

Industry & Trade Summary

Agricultural and
Horticultural
Machinery



USITC Publication 2546 (ME-3)
August 1992

OFFICE OF INDUSTRIES
U.S. International Trade Commission
Washington, DC 20436

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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity, as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.¹

This report on farm and garden machinery and equipment covers the period 1986 through 1990 and represents one of approximately 250 to 300 individual reports to be produced in this series during the first half of the 1990s. Listed below are the individual summary reports published to date on the machinery and equipment sector.

<i>USITC publication number</i>	<i>Publication date</i>	<i>Title</i>
2430 (ME-1)	November 1991	Aircraft, Spacecraft, and Related Equipment
2505 (ME-2)	April 1992	Construction and Mining Equipment
2546 (ME-3)	August 1992	Agricultural and Horticultural Machinery

¹ The information and analysis provided in this report are for the purpose of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

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INTRODUCTION

This summary provides industry and trade information on agricultural and horticultural machinery for the 1986-90 period. The report is organized into three major sections: U.S. and foreign industry profiles; U.S. and foreign tariffs and nontariff measures; and U.S. industry performance in domestic and foreign markets. In addition, appendixes provide information explaining tariff and trade agreement terms and statistical data in tabular form.

The products covered by this summary include farm and garden machinery and equipment, which are used in agricultural, horticultural, and forestry operations, and in animal production. These products are grouped into the following five categories: (1) tractors and parts; (2) mowers for lawns, parks, or sports grounds and parts; (3) soil preparation, seeding, planting, and fertilizing machinery and parts; (4) harvesting machinery and parts; (5) and miscellaneous farm and garden machinery and equipment and parts.

The principal components, producer types, major products, and principal consumers of the U.S. agricultural and horticultural machinery industry are shown in figure 1. The most important groups of products covered in this summary, in terms of shipments' value, are tractors (and parts) and mowers for lawns, parks, or for sports grounds. Each of these product groupings accounted for about one-fourth of total U.S. producers' shipments in recent years. In addition, harvesting machinery and parts, together with miscellaneous farm and garden machinery (including such assorted items as dryers, sprayers, milking machines, incubators, and beekeeping machinery), each accounted for about 20 percent. The remainder of the summary items includes soil preparation equipment (i.e., plows, harrows, and other cultivators); seeding, planting, and transplanting machinery; manure spreaders and fertilizers; and miscellaneous agricultural, horticultural, or forestry equipment, including parts for soil preparation. Products imported in significant volume in recent years include tractors (and parts) and soil preparation, seeding, planting, and fertilizing machinery (and parts).

U.S. INDUSTRY PROFILE

Industry Structure

The farm machinery and equipment included in this summary, with few exceptions, are covered in

Standard Industrial Classification (SIC) industry 3523 (pt.), Farm Machinery and Equipment, which includes commercial turf and grounds care equipment.¹ The remaining products are included in SIC 3524 (pt.), Lawn and Garden Tractors and Home Lawn and Garden Equipment.²

Firms

This industry includes an estimated 1,850 firms³ that produce finished goods ready for immediate use, intermediate units for further assembly onto other products, and parts for both original equipment and replacement parts' use. In 1990, an estimated 1,670 firms produced farm machinery and equipment and parts and an estimated 180 produced lawn and garden machinery and parts (table 1).

U.S. production of most agricultural tractors and combines is concentrated in only a few firms. The largest U.S. producers of agricultural machinery also make construction and industrial equipment, but are dependent on sales of farm machinery for the bulk of their total income. The overall number of agricultural machinery firms has been declining since 1988, with some of the small firms going out of business and others merging with large firms.

Many of the firms in the lawn and garden machinery industry produce a wide assortment of products as well as a considerable variety of sizes or types of equipment, even within narrow product lines. About 12 firms account for the bulk of U.S. production of mowers, the most important type of lawn and garden equipment.

¹ This summary excludes agricultural elevators and blowers.

² Although snow throwers and powered lawn edgers/trimmers and hedge trimmers are included in SIC 3524, for the purposes of this summary they have been excluded.

³ Estimated by the Commission staff based on data published by the U.S. Department of Commerce. The actual number of individual firms is not available. The data may overstate the number of firms in the industry since many of the same firms are believed to manufacture products in a number of different categories.

Table 1
Agricultural and horticultural machinery: Number of establishments, 1986-90
(Number)

Sector	1986	1987	1988	1989	1990
Farm machinery and equipment	1,697	1,642	1,716	1,676	1,706
Lawn and garden machinery	172	181	186	186	188
Total	1,869	1,823	1,902	1,862	1,894

Source: Compiled by the staff of the U.S. International Trade Commission from various editions of the U.S. Bureau of Labor Statistics, *Employment and Wages Annual Averages*, Bulletin 2393.

Figure 1
U.S. agricultural and horticultural machinery industry: Principal components,¹ producer types, major products, and principal consumers

Principal components	Producer types	Major products	Principal consumers
Engines	Full-line farm equipment manufacturers ²	Tractors and parts	Agricultural operations: crop and livestock farms, poultry farms, orchards
Transmissions	Short-line farm equipment manufacturers ³	Soil preparation, seeding, planting, and fertilizing machinery and parts	
Wheels	Lawn and garden machinery manufacturers ⁴	Harvesting machinery and parts	Horticultural and forestry operations: lawn maintenance firms, golf courses, nurseries, tree farms, parks and recreation facilities
Attachments	Grounds care equipment manufacturers ⁵	Mowers	
Tires	Parts manufacturers	Irrigation equipment	
		Sprayers	

¹The components listed here, although made up of numerous individual parts, are the basic components acquired by manufacturers for assembly into the final products.

²Includes those companies that produce or supply an assortment of tractors, combines, and other farm machinery.

³Includes those firms that specialize in equipment production in more narrow industry segments, such as the production of farm implements (e.g., plows, harrows, and cultivators), hay-making machinery, or poultry and livestock equipment.

⁴Include those firms that principally produce lawnmowers.

⁵Include those firms that produce related or accessory items, including such items as rototillers, watering equipment, as rototillers, watering equipment, or miscellaneous related hand tools.

Source: Compiled by the staff of the U.S. International Trade Commission.

In general, the production of agricultural machinery is very automated, especially in the production of large tractors, grain combines, mowers, and parts. Labor skill levels are generally high in this industry. Productivity levels for all employees in general, and more specifically for production workers, have risen steadily in this industry since 1986, with significant productivity rises in the farm machinery and equipment sector offsetting downward trends in the lawn and garden equipment sector since 1987 (table 2).

In the United States, Deere & Co. (Deere), Moline, IL, and the J.I. Case Co. (Case), Racine, WI, are the largest tractor manufacturers, followed by Ford-New Holland, New Holland, PA; Varsity Corp. (Massey-Ferguson), Buffalo, NY; and AGCO, Norcross, GA. In 1990, the market share of total U.S.

tractor sales accounted for by Deere was an estimated 31 percent, followed by Case and Ford-New Holland with 20 percent each. Each of these firms manufactures a full-line of tractors, implements, and parts for industrial, commercial, and residential use.

Most of the other producers of agricultural machinery are small firms that manufacture a narrow product line, often specializing in the production of equipment for specific uses (e.g., milking machines, lawn edgers, garden tillers, sprinkler heads, and egg incubators). A number of other farm and garden manufacturing firms are exclusive parts producers that supply original-equipment manufacturers, repair shops, and other replacement-parts users. Such firms are concentrated in the Midwest and the South.

Table 2
Agricultural and horticultural machinery: Productivity Indexes measured as output per employee hour, by employee type, by industry, and by sector, 1986-90
(1982 = 100.0)

<i>Employee type/industry/sector</i>	<i>1986</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990¹</i>
All employees:					
Agricultural machinery industry	108.6	116.1	117.6	123.8	127.0
Farm machinery & equipment sector	103.0	107.6	113.1	124.6	127.2
Lawn & garden equipment sector	123.7	135.1	128.1	121.5	126.4
Production workers:					
Agricultural machinery industry	101.7	106.9	106.0	109.8	111.4
Farm machinery & equipment sector	98.5	100.8	102.6	110.3	110.9
Lawn & garden equipment sector	114.6	125.4	118.7	112.9	117.8

¹ Estimated by the Commission staff, based on the average annual percent change during 1984-89.

Source: Compiled by Commission staff from data published by the Bureau of Labor Statistics of the U.S. Department of Labor, except as noted.

A small number of firms are believed to account for the bulk of lawn and garden equipment sales in recent years. Such producers include MTD Products Inc., Cleveland, OH; Deere & Co., Moline, IL; Fuqua Industries, Inc. (Snapper), Atlanta, GA; Murray Ohio Manufacturing Co., Brentwood, TN; The Toro Company, Milwaukee, WI; Black & Decker Corp., Hunt Valley, MD; Honda Power Equipment Mfg., Inc., Swepsonville, NC; American Yard Products, Augusta, GA; Textron Inc., Providence, RI; and Vermont American Corp., Louisville, KY. Most of these firms produce or supply principally lawnmowers together with an assortment of such related equipment as rototillers, snowthrowers, and weed eaters.

Most of the U.S. firms producing agricultural machinery are located in a few geographic regions of the United States. Historically, major producers of agricultural and horticultural machinery, including tractors and other farm implements, mowers, and irrigation equipment, were concentrated in the Midwest (i.e., Minnesota, Kansas, Wisconsin, Illinois, Ohio, and Indiana) and California, areas that provided access to nearby major markets, raw materials, and plentiful labor. In recent years, U.S. agricultural machinery dealers reporting the greatest average sales per dealer were located in Western and Northern Plains States, as shown in the following tabulation for 1989 (in millions of dollars):⁴

<i>States</i>	<i>Sales</i>
California, Oregon, Nevada, Washington, and Arizona	Over \$3.5
Idaho, Wyoming, Montana, North Dakota, and South Dakota ...	\$3.1 to \$3.5
Utah, Colorado, Kansas, Nebraska, North Carolina, Florida, Georgia, Mississippi, South Carolina, Alabama, Texas, Oklahoma, New Mexico, Michigan, Wisconsin, and Minnesota	\$2.5 to \$3.0
Indiana, Ohio, Illinois, Iowa, and Missouri	Under \$2.5

⁴ "Highlights of the 1989 Cost of Doing Business Study," *Farm & Power Equipment Dealer*, vol. 86, No. 8, Aug. 1990, p. 13.

According to industry data,⁵ the largest shipments of lawn and garden machinery by State in recent years have been from Midwestern and Southern states, as shown in the following tabulation:

<i>State</i>	<i>Units shipped in 1988</i>
Indiana, Kentucky, Mississippi, Wisconsin, Pennsylvania .	Over 1 million units
Michigan, Illinois, Ohio, North Carolina, and South Carolina	500,000-999,999 units
Alabama, Georgia, Iowa, and Texas	100,000-499,999 units
California, Florida, Nebraska, and New York	Less than 100,000 units

Employment

The total number of employees in the agricultural and horticultural machinery production industry rose steadily from 90,270 in 1986 to 105,480 in 1990, as farmers began to replace older equipment after several years of deferring new purchases (table 3). Manufacturers subsequently expanded their production operations and labor forces.

This trend was reversed in late 1990, however, and is forecast to continue on a downward trend in 1991-92 and beyond, in the face of projected declines in farm income and requirements for machinery and equipment attributable to decreasing agricultural crop demand and general on-farm economic uncertainties. In late 1991, both J.I. Case and Deere & Co. announced large financial losses and charges and planned worker lay-offs in 1992, both in their farm and construction machinery units. J.I. Case eliminated 5,000 jobs in 1990 and announced plans to lay off 4,000 persons by the end of 1992, with the lay-offs split between its

⁵ Data represent the quantity of member shipments compiled by the Outdoor Power Equipment Institute for 1988, the most recent year available.

Table 3
Agricultural and horticultural machinery: Average annual employment, annual wages, annual wages per employee, and weekly wages per employee, by sector 1986-90

Category/sector	1986	1987	1988	1989	1990
Average annual employment (persons):					
Farm machinery and equipment	66,960	67,380	75,880	78,030	78,770
Lawn and garden machinery	23,310	25,700	28,070	26,630	26,710
Total	90,270	93,080	103,950	104,660	105,480
Average annual wages (millions of dollars):					
Farm machinery and equipment	1,786	1,882	2,156	2,295	2,372
Lawn and garden machinery	505	568	633	600	633
Total	2,291	2,450	2,789	2,895	3,005
Average annual wages per employee (dollars):					
Farm machinery and equipment	26,670	27,930	28,410	29,410	30,110
Lawn and garden machinery	21,670	22,100	22,550	22,530	23,700
Average	25,380	26,320	26,830	27,660	28,490
Average weekly wages per employee (dollars):					
Farm machinery and equipment	513	537	546	566	579
Lawn and garden machinery	417	425	433	434	456
Average	488	506	516	532	548

Source: Compiled by Commission staff from data published by the Bureau of Labor Statistics, U.S. Department of Labor, except as noted.

factories in North America and Europe.⁶ Deere & Co. announced that it planned to eliminate 2,100 jobs.⁷

Average annual wages for this industry followed the same pattern and amounted to an estimated \$3.0 billion in 1990. The average annual wage per employee amounted to about \$28,490 in 1990, while the average weekly wage per employee was about \$531, each down slightly from 1989 levels following 4 years of steady growth.

According to industry sources, labor costs at major U.S. agricultural machinery production facilities are generally considered to be higher compared with labor costs for foreign agricultural machinery producers. Since production workers at the major U.S. tractor facilities are members of the United Auto Workers, their wage and benefits agreements are closely aligned to those negotiated for production workers in the automotive industry. Production workers at short-line manufacturers, however, are not unionized and are generally paid less.

Mergers

Since 1986, the agricultural machinery industry has continued to undergo significant structural change,

⁶ Thomas C. Hayes, "J.I. Case Plans to Cut Work Force by 4,000", *The New York Times*, Dec. 5, 1991, p. D4.

⁷ Robert L. Rose, "Deere Will Cut Jobs and Take a Big Charge", *The Wall Street Journal*, Nov. 13, 1991, p. B6.

both through the expansion of some operations (particularly in the lawn and garden equipment industry) and the restructuring of others (table 4). In the farm machinery and equipment sector, a number of mergers and acquisitions have taken place, creating a restructuring of divisions within large corporations. Certain firms have set up foreign production facilities, while others have entered into joint-venture agreements with foreign manufacturers for overseas production of complete units, components, and parts.

In May 1991, a joint venture between the New Holland farm equipment subsidiary of Ford Motor Co. (20 percent) and the farm and construction machinery subsidiary of Fiat S.p.A. (Italy), Fiat Geotech (80 percent) was finalized. Fiat Geotech currently has a controlling interest in the Woods Division of the Hesston Corp., a producer/distributor of commercial-grade riding mowers, attachments, and parts, among other things. The joint venture is controlled by a London-based holding company, N.H. Geotech, N.V.

Since 1986, U.S. producers of large farm machinery and equipment have shifted away from vertical integration toward securing more products from outside producers and suppliers. According to industry sources, U.S. producers have also increased their business with foreign producers, both for finished products and for components. A renewed interest by domestic producers in increasing their domestic and

Table 4
Agricultural and horticultural machinery: Major industry joint ventures, mergers, or acquisitions since 1986, by sector

<i>Sector/Company</i>	<i>Activity</i>
Farm machinery:	
J.I. Case	Finalized purchase International Harvester's farm equipment subsidiary in 1986
	Forms Hay & Forage, a joint venture with Hesston Corp., a subsidiary of Fiat of Italy, in 1987
Allis Gleaner Corp.	Formed by management buy-out of Deutz-Allis Corp. from Deutz-Fahr in 1991
	Purchased the White tractor line from White-New Idea in 1990, a subsidiary of Allied Products Corp.
	Acquired a 50-percent share in ownership of the Hesston Corp. from Fiat Geotech in 1990
Ford Motor Co.	Formed joint venture, N.H. Geotech, between its New Holland subsidiary and Fiat Geotech, the farm and construction machinery subsidiary of Fiat S.p.A. in 1990
Lawn and garden:	
Outboard Marine Corp	Purchased Brouwer Turf Equipment Ltd. of Canada in 1986
Coleman Co	Purchased Dixon Industries Inc. in 1986
Blount, Inc.	Purchased Dixon Industries Inc. in 1990
Garden Way Inc.	Purchased Bolens Tractors Inc. in 1987
Lawn-Boy Division of OMC	Purchased Gilson Co. in 1987
Toro Co.	Purchased Wheelhorse Tractor Inc. in 1986
	Merged with Lawn-Boy in 1990; announced plans to close one existing Lawn-Boy production facility and cease production of Lawn-Boy snowthrowers and rototillers
General Electric Co.	Purchased Roper Industries in 1988
White Consolidated Industries, Inc., sub. at Electrolux AB.	Purchased Roper Industries from General Electric in 1988
Ransomes America	Purchased Cushman turf maintenance in 1989
	Acquired Brouwer Turf Equipment in 1989

Source: Compiled by Commission staff from various industry sources.

global market share has led to the establishment of dealership networks and manufacturing subsidiaries in foreign countries.

In May 1991, the management of Deutz-Allis Corp. (formed from the purchase of the Allis-Chalmers Co. by Deutz-Fahr (Germany) in 1985) purchased the company from Deutz-Fahr, forming a holding company, Allis Gleaner Co. (AGCO). In mid-1991, AGCO purchased the assets of the White tractor line from White-New Idea, a subsidiary of Allied Products Corp., and acquired a 50-percent share of ownership in the Hesston Corp. from Fiat Geotech S.p.A.

There have also been a number of structural changes to the lawn and garden equipment industry owing to acquisitions and shifts in producer locations that resulted from the maturing of the domestic market for both consumer and commercial lawn care equipment. In 1986, Deere & Co. entered the pushmower segment of the commercial lawnmower market. In the same year, Outboard Marine Corp. (OMC) acquired Brouwer Turf Equipment Ltd. of Canada, the world's largest sod harvesting equipment producer. Other acquisitions in the industry followed in

1986 and 1987. In 1989 OMC refocused its business on marine engines and sold its Lawn-Boy Division to Toro Co. The Cushman turf maintenance and vehicle business of OMC was sold to Ransomes America Corp. (Ransomes), a lawn and garden equipment manufacturer. Ransomes, owned by Ransomes PLC of the United Kingdom, also acquired the Brouwer sod harvesting and mowing equipment line in this transaction.

In March 1988, Roper Industries, believed to be the world's largest manufacturer of lawn and garden tractors and a major supplier of other lawn care equipment to such retailers as Sears Roebuck & Co., was acquired by the General Electric Co. (GE). GE wanted Roper's gas ovens business and was not interested in its lawnmower business. Roper was purchased from GE by White Consolidated Industries, a subsidiary of Electrolux AB (Sweden) in November 1988.

Distribution

The bulk of U.S. farm machinery and equipment production is distributed through company-owned or -supported dealerships and retailers. Domestic

producers have an established distribution system that provides factory-assisted service and access to a greater number of dealers. Unlike dealers of other large equipment (e.g., automobiles), farm equipment dealers generally pay the manufacturer only after the equipment is sold. Since farmers generally compare prices for the same equipment at a number of different outlets, dealers often sell machinery at a price close to their own cost, expecting to make their profits on follow-up service work. Dealerships for tractors and implements alone number in the thousands.

In recent years, an estimated 41 percent of wholesale distribution of U.S. lawn and garden equipment shipments were made through wholesaler/distributor outlets, followed by general merchandise firms, discount firms, and retailer/dealer operations with 17, 14, and 12 percent, respectively, of the total. An estimated 24 percent of retail distribution was through national merchandisers (e.g., Sears Roebuck & Co. and J.C. Penney), with 16, 13, and 10 percent of retail distribution through lawn and garden outlets, hardware stores, and outdoor power equipment/farm equipment dealers, respectively. Wholesale distribution of lawn and garden equipment is shown in the following tabulation (in percent):⁸

Channel of distribution	Share
Wholesaler/distributor	41
General merchandiser	17
Discounter	14
Retailer/dealer	12
Home center	5
All other	11
Total	100

Retail distribution of lawn and garden equipment, also according to data from the Outdoor Power Equipment Institute, Inc. (OPEI), is shown in the following tabulation (in percent):

Channel of distribution	Share
National merchandiser	24
Lawn & garden store	16
Hardware store	13
Outdoor power/farm equipment store	10
Discount store	7
Home center	5
Farm supply store	4
All other	21
Total	100

Among these retail outlets, the most significant change in recent years has been an increase in sales through outdoor power or farm equipment dealers, in part because of the availability of after-sales service

⁸ Outdoor Power Equipment Institute, Inc., *Profile of the Outdoor Power Equipment Industry 1989* (Alexandria, VA).

provided by such dealers and because of their usual broader coverage of product lines and attachments. Other important outlets included discount stores, home centers, and farm supply stores. In many cases, equipment sold through retail channels is first shipped to a wholesale distributor.

Investment

During 1986-90, capital expenditures in the U.S. agricultural machinery industry rose irregularly, with total industry expenditures amounting to \$306 million in 1990 (table 5). In 1990, expenditures for the farm machinery and equipment industry amounted to \$220 million. Large tractor manufacturers, in particular, are reported to have invested heavily in factory automation equipment in recent years. Some of the more common innovations include the use of production-line robotics to provide higher, more consistent quality of production, the increased use of flexible machining systems to permit shorter, more variable production runs, and a greater use of computer-aided design and manufacturing systems to lower product development and production costs.⁹

Expenditures for lawn and garden equipment totaled \$86 million in 1990, down significantly from \$131 million in 1989 as domestic producers scaled back some of their operations and closed others in the face of decreasing demand. The bulk of total expenditures was for new plant construction and new machinery and equipment.

Research and Development

Data on aggregate industry-wide research and development (R&D) expenditures in the agricultural machinery industry are not available. According to the Department of Commerce,¹⁰ however, R&D expenditures as a percent of total U.S. sales of farm machinery averaged about 2.5 percent in recent years. According to industry sources, such expenditures are believed to have varied considerably each year, with some firms reported to have spent considerably more than others on R&D. In recent years, R&D expenditures have been concentrated in such areas as increasing machinery operating efficiency through the use of various types of electronic controls, the use of alternative fuel systems, new product development, and the more efficient use of farm machinery in minimum-tillage planting operations.

A large amount of R&D expenditures in recent years has been for the integration of various types of electronic controls on larger, more expensive domestically produced tractors. One area of particular interest has been the use of automatic, on-board guidance systems to electronically control the speed and direction of travel for tractors and harvesters. Through such systems, farmers are able to control operations more accurately with less operator fatigue.

⁹ International Trade Administration, U.S. Department of Commerce, *A Competitive Assessment of the U.S. Farm Machinery Industry*, Mar. 1985, p. 35.

¹⁰ *Ibid.*, p. 32.

Table 5
Agricultural and horticultural machinery: Capital expenditures on new and used plant and equipment, by sector, 1986-90

(Million dollars)

Sector	1986	1987	1988	1989	1990
Farm machinery and equipment:					
New	138.9	200.2	179.7	183.0	210.1
Used	7.1	33.7	10.9	12.0	9.7
Total	146.0	233.9	190.6	195.0	219.8
Lawn and garden equipment:					
New	54.0	111.1	97.4	127.1	82.2
Used	3.7	3.6	5.0	3.8	4.2
Total	57.7	114.7	102.4	130.9	86.4
Grand total	203.7	348.6	293.0	325.9	306.2

Source: Compiled from U.S. Department of Commerce, Bureau of the Census, *Annual Survey of Manufactures*.

Computer-controlled devices are being used to automatically adjust the depth of plowing or height of harvesting implements relative to changes in the terrain. Seeding and pesticide application rates are also being electronically adjusted to reduce or eliminate excessive application amounts.

Research is also being conducted on engine design to allow for a greater use of renewable resources (i.e., ethanol-based products) for fuel. Other components, such as gear boxes, transmissions, and axles, are being redesigned to achieve greater operating efficiencies. Another current area of research interest involves the use of rubber tracks instead of tires on farm machinery in an effort to reduce the harmful effects of soil erosion and of compaction from continued field use of heavy farm machinery.

Data on aggregate industrywide R&D expenditures in the lawn and garden equipment industry are unavailable, but industry sources believe they have amounted to less than 5 percent of total sales for such equipment in recent years. As with other industries, such expenditures have varied considerably each year, with some firms having spent significantly more on R&D than other firms. In recent years, R&D expenditures appear to have been concentrated in the area of reducing materials costs, historically the largest single cost for equipment manufacturers.

Overall, industry efforts have been directed toward increasing machinery operating efficiency through the use of various types of electronic controls for more efficient engine starting and operation, a greater use of alloys and composite materials in engine and mower-deck construction, and new product development. R&D expenditures in this industry have resulted in a number of equipment changes in recent years. These have included the improvement of variable-speed hydrostatic transmissions, the addition of height adjustment capability to riding mowers, a greater use of automotive-type steering assemblies for riding mowers, and a greater availability and use of overhead valve engines. Other enhancements include the proliferation of zero-turn-radius mowers, improved electronic ignition systems, the improvement and

greater use of bagging attachments, and extensive recent efforts at perfecting the mulching capabilities of mowers.

Since the late 1980s, industry and consumer attention has been focused on the increasing accumulation of grass clippings and yard wastes in U.S. landfills. Consequently, equipment such as shredder/chippers have been extolled for their ability to mechanically break down common yard materials into a form easier to handle and more readily composted. A growing number of states currently ban the disposal of yard wastes in municipal landfills. Subsequently, many firms have concentrated their recent R&D expenditures on improving the style of mulching mower that further cuts grass clippings while they are still inside the mower deck. This results in minute organic particles that are released back onto the lawn surface without forming a thatch buildup, eliminating the need for collection, bagging, or composting.

In recent years, agricultural machinery manufacturers and dealers have increasingly stressed consumer safety in the design, manufacture, and operation of their equipment. Manufacturers have stressed the design of equipment with safety features built into the units. Dealers have also become more involved in establishing consumer safety education programs designed to protect users from injury and to prolong the life of the equipment through proper operation and maintenance. A number of manufacturers and distributors now offer retailers and consumers both video tape and in-house training programs on the proper operation of their equipment prior to and after purchase.

With the continuing U.S. oversupply of farm equipment and the globalization of major equipment markets in recent years, U.S. firms have also become especially concerned about international standards for agricultural equipment. Since 1986, members of the agricultural machinery industry have been actively involved in testifying and preparing documents expressing their opinions regarding proposed machinery standards before the International Organization for Standardization in Switzerland. Recent proposed changes in international standards

under review have included defining test procedures and safety requirements for powered lawn and garden equipment as well as the requirement for roll-over-protection devices to be installed on all tractors. The industry is actively monitoring all proposed changes as they are published.

Government Policies

The farm machinery and equipment sector is concerned about U.S. environmental regulations affecting air pollution emissions from farm and construction machinery¹¹ and product liability. Recently, the U.S. Environmental Protection Agency (EPA) conducted a study of non-road vehicles and engines as mandated under section 222 of the Clean Air Act Amendments of 1990 (Public Law 101-549). The 12-month study determined that non-road vehicle and engine air pollution emissions were greater than had been expected and further study and actions might be warranted.¹² The EPA has an additional 12 months to develop any needed standards. This study also covered air pollution emissions from outdoor power equipment. The domestic outdoor power equipment industry is currently working with the EPA in an effort to establish nationwide emissions' standards for outdoor power equipment based on the generation of data regarding the volume of equipment in use and annual hours of use. The level of emissions given off from spilled gasoline during refueling is also under review.

Equipment manufacturers would prefer the establishment of uniform Federal standards relating to their industry as opposed to standards set up by individual states. California has already established state emissions levels for lawn and garden and utility equipment engines. As a result of regulations implemented by the California Air Resources Board (CARB) in December 1990, emissions of hydrocarbons, carbon monoxide, and nitrogen oxides are to be reduced by 45 percent beginning in 1994, with more stringent requirements to go into effect by 1999. The CARB is scheduled to conduct interim emissions reviews in 1994 and 1996 to determine the feasibility of the 1999 deadline. According to industry sources, the added cost of complying with these standards could be about \$66 to \$138 per piece of equipment.¹³

Product liability reform has also been a concern of the U.S. lawn and garden industry. However, since new legislation in this area has not been forthcoming, the OPEI, a trade association representing the majority of the industry, has undertaken a number of initiatives in the area of consumer product safety in order to

reduce liability problems. For example, OPEI has established a Riding Mower Working Group to work with the U.S. Consumer Product Safety Commission. This Working Group has established a stability testing platform for riding mowers in Sarasota, FL, that companies may contract for in product liability associated testing.

Consumer Characteristics And Factors Affecting Demand

Farm Machinery and Equipment

Major customers for farm machinery and equipment include full-scale independent farm equipment dealers; shortline (smaller selection) equipment and parts dealers; private and corporate farm operators; custom applicators for planting, spraying, or harvesting operations; institutional and government users; and crop, beef, dairy, hog, and poultry farmers. The most important segment of this market is composed of individual farm machinery customers who, historically, have been very brand loyal.

Machinery and equipment were used on an estimated 2 million farms in recent years,¹⁴ with many farmers owning more than one tractor along with a number of other farm implements. Investment in farmland and buildings in 1990, an indicator of farm equipment consumption, is shown in the following tabulation (in millions of dollars):¹⁵

States	Investment
Iowa, Illinois, Indiana, Michigan, Ohio, Missouri, Minnesota, and Wisconsin	185,462
Kansas, North Dakota, South Dakota, Texas, Nebraska, and Oklahoma	158,089
Arizona, California, Colorado, Idaho, New Mexico, Utah, Oregon, Montana, Nevada, Washington, and Wyoming	139,913
Alabama, Arkansas, Florida, Georgia, North Carolina, Kentucky, Louisiana, South Carolina, Mississippi, Tennessee, West Virginia, and Virginia	132,263
Connecticut, Delaware, Maine, Maryland, Rhode Island, Massachusetts, New York, New Hampshire, New Jersey, Pennsylvania, and Vermont	42,724
Total	658,451

¹¹ "Legislative Bulletin," *Farm & Power Equipment Dealer*, vol. 86, No. 8, Aug. 1990, p.22.

¹² U.S. Environmental Protection Agency, *Nonroad Engine and Vehicle Emission Study*, Docket No. A1-91-24, 1991.

¹³ "California Restricts Power-Equipment Emissions," *Outdoor Power Equipment*, vol. 33, No. 2, Feb. 1991, p. 64.

¹⁴ U.S. Department of Commerce, *1987 Census of Agriculture*, vol. 1, Pt. 51, Nov. 1989.

¹⁵ Compiled by Commission staff from Resources and Technology Division, Economic Research Service, U.S. Department of Agriculture, *Agricultural Resources: Agricultural Land Values and Markets Situation and Outlook Report*, publication No. AR-21, June 1991, p. 34. Data were for 48 States and excluded Alaska and Hawaii.

Although the geographic distribution of these farms covers virtually all states, over half of these farms are concentrated in Midwestern and Plains states.

Demand for farm machinery and equipment is influenced by a number of factors. During 1986-90, demand was positively affected by a rise in net farm income, farm real estate assets, and agricultural exports, along with a drop in outstanding farm debt, interest expense, the debt-to-asset ratio, and the real farm machinery loan rate (table 6). Demand was negatively affected during the same period by an increase in total farm production expenses and a decrease in direct government payments.

According to industry sources, U.S. Government support programs are probably the single most important influence on farm machinery sales.¹⁶ Such programs cover a wide array of commodity production areas that contribute significantly to annual on-farm profitability. The level of support payments has fallen in recent years and was at a five-year low in 1990. Any additional cuts in current funding could further reduce demand for agricultural machinery.

State and Federal concern over pesticide usage could negatively affect farming profitability and profit margins, should certain chemicals be declared illegal to use or their usage on a number of crops be curtailed. This in turn would reduce future machinery sales.¹⁷ In addition, industry sources report that the implementation of current legislation concerning product liability and farm safety may result in additional costs of retrofitting older equipment that may even exceed the original equipment cost.¹⁸ Foreign demand for U.S.-produced tractors, the largest

¹⁶ Economic Research Service, Resources and Technology Division, U.S. Department of Agriculture, *Agricultural Resources: Inputs Situation and Outlook*, Feb. 1991, publication No. AR-21, pp. 29-31.

¹⁷ U.S. Department of Commerce, "Farm Machinery," *U.S. Industrial Outlook, 1991*, pp. 20-4 to 20-6.

¹⁸ *Ibid.*

segment of current export items, will also significantly affect future demand. There is currently an excess in inproduction capacity in the United States, Canada, and certain EC countries, with little change expected in the near future.

Demand for newer, more fuel efficient equipment has followed the steadily rising costs of other inputs such as fuel. Average U.S. farm fuel prices for all three major types of farm equipment operating fuel had an upward trend since 1986, as shown in the following tabulation (in dollars per gallon).¹⁹

Fuel type	1986	1987	1988	1989	1990
Gasoline	0.89	0.92	0.93	1.05	1.17
Diesel	0.71	0.71	0.73	0.76	0.94
Liquid propane gas	0.67	0.59	0.59	0.58	0.83

Also, demand is expected to rise for four-wheel-drive tractors and tractors with over 200 horsepower as farmers shift their operating procedures toward the use of one tractor.²⁰ Such tractors can accommodate a greater assortment of larger attachments while, at the same time, eliminating the need for additional lower horsepower units. Demand is also expected to rise for newer units to take the place of older tractors currently in operation, many of which are believed to be 10 to 20 years old. The relative size of farms, in terms of land in production, also affects equipment demand. With the merger of many smaller farms into larger operating units, larger pieces of farm equipment are generally preferred and their demand should increase.

¹⁹ Economic Research Service, Resources and Technology Division, U.S. Department of Agriculture, *Agricultural Resources: Inputs Situation and Outlook*, Feb. 1991, publication No. AR-21, p. 29.

²⁰ *Ibid.*, pp. 29-31.

Table 6
Farm machinery and equipment: Factors affecting demand, 1986-90

Factor	1986	1987	1988	1989	1990
<i>(Billion dollars)</i>					
Farm real estate assets	613.0	658.6	687.0	692.7	702.6
Net farm income	31.0	39.7	41.6	50.1	50.8
Agricultural exports	26.3	27.9	35.4	39.6	40.1
Outstanding farm debt	167.0	153.7	148.5	146.0	145.1
Interest expense	17.1	15.0	14.7	14.7	14.7
Total production expenses	125.5	128.7	133.9	140.2	144.3
Direct government payments	11.8	16.7	14.5	10.9	9.3
<i>Percent</i>					
Debt-to-asset ratio	19.6	16.9	15.5	15.0	14.6
Real farm machinery loan rate	9.4	8.0	7.5	8.2	7.8

Source: Compiled by Commission staff from data presented in Economic Research Service, Resources and Technology Division, U.S. Department of Agriculture, *Agricultural Resources: Inputs Situation and Outlook*, publication No. AR-25, Feb. 1992, p. 28.

Lawn and Garden Equipment

Major customers for lawn and garden machinery covered in this summary include outdoor power equipment dealers (for resale), parts and repair dealers, smaller sized private and corporate farms, parks and recreation facilities, lawn and garden maintenance firms, pest control applicators, orchards, nurseries, tree farms, sod farms, smaller-scale vegetable and fruit growers, institutional and government users, and individual households. These consumers are widely dispersed throughout the United States and in a number of other countries.

The largest consuming segment in this industry sector includes household consumers. Most of these consumers are believed to own at least one piece of mowing equipment, with many individuals also owning such additional items as weeders, power vacuum/blowers, shredder/chippers, rototillers, or snowblowers. According to industry sources, lawn and garden equipment was used on an estimated 60 million individual lawns in recent years. As with farm machinery and equipment, the geographic distribution of lawn and garden equipment consumers covers virtually all States, with sales generally concentrated in those areas of greatest population. According to industry sources,²¹ in 1987, sales of the most important equipment covered here (i.e., push mowers, riding lawnmowers, and riding lawn and garden tractors) were concentrated in Southeastern and Midwestern States, respectively, as shown in the following tabulation:

²¹ Compiled by Commission staff from data in the Outdoor Power Equipment Institute, Inc., *Outdoor Power Equipment Retail Sales Report*, June 20, 1988, (Alexandria, VA). Data were for 48 States and excluded Alaska and Hawaii.

States	Percent of sales
Delaware, Maryland, Virginia, Georgia, West Virginia, North Carolina, South Carolina, and Florida	23.5
Ohio, Indiana, Michigan, Illinois, and Wisconsin	20.0
New York, Pennsylvania, and New Jersey	13.5
Texas, Oklahoma, Louisiana, and Arkansas	12.2
Kentucky, Tennessee, Mississippi, and Alabama	8.7
North Dakota, South Dakota, Missouri, Kansas, Iowa, Minnesota, and Nebraska	8.5
California, Oregon, and Washington	6.7
Maine, New Hampshire, Connecticut, Vermont, Massachusetts, and Rhode Island	4.7
Montana, Idaho, Wyoming, Nevada, Utah, New Mexico, Colorado, and Arizona	2.2
Total	100.0

An estimated additional 200,000 consumers are involved in the commercial production of nursery and garden crops, vegetables, sweet corn, and melons, and in orchard fruit production. The geographic distribution of these consumers closely follows that for households.

Demand for lawn and garden equipment is influenced by the number of new housing starts, personal disposable income, and regional precipitation.²² During 1986-90, the number of new housing starts fell from 1.8 million units in 1986 to almost 1.2 million units in 1990 (table 7). The decline in new starts of townhouses and multi-unit structures was greater than the decline in detached houses.

²² U.S. Department of Commerce, "Lawn and Garden Equipment" *U.S. Industrial Outlook*, 1992, p. 37-11.

Table 7
New private residential housing starts, by type of construction, 1986-90
(Thousand units)

Construction type	1986	1987	1988	1989	1990
Single-unit structures:					
Detached houses	1,013	1,004	968	916	832
Townhouses	166	142	113	87	63
Total	1,179	1,146	1,081	1,003	895
Multi-unit structures	628	477	407	373	298
Total housing starts	1,807	1,623	1,488	1,376	1,193

Source: Compiled by the staff of the U.S. International Trade Commission from various editions of the *U.S. Industrial Outlook*.

Equipment sales for consumers in detached single-unit structures are believed to be greater, on average, than sales to customers living in townhouses or multifamily units, because of the larger size of the lawn and garden area of detached houses relative to that of townhouses. Also, the maintenance of individual lawn areas in townhouse, apartment, and condominium complexes is generally contracted out to private firms, thereby reducing the need for homeowners/renters in such units to purchase their own equipment.

Demand for lawn and garden equipment is also affected by such factors as home sales' prices, disposable personal income, and interest rates. Single-family median home sales' prices rose an estimated 34 percent between 1986 and 1990, whereas per capita disposable personal income rose by 37 percent during the same period (table 8). However, as new homes became less affordable to more consumers, equipment demand declined.

Historically, first-time home buyers made up an important segment of the retail consumer market for new lawn and garden equipment. With average annual interest rates of about 10 percent in effect during most of the 1986-90 period, depressed new home sales reduced the number of first-time home buyers entering the market.²³ During 1986-90, the increase in the sales prices of houses, and hence the down payment required, has offset any downward movements in interest rates. According to industry sources, the problem of housing affordability is expected to continue through the 1990s. If so, this will continue to limit the ability of first-time home buyers and of homeowners trying to trade up to newer, more expensive housing to purchase new homes.²⁴

A number of other factors have also affected lawn and garden equipment purchases in recent years. In those geographic areas with a greater number of two-income families, homeowners generally have less time for outdoor activities but more disposable income

available for purchasing higher priced lawn and garden equipment. The result is a greater demand for certain types of equipment, including riding mowers and lawnmowers with such additional features as electric start engines, self-propelled transmissions, and bagging attachments. With these consumers, product quality and ease-of-use become more important factors affecting demand than price. Additionally, these consumers are better situated financially and more likely to contract out their lawn and garden maintenance work to private firms, thus increasing the demand for commercial-grade equipment.

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Weather and season also exert significant influence on lawn and garden equipment sales, especially on a regional basis. Prolonged periods of drought tend to lower demand for lawn care equipment, whereas extended periods of rainfall exert the opposite influence. In recent years, any decrease in equipment demand due to below-normal amounts of rainfall in the more temperate regions of the United States has been offset by a rising population shift into those areas. Demand for such equipment as snowthrowers has been somewhat depressed in recent years because of below-normal amounts of snowfall.

²³ U.S. Department of Commerce, "Construction," *U.S. Industrial Outlook*, 1991, p. 5-5.

²⁴ U.S. Department of Commerce, "Construction," *U.S. Industrial Outlook*, 1992, p. 5-5.

Table 8
Lawn and garden equipment: Factors affecting demand, 1986-90

Factor	1986	1987	1988	1989	1990
<i>Thousand dollars</i>					
Single-family home median sales price	92.0	104.5	112.5	120.0	122.9
Per capita disposable personal income	11.86	13.55	14.48	15.31	16.24
<i>Percent</i>					
Interest rates ¹	10.3	9.7	9.7	10.1	10.1

¹ Average annual effective rates on conventional mortgages of 25 years with 75 percent loan-to-price ratio.

Source: Compiled by Commission staff from data presented in U.S. Department of Commerce, "Construction," *U.S. Industrial Outlook*, 1992, p. 5-5, and U.S. Department of Commerce, *Survey of Current Business*.

FOREIGN INDUSTRY PROFILE

Farm Machinery And Equipment

In recent years, various types of farm machinery and equipment, including tractors, were produced in a number of countries. Many of the producers in these countries are global manufacturers believed to be as technologically advanced in their production processes and end products as are U.S. producers. Important supplier countries include Germany, Japan, Canada, France, Italy, the United Kingdom, Belgium, and Spain. Whereas many of the firms in these countries are completely foreign owned and operated, some firms are wholly owned subsidiaries of U.S. firms, and others are operated as joint ventures. As with other global competitors, all of the major U.S. farm equipment manufacturers currently have machinery manufactured for their firms in other countries.

In addition, firms in such countries as Brazil, Argentina, India, and Australia are producing farm machinery principally for their home market under licensing agreements with major U.S., Japanese, or European manufacturers. The producers in these countries all have access to available labor and raw material supplies and employ the latest production technology. A number of other countries produce a more limited line of tractors and harvesting machinery, or produce mainly less sophisticated farm implements such as plows, harrows, and other miscellaneous equipment. In some instances, firms are producing complete units ready for sale, while other firms are producing mainly components or parts for further assembly.

Producers in some countries appear to have a competitive advantage in selling to their home market, because of local regulations or government assistance provided to domestic producers only (e.g., low-interest long-term loans or subsidies). Producers in other countries selling in their home market have the advantage of an accessible, more developed transportation infrastructure. Even in light of such circumstances, all major global farm machinery companies currently operate successfully through subsidiaries in a number of different countries.

The bulk of tractor and combine production in recent years has taken place in more industrialized countries because of high capital costs for building and operating production facilities. U.S., Japanese, and European firms have historically transferred the technology necessary for running these facilities from their domestic operations to their foreign subsidiaries. In addition, smaller world producers usually import more advanced equipment to use as models for building equipment in their home country.²⁵ Other developing-nation suppliers, including Argentina, Brazil, India, and Mexico, that started as regional suppliers are now becoming important global competitors.

²⁵ International Trade Administration, U.S. Department of Commerce, *A Competitive Assessment of the U.S. Farm Machinery Industry*, Mar. 1985, p. 35.

Farming units in most countries other than the United States and Canada are generally on a smaller per-acre scale, thereby requiring the use of smaller tractors and equipment. Consequently, greater demand for smaller, lower horsepower tractors has led major U.S. manufacturers to shift the bulk of their production overseas. Also, lower production costs created incentives for U.S. manufacturers to locate production in these countries. Japanese production, which typically included small tractors, has expanded in recent years to include medium-sized tractors sold mainly in U.S. and European markets.

Lawn and Garden Equipment

Historically, U.S. firms competed with firms in Japan, Canada, and the United Kingdom in world markets for lawn and garden equipment. A number of other countries including Germany, Taiwan, Sweden, and Italy were major suppliers of parts for lawn mowers and related lawn and garden machinery. Since 1986, however, a number of U.S. firms have become more competitive through the acquisition of foreign firms, by entering into joint-venture agreements or licensing arrangements with other firms, or by having opened sales/distribution offices overseas.

As with farm machinery production, a number of foreign manufacturers are now competing successfully in global markets with equipment comparable to U.S.-produced equipment. The demand for high-quality equipment worldwide, together with the availability of raw materials and labor, has caused this shift into lawn and garden equipment production by other countries, especially by those countries previously producing related machinery and equipment or parts. Japan, in particular, has a large, technologically developed tractor and related equipment industry and has become a major competitor both in foreign markets and in the United States. Since 1986, Honda and Kubota, the largest Japanese manufacturers of lawn mowers and tractors, respectively, both have set up production and/or distribution facilities in the United States, principally for sales in U.S. markets.

U.S. TRADE MEASURES

Tariff Measures

Table 9 provides the 1991 Harmonized Tariff Schedule of the United States (HTS) column 1-general rate of duty, preferential rates of duty, and U.S. exports and imports for 1990 for each 8-digit HTS agricultural machinery subheading.²⁶ The current most-favored-nation (MFN) rates of duty range from free for most of the machinery and parts included here, to a high of 4.2 percent ad valorem on dryers for agricultural products. Duties on mowers and parts, items of significant commercial importance, were 4 percent ad valorem in 1990. Nearly 94 percent of all

²⁶ Appendix A includes an explanation of tariff and trade agreement terms.

Table 9

Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1991; U.S. exports, 1990; and U.S. Imports, 1990

HTS subheading	Description	Col. 1 rate of duty As of Jan. 1, 1991		U.S. exports, 1990	U.S. imports, 1990
		General	Special ¹		
				Million dollars	
8419.31.00	Dryers for agricultural products	4.2%	Free (A,CA,E,IL)	8	2
8424.81.10	Agricultural or horticultural sprayers (except sprayers self-contained, having a capacity not over 20 liters)	Free		10	20
8424.81.90	Mechanical appliances for projecting, dispersing, or spraying liquids or powders, nesi	3.7%	Free (A,CA,E,IL)	229	12
8432.10.00	Plows for soil preparation or cultivation	Free		10	26
8432.21.00	Disc harrows for soil preparation or cultivation	Free		6	62
8432.29.00	Harrows (other than disc), scarifiers, cultivators, weeders, and hoes for soil preparation or cultivation	Free		27	74
8432.30.00	Seeders, planters, and transplanters	Free		36	40
8432.40.00	Manure spreaders and fertilizer distributors	Free		18	17
8432.80.00	Agricultural, horticultural, or forestry machinery for soil preparation or cultivation, nesi; lawn or sports ground rollers	Free		16	20
8432.90.00	Parts of agricultural, horticultural, or forestry machinery for soil preparation or cultivation; parts of lawn or sports ground rollers	Free		71	133
8433.11.00	Mowers for lawns, parks, or sports grounds, powered, with the cutting device rotating in a horizontal plane	4%	Free (A,E,IL) 2.8% (CA)	266	43
8433.19.00	Mowers for lawns, parks, or sports grounds, nesi	4%	Free (A,E,IL) 2.8% (CA)	66	12
8433.20.00	Mowers, nesi, including cutter bars for tractor mounting	Free		42	77
8433.30.00	Haymaking machinery other than mowers	Free		31	14
8433.40.00	Straw or fodder balers, including pick-up balers	Free		72	10
8433.51.00	Combine harvester-threshers	Free		209	35
8433.52.00	Threshing machinery other than combine harvester-threshers	Free		8	4
8433.53.00	Root or tuber harvesting machines	Free		6	2
8433.59.00	Harvesting machinery, nesi; threshing machinery, nesi	Free		61	30
8433.60.00	Machines for cleaning, sorting or grading eggs, fruit, or other agricultural produce	Free		17	5
8433.90.10	Parts of mowers for lawns, parks, or sports grounds	4%	Free (A,E,IL) 2.8% (CA)	71	46
8433.90.50	Parts for machinery of heading 8433, nesi	Free		120	102
8434.10.00	Milking machines	Free		10	(²)
8434.20.00	Dairy machinery other than milking machines	Free		15	1
8434.90.00	Parts for milking machines and dairy machinery	Free		28	16
8436.10.00	Machinery for preparing animal feeds	Free		23	5
8436.21.00	Poultry incubators and brooders	Free		13	5
8436.29.00	Poultry-keeping machinery	Free		32	10

See footnotes at end of table.

Table 9—Continued

Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1991; U.S. exports, 1990; and U.S. imports, 1990

HTS subheading	Description	Col. 1 rate of duty As of Jan. 1, 1991		U.S. exports, 1990	U.S. imports, 1990
		General	Special ¹		
<i>Million dollars</i>					
8436.80.00	Agricultural, horticultural, forestry, or bee-keeping machinery, nesi	Free		85	58
8436.91.00	Parts of poultry-keeping machinery or poultry incubators and brooders	Free		21	6
8436.99.00	Parts for agricultural, horticultural, forestry, or bee-keeping machinery	Free		152	35
8701.10.00	Pedestrian controlled tractors	Free		28	1
8701.30.10	Track-laying tractors suitable for agricultural use	Free		217	141
8701.30.50	Track-laying tractors not suitable for agricultural use	2.2%	Free (A,CA,E,IL)	109	23
8701.90.10	Tractors, nesi, suitable for agricultural use	Free		524	1,294
8701.90.50	Tractors, nesi, not suitable for agricultural use	2.2%	Free (A,E,IL) 1.5% (CA)	43	43
8706.00.30	Chassis fitted with engines, for tractors suitable for agricultural use	Free		12	1
8708.31.10	Mounted brake linings, for tractors suitable for agricultural use	Free		5	1
8708.39.10	Brakes and servo-brakes and parts thereof, other than mounted brake linings, for tractors suitable for agricultural use	Free		63 ⁽³⁾	3
8708.40.30	Gear boxes, for tractors suitable for agricultural use	Free		59 ⁽³⁾	37
8708.50.10	Drive axles with differential, whether or not provided with other transmission components, for tractors suitable for agricultural use	Free		111	19
8708.60.10	Non-driving axles and parts thereof, for tractors suitable for agricultural use	Free		7	1
8708.70.10	Road wheels and parts and accessories thereof, for tractors suitable for agricultural use	Free		15	20
8708.80.10	Suspension shock absorbers, for tractors suitable for agricultural use	Free		1	1
8708.91.10	Radiators, for tractors suitable for agricultural use	Free		2	2
8708.92.10	Mufflers and exhaust pipes, for tractors suitable for agricultural use	Free		2	2
8708.93.10	Clutches and parts thereof, for tractors suitable for agricultural use	Free		7	10
8708.94.10	Steering wheels, steering columns, and steering boxes, for tractors suitable for agricultural use	Free		4	1

See footnotes at end of table.

Table 9—Continued

Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1991; U.S. exports, 1990; and U.S. imports, 1990

HTS subheading	Description	Col. 1 rate of duty As of Jan. 1, 1991		U.S. exports, 1990	U.S. imports, 1990
		General	Special ¹		
				————— Million dollars —————	
8708.99.10	Parts, nesi, of tractors suitable for agricultural use	Free		508	252
8716.80.10	Farm wagons and carts, not mechanically propelled	Free		2 ⁽²⁾	4
8716.90.10	Parts of farm wagons and carts, not mechanically propelled	Free		27 ⁽³⁾	2

¹ Programs under which special tariff treatment may be provided and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn, are as follows: Generalized System of Preferences (A); Automotive Products Trade Act (B); Agreement on Trade in Civil Aircraft (C); United States-Canada Free-Trade Agreement (CA); Caribbean Basin Economic Recovery Act (E); and United States-Israel Free-Trade Area (IL).

² Less than \$500,000.

³ Estimated by the staff of the U.S. International Trade Commission.

Source: U.S. exports and imports compiled from official statistics of the U.S. Department of Commerce.

products covered here entered the United States duty-free in 1990. The aggregate trade-weighted average rate of duty for agricultural machinery based on 1990 data was 0.2 percent ad valorem. There have been few classification problems, criteria adjustments, or substantive changes for agricultural machinery as a result of the conversion from the Tariff Schedules of the United States (TSUS) to the HTS. None of these changes significantly affected U.S. trade.

Because lawnmowers and parts thereof are dutiable, Honda Power Equipment Company applied for and was granted foreign-trade subzone status at its plant in Alamance County, North Carolina, in July 1990.²⁷ Honda is assembling lawn mowers and small engines at this plant.

Many dutiable products that are not classified as agricultural or horticultural machinery and equipment, may receive duty-free treatment, with certain exclusions, under HTS items 9817.00.50, machinery, equipment and implements to be used for agricultural or horticultural purposes, and 9817.00.60, parts to be used in articles provided for in headings 8432, 8433, and 8436, whether or not such parts are principally used as parts of such articles. U.S. imports under these HTS subheadings rose from \$54.0 million in 1986²⁸ to \$190.2 million in 1990. Canada was the principal supplier and accounted for 48 percent of the total entered under these provisions in 1990, and the EC accounted for 40 percent.

Nontariff Measures

The Commission is unaware of any U.S. nontariff barriers to trade in agricultural machinery. The United States does maintain strict regulations for factory-installed safety features on agricultural machinery and is currently studying the implementation of air and noise pollution control laws for lawn and garden equipment and off-road vehicles.²⁹ Such laws and regulations are believed to be some of the most comprehensive in the world and might be considered by some foreign competitors as unusually restrictive relative to such regulations in other countries. These regulations, however, are applied to U.S. produced and imported products alike.

FOREIGN TRADE MEASURES

Tariff Measures

The major U.S. trading partners for agricultural machinery include Canada, Germany, the United Kingdom, Japan, France, Mexico, and Belgium. In

²⁷ Honda Power Equipment Co. had applied for the foreign-trade zone status for its plant on Oct. 30, 1984. See 55 FR 28073.

²⁸ During 1986-88, comparable tariff classifications were *Tariff Schedules of the United States Annotated* items 680.40 and 680.45.

²⁹ "Local Ordinance Forces Blower Firms to Seek Solutions," *Outdoor Power Equipment*, vol. 32, No. 15, Nov. 1990, p. 50.

1990, U.S. exports of agricultural machinery enter these countries at rates significantly higher than rates applicable to products from those countries entered into the United States (table B-1). Before the enactment of the free-trade agreement between the United States and Canada, most of the products covered in this summary entered Canada duty free. Certain commercially important (high demand) items, however, including lawn mowers and parts, entered Canada under duties ranging from 12 to 15 percent ad valorem. Duties on such products are currently being phased out as part of the free-trade agreement.

Duties on U.S. exports of agricultural machinery to the European Community ranged from 3.5 to 11 percent ad valorem, with most of the products in this summary being entered under applicable duties in the 3.5 to 4.9 percent ad valorem duty range. Under the Japanese tariff system, U.S. shipments of all of the summary items covered here were eligible for duty-free treatment under temporary duty suspension provisions. The Mexican general tariff rates applicable to U.S. shipments of lawn and garden machinery ranged from 10 to 20 percent ad valorem, with rates for most of the farm machinery and parts in the 10 to 15 percent ad valorem range.

Nontariff Measures

According to industry sources, a number of foreign government policies and programs affect the ability of U.S. firms to successfully compete abroad.³⁰ EC nontariff barriers include export incentives such as the waiver of value-added taxes on EC-produced equipment, which encourages producers to export more and increases competition in major markets. A number of common market agricultural policies, along with cost control policies on such raw products as steel, also are believed to favor foreign producers by enabling them to keep production costs down. The flow of agricultural machinery from the United States to various EC countries also is somewhat slowed by EC regulations on machinery safety or product specifications. Some of these regulations vary from country to country within the EC.

Some European countries are reported to have provided direct export financing for their producers' machinery and equipment in recent years.³¹ The United States does not have any similar program. Other countries are reported to be providing aid and development funds to lesser developed countries, principally through subsidized credit, in return for their obtaining entry for their exports. In some South American countries, imports have been controlled through import licensing regimes, but many of these have been eliminated.

According to U.S. industry sources, there are few known foreign nontariff barriers specific to trade in lawn and garden machinery. In recent years, U.S. manufacturers have expressed concern over such regulations as EC standards on safety and production

³⁰ International Trade Administration, U.S. Department of Commerce, *A Competitive Assessment of the U.S. Farm Machinery Industry*, Mar. 1985, pp. 58-63.

³¹ *Ibid.*, p. 58.

specifications on farm tractors.³² The EC is also proposing sound emission standards for lawnmowers and is planning to establish standards for garden equipment, such as shredders.³³ As with farm machinery and equipment, the sale of U.S. produced lawn and garden equipment in European markets is believed to be hampered somewhat by different equipment standards among individual member countries and changes made to such standards. Unlike foreign products, which in the United States face the same standards throughout all domestic markets, U.S. products face the additional costs of having to be manufactured for export according to different standards for each country they enter. Any EC-wide effort toward greater standardization could lead to increased U.S. sales in those markets.

U.S. MARKET

Consumption

Apparent U.S. consumption of agricultural and horticultural machinery rose steadily from \$8.6 billion in 1986 to \$12.4 billion in 1990, or by 45 percent (table 10). The bulk of overall consumption and most of the rise in consumption over the 5-year period were accounted for by farm machinery and equipment. Import penetration was 22 percent in 1990, down slightly from almost 24 percent in 1986. Imports as a share of consumption peaked in 1988 at almost 26 percent. U.S. imports of agricultural machinery continued to account for a significant share of U.S. consumption as foreign tractor manufacturers, especially those in Japan, established better U.S. distribution channels. Demand for their products, perceived to be high quality items, continues to rise. Also, large-volume U.S. tractor manufacturers continue to source increasing quantities of small-horsepower tractors overseas.

Apparent U.S. consumption of lawn and garden equipment rose an estimated 32 percent during the period, a much slower rate than that for farm machinery. Consumption of lawn and garden equipment in general tends to closely follow changes in

the overall economy and, more specifically, increases in housing starts. Climactic factors also influence consumption of selected equipment, especially lawn mowers and snow throwers, as do factors such as product development and seasonal availability.

Production

U.S. producers' shipments of agricultural machinery rose steadily from an estimated \$8.9 billion in 1986 to an estimated \$13.1 billion in 1990, or by 48 percent (table 10). About two-thirds of total shipments throughout this period were accounted for by shipments of farm machinery and equipment. Shipments of both agricultural and horticultural³⁴ machinery and equipment are expected to decline by 6 percent between 1990 and 1991. The expected fall in shipments of farm machinery is attributable to the continued drought in California, a spotty drought in the grainbelt, low crop and milk prices, declining crop exports, and reduced U.S. Government subsidies. Shipments of lawn and garden equipment fell during 1986-90 because of declines in housing starts, reduced real personal disposable income, and drier weather in populous areas.

In recent years, small tractors (under 40 horsepower) accounted for the largest single share (about 41 percent) of total U.S. tractor sales, followed by sales of medium-sized (40-99 horsepower) and large (over 100 horsepower) tractors with 35 and 24 percent, respectively, of the market. The largest tractors, most commonly used in the United States and Canada, where fields are large and expansive, also yield the largest per-unit margins for manufacturers. Medium-sized tractors are more common throughout Europe, where farms are generally smaller in overall size. A significant amount of U.S. shipments of these tractors is for export distribution in that market.

U.S. shipments of lawn and garden equipment rose by an estimated 32 percent during 1986-90 and are expected to rise by over 15 percent over the next couple of years.³⁵ While many dealers and distributors express their concern over the economy as a leading factor affecting their future shipments, they also expect increased sales to result from improved marketing and advertising of new products and better service of existing equipment. They also expect a shift in the overall distribution of equipment toward greater shipments through mass merchandiser outlets. In addition, dealers and distributors alike report that their greatest shipments currently are of walk-behind and rear-engine riding mowers and trimmers and that future shipments of mulching mowers, chipper/shredders, and other horticultural equipment are all expected to increase.

³² On June 20, 1991, the EC Commission adopted a proposal for a Council Directive (SEC(91) 466 final). This is a legislative consolidation of existing Directives relating to wheeled agricultural or forestry tractors and shall replace previous instruments, and is limited to regrouping them and incorporating the formal amendments required by the consolidation procedure. Previous instruments consolidated in (SEC(91) 466 final) are EC Directives 88/297, 89/173, 87/402, and 89/681 which amends 87/402.

³³ The EC directives on noise emissions, 88/180 and 8/181, were scheduled for implementation on July 1, 1991. However, the final national balloting is to occur at the end of January 1992. In a related area, the EC standards body, CEN, has begun to draft its own standards for edge-trimmers, shredders grinders, tillers, and lawn trimmers and edgers to be incorporated into the European Standard on Lawnmowing Equipment. See also letter to Mr. Ludolph, Director, Office of European Community Affairs from Laurence J. Lasoff, Counsel, Outdoor Power Equipment Institute, Inc., June 19, 1991.

³⁴ U.S. Department of Commerce, "Farm Machinery," *U.S. Industrial Outlook*, 1992, p. 19-6; "Lawn and Garden Equipment," *U.S. Industrial Outlook*, 1992, p. 37-11.

³⁵ Toni Richard and Jon Hoover, "Industry Optimistic About Future," *Outdoor Power Equipment*, vol. 33, No. 8, Aug. 1991, p. 40.

Table 10

Agricultural and horticultural machinery: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, apparent consumption, and the ratio of imports to consumption, 1986-90

Year	U.S. producers' shipments ¹	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
	Million dollars				Percent
1986	8,881	2,325	2,014	8,570	23.5
1987	9,710	2,500	2,317	9,527	24.3
1988	11,087	3,211	2,693	10,569	25.5
1989	11,629	3,394	2,528	10,763	23.5
1990	13,146	3,525	2,783	12,404	22.4

¹ Estimated by the Commission staff.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Imports

Products Imported

During 1986-90, all of the products covered in this summary were imported into the United States, with such items as tractors and parts, other farm implements, mowers and parts, and miscellaneous farm machinery and parts accounting for the bulk of products imported. Import trends for the products covered here have been mixed since 1986, with imports of such items as tractors and parts, mowers and parts, and miscellaneous farm equipment up considerably. In 1990, U.S. imports of tractors and parts were valued at \$1.9 billion; other agricultural machinery imports were valued at \$829.1 million; and lawn mowers and parts were valued at \$99.9 million.

Import Levels and Trends

Total U.S. imports of agricultural machinery rose by 38 percent from \$2.0 billion in 1986 to \$2.8 billion in 1990 (table 11). Some of these imports are believed to be tractors and parts manufactured offshore for domestic producers. Other imports include smaller tractors and Canadian-produced tractors intended specifically for the U.S. market. Also, part of the trend in imports over this period can be explained by exchange rate fluctuations. In terms of U.S. dollars, imports into the United States were relatively cheaper in the early part of this period and relatively more expensive in the later part.

In 1990, about two-thirds of total imports were of tractors and parts, followed by other agricultural machinery and lawn mowers and parts with 30 and 4 percent, respectively, of the total. The respective share of total imports accounted for by each of these categories has remained about the same since 1986. Duty-free imports of dutiable items under the Generalized System of Preferences totaled \$6.8 million in 1990 and were primarily from Poland and Brazil. Imports under the United States-Israel Free-Trade Area totaled \$1.3 million in 1990 and under the United

States-Canada Free-Trade Agreement totaled \$14.5 million.

Principal Import Suppliers

In recent years, imports of agricultural machinery were entered principally from Canada, West Germany, the United Kingdom, Japan, Italy, and France, which were the leading suppliers throughout this 5-year period. Major import suppliers of lawn mowers and parts also included Taiwan and Sweden. Since 1986, imports from the United Kingdom and former West Germany rose steadily. Products from Germany are in demand because of their perceived high quality. Shipments from the United Kingdom include smaller tractors produced by U.S. subsidiary plants located there. Shipments from Japan have fallen steadily since 1987, as more Japanese equipment was made in the United States. Imports from Italy and France peaked in 1988 following overproduction the year before, but have trended downward to more normal quantities since that time.

Imports from Eastern Europe rose by nearly 240 percent during 1986-90 but remain relatively small. Historically, significant volumes of farm machinery have been produced in Eastern Bloc countries, but such machinery, although lower in price, has been viewed as less durable and less technologically advanced than the U.S., Japanese, or West European machinery. Imports from Poland and Hungary, in particular, have risen dramatically since 1986, as tractors from both countries filled a niche in U.S. markets for lower priced, less advanced machinery.

Manufacturers in both Poland and Hungary have established extensive U.S. distribution channels for handling their equipment. Such equipment is often carried as a lower priced product by a dealer who handles other more expensive equipment. In addition, some Eastern European manufacturers have been making tractors for other global competitors for a number of years, usually under licensing agreements and according to the manufacturers specifications, to be sold in foreign markets under the competitor's label.

Table 11
Agricultural and horticultural machinery: U.S. imports for consumption, by principal source,
1986-90

(1,000 dollars)

Source	1986	1987	1988	1989	1990
Canada	395,247	528,569	615,671	683,633	623,607
West Germany	290,893	306,523	345,964	347,986	521,963
United Kingdom	273,840	281,450	391,183	393,027	439,164
Japan	562,101	621,915	546,415	455,684	436,206
Italy	169,036	178,406	217,525	163,662	165,008
France	84,385	103,677	147,079	118,882	141,547
Belgium	0	0	65,606	70,111	138,703
Netherlands	32,745	34,540	37,385	30,935	38,225
South Korea	7,435	9,893	35,784	30,203	30,605
Brazil	14,703	27,307	39,236	32,614	28,128
All other	184,419	225,111	251,275	200,813	219,511
Total	2,014,404	2,317,391	2,693,123	2,527,550	2,782,667

Source: Compiled from official statistics of the U.S. Department of Commerce.

U.S. Importers

The principal U.S. importers of agricultural machinery in 1990 included U.S. machinery and equipment manufacturers, dealers, and distributors; original equipment manufacturers; parts distributors; and, both U.S.- and foreign-owned distributors of foreign-produced machinery. The three leading U.S. tractor manufacturers currently sell Japanese-made tractors under their own company name. A few European and Japanese firms also have U.S. dealerships or other distribution arrangements in the United States for importing their products.

FOREIGN MARKETS

Foreign Market Profile

Historically, Canada has been the leading foreign market for U.S.-produced agricultural machinery. Although Canada has also been the largest source of U.S. imports, the United States has had a significant positive trade balance with Canada for many years. U.S. exports to Canada have averaged about 50 percent greater in value than Canadian shipments to the United States. Demand for U.S. machinery and equipment in Canada has been heightened by the favorable exchange rates in effect recently and is expected to rise in the near future, although not as rapidly as in other major markets.

Most of the farming operations in Canada are large-scale operations similar in size, design, and equipment needs to those in the United States. During the late 1980s, the major Canadian farm equipment producers, Versatile Farm Equipment Co. (its tractor operations now owned by Ford New Holland) and Massey-Ferguson, Inc. (now owned by Varsity Corp.), had declining sales due to low domestic and global demand for farm equipment. As a result, both companies significantly restructured the operations. Demand for U.S.-produced machinery and equipment in Canada has been directly influenced by a shift from purchases of new additional units to Canadian purchases of replacement machinery.

The European tractor market is reportedly twice as large as that in the United States. Most of the demand in this market is believed to be for small and medium-sized tractors and other equipment. With the expected elimination of intra-EC customs frontiers at the end of 1992, this market is expected to grow even larger. Major multinational firms, including the three largest U.S. tractor producers that currently operate plants in Europe, are expected to gain market share principally at the expense of smaller firms. Other large single-country suppliers are also expected to prosper.

Although the Asian farm machinery market is growing rapidly, most of the demand is expected to be for small to medium-sized tractors. As a result, a significant portion of the production of these units is expected to come from Japan and other Asian manufacturers. Demand is also increasing in other markets, such as in the Mediterranean and Central and South America, but is also expected to be satisfied by smaller, often less technologically developed equipment from local sources.

U.S. Exports

Products Exported

In recent years, the bulk of farm machinery and equipment exports were tractors and parts, with other important items including harvesting machinery, mowing and haymaking machinery, sprayers, and irrigation equipment.³⁶ The bulk of the lawn and garden equipment exports included mowers and other types of grounds maintenance equipment, and parts. The U.S. agricultural machinery industry is considered a world leader in product technology, and its products are noted worldwide for their generally high quality.³⁷

³⁶ U.S. Department of Commerce, "Farm Machinery," *U.S. Industrial Outlook, 1991*, p. 20-6; "Lawn and Garden Equipment," *U.S. Industrial Outlook, 1991*, p. 38-11.

³⁷ International Trade Administration, U.S. Department of Commerce, *A Competitive Assessment of the U.S. Farm Machinery Industry*, Mar. 1985, p. 35.

Table 12
Agricultural and horticultural machinery: U.S. exports of domestic merchandise, by principal market, 1986-90

(1,000 dollars)

Market	1986	1987	1988	1989	1990
Canada	883,832	959,565	948,043	979,500	1,019,660
Mexico	108,069	106,881	168,794	182,153	263,995
Australia	100,905	99,865	198,146	295,317	246,603
Belgium	0	0	251,574	211,162	221,019
France	107,155	161,542	244,232	267,226	213,948
Japan	71,403	88,759	144,602	159,340	177,704
United Kingdom	94,457	111,884	172,134	155,730	163,530
West Germany	69,445	74,455	103,445	108,367	128,665
Saudi Arabia	40,614	58,363	61,763	93,236	97,789
Singapore	25,851	35,324	50,624	67,842	67,711
All other	823,638	803,831	867,313	874,252	924,323
Total	2,325,369	2,500,469	3,210,670	3,394,125	3,524,947

Source: Compiled from official statistics of the U.S. Department of Commerce.

Export Levels and Trends

During 1986-90, U.S. exports of agricultural machinery rose by 52 percent, from \$2.3 billion in 1986 to \$3.5 billion in 1990 (table 12). In 1990, about one-half of total exports were tractors and parts, down from about 60 percent of annual total exports during 1986-89 as U.S. tractor producers shifted more of their production offshore. Other agricultural machinery and parts accounted for about 38 percent of total exports in 1990, up slightly from an annual average of about 32 percent in previous years. The share of total U.S. exports accounted for by lawn mowers and parts has risen steadily from about 5 percent in 1986 to nearly 12 percent in 1990. Also, part of the trend in exports over this period can be explained by exchange rate fluctuations. In terms of U.S. dollars, exports from the United States were relatively more expensive in the early part of this period and relatively cheaper in the later part.

Although most of the major markets for U.S. agricultural machinery exports have remained about the same since 1988, the share of total exports accounted for by each market has changed significantly. Mexico and Australia have become more important markets for U.S.-produced small tractors, tractor parts, and farm implements. Farming in both Mexico and Australia have become more profitable in recent years, and farmers are increasingly looking to purchase moderately priced, high-quality products from U.S. suppliers. Although U.S. exports to Canada increased overall during 1986-90, exports to Canada declined from 38 percent of total exports of agricultural and horticultural machinery to 29 percent during the period. Other smaller but rapidly growing markets included Germany, France, and Saudi Arabia.

According to industry sources, unfavorable exchange rates for the U.S. dollar vis-a-vis foreign currencies were among the most significant factors

negatively influencing exports in the early 1980s.³⁸ Since 1986, however, exchange rates have not been as significant a factor. A major impediment to further trade with some developing countries has been their lack of hard currency and overall financial instability.³⁹

Also, in many developing countries, farms are too small to permit the use of most large-scale U.S.-produced farm equipment. However, an increase in farm size in some countries is expected to result in increased exports.

U.S. exports of tractors to the EC were valued at \$181.3 million in 1990, while exports of parts for tractors totaled \$260.1 million. According to industry sources, most industrialized countries historically preferred to buy machinery produced in their respective countries, even if a local producer was a subsidiary of a foreign manufacturer, or if the equipment available did not contain the most advanced technology.⁴⁰ Recently, firms in the United States and Canada have produced increasing numbers of tractors within the EC, principally in the United Kingdom. Massey-Ferguson, for example, manufactures an estimated 50,000 tractors annually in the United Kingdom recently, followed by Ford and Case with 39,000 and 23,000 units, respectively. Deere is believed to have manufactured a comparable quantity of tractors in Germany in recent years.

U.S. Exporters

The principal exporters of agricultural machinery are U.S. producers exporting to their foreign subsidiary dealers or distributors. In some instances, exports are of certain tractors or implements intended by the exporter to fill out an otherwise incomplete line of products offered in the foreign market. In other cases,

³⁸ International Trade Administration, U.S. Department of Commerce, *A Competitive Assessment of the U.S. Farm Machinery Industry*, Mar. 1985, p. 35.

³⁹ *Ibid.*

⁴⁰ *Ibid.*

exporters are shipping products to compete directly with comparable foreign-produced equipment. Exporters are expected to continue this practice in the near future as increased mergers of global competitors expand their access to readily established distribution channels in major foreign markets.

According to industry sources, UMMA, a consortium of multinational marketing executives, and AG-TECH International, an export trading company, have entered into a cooperative agreement to promote exports of U.S.-made farm machinery and equipment.⁴¹ More specifically, the agreement provides for the development of export marketing strategies in the areas of indirect and direct marketing, licensing and joint ventures, and direct foreign investment. The agreement is expected to cover tractors and other motorized vehicles, soil preparation and planting equipment, watering and irrigation equipment, harvesting equipment, breeding farm equipment, and many types of agricultural farm handling equipment. UMMA will provide a global network of agencies dealing in farm and garden machinery and equipment

⁴¹ "UMMA, AG-TECH Form Consortium," *Implement & Tractor*, vol. 106, No. 7, Aug. 1991, p. 15.

imports. AG-TECH represents a number of U.S. firms manufacturing and marketing a variety of products.

U.S. TRADE BALANCE

The United States had a positive trade balance in agricultural machinery each year during 1986-90. The favorable balance rose steadily from \$183 million in 1987 to a high of \$866 million in 1989, before dropping to \$742 million in 1990 (table 13). The bulk of the trade was believed to have been made up of tractors and parts exported to such major markets as Canada, Belgium (in part for transshipment elsewhere in the EC), France, and Mexico. Favorable weather conditions for crop production in these and other countries during 1987 and 1988 resulted in an increased demand for tractors through 1989. Since 1989, however, there has been a global oversupply of tractors. The current favorable U.S. trade balance is expected to decline steadily over the next few years as more foreign markets, traditionally supplied by U.S.-produced products, are increasingly supplied by other developed and some developing nations. In addition, since the mid-1980s, nearly all tractors under 40 horsepower sold in the United States have been imported. This trend is expected to continue in the near future.

Table 13
Agricultural and horticultural machinery: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected country, 1986-90¹
(In millions of dollars)

Item	1986	1987	1988	1989	1990
U.S. exports of domestic merchandise:					
Canada	884	960	948	979	1,020
West Germany	69	74	103	108	129
Japan	71	89	145	159	178
United Kingdom	94	112	172	156	164
Belgium	0	0	252	211	221
France	107	162	244	267	214
Mexico	108	107	169	182	264
Australia	101	100	198	295	247
Italy	22	21	31	37	39
Saudi Arabia	41	58	62	93	98
All other	828	817	887	907	951
Total	2,325	2,500	3,211	3,394	3,525
U.S. imports for consumption:					
Canada	395	529	616	684	624
West Germany	291	307	346	348	522
Japan	562	622	546	456	436
United Kingdom	274	281	391	393	439
Belgium	0	0	66	70	139
France	84	104	147	119	142
Mexico	18	29	63	34	26
Australia	6	7	9	10	5
Italy	169	178	218	164	165
Saudi Arabia	0	0	0	0	46
All other	215	260	291	250	239
Total	2,014	2,317	2,693	2,528	2,783

See footnote at end of the table.

Table 13—Continued

Agricultural and horticultural machinery: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected country, 1986–90¹
(In million of dollars)

<i>Item</i>	<i>1986</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>
U.S. merchandise trade balance:					
Canada	489	431	332	295	396
West Germany	-222	-233	-243	-240	-393
Japan	-491	-533	-401	-297	-258
United Kingdom	-180	-169	-219	-237	-275
Belgium	0	0	186	141	82
France	23	58	97	148	72
Mexico	90	78	106	148	238
Australia	95	93	189	285	242
Italy	-147	-157	-187	127	126
Saudi Arabia	41	58	62	93	52
All other	613	558	596	657	712
Total	311	183	518	866	742

¹ Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export.
Source: Compiled from official statistics of the U.S. Department of Commerce.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

TARIFF AND TRADE AGREEMENT TERMS

The *Harmonized Tariff Schedule of the United States* (HTS) replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989. Chapters 1 through 97 are based on the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description, with additional U.S. product subdivisions at the 8-digit level. Chapters 98 and 99 contain special U.S. classification provisions and temporary rate provisions, respectively.

Rates of duty in the *general* subcolumn of HTS column 1 are most-favored-nation (MFN) rates; for the most part, they represent the final concession rate from the Tokyo Round of Multilateral Trade Negotiations. Column 1-general duty rates are applicable to imported goods from all countries except those enumerated in general note 3(b) to the HTS, whose products are dutied at the rates set forth in *column 2*. Goods from Armenia, Bulgaria, the People's Republic of China, Czechoslovakia, Estonia, Hungary, Latvia, Lithuania, Moldova, Mongolia, Poland, Russia, the Ukraine and Yugoslavia are currently eligible for MFN treatment. Among articles dutiable at column 1-general rates, particular products of enumerated countries may be eligible for reduced rates of duty or for duty-free entry under one or more preferential tariff programs. Such tariff treatment is set forth in the *special* subcolumn of HTS column 1. Where eligibility for special tariff treatment is not claimed or established, goods are dutiable at column 1-general rates.

The *Generalized System of Preferences* (GSP) affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974 and renewed in the Trade and Tariff Act of 1984, applies to merchandise imported on or after January 1, 1976, and before July 4, 1993. Indicated by the symbol "A" or "A*" in the special subcolumn of column 1, the GSP provides duty-free entry to eligible articles the product of and imported directly from desig-

nated beneficiary developing countries, as set forth in general note 3(c)(ii) to the HTS.

The *Caribbean Basin Economic Recovery Act* (CBERA) affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984; this tariff preference program has no expiration date. Indicated by the symbol "E" or "E*" in the special subcolumn of column 1, the CBERA provides duty-free entry to eligible articles the product of and imported directly from designated countries, as set forth in general note 3(c)(v) to the HTS.

Preferential rates of duty in the special subcolumn of column 1 followed by the symbol "IL" are applicable to products of Israel under the *United States-Israel Free-Trade Area Implementation Act* of 1985, as provided in general note 3(c)(vi) of the HTS. When no rate of duty is provided for products of Israel in the special subcolumn for a particular provision, the rate of duty in the general subcolumn of column 1 applies.

Preferential rates of duty in the special duty rates subcolumn of column 1 followed by the symbol "CA" are applicable to eligible goods originating in the territory of Canada under the *United States-Canada Free-Trade Agreement*, as provided in general note 3(c)(vii) to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn of column 1 followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the *Andean Trade Preferences Act* (ATPA), enacted in title II of Public Law 102-182 and implemented by Presidential Proclamation 6455 of July 2, 1992 (effective July 22, 1992), as set forth in general note 3(c)(ix) to the HTS.

Other special tariff treatment applies to particular *products of insular possessions* (general note 3(a)(iv)), goods covered by the *Automotive Products Trade Act* (general note 3(c)(iii)) and the *Agreement on Trade in Civil Aircraft* (general note 3(c)(iv)), and *articles imported from freely associated states* (general note 3(c)(viii)).

The *General Agreement on Tariffs and Trade* (GATT) (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) is the multilateral agreement setting forth basic principles governing international trade among its more than 90 signatories. The GATT's main obligations relate to most-favored-nation treatment, the maintenance of scheduled concession rates of duty, and national (nondiscriminatory) treatment for imported products. The GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, and other measures. Results of GATT-sponsored multilateral tariff negotiations are set forth by way of separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as schedule XX.

Officially known as "The Arrangement Regarding International Trade in Textiles," the *Multifiber Arrangement* (MFA) provides a framework for the negotiation of bilateral agreements between importing and producing countries, or for unilateral action by importing countries in the absence of an agreement. These bilateral agreements establish quantitative limits on imports of textiles and apparel, of cotton and other vegetable fibers, wool, manmade fibers, and silk blends, in order to prevent market disruption in the importing countries—restrictions that would otherwise be a departure from GATT provisions. The United States has bilateral agreements with more than 30 supplying countries, including the four largest suppliers: China, Hong Kong, the Republic of Korea, and Taiwan.

APPENDIX B
STATISTICAL TABLES

Table B-1
Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; tariff treatment in primary U.S. export markets, 1990

HTS subheading	Description	Canada			Japan				EC MFN	Mexico' General
		MFN	GPT ²	US	G ³	GATT	P ⁴	T ⁵		
8419.31.00	Dryers for agricultural products	Free	Free	Free	15	Free	-	Free	4.1	10-20
8424.81.10	Agricultural or horticultural sprayers (except sprayers self-contained, having a capacity not over 20 liters)	9.2	2.5	Free	15	Free	-	Free	4.4	10-20
8424.81.90	Mechanical appliances for projecting, dispersing, or spraying liquids or powders, nesi	9.2	2.5	Free	15	Free	-	Free	4.4	10-20
8432.10.00	Plows for soil preparation or cultivation	Free	Free	Free	15	4.2	-	Free	3.5	10
8432.21.00	Disc harrows for soil preparation or cultivation	Free	Free	Free	15	4.2	-	Free	3.5	10
8432.29.00	Harrows (other than disc), scarifiers, cultivators, weeders, and hoes for soil preparation or cultivation	Free	Free	Free	15	4.2	-	Free	3.5	10
8432.30.00	Seeders, planters, and transplanters	9.2	2.5	5.5	15	4.2	-	Free	3.5	10-15
8432.40.00	Manure spreaders and fertilizer distributors	Free	Free	Free	15	4.2	-	Free	3.5	15
8432.80.00	Agricultural, horticultural, or forestry machinery for soil preparation or cultivation, nesi; lawn or sports ground rollers	9.2	2.5	5.5	15	4.2	-	Free	3.5	10-15
8432.90.00	Parts of agricultural, horticultural, or forestry machinery for soil preparation or cultivation; parts of lawn or sports ground rollers	Free	Free	Free	15	4.2	-	Free	3.5	10
8433.11.00	Mowers for lawns, parks, or sports grounds, powered, with the cutting device rotating in a horizontal plane	10.2	6.5	8.1	15	6	-	Free	3.5	20
8433.19.00	Mowers for lawns, parks, or sports grounds, nesi	9.2	6	7.3	15	6	-	Free	3.5	20
8433.20.00	Mowers, nesi, including cutter bars for tractor mounting	Free	Free	Free	15	6	-	Free	3.5	10
8433.30.00	Haymaking machinery other than mowers	Free	Free	Free	15	6	-	Free	3.5	15
8433.40.00	Straw or fodder balers, including pick-up balers	Free	Free	Free	15	6	-	Free	3.5	10
8433.51.00	Combine harvester-threshers	Free	Free	Free	15	6	-	Free	3.5	10
8433.52.00	Threshing machinery other than combine harvester-threshers	Free	Free	Free	15	6	-	Free	3.5	10
8433.53.00	Root or tuber harvesting machines	Free	Free	Free	15	6	-	Free	3.5	10

See footnotes at end of table.

Table B-1—Continued

Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; tariff treatment in primary U.S. export markets, 1990

HTS subheading	Description	Canada			Japan				EC MFN	Mexico ¹ General
		MFN	GPT ²	US	G ³	GATT	P ⁴	T ⁵		
8433.59.00	Harvesting machinery, nesi; threshing machinery, nesi	Free	Free	Free	15	6	—	Free	3.5	10-15
8433.60.00	Machines for cleaning, sorting, or grading eggs, fruit, or other agricultural produce	Free	Free	Free	15	6	—	Free	3.5	10-15
8433.90.10	Parts of mowers for lawns, parks, or sports grounds	9.2	2.5	5.5	15	6	—	Free	3.5	10
8433.90.50	Parts for machinery of heading 8433, nesi	6.8	4.5	5.4	15	6	—	Free	3.5	10
8434.10.00	Milking machines	Free	Free	Free	15	4.2	—	Free	4.1	15
8434.20.00	Dairy machinery other than milking machines	Free	Free	Free	15	4.2	—	Free	4.1	10
8434.90.00	Parts for milking machines and dairy machinery	9.2	2.5	5.5	15	4.2	—	Free	4.1	10
8436.10.00	Machinery for preparing animal feeds	Free	Free	Free	15	4.2	—	Free	3.8	15
8436.21.00	Poultry incubators and brooders	Free	Free	Free	15	4.2	—	Free	3.8	10-15
8436.29.00	Poultry-keeping machinery	Free	Free	Free	15	4.2	—	Free	3.8	10
8436.80.00	Agricultural, horticultural, forestry, or bee-keeping machinery, nesi	Free	Free	Free	15	4.2	—	Free	3.8	10-15
8436.91.00	Parts of poultry-keeping machinery or poultry incubators and brooders	9.2	2.5	5.5	15	4.2	—	Free	3.8	10
8436.99.00	Parts for agricultural, horticultural, forestry, or bee- keeping machinery	Free	Free	Free	15	4.2	—	Free	3.8	10
8701.10.00	Pedestrian controlled tractors	Free	Free	Free	30	4.2	—	Free	4.4	10
8701.30.10	Track-laying tractors suitable for agricultural use	9.2	6	7.3	15	Free	—	Free	11.0	10-20
8701.30.50	Track-laying tractors not suitable for agricultural use	Free	Free	Free	15	Free	—	Free	11.0	10-20
8701.90.10	Tractors, nesi, suitable for agricultural use	9.2	6	Free	30	Free	—	Free	8.5-11	15
8701.90.50	Tractors, nesi, not suitable for agricultural use	8	5	6.4	30	4.2	—	Free	8.5-11	15
8706.00.30	Chassis fitted with engines, for tractors suitable for agricultural use	Free	Free	Free	30	5.7	—	Free	9.3-11	10-15
		9.2	6	6.4						

See footnotes at end of table.

Table B-1—Continued
Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; tariff treatment in primary U.S. export markets, 1990

HTS subheading	Description	Canada			Japan				EC	Mexico ¹
		MFN	GPT ²	US	G ³	GATT	P ⁴	T ⁵	MFN	General
8708.31.10	Mounted brake linings, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.39.10	Brakes and servo-brakes and parts thereof, other than mounted brake linings, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.40.30	Gear boxes, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.50.10	Drive axles with differential, whether or not provided with other transmission components, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.60.10	Non-driving axles and parts thereof, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.70.10	Road wheels and parts and accessories thereof, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.80.10	Suspension shock absorbers, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.91.10	Radiators, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.92.10	Mufflers and exhaust pipes, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.93.10	Clutches and parts thereof, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15
8708.94.10	Steering wheels, steering columns and steering boxes, for tractors suitable for agricultural use	Free 9.2	Free 6	Free 7.3	30	3.0	—	Free	4.9	10-15

See footnotes at end of table.

Table B-1—Continued

Agricultural and horticultural machinery: Harmonized Tariff Schedule subheading; description; tariff treatment in primary U.S. export markets, 1990

<i>HTS subheading</i>	<i>Description</i>	<i>Canada</i>			<i>Japan</i>				<i>EC</i>	<i>Mexico¹</i>
		<i>MFN</i>	<i>GPT²</i>	<i>US</i>	<i>G³</i>	<i>GATT</i>	<i>P⁴</i>	<i>T⁵</i>	<i>MFN</i>	<i>General</i>
8708.99.10	Parts, nesi, of tractors suitable for agricultural use	Free	Free	Free	30	3.0	—	Free	4.9	10-15
8716.80.10	Farm wagons and carts, not mechanically propelled	9.2	6	7.3	7.5	4.2	—	Free	4.1	20
8716.90.10	Parts of farm wagons and carts, not mechanically propelled	Free	Free	Free	7.5	4.2	—	Free	4.4	15

¹ All imports into Mexico, including those from the United States, are subject to what have been called "General" duties. The only exceptions are "special" duty rates applicable to members of the Latin American Integration Association (LAIA). Member countries include Argentina, Bolivia, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela. LAIA rates vary by country within a commodity classification.

² General Preference Tariff.

³ General.

⁴ Preferential.

⁵ Temporary rate, applicable to the United States.

Source: Compiled by Commission staff from tariff schedules of Japan, Canada, the EC, and Mexico.

