feed Annual Report 2014*, March 13, 2014, 13.
[1109] USDA PSD estimates of Nigerian rice imports, which account for gray-market trade, were on average six times larger than other reported data for direct Nigerian imports from 2008 to 2012.
[1110] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 23; USDA, FAS, *Nigeria: Grain and Feed Annual Report 2014*, March 13, 2014, 15.
[1111] Oryza, "Nigeria Lowers Import Duty on Rice," July 7, 2014.
[1112] USITC DataWeb/USDOC (accessed February 17, 2015).
[1113] FAS, *Nigeria: Grain and Feed Annual Report 2014*, March 13, 2014, 14; USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 23.

quality. It is often used for table rice and further-processed food products.[1114] China does not provide official trade access for rice from key rice exporters Burma, India, or the United States, but is in negotiations to do so.[1115]

The United States does not export rice to China because the two countries have not reached an agreement on a phytosanitary protocol. The U.S. industry has been working with U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) since 2006 toward this end. In 2012, China submitted a draft protocol to APHIS, followed by a revised offer in late 2013. APHIS responded to the revised offer in February 2014 after having again consulted with the U.S. rice industry.[1116]

The U.S. rice industry believes that China could be a significant importer of U.S. long and medium grain white rice if a phytosanitary protocol were finalized.[1117] U.S. rice exports to China are expected to be packaged rice products that would fill a high-end niche.[1118] Demand in China for U.S. rice would likely be concentrated in large cities with high-income consumers, along with international hotels, upscale restaurants, and high-end food service options that serve wealthy and upper-middle-class Chinese consumers, as well as foreigners.[1119] This type of rice product would not compete directly with the low-priced import suppliers currently serving the Chinese market. Some U.S. industry estimates put the potential sales at several hundred million dollars a year, or about the size of the largest current U.S. export markets.[1120] The U.S. reputation as a high-quality, safe food source is thought to be a particular competitive advantage in China, given Chinese consumers' unease about the safety of many domestically produced foods.[1121]

[1114] USDA, FAS, *China: Grain and Feed Annual 2014*, April 2, 2014, 6.
[1115] Htike, "First Step Made," September 29, 2014; Oryza, "China Promises to Import One Million Tons," November 14, 2014.
[1116] USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 10.
[1117] In recent years, U.S. rice producers and exporters have met with a number of large Chinese rice importers to gauge their interest and ability to import U.S. rice, and to establish relationships for when access to the market is granted. Chinese importers have expressed great interest in importing U.S. rice once a protocol is established. USA Rice Federation and U.S. Rice Producers Association, *Unified Export Strategy*, 2014, 10; industry representatives, interviews by USITC staff, Arkansas, December 10–11, 2014.
[1118] Pierson, "U.S Rice Farmers See Opportunity in China," August 24, 2014.
[1119] China's growing middle class presents significant opportunities for U.S. exporters of a wide range of agricultural products. USITC, *China's Agricultural Trade: Competitive Conditions*, March 2011.
[1120] Pierson, "U.S. Rice Farmers See Opportunity in China," August 24, 2014.
[1121] Freifelder, "U.S. Rice Could See Potential Market in China," August 28, 2014.

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Chapter 12 Quantitative Assessment of the Impact of Government Programs on the Global Rice Market

Introduction

As discussed in previous chapters, many of the world's major rice-producing, -consuming, and -trading countries use a variety of policy instruments aimed at achieving a range of policy objectives. As also noted, the effects of country-specific policies are rarely confined to the countries that apply them, and often have large repercussions for the rice market globally. This chapter uses the RiceFlow partial equilibrium model to assess how government programs impact global production, consumption, and trade flows of rice.[1122]

To perform these assessments, the Commission carried out a series of comparative-static analyses using the RiceFlow model.[1123] The model was first run with the existing policies in place, establishing base levels of production, consumption, trade, and prices. Then it was run again with policies removed to give new, counterfactual levels of production, consumption, trade, and prices. The difference between the base and counterfactual levels provides an estimate of the effects of the policy.

The policies that have the greatest impact on global production and consumption are direct support for domestic rice consumption, and intermediate input support. Tariff elimination would have led to a significant increase in global rice trade, but only a small increase in production and consumption. However, of the policy changes considered, eliminating tariffs would have had the greatest impact on U.S. production and exports.

Policy Descriptions

Rice markets are subject to many policy interventions that can be broadly classified into three types: production policies, consumption policies, and trade policies. Production policies include

[1122] For a detailed description of the RiceFlow model, see appendix H. A review of economic literature on econometric analysis of global rice prices and trade is presented in appendix I. More detail on government policies can be found in chapters 5–10.
[1123] Comparative statics is the determination of changes in endogenous variables with a change in some exogenous parameter.

producer price support programs and input support. In the model, input support policies are of two types: factor input support, which reduces the prices producers pay for land and capital, and intermediate input support, which lowers the cost to producers of purchased inputs, such as fertilizer, seed, and water. Consumption policies include direct distribution of rice, as well as price caps for domestic consumers. Trade policies include restrictions on exports (typically designed to protect domestic consumers from rising international prices) and barriers to imports (aimed at raising domestic prices for producers). The RiceFlow model incorporates a number of policy measures into its 2013 baseline of the global rice economy.

Description of Simulations

In the model, policies are captured by "price wedges," which are measured as the percentage difference between prices paid by buyers or received by sellers, with and without the policy in effect. For example, production policies include producer price support programs. These are captured in the model by price wedges equal to the difference between what producers receive for rice in the domestic market with the policy in place, compared to what they would receive in the international market. Input support policies are captured by price wedges equal to what farmers pay for inputs, compared to what they would have to pay in the international market. In the European Union (EU), for example, price supports to growers of long grain and medium grain paddy rice raise the price received by these producers to about 21.5 percent and 18.8 percent, respectively, above the market price, so these are the price wedges in the model. Simulations involve the removal of price wedges for a particular country, rice type (long grain, medium grain, or aromatic), and rice form (paddy, brown, or white).

A policy measure is included in the database if enough data for it are available, if it was in effect in 2013, and if it introduced a difference between the price received at any production stage and the market price (i.e., it created a price wedge). If a given policy did not have a discernible impact on prices in 2013, it was not included in the database. For example, India and Vietnam have producer price support policies for paddy rice, but because no differences could be identified between the average annual price received by farmers in 2013 and the market price, these policies were not included in the database. The Philippines has documented consumer price support, but no difference could be identified between the price paid by consumers and the market price. Brazil has a policy to offset transportation costs for farmers and millers if market prices drop below a certain threshold, but this policy had no effect on prices in 2013 and so was not included in the database. Similarly, the United States direct support to rice farmers in 2013 was based on historical production levels and had no direct effect on 2013 production, so was not included in the database. All of the support documented in the RiceFlow database is for production of paddy rice. There is no documented support in the RiceFlow database to producers of brown or white rice.

Production Policies

Producer Price Support

Producer price supports were identified for producers of paddy rice in seven countries (table 12.1).[1124] In percentage terms, the highest levels of support were in Venezuela and the EU. Although the United States offers direct support to rice farmers, these payments are based on historical production levels and have no direct effect on current production. The Thai Paddy Pledging Program did provide producer price support, but its primary effects on the global rice market were due to stockholding by the Thai government. Impacts of this program are treated separately in chapter 8. The global effects of producer price support to rice growers were assessed by the simulated removal of these price supports.

Table 12.1: Producer price support for paddy rice, by crop and country (percent above market price)

Country	Long grain	Medium grain	Aromatic
Bangladesh	1.3	0.0	0.0
China	0.8	0.7	0.0
EU	21.5	18.8	0.0
Malaysia	8.1	0.0	0.0
Mexico	3.4	0.0	0.0
South Korea	0.0	5.5	0.0
Venezuela	85.2	0.0	0.0

Source: RiceFlow database and USITC calculations.

Model results indicate that removing all producer price supports for these seven producers in 2013 would have led to lower production in the countries offering the support ("supporting countries") (table 12.2).[1125] The largest declines in production would have been in the EU and Venezuela. Absent the identified producer price supports, production in the EU and Venezuela would have declined by 253,000 metric ton (mt) or about 12 percent and 257,000 mt or about 67 percent, respectively. Other supporting countries would have experienced smaller declines. Lower production in supporting countries would have led to higher global prices, which, in turn, would have stimulated higher production in the non-supporting countries, especially in the United States.[1126] The net effect of removing price supports would have been a very small decrease in global production of 0.1 percent and a slight (404,000 mt, or about 1 percent)

[1124] In all RiceFlow calculations, the EU is considered as one country.
[1125] Throughout this chapter, tables presenting estimates of the impacts of eliminating a given policy include data for China, India, Indonesia (the three largest rice producers), and the United States, plus countries identified as having the policy in place in 2013. All production, consumption, and trade data in this chapter are calculated on a milled-rice-equivalent (MRE) basis and reported to the nearest 1,000 mt.
[1126] Rice production would have increased in a large number of countries. After the United States, the next-largest increase would have been in Brazil.

Table 12.2: Estimated effects of eliminating producer price support for rice, by country, 2013 (1,000 mt)

Country	Production	Consumption	Exports	Imports
Supporting countries				
Bangladesh	-6	-4	[a]	2
China	-171	-144	25	51
EU	-253	-32	-183	38
Malaysia	-95	-28	[a]	67
Mexico	-6	-1	[a]	6
South Korea	-122	-84	[a]	38
Venezuela	-257	-6	[a]	255
Non-supporting countries				
India	44	-7	51	0
Indonesia	1	[a]	[a]	-1
Thailand	52	[a]	52	[a]
United States	105	[a]	110	1
Other	378	-23	348	-54
Global total	-329	-329	404	404

Source: RiceFlow database and USITC calculations.
[a] Less than 500 mt.

increase in global exports. U.S. paddy production would have been higher by 105,000 mt or almost 2 percent. U.S. exports would have increased by over 3 percent (110,000 mt) above baseline exports.

Factor Input Support

Support policies for factor inputs reduce the cost of land and capital to farmers. Table 12.3 lists factor input support provided by China, India, Japan, and Taiwan for long grain and medium grain paddy rice production, as a percentage of the prevailing cost. For example, China's 12.4 percent support for land in long grain paddy production means that the rental price of land is 12.4 percent higher than the price paid by farmers. Note that while the RiceFlow model allows for the presence of support for labor inputs, none are documented in the database. Support policies for factor inputs are less important to global rice trade than import tariffs and producer price supports. China provides support for land and India for capital, but the largest factor support systems (in percentage terms) are land support programs in Japan and Taiwan, two economies that are not well integrated into global rice trade.

The model results indicate that if these factor input support programs had not been in place in 2013, global paddy production and consumption would have been lower by just over 0.5 million mt, about 0.1 percent of the global total (table 12.4), caused by increasing prices in supporting countries. The largest declines in production and consumption would have been in China and India, although production changes in these countries would have been a small share of baseline production levels (-0.3 percent and -0.2 percent, respectively). As domestic production

Table 12.3: Factor input support for paddy rice, by crop, country, and factor (percent of market price)

Country	Land	Capital
Long grain		
China	12.4	0.0
India	0.0	3.1
Medium grain		
China	11.1	0.0
Japan	27.2	0.0
Taiwan	70.4	0.0

Source: RiceFlow database and USITC calculations.

Table 12.4: Estimated effects of eliminating factor input support for rice, by country, 2013 (1,000 mt)

Country	Production	Consumption	Exports	Imports
Supporting countries				
China	-444	-308	-17	119
India	-223	-129	-93	[a]
Japan	-73	-38	[a]	35
Taiwan	-75	-22	[a]	53
Non-supporting countries				
Indonesia	2	[a]	[a]	-3
Thailand	39	[a]	41	2
United States	44	[a]	45	1
Other	205	-25	163	-68
Global total	-523	-523	139	139

Source: RiceFlow database and USITC calculations.
[a] Less than 500 mt.

declined, China's rice imports would have been somewhat higher and its exports slightly lower. For India, without the government support for capital, production and consumption would also have been lower. India would have seen a small decline in exports (93,000 mt or just under 1 percent), but no change in import levels. Taiwan and Japan would have experienced sharper drops in production, in percentage terms, from the withdrawal of support for land. Taiwan would have lost about 6 percent of its baseline production, while Japan would have lost 1 percent. Imports for both countries would have expanded, partially offsetting the decline in rice production.

Lower production in China, India, Japan, and Taiwan would have given rise to higher global prices for rice, which, in turn, would have led to more production in the rest of the world, including the United States. Absent the factor input support worldwide, production and net exports would have been slightly higher in Thailand and the United States. With higher global prices, the increases in production would have served export markets rather than domestic consumption.

Intermediate Input Support

Support policies for intermediate inputs reduce the cost to farmers of fertilizer, energy, water, and seed. Table 12.5 presents documented support policies for intermediate inputs in the RiceFlow database. These operate much as factor input support does, by reducing farmers' costs for intermediate inputs below the prevailing market price. Fertilizer is the most commonly supported input, with farmers in nine countries benefiting, while support for energy, water, and seed purchases is less common. The Commission simulated the removal of identified support to fertilizer, energy, water, and seed in order to assess these programs' effects on the global rice market.

Table 12.5: Intermediate input support programs for paddy rice, by crop, country, and input (percent of market price)

Country	Fertilizer	Energy	Water	Seed
Long grain				
Bangladesh	16.9	17.4	0.0	0.0
Burkina Faso	30.0	0.0	0.0	0.0
China	0.0	0.0	0.0	20.8
Ghana	40.0	0.0	0.0	0.0
India	68.2	74.7	0.0	0.0
Indonesia	44.2	0.0	0.0	0.0
Mali	28.7	0.0	0.0	0.0
Nigeria	25.0	0.0	0.0	0.0
Senegal	50.0	0.0	0.0	0.0
Sri Lanka	77.1	0.0	0.0	0.0
Medium grain				
China	0.0	0.0	0.0	18.8
Egypt	0.0	0.0	50.0	0.0

Source: RiceFlow database and USITC calculations.

If farmers had been paying higher input costs in supporting countries, production would have been lower in these countries, except Nigeria, and the net effect on both global production and consumption would have been a decline of 3.1 million mt or almost 1 percent (table 12.6).[1127] Lower production would have led to a slight decline in global exports and to a modest increase in world prices, predominantly for long grain rice. Given that Indian producers receive 68 percent support for fertilizer and 75 percent for energy, the largest results would be observed for India. Removing these support policies would have reduced Indian production of paddy rice by almost 4 percent. India would have seen its exports decline by 1.6 million mt, or about 16 percent, as India's price for long grain paddy rose. But because India's identified input support is restricted to long grain rice, in the absence of the support, the production of

[1127] Nigeria is a major importer of long grain rice from India, and the increase in the price of these imports would have led to an increase in Nigeria's production.

Table 12.6: Estimated effects of eliminating intermediate input support for rice, by country, 2013 (1,000 mt)

Country	Production	Consumption	Exports	Imports
Supporting countries				
Bangladesh	-15	-17	[a]	-2
Burkina Faso	-10	-2	[a]	8
China	-257	-200	-11	46
Egypt	-62	-31	-31	0
Ghana	-14	-2	[a]	12
India	-3,896	-2,287	-1,608	1
Indonesia	-317	-287	[a]	30
Mali	-7	-6	[a]	1
Nigeria	53	-27	[a]	-80
Senegal	-4	-15	[a]	-10
Sri Lanka	-55	-55	[a]	[a]
Non-supporting countries				
United States	51	[a]	47	-4
Other	1,436	-168	1,288	-315
Global total	-3,098	-3,098	-314	-314

Source: RiceFlow database and USITC calculations.
[a] Less than 500 mt.

aromatic rice would have become more attractive to farmers.[1128] As a result, factors of production would have moved into the growing of aromatic rice in India, boosting India's production and exports of aromatic rice.

The effects on the U.S. rice market of removing intermediate input support worldwide would have been small. The modest increase in global long grain rice prices would have led to marginally higher U.S. production and exports, and higher prices would have led to a slight decline in U.S. imports of aromatic rice.

Consumption Policies

The RiceFlow database documents consumption support for three countries—Bangladesh, India, and Indonesia (table 12.7). All of these policies reduce consumer prices of long grain white rice. The level of support entered into the model is the annual average support nationwide, regardless of whether the policy is aimed at the entire population or a subset. For example, in 2013, India's support for the consumption of long grain rice lowers consumer prices by 30.4 percent on average, so the simulation was the removal of this price wedge.

[1128] The RiceFlow model includes input support in India for long grain rice only.

Table 12.7: Support for long grain rice consumption by country (percent of market price)

Country	Support
Bangladesh	1.5
India	30.4
Indonesia	4.9

Source: RiceFlow database and USITC calculations.

The effects of consumption support on the global rice market were assessed by the simulated removal of identified support in these three countries (table 12.8). The results show that had these countries not supported rice consumption within their borders, global paddy production and consumption would have been lower by 6.1 million mt, or about 1.3 percent, while global trade in rice would have been less than 1 percent higher (259,000 mt). Producer prices for paddy and white rice would have been lower by less than 1 percent as a result of reduced production and consumption, except in India, where the price would have been about 3 percent lower.

Table 12.8: Estimated effects of eliminating support for rice consumption, by country, 2013 (1,000 mt)

Country	Production	Consumption	Exports	Imports
Supporting countries				
Bangladesh	-8	-5	[a]	3
India	-5,126	-5,935	809	[a]
Indonesia	-238	-235	[a]	3
Non-supporting countries				
China	-15	2	-1	16
United States	-14	[a]	-12	2
Other	-666	107	-537	236
Global total	-6,066	-6,066	259	259

Source: RiceFlow database and USITC calculations.
[a] Less than 500 mt.

For Bangladesh, its modest consumption support (1.5 percent) is estimated to have had only a small effect on consumption, net exports, and paddy production. Absent the support programs, production and consumption in Bangladesh would have been slightly lower (declines of 8,000 mt and 5,000 mt, respectively, much less than 1 percent). The greatest changes would have been in India. The absence of India's much higher level of support (30.4 percent) would have led to a decline in paddy production of about 5.1 million mt (4.9 percent), a decline in consumption of about 5.9 million mt (much less than 1 percent), and a modest increase in Indian exports (about 8 percent). In Indonesia, absent the 4.9 percent consumption support, production and consumption would have been slightly lower and imports slightly higher, with no change in exports.

In the United States, the elimination of consumer support in Bangladesh, India, and Indonesia and consequently lower consumption in those countries would have led to a dip in paddy rice production (14,000 mt, less than 1 percent). Consumption would have been unchanged, and there would have been a very slight drop in exports, along with an even smaller increase in imports.[1129]

Trade Policies

Import Tariffs

As mentioned in chapter 2, several countries impose high tariffs on rice to protect their domestic rice industries from competition from imports. For example, in 2013, China, Japan, Nigeria, and South Korea had high average tariff levels on rice, ranging from 33.9 percent for China to 322.4 percent for Japan (table 12.9).[1130] In contrast, other major producing and exporting countries maintain low tariffs. Examples include Brazil, Pakistan, Thailand, Uruguay, and the United States, where average tariffs on rice are under 10 percent ad valorem. The Commission assessed the impact of high tariffs on global markets by simulating the elimination of tariffs on a bilateral basis.

Model results indicate that eliminating import tariffs on rice in 2013 would have triggered increases in production and exports in the United States and other major rice-exporting countries, and would have led to slightly higher global rice consumption overall (table 12.10). Global trade in rice would have increased by 45 percent, and would have accounted for 11 percent of global production. The increase in global production would have been much smaller (0.5 percent) as production moved from less-efficient to more-efficient producers.

Production effects would have varied considerably from country to country. Production would have declined in countries in which producers were no longer protected by very high tariffs, such as Japan and South Korea. Japan and South Korea are major producers and consumers of medium grain rice. If global tariffs had been eliminated, production of medium grain rice in these countries would have declined, and their imports of medium grain rice would have risen. By contrast, China is a major producer and consumer of both long grain and medium grain rice. China’s production of medium grain rice would have risen because of the increased global

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[1129] Because all of the identified consumer support is to long grain rice, its absence would have led to higher global production of aromatic rice and to increased U.S. imports of aromatic rice.
[1130] Table 12.9 presents the average tariffs by country for imports from all trading partners. The simulation involved the elimination of tariffs on a bilateral basis—that is, eliminating the trade-weighted average tariffs imposed by each reporting country on imports, by partner country, for each of the types and forms of rice traded.

Table 12.9: Average marginal ad valorem equivalent tariffs, by country (percent)

Country/region[a]	Average	Country/region[a]	Average
Argentina	0.3	Iran	18.6
Benin	10.0	Japan	322.4
Bolivia	10.0	Laos	5.0
Brazil	0.2	Liberia	8.7
Burkina Faso	10.0	Malaysia	23.5
Burma	5.0	Mali	10.0
Cambodia	7.0	Nicaragua	1.2
Cameroon	5.0	Niger	10.0
Chile	0.8	Nigeria	110.0
China	33.9	Pakistan	8.0
Colombia	34.0	Panama	90.0
Costa Rica	25.8	Peru	14.3
Côte d'Ivoire	10.0	Philippines	41.6
Cuba	15.0	Russia	7.3
Ecuador	68.0	Senegal	10.0
El Salvador	0.7	Sierra Leone	10.0
EU	13.4	South Korea	218.0
Ghana	20.0	Sri Lanka	27.2
Guatemala	3.0	Tanzania	75.0
Guinea-Bissau	10.0	Togo	10.0
Haiti	3.0	Turkey	40.9
Honduras	1.2	United States	1.2
India	73.9	Venezuela	15.3
Indonesia	33.9	Vietnam	16.6

Source: RiceFlow database and USITC calculations.
[a] Economies that are not listed as imposing import tariffs in the RiceFlow database are Australia, Bangladesh, Canada, Egypt, The Gambia, Guinea, Guyana, Hong Kong, Iraq, Mexico, Paraguay, Saudi Arabia, Singapore, South Africa, Suriname, Taiwan, Thailand, Uruguay, the United Arab Emirates, and the regional aggregates Other Africa, Other Asia, Other Caribbean, Other Europe, Other Middle East, and Other Oceania.

Table 12.10: Estimated effects of eliminating tariffs on rice, by country, 2013 (1,000 mt)

Country	Production	Consumption	Exports	Imports
Burma	1,175	-67	1,243	0
China	-2,106	52	5,787	3,733
India	1,992	-351	2,356	12
Indonesia	-390	77	[a]	467
Japan	-3,677	336	[a]	4,013
Nigeria	-1,687	390	[a]	2,076
South Korea	-2,808	1,559	[a]	4,359
Thailand	1,245	-8	1,324	72
United States	1,269	-7	1,329	75
Vietnam	2,780	-133	2,978	65
Other	184	341	1,586	1,729
Global total	2,190	2,189	16,602	16,602

Source: RiceFlow database and USITC calculations.
Note: Countries included are those with the greatest estimated change in production (greater than 1.0 million mt MRE), plus Indonesia and the United States.
[a] Less than 500 mt.

demand for medium grain rice. On the other hand, China's production of long grain rice would have declined, as land would have been shifted to production of medium grain rice, and some land would have been taken out of rice production altogether. The United States would have experienced a substantial expansion in production (nearly 1.3 million mt or 20 percent), since U.S. import tariffs on rice are low. The increase in U.S. production would have been entirely in medium grain rice. There would have been more exports of medium grain rice and more U.S. imports of aromatic rice.

Export Taxes

Only Argentina and Burma were identified as maintaining export taxes in 2013 (table 12.11), and these taxes apply to a small percentage of global trade. Both Argentina and Burma primarily export long grain white rice, and trade effects are largely confined to long grain white rice.

Table 12.11: Export tax, by product and country (percent)

Country	Long grain paddy	Long grain brown	Long grain white
Argentina	10.0	5.0	5.0
Burma	0	0	5.0

Source: RiceFlow database and USITC calculations.

The model simulation indicates that these taxes had only minimal effects on rice production, consumption, and trade in the United States and the rest of the world (table 12.12). Absent the export taxes, exports by Argentina and Burma would have been higher in 2013 (by about 40,600 mt or less than 8 percent and 197,000 mt or over 15 percent, respectively), as exports from these two countries would have become cheaper on global markets. Exports from other major exporters would have contracted very slightly in response to the increased competition. In China, imports from Burma would have led to a decline in domestic production. U.S. production and exports of long grain rice would have declined slightly. Global paddy production would have been very slightly higher (14,000 mt or much less than 1 percent).

Comparing the Effects of Different Policies

The effects of the different policies are compared in table 12.13. Consumption support and intermediate input support have the strongest impacts on global production and consumption, followed by tariffs. The policy instrument that has the strongest impacts on U.S. producers, however, is tariffs.

Table 12.12: Estimated effects of eliminating export taxes on rice, by country, 2013 (1,000 mt)

Country	Production	Consumption	Exports	Imports
Supporting countries				
Argentina	39	-1	41	1
Burma	187	-10	197	[a]
Non-supporting countries				
China	-64	9	[a]	73
India	-23	3	-27	[a]
Indonesia	-1	[a]	[a]	1
United States	-2	[a]	-2	[a]
Other	-122	11	-94	40
Global total	14	14	116	116

Source: RiceFlow database and USITC calculations.
[a] Less than 500 mt.

Table 12.13: Simulation results by policy instrument for rice, United States and global, 2013 (1,000 mt)

Policy instrument	United States				Global total	
Change from removal of	Production	Consumption	Exports	Imports	Production	Consumption
Producer price support	105	[a]	107	1	-329	-329
Factor input support	44	[a]	46	1	-523	-523
Intermediate input support	51	[a]	47	-4	-3,098	-3,098
Consumption support	-14	[a]	-12	2	-6,066	-6,066
Tariffs	1,269	-7	1,329	75	2,190	2,189
Export tax	-2	[a]	-2	[a]	14	14
All except tariffs	182	-1	182	-1	-9,950	-9,950
All including tariffs	1,359	-7	1,435	69	-7,650	-7,651

Source: USITC economic modeling simulation using the RiceFlow model.
Note: In 2013, U.S. and global totals (in million mt) were: U.S. production = 6.3; U.S. consumption = 3.8; U.S. exports = 3.2; U.S. imports = 0.6; global production = 472, and global consumption = 467.
[a] Less than 500 mt.

Two additional simulations were performed: first, the simultaneous removal of all identified policy instruments, except for tariffs; and second, the simultaneous removal of all identified policy instruments, including tariffs. The results are consistent with the sum of the results from the individual policy liberalizations, indicating that the magnitude of policy interactions is relatively small. Elimination of all barriers except tariffs would have increased U.S. paddy production by 182,000 mt (almost 3 percent) and increased exports by 182,000 mt (about 6 percent). Global production would be expected to drop by about 10 million mt, or 2 percent. Eliminating tariffs in addition to removing other support policies would have led to an expansion in U.S. production of over 1.3 million mt (over 21 percent) and a rise in exports of 1.4 million mt (about 45 percent). Global production and consumption, however, would have declined by nearly 7.7 million mt, or less than 2 percent.

Appendix A
Request Letter

Congress of the United States

U.S. House of Representatives

COMMITTEE ON WAYS AND MEANS

1102 LONGWORTH HOUSE OFFICE BUILDING
(202) 225–3625

Washington, DC 20515–6348

http://waysandmeans.house.gov

May 15, 2014

The Honorable Irving A. Williamson
Chairman
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

Dear Chairman Williamson:

The Committee on Ways and Means is interested in obtaining current information on relevant factors affecting the global competitiveness of the U.S. rice industry. Although the United States produces less than 2 percent of the world's rice, it is a major exporter, accounting for more than 10 percent of the annual volume of global rice trade.

In order to better assess the current market conditions confronting the U.S. industry, we request that the U.S. International Trade Commission conduct an investigation under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), and provide a report setting forth the results of the investigation.

To the extent that information is publicly available, the report should contain:

- an overview of the rice industry in the United States and other major global producing and exporting countries (such as China, India, Indonesia, Thailand, Vietnam, Uruguay, and Brazil), including production of rice, processing volumes, processing capacity, carry-over inventory, and consumption;
- information on recent trade trends and developments in the global market for rice, including U.S. and major foreign supplier imports and exports;
- a comparison of the competitive strengths and weaknesses of rice production and exports in the United States and other major exporting countries, including such factors as producer revenue and costs of production, industry structure, input prices and availability, processing technology, product innovation, exchange rates, pricing, and marketing regimes, as well as government policies and programs that directly or indirectly affect rice production and exporting in these countries;
- a qualitative and, to the extent possible, quantitative assessment of the impact of government policies and programs of major producing and exporting countries on their rice production, exports, consumption, and domestic prices, as well as on rice prices globally; and

- an overview of the impact on the U.S. rice industry of exports from the highlighted countries of rice to the United States and to traditional export markets of the United States such as, but not limited to, Mexico, Haiti and West Africa.

The report should focus primarily on the 2009-2013 time period. The Committee requests that the Commission transmit its report to Congress no later than 11 months following the receipt of this request. It is the Committee's intent to make the Commission's report available to the public in its entirety. Therefore, the report should not include any confidential business information.

Thank you for attention to this request.

Sincerely,

Dave Camp

Dave Camp
Chairman
Committee on Ways and Means

Cc: Rep. Sandy Levin, Ranking Member

Appendix B
Federal Register Notice

Federal Register / Vol. 79, No. 119 / Friday, June 20, 2014 / Notices 35381

INTERNATIONAL TRADE COMMISSION

[Investigation Nos. 701–TA–417 and 731–TA–953, 957–959, 961, and 962 (Second Review)]

Carbon and Certain Alloy Steel Wire Rod From Brazil, Indonesia, Mexico, Moldova, Trinidad and Tobago, and Ukraine

Determinations

On the basis of the record [1] developed in the subject five-year reviews, the United States International Trade Commission (''Commission'') determines, pursuant to section 751(c) of the Tariff Act of 1930 (19 U.S.C. 1675(c)), that revocation of the countervailing duty order on carbon and certain alloy steel wire rod (''wire rod'') from Brazil and the antidumping duty orders on wire rod from Brazil, Indonesia, Mexico, Moldova, and Trinidad and Tobago would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time. The Commission also determines, pursuant to section 751(c) of the Tariff Act of 1930 (19 U.S.C. 1675(c)), that revocation of the antidumping duty order on wire rod from Ukraine would not be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time.[2]

Background

The Commission instituted these reviews on June 3, 2013 (78 FR 33103) and determined on September 6, 2013 that it would conduct full reviews (78 FR 60316, October 1, 2013). Notice of the scheduling of the Commission's reviews and of a public hearing to be held in connection therewith was given by posting copies of the notice in the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and by publishing the notice in the **Federal Register** on December 18, 2013 (78 FR 76653). The hearing was held in Washington, DC, on April 22, 2014, and all persons who requested the opportunity were permitted to appear in person or by counsel.

The Commission completed and filed its determinations in these reviews on June 16, 2014. The views of the Commission are contained in USITC Publication 4472 (June 2014), entitled *Carbon and Certain Alloy Steel Wire Rod from Brazil, Indonesia, Mexico, Moldova, Trinidad and Tobago, and Ukraine: Investigation Nos. 701–TA–417 and 731–TA–953, 957–959, 961, and 962 (Second Review).*

By order of the Commission.

Issued: June 16, 2014.

Lisa R. Barton,

Secretary to the Commission.

[FR Doc. 2014–14422 Filed 6–19–14; 8:45 am]

BILLING CODE 7020–02–P

[1] The record is defined in sec. 207.2(f) of the Commission's Rules of Practice and Procedure (19 CFR 207.2(f)).

[2] Chairman Irving A. Williamson and Commissioner David S. Johanson dissented with respect to subject imports from Ukraine, finding that revocation of the antidumping duty order on wire rod from Ukraine would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time. Commissioner David S. Johanson also dissented with respect to subject imports from Mexico, finding that revocation of the antidumping duty order on wire rod from Mexico would not be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time. Commissioner Rhonda K. Schmidtlein did not participate in these reviews.

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–549]

Rice: Global Competitiveness of the U.S. Industry

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of hearing.

SUMMARY: Following receipt on May 15, 2014, of a request from the Committee on Ways and Means (Committee) of the House of Representatives under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), the U.S. International Trade Commission (Commission) instituted investigation No. 332–549, *Rice: Global Competitiveness of the U.S. Industry.*

DATES:

August 26, 2014: Deadline for filing requests to appear at the public hearing.
September 2, 2014: Deadline for filing prehearing briefs and statements.
September 10, 2014: Public hearing.
September 17, 2014: Deadline for filing posthearing briefs and statements.
December 9, 2014: Deadline for filing all other written submissions.
April 14, 2015: Transmittal of Commission report to the Committee.

ADDRESSES: All Commission offices, including the Commission's hearing rooms, are located in the United States International Trade Commission Building, 500 E Street SW., Washington, DC. All written submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW., Washington, DC 20436. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://www.usitc.gov/secretary/edis.htm.*

FOR FURTHER INFORMATION CONTACT: Project leader John Giamalva (202–205–3329 or *john.giamalva@usitc.gov*) or deputy project leader Marin Weaver (202–205–3461 or *marin.weaver@usitc.gov*) for information specific to this investigation. For information on the legal aspects of this investigation, contact William Gearhart of the Commission's Office of the General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). The media should contact Margaret O'Laughlin, Office of External Relations (202–205–1819 or *margaret.olaughlin@usitc.gov*). Hearing-impaired individuals may obtain information on this matter by contacting the Commission's TDD terminal at 202–205–1810. General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*). Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

Background: As requested by the Committee, the Commission will conduct an investigation and prepare a report on the factors affecting the global competitiveness of the U.S. rice industry. As requested and to the extent that information is publicly available, the report will include the following:

1. An overview of the rice industry in the United States and other major global producing and exporting countries (such as China, India, Indonesia, Thailand, Vietnam, Uruguay, and Brazil), including production of rice, processing volumes, processing capacity, carry-over inventory, and consumption;

2. Information on recent trade trends and developments in the global market for rice, including U.S. and major foreign supplier imports and exports;

3. A comparison of the competitive strengths and weaknesses of rice production and exports in the United States and other major exporting countries, including such factors as producer revenue and costs of production, industry structure, input prices and availability, processing technology, product innovation, exchange rates, pricing, and market regimes, as well as government policies and programs that directly or indirectly

affect rice production and exporting in these countries;

4. A qualitative and, to the extent possible, quantitative assessment of the impact of government policies and programs of major producing and exporting countries on their rice production, exports, consumption, and domestic prices, as well as on rice prices globally; and

5. an overview of the impact on the U.S. rice industry of exports from the highlighted countries of rice to the United States and to traditional export markets of the United States such as, but not limited to, Mexico, Haiti, and West Africa.

The Committee asked that the report focus primarily on the period 2009–2013 and that the Commission deliver its report no later than 11 months following the receipt of this request. The Committee also stated that it intends to make the Commission's report public and asked that the report not include any confidential business information.

Public Hearing: The Commission will hold a public hearing in connection with this investigation at the U.S. International Trade Commission Building, 500 E Street SW., Washington, DC, beginning at 9:30 a.m. on Wednesday, September 10, 2014. Requests to appear at the public hearing should be filed with the Secretary not later than 5:15 p.m., August 26, 2014, in accordance with the requirements in the ''Submissions'' section below. All prehearing briefs and statements should be filed with the Secretary not later than 5:15 p.m., September 2, 2014; and all posthearing briefs and statements responding to matters raised at the hearing should be filed with the Secretary not later than 5:15 p.m., September 17, 2014. All hearing-related briefs and statements should be filed in accordance with the requirements for filing written submissions set out below. In the event that, as of the close of business on August 26, 2014, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant may call the Office of the Secretary (202–205–2000) after August 26, 2014, for information concerning whether the hearing will be held.

Written Submissions: In lieu of, or in addition to, participating in the hearing, interested parties are invited to file written submissions concerning this investigation. All written submissions should be addressed to the Secretary, and all such submissions (other than prehearing and posthearing briefs and statements) should be received not later than 5:15 p.m., December 9, 2014. All written submissions must conform with the provisions of section 201.8 of the *Commission's Rules of Practice and Procedure* (19 CFR 201.8). Section 201.8 and the Commission's Handbook on Filing Procedures require that interested parties file documents electronically on or before the filing deadline and submit eight (8) true paper copies by 12:00 p.m. eastern time on the next business day. In the event that confidential treatment of a document is requested, interested parties must file, at the same time as the eight paper copies, at least four (4) additional true paper copies in which the confidential information must be deleted (see the following paragraph for further information regarding confidential business information). Persons with questions regarding electronic filing should contact the Secretary (202–205–2000).

Any submissions that contain confidential business information must also conform with the requirements of section 201.6 of the *Commission's Rules of Practice and Procedure* (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the ''confidential'' or ''nonconfidential'' version, and that the confidential business information be clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available for inspection by interested parties.

In the request letter, the Committee stated that it intends to make the Commission's report available to the public in its entirety, and asked that the Commission not include any confidential business information in the report it sends to the Committee. Any confidential business information received by the Commission in this investigation and used in preparing this report will not be published in a manner that would reveal the operations of the firm supplying the information.

By order of the Commission.

Issued: June 17, 2014.

Lisa R. Barton,

Secretary to the Commission.

[FR Doc. 2014–14455 Filed 6–19–14; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 337–TA–750]

Certain Mobile Devices, and Related Software Thereof; Commission Determination Not To Review an Initial Determination Granting Joint Motion To Terminate the Remand Investigation Based on a Settlement Agreement; Termination of Remand Investigation

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined not to review the initial determination (''ID'') of the presiding Administrative Law Judge, granting the joint motion of complainant Apple Inc., f/k/a Apple Computer, Inc., of Cupertino, California (''Apple'') and respondent Motorola Mobility, Inc. (''Motorola'') of Libertyville, Illinois to terminate the investigation based on a settlement agreement.

FOR FURTHER INFORMATION CONTACT: Megan M. Valentine, Office of the General Counsel, U.S. International Trade Commission, 500 E Street SW., Washington, DC 20436, telephone (202) 708–2301. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street SW., Washington, DC 20436, telephone (202) 205–2000. General information concerning the Commission may also be obtained by accessing its Internet server at *http://www.usitc.gov.* The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov.* Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205–1810.

SUPPLEMENTARY INFORMATION: The Commission instituted this investigation on November 30, 2010, based on a complaint filed by Apple. 75 FR 74081–82 (Nov. 30, 2010). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337 (''section 337''), in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain mobile devices and related software by reason of infringement of

Appendix C
Positions of Interested Parties

Introduction

This appendix summarizes the positions of interested parties presented in written submissions to the U.S. International Trade Commission (Commission or USITC). A public hearing was scheduled for September 10, 2014, but was cancelled. Interested parties were invited to file written submissions for the investigation. The individual summaries below were prepared by Commission staff, and the views and information contained in these summaries are those of the interested parties, not the Commission. Commission staff did not attempt to confirm the accuracy of the information presented or to correct any errors in it. The full text of the submissions can be found by searching the record for this investigation, number 332-549, in the Commission's Electronic Docket Information System (https://edis.usitc.gov/edis3-external/app).

Embassy of the Republic of Indonesia[1131]

In a written submission, the Embassy of the Republic of Indonesia described rice growing and exporting in Indonesia, and emphasized efforts in the Indonesian rice industry to implement production methods that protect the environment and improve incomes for small-scale farmers. The submission emphasized that Indonesia does not export any "commodity rice" to the United States, but rather ships only certified organic and fair trade rice. This rice is usually of traditional Indonesian varieties that are not otherwise available in the United States. Because such rice is a specialty item and sells for a high price, the embassy stated that it does not compete with rice offered by U.S. producers.

The submission further highlighted efforts among small-scale Indonesian rice farmers to adopt the System of Rice Intensification introduced by the Food and Agriculture Organization of the United Nations, which minimizes use of water and seed while improving yields and is compatible with farmers' pursuit of organic and/or fair trade certifications. Because the Indonesian market for rice is not highly differentiated, export markets are essential for rice farmers seeking to sell these products, the embassy stated.

Embassy of Uruguay[1132]

In a written submission to the Commission, the Embassy of Uruguay provided data and policy information concerning rice production in Uruguay. The data provided in the submission document the main rice-growing areas in the country; trends in land planted, rice produced, and yields over time; total production costs, prices, and producers' margins; shares of rice

[1131] Embassy of the Republic of Indonesia, written submission to the USITC, December 15, 2014.
[1132] Embassy of Uruguay, written submission to the USITC, December 8, 2014.

milled by the major mills; and shifts in the major export markets for Uruguayan rice since the 1990s. The embassy particularly highlighted the improvement in yields, which it attributes primarily to concerted efforts by the industry to use better and more uniform varieties of rice and to invest in needed improvements. The submission also emphasized irrigation of 100 percent of the rice crop as a notable feature of production in Uruguay. Finally, the submission provided both primary data and economic analysis demonstrating the diversification of export markets for Uruguayan rice in recent years, with the Brazilian market accounting for 95 percent of Uruguay's exports in the 1990s and just 13 percent by 2013, behind Iraq (24 percent) and Peru (19 percent).

In a policy section, the Embassy of Uruguay noted that the only government policies applied to the rice sector are service programs, such as advisory and research services, which are available in all agricultural sectors; and refunds of indirect taxes, which are available to many exporters in various industries. The submission states that there are no assistance policies specifically applicable to the rice sector.

U.S. Rice Producers Association[1133]

The U.S. Rice Producers Association (USRPA) provided a written submission to the Commission outlining several challenges facing the U.S. rice industry, mostly stemming from changes to U.S. domestic agricultural policy and from difficulties with the international trading system. Writing for USRPA, President and CEO Dwight Roberts provided a summary of U.S. policy changes since the mid-20th century and their effects on the rice industry. He stated that historically (from the 1940s onward), support programs for rice have changed frequently and have created a sharp focus on yields, because support depended on production levels. In some cases, according to Mr. Roberts, such programs harmed U.S. price competitiveness. He asserted that these support programs for rice have largely been eliminated, except in years when prices are extremely low.

At the same time, U.S. trade policies have not always worked in rice producers' favor, according to Mr. Roberts; for instance, political issues such as the Cuban embargo and conflicts with Iran and Iraq have had a heavy negative effect on the U.S. rice industry. He said that the reduction of trade barriers in North and Central America through the North American Free Trade Agreement (NAFTA) and Central American Free Trade Agreement (CAFTA), by contrast, has created a valuable market for U.S. paddy rice in partner countries. In fact, he remarked, in some of those countries, the United States accounts for nearly 100 percent of the import market. The USRPA cautioned, however, that the Trans-Pacific Partnership (TPP) free trade agreement, if implemented, would reduce U.S. competitiveness in some of these markets, since Asian countries could then export rice to those markets at the same duty rate as the United States.

[1133] U.S. Rice Producers Association, written submission to the USITC, December 8, 2014.

He predicted that this problem would be compounded by the fact that many Asian rice-producing countries use government policies such as public storage to support their rice industries and sell excess rice on the global market, reducing U.S. price competitiveness.

USA Rice Federation[1134]

In a written submission, the USA Rice Federation (USA Rice) provided information on the rice industry and associated government programs in the United States and five other rice-producing countries, and on the import policies in several key markets. The submission emphasized that the U.S. industry supplies about 80 percent of the U.S. domestic market and is the world's fifth-largest rice exporter, despite producing less than 2 percent of the world's rice. In reviewing government support programs in rice-producing countries, USA Rice concluded that such support measures are declining in the United States but rising in many other countries, and that this distorts international markets.

The submission notes that in the United States, government support for the rice industry has fallen throughout the 2000s and is expected to fall further under the 2014 Farm Bill. Federal spending on support for rice in 2014–18 is expected to be 85 percent lower than the 2000–04 average, according to USA Rice.

The submission stated that some rice programs have been restructured in the 2014 Farm Bill: direct payments to farmers were eliminated, income support (payments to producers when marketing year average prices fall below a set target price) was adjusted, and crop insurance was given increased priority.

Meanwhile, the submission stated, other rice-producing countries use a variety of government programs to support the sector, and these programs seem to be on the rise. Among the country-specific statements the submission provided were the following:

- In China, government programs include a wide range of input subsidies, direct payments, and price supports. The price supports are the "central pillar" of these policies; support price levels are relatively high and have been rising quickly in recent years, resulting in higher production volumes than would otherwise be expected.
- India provides input subsidies and price supports to rice farmers. The minimum support price rose substantially between 2005 and 2014, and this was associated with an increase in production levels and exports. The government also purchases and stores a significant share of the rice crop, and some of these government stocks are sold in export markets.

[1134] USA Rice Federation, written submission to the USITC, November 25, 2014.

- In Thailand, the government has replaced the Paddy Pledging Program, a price support program, with an assistance program consisting of subsidized credit and input subsidies. In late 2014, the government also announced direct payments for rice farmers. Despite the fact that price supports are no longer in place, the government still holds large stockpiles of rice accumulated under this program and is likely to sell them in export markets.

- Brazil sets a minimum guaranteed price for rice and uses various programs to ensure that producers receive this price even when the market price is lower. These programs include direct government purchases of rice, the sale of option contracts, and payments that provide the difference between the minimum guaranteed price and the market price either to commercial buyers or to producers. The latter program was used extensively in 2011, and much of the rice that benefited was exported.

- Vietnam has a price support program for rice, and all rice purchased under the program must be exported. The program has likely contributed to Vietnam's increased rice exports in the last few years.

For many of the policies listed, USA Rice expressed the view that the support programs may violate the country's World Trade Organization (WTO) obligations on agricultural subsidies. Finally, the submission listed challenges in importing markets, including Taiwan's use of a price ceiling that reduces the value of the country-specific import quota allotted to the United States, U.S. trade sanctions that limit rice exports to Cuba, cumbersome phytosanitary requirements in China, and the exclusion of rice from the U.S.-Korea free trade agreement. It also reviewed the rice import regimes in Japan and the European Union and expressed the hope that the pending TPP and Transatlantic Trade and Investment Partnership free trade agreement negotiations will improve access to these markets.

Appendix D
Regional Country Groupings

Regional Lists

Asia

East Asia

China
Hong Kong
Japan
Korea, South
Korea, North
Macau
Mongolia
Taiwan
Ryukyu Island (Nansei Island)

Source: USDA, PSD Online: Country and Region Definitions http://apps.fas.usda.gov/psdonline/ (accessed August 2, 2014).

South Asia

Afghanistan
Bangladesh
Bhutan
India
Maldives
Nepal
Pakistan
Sri Lanka

Source: USDA, PSD Online: Country and Region Definitions, (accessed August 2, 2014).

Southeast Asia

Brunei
Burma
Cambodia
Indonesia
Laos
Malaysia
Philippines
Singapore
Thailand
Vietnam

Source: USDA, PSD Online: Country and Region Definitions (accessed August 2, 2014).

Africa

West Africa

Benin
Burkina Faso
Cabo Verde
Côte d'Ivoire
Gambia, The
Ghana
Guinea
Guinea-Bissau
Liberia
Mali
Mauritania
Niger
Nigeria
Saint Helena, Ascension, and Tristan da Cunha
Senegal
Sierra Leone
Togo

Source: United Nations, Food Agricultural Organization website, Country Groups http://faostat.fao.org/site/371/default.aspx (accessed July 17, 2014).

North Africa

Algeria
Egypt
Libya
Morocco
Tunisia

Source: USDA, PSD Online: Country and Region Definitions (accessed August 2, 2014).

Sub-Saharan Africa

Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cabo Verde
Central African Republic
Chad
Comoros
Congo, Democratic Republic
Congo, Republic
Côte d'Ivoire
Djibouti
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia, The
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Reunion
Rwanda
São Tomé and Príncipe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
South Sudan
Sudan
Swaziland
Tanzania
Togo
Uganda
Zambia
Zimbabwe

Source: USITC, AGOA: Trade and Performance Overview, April 2014, 16.

Middle East

Bahrain
Gaza Strip
Iran
Iraq
Israel
Jordan
Kuwait
Lebanon
Oman
Qatar
Saudi Arabia
Syria
Turkey
United Arab Emirates
West Bank
Yemen

Source: USDA, PSD Online: Country and Region Definitions (accessed August 2, 2014).

North America

Canada
Greenland
Mexico
St. Pierre and Miquelon
United States of America

Source: USDA, PSD Online: Country and Region Definitions (accessed August 2, 2014).

South America

Argentina
Bolivia
Brazil
Chile
Colombia
Ecuador
Falklands Islands
French Guiana
Guyana
Paraguay
Peru
Suriname
Uruguay
Venezuela

Source: USDA, PSD Online: Country and Region Definitions (accessed August 2, 2014).

Central America

Belize
Costa Rica
El Salvador
Guatemala
Honduras
Nicaragua
Panama

Source: USDA, PSD Online: Country and Region Definitions (accessed August 2, 2014).

European Union

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
United Kingdom

Source: EUROPA, Countries, List of Members, http://europa.eu/about-eu/countries/index_en.htm (accessed July 24, 2014).

Appendix E
Production and Consumption Data

Table E.1: Milled rice: World production of selected countries by marketing year, 1,000 mt

Region/country	1990/91	2000/01	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Asia[a]									
China	132,532	131,536	130,224	134,330	136,570	137,000	140,700	143,000	142,530
India	74,291	84,980	96,690	99,180	89,090	95,980	105,310	105,240	106,540
Indonesia	29,042	32,960	37,000	38,310	36,370	35,500	36,500	36,550	36,300
Bangladesh	17,852	25,086	28,800	31,200	31,000	31,700	33,700	33,820	34,390
Vietnam	12,393	20,473	24,375	24,393	24,993	26,371	27,152	27,537	28,161
Thailand	11,347	17,057	19,800	19,850	20,260	20,262	20,460	20,200	20,460
Burma	7,943	10,771	11,840	11,200	11,642	11,060	11,473	11,715	11,957
Philippines	6,425	8,135	10,479	10,755	9,772	10,539	10,710	11,428	11,858
Japan	9,554	8,636	7,930	8,029	7,711	7,720	7,646	7,756	7,832
Pakistan	3,265	4,802	5,700	6,900	6,800	5,000	6,200	5,800	6,700
Cambodia	1,575	2,536	3,305	3,992	4,056	4,233	4,268	4,670	4,725
South Korea	5,606	5,291	4,408	4,843	4,916	4,295	4,224	4,006	4,230
All other	9,878	10,268	10,271	11,117	11,589	11,100	12,304	12,312	12,870
Asia total	321,703	362,531	390,822	404,099	394,769	400,760	420,647	424,034	428,553
North America									
United States	5,098	5,941	6,288	6,546	7,133	7,593	5,866	6,348	6,115
Mexico	200	215	203	161	182	146	113	131	131
Canada	0	0	0	0	0	0	0	0	0
North America total	5,298	6,156	6,491	6,707	7,315	7,739	5,979	6,479	6,246
South America									
Brazil	6,800	6,933	8,199	8,570	7,929	9,300	7,888	8,037	8,300
Peru	562	1,308	1,703	1,948	2,088	1,939	1,837	2,100	2,156
Argentina	299	567	810	867	706	1,118	1,008	1,014	1,027
Colombia	900	1,330	1,647	1,904	1,714	1,323	1,258	1,307	1,310
Uruguay	365	721	931	901	804	1,150	997	952	944
Venezuela	260	500	560	495	500	358	380	385	385
All other	934	1,503	1,821	1,774	1,923	2,009	1,847	2,057	2,158
South America total	10,120	12,862	15,671	16,459	15,664	17,197	15,215	15,852	16,280
Middle East									
Iran	1,307	1,301	1,758	1,441	1,487	1,518	1,551	1,535	1,650
Saudi Arabia	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]	[b]
All other	313	270	602	634	562	613	619	600	680
Middle East total	1,620	1,571	2,360	2,075	2,049	2,131	2,170	2,135	2,330
Africa[c]									
Egypt	2,122	3,965	4,655	4,673	4,564	3,100	4,250	4,675	4,750
Nigeria	1,500	1,979	2,008	2,632	2,234	2,818	2,877	2,370	2,772
Madagascar	1,540	1,587	1,920	2,505	2,880	3,062	2,752	2,913	2,311
Guinea	325	566	925	1,012	961	990	1,102	1,267	1,355
Tanzania	460	511	886	938	881	1,320	1,484	1,189	1,327
Mali	182	492	703	1,055	1,268	1,500	1,130	1,250	1,438
Sierra Leone	326	120	370	428	559	648	679	719	791
Côte d'Ivoire	394	570	465	442	447	469	456	471	520

Region/country	1990/91	2000/01	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Ghana	49	150	111	181	235	295	278	289	352
Senegal	118	140	131	277	345	408	276	320	290
Liberia	126	120	146	181	185	187	183	188	150
Guinea-Bissau	104	68	76	89	109	125	105	119	126
Benin	6	22	47	70	72	80	141	140	133
Mauritania	21	70	39	64	32	80	97	146	109
Togo	13	53	52	56	78	72	73	75	100
Kenya	27	33	31	15	28	57	73	81	97
Niger	48	40	46	50	58	66	35	46	26
All other	413	682	773	950	1,114	1,175	1,202	1,238	1,300
Africa total	7,774	11,168	13,384	15,618	16,050	16,452	17,193	17,496	17,947
Europe									
European Union[d]	1,695	1,584	1,906	1,773	2,176	2,172	2,139	2,100	1,965
Russia	582	381	460	480	590	690	686	684	608
All other	17	11	12	12	12	12	12	10	10
Europe total	2,294	1,976	2,378	2,265	2,778	2,874	2,837	2,794	2,583
Other									
Australia	563	1,175	13	44	142	521	662	836	600
Haiti	78	78	53	55	50	78	78	62	78
Cuba	308	359	283	283	366	295	370	417	423
All other	1,613	1,384	1,491	1,524	1,764	1,913	1,852	1,777	1,814
Other total	351,371	399,260	432,946	449,129	440,947	449,960	467,003	471,882	476,854

Source: USDA, PSD Online (accessed December 29, 2014).
[a] Asia includes East Asia, South Asia, and Southeast Asia.
[b] Data not available.
[c] Africa includes North Africa and sub-Saharan Africa.
[d] Based on the EU's current 28-country membership for all years.

Table E.2: Milled rice: World consumption of selected countries by marketing year, 1,000 mt

Region/country	1990/91	2000/01	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Asia[a]									
China	123,911	134,300	127,450	133,000	134,320	135,000	139,600	144,000	146,300
India	73,091	75,960	90,466	91,090	85,508	90,206	93,334	94,031	99,180
Indonesia	30,121	35,877	36,350	37,100	38,000	38,044	38,188	38,127	38,500
Bangladesh	18,153	24,958	30,747	31,200	31,600	32,400	34,300	34,500	34,900
Vietnam	11,345	16,932	19,400	19,000	19,150	19,400	19,650	21,900	22,000
Thailand	8,400	9,250	9,600	9,500	10,200	10,300	10,400	10,600	10,875
Burma	7,350	9,700	10,750	10,800	10,890	10,100	10,200	10,400	10,500
Philippines	6,154	8,750	13,499	13,100	13,125	12,900	12,860	12,850	12,850
Japan	9,580	8,297	8,162	8,326	8,200	8,200	8,050	8,250	8,250
Pakistan	2,100	2,615	2,718	3,490	2,916	2,447	2,548	2,317	2,630
Cambodia	1,630	2,575	3,000	3,220	3,270	3,370	3,400	3,550	3,650
South Korea	5,490	5,152	4,670	4,789	4,701	5,175	4,880	4,489	4,460
All other	11,033	12,276	12,541	13,409	13,614	13,348	14,447	14,772	15,462
Asia total	308,358	346,642	369,353	378,024	375,494	380,890	391,857	399,786	409,557
North America									
United States	2,981	3,676	4,042	4,082	4,014	4,329	3,492	3,779	3,994
Mexico	440	650	725	766	781	773	825	835	860
Canada	189	255	388	329	363	327	351	363	350
North America total	3,610	4,581	5,155	5,177	5,158	5,429	4,668	4,977	5,204
South America									
Brazil	7,675	8,025	8,350	8,400	8,477	8,200	7,928	7,850	7,900
Peru	880	1,350	1,750	1,950	2,025	2,029	2,150	2,280	2,294
Argentina	219	325	325	330	270	350	390	430	435
Colombia	950	1,400	1,770	1,830	1,800	1,600	1,525	1,550	1,600
Uruguay	75	100	60	60	60	60	60	60	55
Venezuela	261	405	575	600	615	630	660	660	650
All other	801	1,323	1,581	1,607	1,611	1,558	1,467	1,564	1,592
South America total	10,861	12,928	14,411	14,777	14,858	14,427	14,180	14,394	14,526
Middle East									
Iran	2,107	2,860	3,000	3,100	3,150	3,250	3,300	3,350	3,400
Saudi Arabia	547	875	1,157	1,100	1,085	1,100	1,150	1,300	1,325
All other	1,421	2,525	3,430	3,427	3,546	3,943	4,153	4,160	4,245
Middle East total	4,075	6,260	7,587	7,627	7,781	8,293	8,603	8,810	8,970
Africa[b]									
Egypt	1,813	3,015	3,610	4,270	3,940	3,300	3,620	4,050	4,000
Nigeria	2,757	3,029	4,100	4,220	4,350	4,800	5,600	5,300	6,000
Madagascar	1,611	1,917	2,115	2,615	2,990	3,202	2,902	3,133	2,861
Guinea	413	841	1,100	1,212	1,231	1,255	1,377	1,512	1,610
Tanzania	500	761	951	963	961	1,360	1,584	1,359	1,497
Mali	206	531	803	1,140	1,316	1,400	1,400	1,450	1,480
Sierra Leone	383	220	545	498	649	763	939	994	1,061

Region/country	1990/91	2000/01	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Côte d'Ivoire	657	1,050	1,330	1,350	1,330	1,320	1,530	1,600	1,650
Ghana	155	450	463	486	600	790	875	950	975
Senegal	476	850	1,160	1,020	1,055	1,130	1,300	1,350	1,400
Liberia	255	217	286	331	385	402	383	460	460
Guinea-Bissau	121	70	156	164	219	235	235	245	250
Benin	36	125	197	215	232	265	391	490	483
Mauritania	69	93	129	169	132	135	182	215	230
Togo	58	198	137	136	168	172	168	185	200
Kenya	48	55	206	240	318	311	310	326	326
Niger	48	55	206	240	318	311	310	326	326
South Africa	290	550	927	703	759	700	850	880	905
All other	1,271	2,058	2,926	2,682	3,161	3,424	3,830	4,306	4,510
Africa total	11,167	16,085	21,347	22,654	24,114	25,275	27,786	29,131	30,224
Europe									
European Union[c]	1,876	2,600	3,000	3,100	3,200	3,250	3,300	3,250	3,250
Russia	532	650	676	640	670	680	650	720	720
All other	81	68	106	110	121	134	135	145	145
Europe total	2,489	3,318	3,782	3,850	3,991	4,064	4,085	4,115	4,115
Other									
Australia	212	356	343	270	291	308	325	350	357
Haiti	184	330	380	410	390	410	440	480	490
Cuba	572	840	935	746	834	937	839	786	873
All other	2,293	2,338	2,532	2,479	2,639	2,754	2,847	2,934	2,964
Other total	343,821	393,678	425,825	436,014	435,550	442,787	455,630	465,763	477,280

Source: USDA, PSD Online (accessed December 29, 2014).

[a] Asia includes East Asia, South Asia, and Southeast Asia.

[b] Africa includes North Africa and sub-Saharan Africa.

[c] Based on the EU's current 28-country membership for all years.

Appendix F
Trade Data Sources

The global rice trade data used in this study were complex and often difficult to access. Unofficial or "gray market" trade plays an important role in rice trading in at least two regions, and even official data are partly unavailable in several major importing and exporting countries. A number of sources for trade data exist. However, each has a different reporting methodology, which can result in inconsistent data, and all have certain data limitations (table F.1).

Table F.1: Comparison of trade data sources

Database	Number of countries	Year range	Value data	Quantity data	Accounts for unofficial trade	MRE[a] conversion?	Bilateral trade flows
Global Trade Atlas	76	2007–13	Yes	Yes	No	N	Yes
UN Comtrade	194	2007–13[b]	Yes	Yes	No	N	Yes
PSD Online	116[c]	2007–13	No	Yes	Some	Y	No
FAOSTAT	203	2007–11	Yes	Yes	Some	Y	No

Source: Compiled by USITC staff.

[a] MRE = milled rice equivalent. When data are presented on an MRE basis, all trade is quantified as if it were milled rice, even that of paddy rice. When data sources are combined this conversion only affects the data of countries which trade in paddy, which is a small share of the total.

[b] Some countries do not have data available for 2013.

[c] USDA's PSD Online treats the EU as a single entity, while FAO counts the EU's 28 member states as individual countries.

The Commission found that the U.S. Department of Agriculture (USDA) Production Supply and Distribution (PSD) Online database was best suited for comparing trade volumes among countries and global shares, because (1) it includes estimates of unofficial trade data and (2) it contains data for certain countries not included in the Global Trade Information Services (GTIS) Global Trade Atlas (GTA) database (e.g., Vietnam and Burma). However, PSD Online's data report quantity only, on a milled-rice-equivalent basis, so it was not possible to use them directly to analyze values, bilateral trade flows, or trade in specific types of rice.

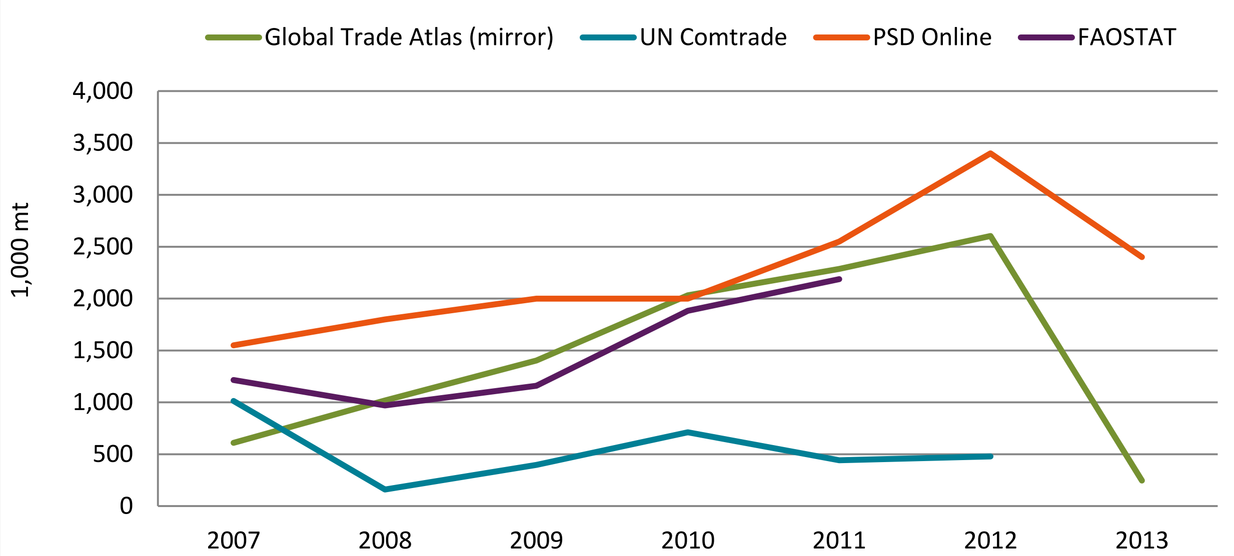
The GTA database contains, as available, both value data and bilateral trade data. Its data also allow for reporting trade data by type and form, using the subheadings of the Harmonized Commodity Description and Coding System (HS). Data can be broken down to at least the 6-digit HS level, and, for some countries, into even more specific groupings. However, the GTA database does not contain data for all the rice-producing countries examined in this report. Sometimes when the GTA database does not contain a country, partner-country (or "mirror") data can be used to construct trade data. For example, to analyze Vietnamese exports, import data for Vietnam's trade partners can be examined. However, since the GTA does not have trade data for a number of major rice-importing and rice-exporting countries—including several countries that trade rice with each other—this method could not be used in all cases for this report.

GTIS also offers the option of including supplemental data for additional countries sourced from the United Nations Comtrade database (UN Comtrade). While the Commission found this option helpful, the year range is limited for some countries, which can result in inconsistent comparisons across years.

The Commission also used the UN Food and Agriculture Organization statistics database (FAOSTAT). FAOSTAT includes both value and quantity for the widest range of countries, but it, too, has a number of important data constraints: (1) many data are aggregated, (2) it lacks data on bilateral trade flows, and (3) it only contains data through 2011.[1135]

The data differences between each database can clearly be seen in figure F.1, which shows figures for Nigerian rice imports by database.[1136] As a result of these differences, the Commission sed multiple sources[1137] in obtaining trade data for this report so that it could more accurately portray global rice trade flows (see table F.2).

Figure F.1: Nigerian rice imports, by database, 2007–13 (thousand metric tons)



Source: FAOSTAT (accessed September 2, 2014); GTIS, Global Trade Atlas database (accessed September 4, 2014); USDA, PSD Online (accessed August 26, 2014).

1135 FAOSTAT trade data are also given on a milled-rice-equivalent basis; GTA data are by product weight.
1136 Nigeria trade data are not reported to GTA, so mirror data were used for this figure.
1137 Sometimes, needed data were not available in any of these databases. In these cases the study used other data sources, including USDA attaché reports.

Table F.2: Trade data sources and calculations by country

Country	Sources
Exporters	
Brazil	*Global tables:* GTA data were used for value and quantity. *Country tables:* GTA data were used for value and quantity.
Burma	*Global tables:* Values were estimated by USITC based on PSD Online quantities and unit values from FAOSTAT for 2007-11 and, for 2012-13, from GTIS mirror data (which are obtained from UN Comtrade and GTA). PSD Online data were used for quantity. *Country tables:* GTIS mirror data (which are obtained from UN Comtrade and GTA) were used for value and quantity. The USITC compared these data with PSD Online total export quantities to identify differences due to grey market trade not included in the GTA database.
Cambodia	*Global tables:* Values were estimated by USITC using mirror data unit values from GTIS mirror data (which are obtained from UN Comtrade and GTA) and quantity data from PSD Online. PSD Online data were used for quantity. *Country tables:* UN Comtrade data (obtained from GTIS) were used for value and quantity. The USITC compared these data with PSD Online total export quantities to identify differences due to grey market trade not included in the GTA database.
China	*Global tables:* GTA data were used for value and quantity.
India	*Global tables:* GTA data were used for value and quantity. *Country tables:* GTA data were used for value and quantity.
Pakistan	*Global tables:* UN Comtrade data (obtained from GTIS) were used for value and quantity. *Country tables:* UN Comtrade data (obtained from GTIS) were used for value and quantity.
Thailand	*Global tables:* GTA data were used for value and quantity. *Country tables:* GTA data were used for value and quantity.
United States	*Global tables:* GTA data were used for value and quantity. *Country tables:* GTA data were used for value and quantity.
Uruguay	*Global tables:* GTA data were used for value and quantity. *Country tables:* GTA data were used for value and quantity.
Vietnam	*Global tables:* For 2008–13, value and quantity data are from the Vietnam Food Association (VFA). For 2007, FAOSTAT data were used for value and quantity, because data for that year were not available from VFA. VFA quantity data do not differ significantly from PSD Online or from export data obtained from USDA Global Agricultural Information Network (GAIN) reports. *Country tables:* Export quantity data by region from USDA GAIN reports were used. These were cited to industry sources. Data for values and exports by country were not available.
Total	*Value:* FAOSTAT data were used for 2007–11. For 2012–13, USITC estimated values using unit values from GTA and quantity data from PSD Online. *Quantity:* PSD Online data were used because they include some figures for unofficial trade.
Importers	
China	*Global tables:* For 2007–11, GTA data were used for value and quantity. For 2012–13, because there were large amounts of unofficial trade in those years not reflected in GTA, USITC estimated values using unit values from GTA and quantity data from PSD Online. PSD Online data were used for quantity. *Country tables:* GTA data were used for value and quantity. The USITC compared these data with PSD Online total export quantities to identify differences due to grey market trade not included in the GTA database.
Côte d’Ivoire	*Global tables:* GTA data were used for value and quantity.
EU	*Global tables:* GTA data were used for value and quantity.
Indonesia	*Global tables:* Values were estimated by USITC using GTA unit values and quantity data from PSD Online. PSD Online data were used for quantity.

Country	Sources
	Country tables: GTA data were used for value and quantity.
Iran	*Global tables:* Values were estimated by USITC unit values from GTIS mirror data (which are obtained from UN Comtrade and GTA) and quantity data from PSD Online. PSD Online data were used for quantity.
Iraq	*Global tables:* FAOSTAT data were used for 2007–10 value and quantity. For 2011–13, the GTIS mirror data (which are obtained from UN Comtrade and GTA) were used for value and quantity.
Japan	*Global tables:* GTA data were used for value and quantity.
Mexico	*Global tables:* GTA data were used for value and quantity.
Nigeria	*Global tables:* The USITC estimated values based on unit values from UN Comtrade data (obtained from GTIS) and quantity data from PSD Online. PSD Online data were used for quantity because large amounts of unofficial trade were not captured in the mirror data.
Philippines	*Global tables:* GTA data were used for value and quantity for 2007–10. For 2011–13, because large amounts of unofficial trade in those years were not reflected in GTA, values were estimated by USITC based on unit values from GTA and quantity data from PSD Online. PSD Online data were used for quantity. *Country tables:* GTA data were used for value and quantity. The USITC compared these data with PSD Online total export quantities to identify differences due to grey market trade not included in the GTA database.
Saudi Arabia	*Global tables:* GTA data were used for value and quantity.
Senegal	*Global tables:* GTA data were used for value and quantity.
South Africa	*Global tables:* GTA data were used for value and quantity.
United States	*Global tables:* GTA data were used for value and quantity. *Country tables:* GTA data were used for value and quantity.
Total	*Value:* For 2007–11, FAOSTAT data were used for value and quantity. For 2012–13, USITC estimated values based on unit values from GTA (excluding Uruguay because of unknown units of measure) and quantity data from PSD Online. *Quantity:* PSD Online data were used because they include some unofficial trade.

Source: Compiled by USITC staff.

Note: Global tables show aggregate figures for trade (imports and/or exports) with the rest of the world; country tables show figures for trade with each partner country.

Appendix G
Competitive Conditions Analytical Framework

A Framework for Analyzing the Competitive Conditions Affecting Global Rice Trade

Over the years, several Commission factfinding investigations have addressed competitive conditions affecting U.S. agricultural markets.[1138] In many of these studies, "competitive conditions" refer mostly to factors that determine costs of production, such as natural resource base, input costs, government subsidies, technology, transportation costs, marketing infrastructure, and exchange rates.[1139] Subsequent discussions with industry representatives and government officials suggest that the competitive conditions affecting global trade in agricultural products go far beyond costs of production and include a wide range of market, institutional, and regulatory factors.

To analyze the competitive factors affecting trade in agricultural products, the USITC adopted an economic framework incorporating the analytical assumptions, parameters, and structure that define competitive conditions in agricultural trade.[1140] Competitive conditions in agriculture refer to the economic, institutional, and regulatory environment in which firms compete. Differences between countries in their competitive conditions provide opportunities and incentives for agricultural trade to take place. The competitiveness of a country's agricultural sector is defined as the ability of its farmers and food processors to sell their products in domestic and overseas markets.[1141] The ability of suppliers to sell agricultural products is determined by purchasers that base their buying decisions on a set of desired product characteristics, such as low delivered cost, product differentiation, and reliability of supply (figure G.1). The remainder of the appendix provides more detail about these characteristics, as well as a description of the Porter Framework for Competitive Advantage (a key source for the USITC framework) and its application to agriculture.

[1138] Examples include USITC, *Conditions of Competition for Milk Protein Products in the U.S. Market*, 2004; USITC, *Conditions of Competition for Certain Oranges and Lemons in the U.S. Fresh Market*, 2006; USITC, *Canned Peaches, Pears, and Mixtures: Conditions of Competition between U.S. and Principal Foreign Supplier Industries*, 2007; USITC, *Olive Oil: Conditions of Competition between U.S. and Major Foreign Supplier Industries*, 2013.
[1139] For example, in recent Commission investigations, factors affecting competitiveness in the canned fruit and citrus fruit industries were identified as natural resource endowments, production costs, technology, market size, industry concentration, government involvement, and exchange rates, and in the U.S. milk protein industry, competitiveness factors included costs of production, government programs, production technology, transportation costs, and exchange rates.
[1140] USITC, *Guidelines for Developing an Economic Framework for an ITC Study*, 2008.
[1141] Other definitions of competitiveness are (1) "the ability of a nation, national industry, or firm to produce goods and services that consumers choose over competing alternative." President's Commission on Industrial Competitiveness, Global Competition—New Reality (vol. 1), January 1985, 6; and (2) "the ability of producers to sell goods in foreign markets at price, quality and timeliness comparable to competing foreign products." USITC, *Sub-Saharan Africa: Effects of Infrastructure Conditions on Export Competitiveness*, 2009.

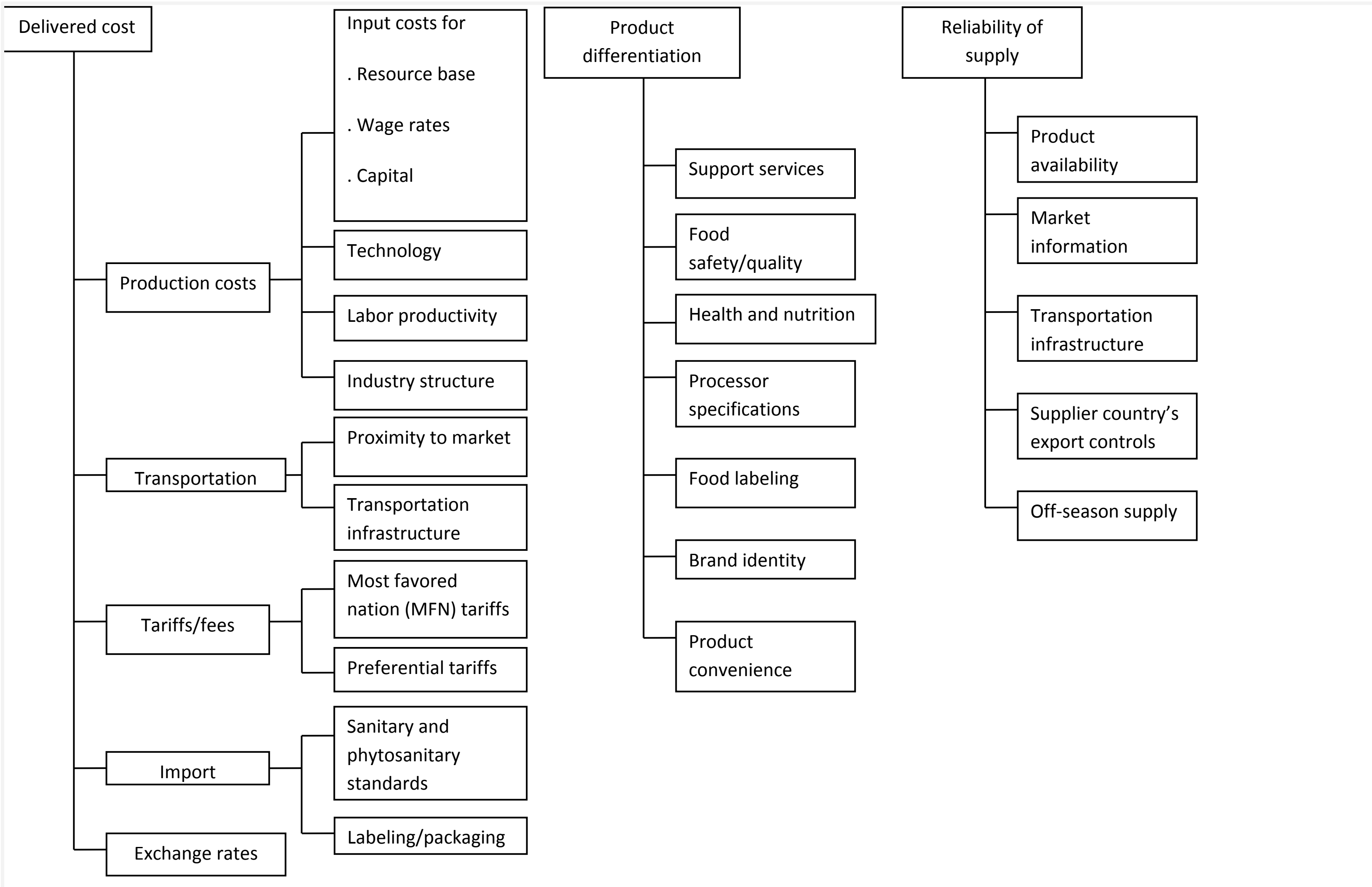
The relative importance of delivered cost, product characteristics, and reliability of supply in determining competitiveness depends on the type of agricultural product traded. Many agricultural products are highly heterogeneous, differing, for example, in terms of the level of processing, branding, by type of purchaser (food processor/food consumer), or whether the products are used in food or industrial applications. For bulk, undifferentiated products, purchasers typically buy based largely on delivered cost. In fact, for some products, cost may be the only consideration. But for other products including semi-processed, highly processed, and branded products, purchasers increasingly consider specific product characteristics, in addition to cost and reliability, in making their buying decisions.

Delivered Cost

For many globally traded agricultural products, delivered cost is the most important criterion in making purchasing decisions. For producers of these goods to be competitive in export markets, they must be able to supply the products to purchasers at or below the price offered by other exporters and domestic producers. The price competitiveness of these suppliers therefore depends on factors that tend to lower or raise their delivered costs vis-à-vis the delivered costs of other imported and domestic products in their home market.

The delivered cost of domestically produced goods depends on the costs of producing the good and the cost of domestic transportation from production points to consumption points. Production costs in turn depend on the costs of inputs, such as fertilizer and wages. The use of biotechnology, such as in high-yielding seeds, and production technology, such as machinery and irrigation, also influences delivered cost. Transportation costs derive from several factors, including fuel costs and the efficiency of the transportation system, which in turn depends on factors such as the quality of roads and ports. Additional costs affect the overall delivered cost to export markets. These include the costs of international transportation, currency conversion, trade risk coverage, and tariffs in the foreign market. The delivered cost of exported goods also includes expenditures on import compliance, such as complying with sanitary and phytosanitary (SPS) standards, and meeting labeling and packaging requirements of third-country markets.

Figure G.1: Factors that affect competitiveness in agricultural markets



Source: Compiled by USITC staff.

Product Differentiation

In addition to delivered cost, purchasers compare the level of product differentiation of domestically-produced and imported products in making their buying decisions. The more processed and branded the product, the more likely product characteristics and reputation will form the basis of the purchasing decision, thereby making delivered cost less important. Similar products are differentiated from one another through their unique product characteristics, such as quality attributes, brand packaging, labeling, and their level of convenience, with the help of large investments in marketing, promotion, and media advertising.

Reliability of Supply

Reliability of supply refers to the ability of a supplier to deliver a specified product, of a particular quality and in an agreed-upon volume, to a specified location at a contracted time. Risks inherent in agricultural production (potentially impacting both the quantity and quality of supply) make this criterion particularly important for purchasers to consider. Products can be differentiated by their availability at different times of year, particularly when overseas suppliers are able to ship goods in the off-season to domestic consumers. Reliability of supply depends on the efficiency of the supply chain, including storage and transportation infrastructure, as well as market information systems. In agriculture, several factors may disrupt the reliability of supply, such as government-imposed export controls, political unrest, poor transportation infrastructure, and unstable production quantities (owing to poor weather); these may in turn shrink a country's exportable surplus.

Porter Framework for Competitive Advantage

Summary of the Framework

Michael Porter provides a useful starting point from which to develop a framework for analyzing competitive conditions affecting agricultural trade.[1142] According to Porter, there are two basic types of competitive advantage—low cost and differentiation. From these, Porter describes three generic strategic approaches firms can employ to achieve a competitive advantage in an industry—overall cost leadership, differentiation, and focus. Firms can pursue a competitive advantage within an industry by becoming the low-cost producer. Cost leadership strategies for firms involve aggressively pursuing preferential access to low cost inputs, seeking

[1142] Porter, Michael E., *Competitive Strategy*, 1980.

economies of scale, investing in cost-saving technologies, and minimizing costs associated with research and development, advertising, marketing, and sales. Porter notes that firms seeking cost leadership typically supply generic, undifferentiated, no-frills products and "place considerable emphasis on reaping scale or absolute cost advantage from all sources."[1143]

Alternatively, firms may seek a competitive advantage in a market through product differentiation. With this strategy, firms create an advantage in the market by offering a product perceived by purchasers as being special or unique. Porter identifies several forms of differentiation, including product design or brand image, special features, customer service, and dealer networks. Product differentiation creates brand loyalty among customers, who respond by being less sensitive to price in making their purchasing decisions.

Cost leadership and product differentiation strategies are employed by firms competing for a broad range of consumers in many segments of the market. However, Porter describes a third strategy whereby firms seek a competitive advantage by focusing on a narrow market segment or consumer type. Under a "focus" strategy, firms target a narrow segment of the market (e.g., a certain demographic or income level, consumers with unusual or specific needs, consumers for which a specific delivery system better suits their needs) and aim to provide products and services better than firms trying to satisfy many consumers in a broader market segment. A focus strategy assumes that the needs of the target market are not well served by firms serving the entire market.[1144]

Porter points out that the three strategies are not mutually exclusive. Firms looking for a competitive advantage through cost leadership must not ignore product quality and customer service. Similarly, a differentiation strategy does not allow firms to ignore costs and the importance of maintaining costs close to those of their competitors. Further, Porter describes two types of focus strategies—cost focus (firms aim to be the cost leader in the target market) and differentiation focus (firms seek differentiation in the target market).

A Framework for Agriculture

In spite of the weaknesses identified in the Porter approach, it still provides a useful starting point from which to develop a framework for agriculture. Porter developed this framework for individual firms competing in an industry. However, it is possible to apply it at a more macro level to analyze how individual country agricultural sectors (made up of several firms) compete

[1143] Porter, Michael E., *Competitive Advantage*, 1985, 13.
[1144] Porter provides an example of a focus strategy used by Martin-Brower, once the third largest food distributor in the United States. "Martin-Brower has reduced its customer list to just eight leading fast food chains. Its entire strategy is based on meeting the specialized needs of the customers, stocking only their narrow product lines, order taking procedures geared to their purchasing cycles, locating warehouses based on their locations, and intensely controlling and computerizing record-keeping." Porter, Michael E., *Competitive Advantage*, 1985, 40.

in a global marketplace.[1145] Porter identified low costs and differentiation as drivers of competitive advantage for firms in a market. Similarly, within global agricultural markets, delivered cost (low costs) and product characteristics (differentiation) form the essential criteria upon which importers and buyers of agricultural products make their purchasing decisions. For many bulk, unprocessed agricultural products such as wheat, corn, and soybeans, success in global markets is determined largely by whichever supplier is able to offer buyers the lowest delivered cost (assuming that minimum quality standards and other basic product specifications of the buyer are met). For other agricultural products—especially value-added, processed products such as infant formula, alcoholic beverages, and snack foods—buyers are less sensitive to delivered cost and choose among suppliers more on the basis of product differentiation (assuming cost is not prohibitive).[1146]

In addition to delivered cost and product differentiation identified by Porter, importers and buyers of agricultural products view the *reliability of the supplier* as a further factor in their selection among competing suppliers.[1147] Reliability refers to the ability of a supplier to deliver a product in the desired form, at the desired place and time, and in sufficient volume on a consistent basis. Although reliability of supply is important for nonagricultural products, the inherent riskiness of agricultural production (because of weather and disease, for example) and the economic and political importance of agricultural production in many countries means that reliability of supply for agricultural products takes on a particularly strong significance.

Porter's theoretical framework of competitiveness, in combination with practical knowledge of how agricultural products are traded internationally, provides the building blocks for an analytical framework to address the competitive conditions and factors affecting global agricultural trade. This framework assumes that purchasers base their buying decisions on three main criteria: delivered cost, product differentiation, and reliability of supply. Buyers evaluate the importance they place on these criteria and then make purchasing decisions based on which competing supplier is best able to meet their requirements.

[1145] Porter, *The Competitive Advantage of Nations*, 1990.
[1146] The focus strategy discussed by Porter can be viewed as a type of product differentiation in which sellers adapt their products to fit the particular desires of a narrow segment of consumers. This is particularly true for branded items such as wine produced in small lots and hand-crafted cheese. For this reason, further discussion of the focus strategy is dropped from this analytical framework.
[1147] The assertion that reliability of supply is a major factor in importer purchasing decisions is based on Commission staff experience in dealing with agricultural industry exporters and importers.

This framework highlights several important aspects of agricultural competitiveness:

- Competitiveness is a relative, not absolute, concept, and not all products are competitive in all markets. For example, consider the market for soybean oil in India. Buyers in the Indian market are highly price-sensitive and base their purchasing decisions largely on delivered cost. Even though the United States is a highly efficient producer and one of the world's lowest-cost suppliers of soybean oil, Indians buy this product almost exclusively from Argentina and Brazil. One reason is that these countries may have even lower costs, after adjusting for exchange rates.[1148] In addition, Argentina's use of differential export taxes on soybeans, compared to soybeans oil, has the effect of significantly reducing the price level at which Argentina soybean processors can sell oil profitably to other countries. In this case, being a low-cost producer is not enough to make the United States competitive in India's soybean oil market.[1149]

- As with all efficiently functioning markets, buyers of agricultural products are the ultimate arbiters of which suppliers are competitive, not the suppliers themselves. However, suppliers can make their products attractive to a buyer by offering low-cost, differentiated products and reliable delivery in order to entice a buyer to select their product.

- Competition among agricultural suppliers takes place in two markets—domestic and export. Domestic competitiveness is the ability of local suppliers to sell goods in the domestic market with better delivered cost, product differentiation, and/or reliability than other domestic suppliers and competing import suppliers. Export competitiveness is the ability of local suppliers to sell goods in foreign markets with better delivered cost, product differentiation, and/or reliability than competing domestic and foreign producers.

[1148] USITC, *India: Effects of Tariffs and Nontariff Measures*, 2009.

[1149] This does not mean that the United States is not competitive in all markets. In other markets, buyers may base their purchasing decisions less on delivered cost and more on product quality and the ability of U.S. exporters to meet the desired product specifications of customers. In such markets, the U.S. product may be more competitive than that of Brazil and Argentina.

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Appendix H
Analytical Framework of the RiceFlow Model

The RiceFlow Model

As discussed in chapter 12, the impacts of government policies and programs of major producing and exporting countries, and of potential changes in production technologies, were assessed using the RiceFlow model, a partial equilibrium model of rice production and trade.[1150] The RiceFlow model includes a database including behavioral parameters and supply, demand, and trade data for 73 countries or regions of the world, for different varieties of rice and stages of processing. RiceFlow models production of three different types of rice: (1) long grain, (2) medium and short grain, and (3) aromatic rice, and three different processing levels: (1) paddy, (2) brown (i.e., partially processed), and (3) white (i.e., fully milled). The model connects production from the field through milling operations, trade, and final consumption, including policies affecting these markets. Policies included in the model cover production and consumption support, as well as trade policies such as tariffs or export taxes. All of the connections between production inputs, outputs, and policies are determined by equations linking the data elements and parameters of the model. The equations are calibrated to market conditions in the baseline year 2013. The elements of the model that are most pertinent to this analysis are described in more detail below, as are major types of government policies and the modeling of changes to these policies in the RiceFlow model.

Among the model components discussed below are several policy variables that represent costs (sometimes called "taxes" in economic literature) or benefits (often referred to as "subsidies") to rice applied at the point of production, to inputs to production, to imports and exports, and to final consumption. The effects of these policy variables on rice markets are estimated through various simulations in which these variables are changed in the model, generally to zero (although in the case of the Mexico tariff simulation, tariffs are raised to simulate the re-imposition of tariffs). In simulations for China and Thailand, the rate of rice stock accumulation, treated as exogenous, is changed to simulate relevant changes in government policy. Values of different prices and quantities within the model are then compared before and after imposition of the policy change. The differences are the implied effects of each policy simulation.

These effects are interpreted in terms of the base year; in other words, they do not show what the market would look like (or would have looked like) after the policy elimination, but what it would have looked like in the base year (i.e., 2013) had the policy been different. It is important to note that the components of the model described below all interact with each

[1150] Durand-Morat, Alvaro, and Eric Wailes. "RiceFlow: A Multi-Region, Multi-Product, Spatial Partial Equilibrium Model of the World Rice Economy." Department of Agricultural Economics and Agribusiness, University of Arkansas, July 2010. This appendix draws heavily on the model documentation, updated to reflect the current version of the model, found at: http://ageconsearch.umn.edu/bitstream/92010/2/RICEFLOW%20model%20documentation%20SP%2003%202010.pdf.

other to generate a rice economy that is in equilibrium, matching supply and demand for each type of rice at each stage of production and consumption, and for each of the inputs to that production. Thus, a change in input support, for example, affects not just the price and quantity marketed of that input, but also the rice production that uses it, other inputs, other varieties of rice, and ultimately rice consumption.

Factor Markets and Intermediate Inputs

RiceFlow models the markets for intermediate inputs (seed, water, fertilizer, pesticide, and energy) and factors of production (labor, capital, and land).[1151] The benchmark version of RiceFlow treats wages (the price of labor) and returns to capital (the price of capital) as fixed, and the supply of labor and capital immediately adjusts throughout production as a result. The supply of land, however, has an upward-sloping demand curve and adjusts slowly in response to demand. In the benchmark RiceFlow model, the own-price elasticity of supply of land is set to 0.25, that is, a 1 percent rise in the rental rate of land (the price of land) will induce an increase of 0.25 percent in the supply of land to the rice sector. The model also features an elasticity of transformation for land, which captures the ease with which land moves between the production of different rice types. Most countries in the model have an elasticity of 1, while the European Union and the United States have an elasticity of 5, and China, India, Pakistan, and Thailand have an elasticity of 10, meaning that land in these latter four countries moves very easily across production of different types of rice.[1152]

Government policies to support rice production can take the form of assistance for the purchase of intermediate inputs (e.g., fuel, water, or fertilizer) or factors of production (e.g. low-interest loans for land or capital equipment). In the model, the effect of these policies is simulated under each scenario by the addition or removal of taxes in the 2013 base year. Changes in policies affecting factors of production and other intermediate inputs feed into changes in costs of production and output.

Production

The purpose of this analysis is to evaluate the effect of rice market policies on rice production.[1153] The model assumes that production by growers and processors is competitive. Production of commodities other than rice by growers or processors is not explicitly modeled in

[1151] While the RiceFlow model allows for support for labor inputs, none are documented in the database.
[1152] India, Pakistan, and Thailand produce large volumes of both long grain and aromatic rice. China produces large volumes of both long grain and medium grain rice. Although the United States also produces both long grain and medium grain rice, they are largely produced in different parts of the country, under very different conditions.
[1153] All of the policies and productivity changes modeled concern production of paddy rice.

RiceFlow.[1154] Within each country, there is a single production function for each type and form of rice. In countries where two different technologies exist for the production of lowland and upland rice, the sector within RiceFlow represents an aggregate or average of the two. Production is specified as a two-stage process. The first production stage determines the conditional demand functions for intermediate inputs to rice and the capital and labor value-added components of its production.[1155] The derived demand for the value-added and intermediate composites are a function of the technological characteristics of production, the producer price for the activity, and the composite prices of value-added and intermediates, respectively. This links rice production to policies that affect the supply and price of the inputs water, seed, fertilizer, pesticide, energy, land, and labor. This study uses the benchmark parameterization of the RiceFlow model, where paddy production employs all inputs in fixed proportion (i.e., Leontief production technology). For brown and white rice production, paddy or brown rice are used in fixed proportion along with a value-added composite of labor and capital. Labor and capital, in turn, follow a Cobb-Douglas functional form, meaning that labor and capital's value shares in the value-added composite are constant. This functional form implies that there is no substitutability in the inputs to paddy rice production, and therefore no induced change in the production process for paddy rice: application of additional fertilizer, for example, cannot substitute for the use of seed. Milling of brown and white rice requires fixed proportions of the primary inputs (paddy and brown rice, respectively), but allows for some substitution between capital and labor within the value-added nest.

The supply of land, labor, and capital also help determine the behavior of production. As noted above, capital and labor are perfectly elastically supplied, that is, the wage and land rental rates are fixed in each country regardless of the level of demand in the rice sector. Land, however, has an upward-sloping supply curve and an increase in the rate of return will lead to an increase in the supply of land in rice production. The ease with which land shifts between the production of long grain, medium grain, or aromatic rice is determined by the elasticity of transformation, which ranges between 1 and 10 as noted above. Labor and capital move freely between rice types, in keeping with the assumption of perfect elasticity.

The model includes a number of technology-related exogenous variables that can be shocked to evaluate the effect of a change in production technology. These represent augmenting technical changes in the productivity of the value-added and intermediates composites by activity and region. A positive change in activity technical change in production has two main

[1154] The model assumes that factors of production may shift between types of rice and between rice and other crops. To the extent that rice producers lack the ability to shift to alternate crops, model results may be overstated. For example, government policies may dictate the crop to be grown, additionally, subsistence farmers may not be responsive to price.

[1155] Labor and capital are the primary factors of production that add value in the milling of rice.

effects: (1) at constant prices, it uniformly reduces the demand for factors of production; and (2) it lowers the cost of value-added, thus encouraging the expansion of production.

In the RiceFlow model, government policies can be applied directly to the production of rice in the form of production support and policies directed at production technology. The quantity of rice produced depends not only on the inputs (and polices affecting them), but also on the production process and policies affecting that process. It also depends on demand for the output, which include stocks, exports, and consumer demand.

Stocks

In this implementation of the model, RiceFlow accounts for changes in stocks of paddy rice by region, specifying a baseline exogenous change in stocks. For this investigation, changes in stocks are altered in three simulations: for China, one simulation raises stock accumulation by 5 million mt, while a second simulation decreases stock accumulation by 5 million mt (see chapter 6). In the simulation of Thailand's termination of the Paddy Pledging Program, the benchmark 3.5 million mt accumulation of stocks is reversed and changed to a 3.5 million mt reduction in stocks (see chapter 8).

Trade

Imports are imperfectly substitutable among each other based on country sources. The sourcing of imports can be specified as a Leontief, Cobb-Douglas, or CES function depending on the value of two substitution elasticities within the model: (1) the elasticity of substitution of bilateral imports by source, and (2) the elasticity of substitution between the import composite good and domestic production. These elasticities are drawn from the same source used by the GTAP model.[1156] For paddy rice, the substitution elasticity of bilateral imports by source is 10.10, and for white rice, 5.20. The elasticity for brown rice is taken to be the average of paddy and white, 7.65. The corresponding elasticities of substitution between the import composite good and domestic production is half of the respective elasticity of substitution of bilateral imports by source—5.05, 3.825, and 2.60 for paddy, brown and white rice, respectively. Because these values are greater than 1, this means that a CES functional form is employed. The market price of imports by commodity and region is estimated as the trade-weighted average of region-specific import market prices, which in turn depend on production levels, technology, and policy, as well as on input supply and policies.

[1156] Hertel, Thomas, David Hummels, Maros Ivanic, and Roman Keeney. "How confident can we be of CGE-based assessments of Free Trade Agreements?," *Economic Modelling*, Elsevier, 24 no. 4 (July 2007): 611-635.

Trade policies directly applied to trade, such as tariffs or export fees, are applied typically to protect a country's domestic production from import competition or to protect domestic consumers from price increases. In RiceFlow, these policies are modeled by changing the tariff, the tariff equivalent of NTMs or tariff-rate quotas.

Tariffs are derived from the RiceFlow database which contains the value of bilateral trade flows both with and without tariffs. Simulations involve the elimination of any tariff wedge between the world price and the import price. The effects of tariffs are determined by comparing the estimated production, consumption, and trade values to the baseline levels.

Final Consumption

In many countries, the final objective of government policy is to provide an affordable supply of rice to consumers. In the model, preferences of final consumers follows an isoleastic functional form, determined by own-price and cross-price elasticities of demand. Own-price elasticities are primarily drawn from the Food and Agricultural Policy Research Institute, and are assumed to be the same across different types of rice.[1157] Cross-price elasticities are set to one-quarter of the own-price elasticity and weighted by consumption share.

Government policy, as applied directly to final consumption, is achieved through support for consumption. The model includes a tax/subsidy on consumption, which is modified in the simulations treating consumption policies.

Production Technology

RiceFlow can also be used to assess the impacts of a change in production technology within a specific country as a change in productivity. For instance, for any given estimate of the expected productivity increase that would be expected given a change in production technology (such as improved irrigation) within a given country, the effects on production, consumption, and trade in the three types of rice and three levels of processing can be estimated for all 73 countries or regions modeled. Estimates of the impacts of identified changes in production technology are reported in chapters 6–11.

[1157] "FAPRI U.S. Agricultural Sector Elasticities Volume I: Crops." Meyers, William H., Patrick Westhoff, Deborah L. Stephens, Brian L. Buhr, Michael D. Helmar, and Kyle J. Stephens. Technical Report 93-TR 25, January 1993. Available at www.card.iastate.edu/publications/dbs/pdffiles/93tr25.pdf. Elasticities downloadable at Food and Agricultural Policy Research Institute (FAPRI), http://www.fapri.iastate.edu/tools/elasticity.aspx.

Table H. 1: Country-specific model simulations

Country	Policy or technology	Chapter
Burma	Increase in acreage and productivity	7
Cambodia	Preferential access to the EU market	7
China	Increase or decrease in stocks	5
India	Input subsidies on fertilizer and fuel	6
Indonesia	Decrease in productivity	8
Pakistan	Increase in productivity	6
Philippines	Eliminate the quantitative restriction on rice	8
Thailand	Eliminate output support (Paddy Pledging Program)	7
United States	Effects of Mexico's re-imposition of tariffs on rice	11
Vietnam	Increase in productivity	7

Appendix I
Literature Review

Literature Review

Given that policy interventions are commonplace in the rice market, it is not surprising that a substantial amount of scholarship has been devoted to estimating their quantitative impacts. These studies have used a variety of analytical tools, including econometric estimation; partial equilibrium models, devoted to either the rice sector or a handful of crop sectors; and general equilibrium models that consider entire economies. All types of analyses appear in the following literature review, clustered into three topic groups: (1) the impacts of trade policies, including export bans and tariff-rate quotas; (2) the impacts of domestic policies, including support prices and input subsidies; and (3) the impacts of other exogenous shocks, such as climate change and productivity growth. In general, research has found that trade policy has had the effect of increasing world rice prices, particularly during the 2007/08 price run-up. Some researchers have found that policy interventions by different parties (importing and exporting countries, particularly) have had conflicting effects.

Trade Policies

Many authors have pointed to the imposition of export restrictions as a major factor contributing to the 2007/08 run-up in global rice prices.[1158] Fewer, however, have tried to either tease out the amount of the price rise that was due to export restrictions or else simulate how export restrictions might affect world rice markets were they to occur again. Martin and Anderson's 2012 work attempted to isolate the contribution of export restrictions within the overall increase in rice prices during 2007/08. Using a simple global market framework, the authors estimated that changes in border restrictions were responsible for 45 percent of the change in international rice prices from 2005 to 2008, and for nearly half of the 90 percent increase in prices in 2008 alone.[1159]

In a similar vein, Anderson and Nelgen explored the relationship between policy and trade by focusing on country nominal rates of assistance (NRAs). An NRA measures the extent to which the domestic producer price exceeds the border price, often a result of government intervention. Examining the relationship between countries' NRAs and prices during the crisis, the authors found that, as international prices rose above historical trends, rates of assistance to producers fell as governments sought instead to insulate consumers from rising prices.[1160]

[1158] See, for example, Timmer, "Reflections on Food Crises Past," 2010, 1–11.
[1159] Martin and Anderson, "Export Restrictions," 2012, 425.
[1160] The negative correlation between NRAs and prices was particularly stark in the case of South Asia, with an estimated correlation coefficient of -0.7. The authors also noted that NRAs are highly correlated to consumer tax equivalents (the extent to which the domestic consumer price exceeds the border price), which underscores the fact that policy interventions in food markets typically take place at the border. See Anderson and Nelgen, "Trade Barrier Volatility," 2012, 38–39.

The authors noted that such price-insulating behavior is problematic because it reduces trade below what would have been otherwise observed, which thins markets and makes prices and trade volumes more volatile than they would be in the absence of those policies.[1161] The authors also found that border measures were responsible for the majority of producer-price distortions for both developing and high-income countries, although the likelihood of choosing a given measure depended upon whether the country was developing or high-income.[1162] Moreover, net exporting countries and net importing countries tended to alter their assistance policies in the same direction, tending to offset each other's efforts to insulate their own domestic markets from price fluctuations.[1163] Perhaps most surprisingly, the authors found that in most cases, these offsetting policy interventions were not very effective in preventing fluctuations in domestic prices.

Giordani, Rocha, and Ruta also attempted to quantify the relationship between trade restrictions and food prices using logit regression, linear probability regression, and a simultaneous equations framework.[1164] The authors first proposed a theoretical model of trade policy for loss-averse agents, in which governments set trade policy in order to maximize domestic social welfare, and then tested their model using data from 2008–11. One notable feature of their model was their attempt to capture the multiplier effect of trade policy, in that the implementation of a policy by one player would be likely to raise prices and induce other market participants to also implement new trade restrictions. Using the Global Trade Alert database and World Trade Organization (WTO) Trade Monitoring Reports, the authors identified 281 trade policy instruments used on food products over the 2008–11 time period and estimated the amount of trade covered by export restrictions. Rice was one of the 10 most restricted products, with an estimated 35 percent of trade covered by some trade restriction in 2008–11.[1165] Two estimations were conducted: one for all food products and one for all staple food products, including rice.

Although the authors did not estimate a rice-specific model, the results are still relevant for the rice market—particularly given how frequently export restrictions are used in global rice trade. First, the authors found that a 1 percent increase in the share of global staple food trade covered by a trade measure raised by 0.5 percent the probability that any given country would

[1161] Anderson and Nelgen, "Trade Barrier Volatility," 2012, 39.
[1162] For developing countries, export restrictions were overwhelmingly the most prominent border policy mechanism. For high-income countries, by contrast, import taxes and export subsidies were most important; import taxes were more likely to be increased in times of low prices and reduced in times of high prices, while export subsidies were more likely to be applied in times of low prices. See Anderson and Nelgen, "Trade Barrier Volatility," 2012, 43, 45.
[1163] Anderson and Nelgen, "Trade Barrier Volatility," 2012, 41.
[1164] A simultaneous-equations framework was used to account for the joint endogeneity problem presented by the relationship between trade policy and prices.
[1165] Giordani, Rocha, and Ruta, "Food Prices and the Multiplier Effect," September 2014, 38.

implement a new restriction on trade.[1166] Interestingly, the authors found that as restrictions were introduced into the model, the importance of prices declined; and in some cases they became an insignificant factor in whether or not a country would implement a new restriction. The authors pointed out that this empirical finding was consistent with the prediction of their theoretical model that while an initial trade measure is caused by some type of exogenous shock, subsequent restrictions are mostly driven by the initial trade measure. The authors also estimated that a 1 percent increase in a price from its international reference point was associated with a 6 percent increase in the probability that any given country would implement some kind of export restriction.[1167] Lastly, the estimation found that an increase of one standard deviation in the share of trade covered by an export or import measure led staple food prices to increase between 8 and 42 percent—a figure very similar to the estimates provided by Martin and Anderson.[1168]

Partial equilibrium models have also been used post-crisis to quantify the impacts of trade restrictions. Yu et al. used the 2008 linked partial equilibrium models for eight crops from the Food and Agricultural Policy Research Institute (FAPRI)[1169] to estimate the effects of trade policy changes implemented in major agricultural markets (on both the importer and exporter sides) during the 2007/08 food price crisis. Of all the sectors modeled, rice prices saw the largest increase in response to policy changes, rising by 24 percent.[1170] But underscoring the "beggar-thy-neighbor" nature of the policies, developing-country net importers that did not implement a policy in response to market conditions saw the largest increases in prices—a rise of 23 percent, compared to countries that did implement such policies—a rise of 2 percent. On the other hand, net exporting countries who did not implement any export policies also experienced large price gains to the benefit of their producing industries, with prices for developing and developed countries rising 18 percent and 20 percent, respectively.[1171] Developed exporting countries also saw a huge increase in the volume of their exports due to these policies (an estimated 50 percent increase), even though total world trade declined.[1172]

More recent work using computable general equilibrium (CGE) modeling and estimates of NRAs has validated these initial estimates of the role of trade restrictions in raising prices, as well as the offsetting effects of actions by net exporters versus net importers. In their 2014 analysis, Jensen and Anderson used estimates of NRAs from the World Bank's "Distortions to Agricultural

[1166] Giordani, Rocha, and Ruta, "Food Prices and the Multiplier Effect," September 2014, 22–23.
[1167] Ibid.
[1168] Ibid., 26.
[1169] Wheat, corn, barley, sorghum, rice, soybeans, rapeseed, and sunflower.
[1170] Yu et al., "A Quantitative Analysis of Trade Policy," July 30, 2011, 548.
[1171] Ibid., 548, 551.
[1172] Ibid., 551.

Incentives" database in the Global Trade Analysis Project (GTAP) CGE model to estimate the proportion of the 2008 rice price increase that was due to trade policy interventions.

The researchers reported that they were surprised when their CGE simulation results returned estimates similar to the back-of-the-envelope calculations previously reported by Martin and Anderson, with the CGE simulation estimating that changes in trade policies alone caused rice prices to rise by 34 percent, accounting for around 30 percent of the total price increase (versus Martin and Anderson's estimate of 45 percent).[1173] Moreover, the authors found that exporter restrictions were responsible for nearly all of the price rise attributed to trade policy changes (86 percent), while importer actions (including reductions in tariffs or import subsidies) were less of a factor.[1174] The authors also estimated which countries' trade policy actions contributed the most to rising prices, finding that India's policies were responsible for 9.1 percent of the total rise in global rice prices in 2006–08, followed by those of Pakistan (7.5 percent), Thailand (5.6 percent), and China (2.4 percent).[1175] Furthermore, the authors stressed that the policies constituted a huge transfer of welfare from importing to exporting countries.[1176]

Finally, the authors noted that these policy measures were not very effective at insulating domestic prices from the world price spike. They estimated that on average, the interventions reduced domestic price increases by only about 25 percent from the levels that would have occurred without any policy interventions,[1177] concluding, "This study underscores the key conclusion from those earlier studies, which is that, in a many-country world, the actions of grain-exporting countries are being offset by those of import-competing countries such that market-insulating interventions are rather ineffective in achieving their stated aim of avoiding large domestic price rises when international food prices spike."[1178]

Writing in 2013, Karapinar and Tanaka used a CGE framework to estimate the potential welfare implications of export restrictions imposed in response to production shocks. The authors found that in almost all cases, production shocks based on historical yield variations alone were not sufficient to raise prices above an arbitrary 15 percent price increase threshold at which restrictions would be implemented.[1179] However, when they introduced greater yield variability into the model, productivity shocks led to restriction-inducing price rises in some cases, with damaging effects on global welfare. In cases where 50 percent export duties were applied, global welfare fell by 17 percent, whereas export duties of 100 percent reduced global welfare

[1173] Jensen and Anderson, "Grain Prices and Beggar-Thy-Neighbor," 2014, 10, 17.
[1174] Ibid., 29.
[1175] Ibid., 28.
[1176] Ibid., 17, 26.
[1177] Ibid., 17.
[1178] Ibid., 18.
[1179] Karapinar and Tanaka, "How to Improve World Food Supply," 2013, 12.

by an estimated 27 percent, with Africa being most negatively affected.[1180] An export quota was even more harmful, with a 95 percent quota (functionally similar to a total ban) reducing global welfare by 62 percent compared to the baseline productivity shock scenario.[1181]

Domestic and Regional Policies

Major Exporters

India

Many of the policy simulations dealing with India relate to the trade restrictions mentioned in the previous section. But India also has many domestic rice policies that are intended to either support prices for producers or hold them down for consumers. Kozicka et al. econometrically estimated the impacts of various Indian policies on the supply-and-demand balance of rice within India from 1990 to 2013. Several insights emerged from this investigation. First, the authors estimated the relationship between the minimum support price (MSP) and Indian rice production, finding that a 1 percent increase in the MSP resulted in a 0.3 percent increase[1182] in Indian rice production, while the market price had no significant effect on rice production.[1183] Summarizing their results, the authors said that "[the MSP] has serious implications for the production determination; not only has the MSP the largest impact on the production level, but also it has wiped out the market impact on the farmer's production decisions." Furthermore, the authors found that the share of total rice production procured by the government had a strong statistical relationship to the ratio between the MSP and market prices: for every 1 percent increase in the MSP relative to the wholesale price of rice, procurement increased by 0.32 percent.[1184]

In addition to this retrospective look at the effects of India's policies, a few investigations have attempted ex ante analysis of the country's recently passed National Food Security Act (NFSA). The forward-looking OECD-FAO baseline study projected that the NFSA's expansion of consumer subsidies will cause a modest rise in rice consumption in India that would not occur in the absence of these new subsidies. However, the study is quick to state that if the forecasted consumption increases do not materialize, "excess production stemming from higher MSPs [minimum support prices] for wheat and rice will need to be stored or exported,

[1180] Karapinar and Tanaka, "How to Improve World Food Supply," 2013, 12.
[1181] Ibid., 13.
[1182] While this may seem like a small amount of rice, given the size of India's rice production, an increase of 0.3 percent is equal to about half a million metric tons, or 1 percent of total world trade in any given year. Author's calculations based on USDA, FAS, PSD Online (accessed November 6, 2014).
[1183] Kozicka et al., "Modeling Indian Wheat and Rice," July 2014, 23.
[1184] Ibid., 25.

with consequences for domestic and international markets."[1185] Birur and Beach used a CGE model to investigate the potential effects of NFSA on global markets (2014).[1186] In their study, NFSA is projected to increase Indian rice production 4 percent by 2015 from the 2010 base.

Thailand

Thailand's Paddy Pledging Program[1187] has been one of the more debated policies of the past five years, and the potential effects of the release of its large accumulated stocks have motivated two recent analyses. Permani and Vanzetti analyzed the welfare impacts of five scenarios related to Thailand's Paddy Pledging Program using a partial equilibrium[1188] analysis. These scenarios included higher market prices paid to Thai farmers, large purchases of stocks by the Thai government, a phased sell-off of government-held stocks, and an alternative program of providing cash transfers directly to poor farmers,[1189] with most simulations designed to show the effects of certain aspects of the Paddy Pledging Program.[1190] For each simulation, consumer, producer, and taxpayer welfare effects were calculated.

The authors found that the scenario that most closely resembled the Paddy Pledging Program raised production by 13 percent compared with the baseline, but also likely led to at least a temporary increase in world prices of around 7 percent as the government held stocks off the market.[1191] Although this scenario raised producers' welfare, consumers were negatively affected and the Thai government had to spend a significant amount of money to stock the rice, resulting in total net welfare losses of nearly $10 billion.[1192] Negative world market effects were seen, however, under the scenario where the Thai government began to offload their large accumulated stocks into the export market. World prices would fall an estimated 4 percent as Thai exports would climb more than 80 percent compared with baseline levels.[1193]

[1185] OECD and FAO, *OECD-FAO Agricultural Outlook 2014,* 2014, 102.
[1186] Birur and Beach, "Achieving Food vs. Fuel Security," 2014.
[1187] This is a program to support production prices by government purchases of rice at above-market prices. See chapter 7.
[1188] The authors used a dynamic, stochastic, 10-region partial equilibrium model of the global rice trade, in which the stochastic element was production.
[1189] This policy alternative has been proposed by the World Bank and others as less distorting and more likely to reach only the intended beneficiaries, as "very poor farmers in Thailand are subsistence farmers and do not have excess rice to sell and, therefore, do not benefit from the pledging program." See Permani and Vanzetti, "Rice Mountain," February 2014, 11–12.
[1190] Permani and Vanzetti, "Rice Mountain," February 2014, 11.
[1191] Author calculations based on table 3, "Simulation Result for Thailand," in Permani and Vanzetti, "Rice Mountain," February 2014, 13.
[1192] Permani and Vanzetti, "Rice Mountain," February 2014, 13–14.
[1193] Author calculations based on table 3, "Simulation Result for Thailand," in Permani and Vanzetti, "Rice Mountain," February 2014, 13.

The Thai Paddy Pledging Program was also the subject of a 2014 analysis by Chavez, Wailes, and Durand-Morat. Using the Arkansas Global Rice Model (AGRM),[1194] the authors analyzed deterministic and stochastic scenarios of the effects of the release of all or part of Thailand's excess stocks (defined as any stock above their average stocks-to-use level over the three-year period 2008–10) onto the world market.[1195] The deterministic results indicated that the release of half of Thailand's excess stocks would drive up world trade in rice by 11.5 percent, triggering a 16 percent reduction in world long grain prices.[1196] The release of all of Thailand's excess stocks would cause a 23 percent rise in global trade, while world prices would drop by 28 percent. The authors estimated that these declines in the global benchmark price would bring down prices for U.S. long grain rice exports by 9 percent and 17 percent, respectively.[1197] Although U.S. prices were forecast to be adversely affected by a Thai stock release, Vietnam's exports were projected to suffer the most from a Thai stock release.[1198]

United States

In 2011, U.S. rice policy researchers Chavez and Wailes used the AGRM to analyze the effect of eliminating U.S. direct payments for rice producers in both deterministic and stochastic settings.[1199] The deterministic simulation concluded that the removal of direct payments would be expected to cause a 5 percent contraction in U.S. production over baseline levels by 2020, and a subsequent reduction in U.S. exports of around 8 percent.[1200] Global trade in rice, however, would be projected to fall by less than 1 percent, as other major exporters would increase shipments to fill the gap left by the United States.[1201] This decline in global trade would be accompanied by a less than 1 percent increase in global rice prices.[1202] The authors stressed that when stochastic yields were introduced into the simulation, the results pointed toward slightly greater volatility in global rice prices.[1203]

[1194] This is a partial equilibrium model developed by researchers at the University of Arkansas that can be linked into the annual baseline projections from the FAPRI model used by Yu et al. above. See Wailes and Chavez, "2011 Updated Global Rice Model," 2011.

[1195] The deterministic analysis is based on simulation modeling of scenarios describing alternative schemes for releasing excess stocks. The stochastic analysis develops estimates of likely confidence intervals for selected variables, as opposed to the deterministic analysis, which generates average values. Chavez, Wailes, and Durand-Morat, "Trade and Price Impacts of Thailand," February 2014, 8.

[1196] Chavez, Wailes, Durand-Morat, "Trade and Price Impacts of Thailand," February 2014, 9.

[1197] Ibid.

[1198] Ibid.

[1199] The 2014 U.S. farm bill does in fact eliminate direct payments, but, as other authors have noted, it replaces them with a price/revenue insurance program.

[1200] Chavez and Wailes, "Analysis of U.S. Rice Policy," February 2011, 10.

[1201] Ibid., 11.

[1202] Ibid., 5.

[1203] Ibid., 7, 17.

More recently, the AGRM was used by Wailes et al to simulate the potential effects of a price loss coverage (PLC) program similar to the one contained in the 2014 Farm Bill.[1204] The simulations suggested that a PLC program would lead to increases in harvested rice area of around 15 percent over baseline levels by 2017, with nearly all of this gain attributed to higher long grain area. The rise in harvested area is projected to lead to mixed effects on long grain and all-rice average farm prices. Average all-rice prices under the PLC simulations were projected to be higher than baseline levels through 2015, but lower than baseline levels in 2016 and 2017. Similarly, long-grain prices would be above baseline levels through 2015 and then slide back to roughly baseline levels into 2017.[1205]

One additional recent analysis by Davis, Anderson, and Smith modeled U.S. rice farm revenues under new programs similar to those that were eventually included in the 2014 Farm Bill. Using a stochastic framework across a range of potential yields and prices, the authors estimated that the PLC option would trigger a payment more than 75 percent of the time, with farmers' positive net revenues estimated at nearly $32/acre.[1206] Conversely, the agricultural risk coverage (ARC) option was estimated to trigger in only 18 percent of cases at the individual coverage level and 21 percent of cases at the county level, with average farm revenue under this program estimated at about $1/acre in both cases. The supplemental coverage option (SCO) was in between the two, estimated to pay out in 67–75 percent of cases for average net revenues of between $8.58 and $16.41 per acre for various levels of coverage.

Major Importers

China

China has introduced a new dynamic to the global rice market by switching from being a marginal net rice exporter in 2010 to the world’s largest rice importer in 2013.[1207] One of the reasons for this change in status has been China's implementation of a minimum purchase price policy, as minimum prices have exceeded world rice prices since 2013. But besides raising the demand for more competitively priced imports, this policy has been found to be associated with increased production as well. In a 2012 paper, Zhang found a positive, statistically significant relationship between the government minimum purchase price level and rice production in major producing areas.[1208]

[1204] The simulations were based on the PLC program included in H.R. 6083, as the 2014 Farm Bill had not been signed into law when the simulations were conducted.
[1205] Wailes, et al., "Analysis of Shallow Loss Safety Net Programs," 2013, 11-12.
[1206] Davis, Anderson, and Smith, “Evaluating the Impact,” February 2014, 15.
[1207] USDA, PSD Online (accessed November 3, 2014).
[1208] Zhang, “Establishment of Grain Farmers’ Supply Response,” 2012, 4.

Aside from the impact of support prices in China, researchers have also explored the question of how a potential liberalization of China's rice sector might impact the global market.[1209] In their 2013 paper, Liu et al. used a spatial-temporal rational expectations model to estimate the effects of an opening of the Chinese market to unrestricted world trade, including world market access to the country's massive stocks. Their model estimated that the entry of China into the global market would result in a large increase in China's exports, a nearly proportional reduction in world stocks, a 15 percent decline in shipments from current major exporters, and a 6 percent reduction in world prices.[1210]

Indonesia

While not currently one of the world's top five importers, Indonesia is one of the world's largest rice consumers and has historically been a large importer. The country also actively manages its domestic rice market through a state trading agency, provides floor prices to domestic farmers, and sets ceiling prices for domestic consumers. In this context, Dartanto explored the potential effects of changes in Indonesian rice import tariffs on welfare inside the country. He found that ending Indonesian rice import tariffs would lead to a 2.9 percent decline in domestic rice prices and reduce the number of households in poverty by more than 160,000, while doubling the tariff would lead to a 2.5 percent increase in prices and push more than 110,000 new households into poverty.[1211]

Nigeria

Before China entered the rice market, Nigeria was the world's largest rice importer. But the Nigerian rice import picture was already complicated: Nigeria's government had a history of adjusting import restrictions depending on market conditions, ranging from outright import bans to a complete elimination of import tariffs.[1212] In this context, in 2013 Obi-Egbedi et al. analyzed the welfare effects of both an increase and a decrease in Nigerian rice tariffs, with paradoxical results. The simulations found that an 80 percent increase in import tariffs would lead to a small increase in rice output, but would also raise Nigerian import prices and have large negative welfare effects on urban Nigerian households.[1213] However, a 5 percent reduction in import tariffs would result in a *larger* increase in rice output than under the protectionist scenario (a result attributed to an increased demand for rice, due to its lower

[1209] In addition to being the world's largest rice producer and consumer, China holds the world's largest rice stocks, accounting for a little less than half of total global stocks in any given year. China maintains these large stocks for domestic food security purposes, and the government uses them to manage trade by regulating both exports and imports. See chapter 5.
[1210] Liu et al., "The Global Food Price Crisis and China," August 2013, 14.
[1211] Dartanto, "Volatility of World Rice Price," 2010, 142.
[1212] Obi-Egbedi et al., "Rice Trade Protectionism," September 2013, 4.
[1213] Ibid., 11–15.

price). Both import and domestic prices would fall, with almost no effects on household welfare.[1214]

ASEAN Regional Analyses

Various authors have also considered the potential market effects of more collaborative policy movements within the ASEAN community. Clarete hypothesized that deeper collaboration through an opening of trade by ASEAN members would actually result in better outcomes in the face of a crisis than could be expected under the status quo. To address this issue, Clarete used the RiceFlow partial equilibrium model to simulate the effects of large negative production shocks in China and India (the world's two largest rice producers) on the major ASEAN rice importers (Indonesia, Malaysia, and the Philippines) under two scenarios: a baseline scenario with current tariffs, and a liberalization scenario where import tariffs on rice were eliminated. His results suggested that with reduced import tariffs in the face of a large negative shock in world rice supplies, retail prices in all three import markets would actually decline from baseline levels. The reason for the decline was that supply shortfalls in China or India would be more than offset by higher exports from Thailand and Vietnam.[1215] Both import levels and retail prices were forecast to be much more affected in Malaysia and the Philippines than in Indonesia. According to the author, these results underscore the fact that better cooperation in the region (through reduced reliance on self-sufficiency for importers and a pledge not to impose export restrictions on the part of exporters) would potentially make the region better prepared for supply or demand shocks.[1216]

RiceFlow was also used by Briones et al. to investigate how much an emergency ASEAN rice reserve would mitigate price increases from production shocks due to climate change. In order to quantify those impacts, the authors first simulated negative production shocks of 5 percent for China and Indonesia. They estimated that the shock in China would raise consumer rice prices in China by 55 percent and reduce demand there by 3 percent, while the shock in Indonesia would raise prices by 32 percent and reduce demand by 4 percent.[1217] The authors then used a single-equation econometric model to estimate the price-mitigating impacts of releases from ASEAN reserves, finding that every 100,000 mt of emergency reserves imported would reduce domestic prices by 1.5 percent. This result suggests that if the entire ASEAN reserve (roughly 700,000 mt) were to be released, prices in the case of Indonesia would only be reduced by 10.5 percent, which would not be enough to offset the 32 percent increase estimated in the production shock scenario.[1218] Results from China are similar, leading the

[1214] Obi-Egbedi et al., "Rice Trade Protectionism," September 2013, 15–17.
[1215] Clarete, "Enhancing ASEAN'S Resiliency," August 2012, 10.
[1216] Ibid., 11.
[1217] Briones et al., "Climate Change and Price Volatility," August 2012, 6–7.
[1218] Ibid., 8.

authors to conclude that "the release from regional reserves appears to be inadequate to offset the market impacts of a severe crop loss . . . however, such releases may still be helpful in restraining the worst price spikes."[1219]

Productivity Change

Although the bulk of the literature focuses on the effects of policies on production, trade, prices, and welfare, these are not the only factors that have the potential to change the global rice market landscape; productivity improvement may also have a significant effect over the coming decades.

As part of their efforts to ensure global food security, the International Rice Research Institute and other agricultural research institutions continue to invest in the development of new, higher-yielding rice varieties. Ludwig investigated the potential effects on the global market of increased adoption of higher-yielding varieties in his 2012 investigation. The author used RiceFlow to simulate the widespread adoption of hybrid rice in Bangladesh, China, India, Indonesia, the Philippines, the United States, and Vietnam. The model estimated that hybrid adoption in all these countries would lead to an 11 percent increase in global rice production over the baseline scenario.[1220] Global rice consumption would rise under this scenario, as the increase in production would reduce retail prices in major consuming countries.

[1219] Briones et al., "Climate Change and Price Volatility," August 2012, 8.
[1220] Ludwig, "Impact of Hybrid Rice on Food Security," 2012, 2.

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Appendix J
Data for Maps

In compliance with Section 508, an amendment to the United States Workforce Rehabilitation Act of 1973, alternative text is used by screen readers to provide people with disabilities text equivalent for non-text elements. The tables in this appendix are referenced in the alternative text for the maps contained in this report.

Table J.1: Global paddy production for select countries, 2013/14 (1,000 mt)

Country	Production
China	203,614
India	159,826
Indonesia	57,165
Bangladesh	51,590
Vietnam	45,058
Thailand	31,000
Philippines	18,822
Burma	18,683
Brazil	12,206
Japan	10,758
Pakistan	10,051
United States	8,613
Cambodia	7,383
Egypt	6,884
South Korea	5,632
Nepal	5,047
Nigeria	4,400
Sri Lanka	4,176
Madagascar	3,611
Peru	3,125
North Korea	2,892
European Union	2,828
Malaysia	2,700
Iran	2,500
Laos	2,325
Mali	2,212
Guinea	2,053
Tanzania	2,011
Colombia	1,926
Taiwan	1,590
Argentina	1,580
Uruguay	1,349
Sierra Leone	1,256
Ecuador	1,254

Source: USDA, PSD online (accessed January 6, 2015).
Note: These data correspond to figure 1.1 in chapter 1.

Table J.2: Rice: Major global trade flows, 2011–13 (1,000 mt)

From	To	Volume
India	EU	389
	Middle East	3,397
	South Africa	323
	West Africa	2,657
Vietnam	China	1,087
	Indonesia	1,012
	Malaysia	623
	Philippines	541
	West Africa	648
Thailand	China	269
	EU	279
	Indonesia	441
	Japan	252
	Middle East	1,266
	South Africa	459
	United States	381
	West Africa	2,452
Pakistan	China	323
	Middle East	850
	West Africa	532
United States	Central America	487
	Japan	337
	Mexico	878
	Middle East	471
	West Africa	203
Brazil	West Africa	550
Uruguay	Middle East	250

Source: GTIS Global Trade Atlas database (accessed November 17, 2014).
Note: These data correspond to figure 2.8 in chapter 2.

Table J.3: United States: Paddy production, by state, 2013 (1,000 mt)

State	Production
Arkansas	3,668
California	2,158
Louisiana	1,367
Mississippi	416
Missouri	497
Texas	505
Total	8,612

Source: USDA, NASS, Crop Production 2013 Summary, January 2014.
Note: These data correspond to figure 5.2 in chapter 5.

Table J.4: China: Paddy production, by province, 2013 (1,000 mt)

Province	Production
Beijing	1
Tianjin	129
Hebei	588
Shanxi	7
Inner Mongolia	560
Liaoning	5,069
Jilin	5,633
Heilongjiang	22,206
Shanghai	868
Jiangsu	19,223
Zhejiang	5,802
Anhui	13,623
Fujian	5,020
Jiangxi	20,040
Shandong	1,036
Henan	4,858
Hubei	16,766
Hunan	25,615
Guangdong	10,450
Guangxi	11,562
Hainan	1,498
Chongqing	5,031
Sichuan	15,495
Guizhou	3,613
Yunnan	6,679
Tibet	6
Shaanxi	910
Gansu	38
Qinghai	0
Ningxia	689
Xinjiang	598
Total	203,612

Source: NBS, China Statistical Yearbook, 2013.
Note: These data correspond to figure 6.2 in chapter 6.

Table J.5: India: Rice production in major producing states, 2012/13 (milled rice equivalent, million mt)

State	Production
West Bengal	15
Uttar Pradesh	14
Punjab	11
Andhra Pradesh	11
Odisha	8
Bihar	7
Chhattisgarh	7
Assam	5
Tamil Nadu	4
Haryana	4
Karnataka	3
Maharashtra	3
Jharkhand	3
Madhya Pradesh	3
Gujarat	2
Kerala	1
All other	4
India total	104

Source: GOI, Ministry of Agriculture, Agricultural Statistics at a Glance: 2013, Table 4.6(b).
Note: These data correspond to figure 7.3 in chapter 7.

Table J.6: Pakistan: Paddy production for selected provinces, 2013/14 (1,000 mt)

Province	Production
Punjab	3,481
Sindh	2,617
Kyber Pakhtunkhwa[a]	112
Balochistan	588
Pakistan total	6,798

Source: Government official, e-mail to Commission staff, November 26, 2014.
Note: These data correspond to figure 7.5 in chapter 7.
[a] Formerly Northwest Frontier.

Table J.7: Thailand: Paddy production, by region, 2013 (1,000 mt)

Region	Production
Northern	13,417
Northeastern	14,021
Central	10,690
Southern	660
Total	38,788

Source: Government official, e-mail to Commission staff, November 26, 2014.
Note: These data correspond to figure 8.2 in chapter 8.

Table J.8: Cambodia: Paddy production, by town or province, 2013/14 (1,000 mt)

Town or province	Production
Banteay Mean Chey	629
Battambang	796
Kampong Cham	780
Kampong Chhnang	511
Kampong Speu	357
Kampong Thom	691
Kampot	454
Kandal	398
Koh Kong	29
Kratie	149
Mondulkiri	57
Phnom Penh City	40
Preah Vihear	214
Prey Veng	1,261
Pursat	390
Rotanakiri	56
Siem Reap	560
Preah Sihanouk	49
Stueng Treng	65
Svay Rieng	539
Takeo	1,161
Otdar Mean Chey	164
Kep	11
Pailin	27
Total	9,390

Source: Cambodia Ministry of Agriculture, Forestry and Fisheries, Annual Conference 2013–2014, Annex 5, "Rice Balance Sheet by Province, 2013-2014."
Note: These data correspond to figure 8.8 in chapter 8.

Table J.9: Indonesia: Paddy rice production, by province, 2013 (1,000 mt)

Province	Production
Aceh	1,957
North Sumatra	3,727
Western Sumatra	2,430
Riau	434
Jambi	665
South Sumatra	3,677
Bengkulu	623
Lampung	3,207
Bangka Belitung	28
Riau Islands	1
Jakarta	10
West Java	12,083
Central Java	10,345
DI Yogyakarta	922
East Java	12,049
Banten	2,084
Bali	882
West Nusa Tenggara	2,194
East Nusa Tenggara	730
West Kalimantan	1,442
Central Kalimantan	813
South Kalimantan	2,031
East Kalimantan	439
North Borneo	125
North Sulawesi	638
Central Sulawesi	1,031
South Sulawesi	5,036
Southeast Sulawesi	561
Gorontalo	296
West Sulawesi	445
Moluccas	102
North Maluku	72
West Papua	30
Total	71,280

Source: BPS, “Food Crops,” http://www.bps.go.id/eng/tnmn_pgn.php?kat=3.
Note: These data correspond to figure 9.2 in chapter 9.

Table J.10: Philippines: Paddy production, by region, 2013 (1,000 mt)

Province	Production
Central Luzon	3,409
Cayagan Valley	2,423
Western Visayas	2,091
Ilocos	1,750
Soccsksargen	1,348
Bicol	1,243
Mimaropa	1,034
Eastern Visayas	990
Northern Mindanao	675
Zamboanga Peninsula	639
Autonomous Region in Muslim Mindanao	612
Caraga	584
Cordillera Administrative	460
Davao Region	422
Calabarzon	412
Central Visayas	348
National Capital	0
Total	18,439

Source: Bureau of Agricultural Statistics,“ Palay and Corn: Volume of Production by Ecosystem/Croptype, Provinces, Period and Year,” 2013.
Notes: Based on revised data for April–June 2013 data. These data correspond to figure 9.4 in chapter 9.

Table J.11: Brazil: Paddy production, by state, 2013/14 (1,000 mt)

State	Production
Rio Grande do Sul	8113
Santa Catarina	1067
Maranhao	658
Mato Grosso	579
Tocantins	544
Para	190
Parana	159
Piaui	148
Goias	140
Rondonia	137
Mato Grosso do Sul	95
Roraima	78
Sao Paolo	43
Sergipe	40
Minas Gerais	39
Ceara	32
Alagoas	18
Acre	9
Amazonas	8
Bahia	8
Rio Grande do Norte	5
Pernambuco	5
Rio de Janeiro	3
Amapa	2
Paraiba	1
Espirito Santo	1
Brazil total	12,122

Source: Acomp. safra bras. grãos, v. 2 – Safra 2014/15, n. 3 – Terceiro Levantamento, dez. 2014, 46.
Note: These data correspond to figure 10.2 in chapter 10.

Table J.12: Uruguay: Land in rice production, by department, 2013/14 (hectares)

Department	Land
Artigas	20,000
Salto	14,000
Rivera	3,000
Tacuarembo	9,000
Cerro Largo	49,000
Durazno	1,000
Treinta y Tres	23,000
Lavalleja	18,000
Rocha	22,000

Source: Ricepedia, “Uruguay” (accessed January 5, 2015).
Notes: No year was given for acreage data. These data correspond to figure 10.3 in chapter 10.