Industry & Trade Summary

Grain (Cereals)

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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 grain covers the period 1995-99. Listed below are the individual summary reports published to date on the agriculture and forest product sectors.

USITC publication number	*Publication date*	*Title*
2459	November 1991	Live Sheep and Meat of Sheep
2462	November 1991	Cigarettes
2477	January 1992	Dairy Produce
2478	January 1992	Oilseeds
2511	March 1992	Live Swine and Fresh, Chilled, or Frozen Pork
2520	June 1992	Poultry
2544	August 1992	Fresh or Frozen Fish
2545	November 1992	Natural Sweeteners
2551	November 1992	Newsprint
2612	March 1993	Wood Pulp and Waste Paper
2615	March 1993	Citrus Fruit
2625	April 1993	Live Cattle and Fresh, Chilled, or Frozen Beef and Veal
2631	May 1993	Animal and Vegetable Fats and Oils
2635	June 1993	Cocoa, Chocolate, and Confectionery
2636	May 1993	Olives
2639	June 1993	Wine and Certain Fermented Beverages
2693	October 1993	Printing and Writing Paper
2702	November 1993	Fur Goods
2726	January 1994	Furskins
2737	March 1994	Cut Flowers
2749	March 1994	Paper Boxes and Bags
2762	April 1994	Coffee and Tea

[1] The information and analysis provided in this report are for the purposes 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.

PREFACE—*Continued*

USITC publication number	*Publication date*	*Title*
2859	May 1995	Seeds
2865	April 1995	Malt Beverages
2875	May 1995	Certain Fresh Deciduous Fruits
2898	June 1995	Certain Miscellaneous Vegetable Substances and Products
2917	October 1995	Lumber, Flooring, and Siding
2918	August 1995	Printed Matter
2928	November 1995	Processed Vegetables
3015	February 1997	Hides, Skins, and Leather
3020	March 1997	Nonalcoholic Beverages
3022	April 1997	Industrial Papers and Paperboards
3080	January 1998	Dairy Products
3083	February 1998	Canned Fish, Except Shellfish
3095	March 1998	Milled Grains, Malts, and Starches
3096	April 1998	Millwork
3145	December 1998	Wool and Related Animal Hair
3148	December 1998	Poultry
3171	March 1999	Dried Fruits Other Than Tropical
3268	December 1999	Eggs
3275	January 2000	Animal Feeds

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ABBREVIATIONS, DEFINITIONS, AND ACRONYMS

Cereal	Any grain used for food or animal feed, and any grass producing such grain. For purpose of this report, the term "cereal" is interchangeable with the term "grain."
Coarse grain	Grain used principally for animal feed, and includes corn, sorghum, barley, oats, and rye.
EEP	Export Enhancement Program: provides financial bonuses under the FAIR Act to U.S. exporters for certain U.S. exports of grain and other agricultural products.
FAIR Act	The Federal Agriculture Improvement and Reform Act of 1996 also called the "Farm bill of 1996."
Feedgrain	Term used interchangeably with the term "coarse grain": grain used principally for animal feed, includes corn, sorghum, barley, oats, and rye.
GM crops	Genetically engineered or modified crops containing genetic modification of organisms by recombinant DNA techniques.
Grain	Used interchangeably with the term "cereal": the small hard seed or seedlike fruit, especially that of cereal plant such as wheat, rice, corn, or rye, and classified for tariff purposes under Chapter 10 of the *Harmonized Tariff Schedule of the United States*.
LDP	Loan deficiency payment: a payment based on the difference between the USDA's fixed loan rate and the prevailing market price of the grain eligible to be placed under the loan program.
PCP	Posted country price: the daily market price for a specified grain in a particular geographic location, as determined by USDA under the FAIR Act, for purposes of the commodity loan program.
PFC	Production flexibility contract.
Specialty grains	The term includes buckwheat, popcorn, canary seed, rye, wild rice, millet, triticale, emmer, and spelt.
USDA	U.S. Department of Agriculture

ABSTRACT

This report addresses trade and industry conditions for grain (cereals) such as wheat, corn, rice, sorghum, barley and oats, for the period 1995-99 (generally covering the crop years 1995/96 to 1999/00). The report primarily addresses raw or unprocessed grain (except in the case of milled rice).

- The United States was the world second leading grain producer and leading grain exporter during crop-years 1995/96 to 1999/00 and grew annually about 330 million metric tons of grain (18 percent of world production). Grain is used to produce milled grain products, such as flour or parboiled rice, or fed directly to commercial livestock for meat, dairy, and poultry products. The United States has some of the most productive crop land in the world, and is a major supplier to other countries of this basic foodstuff.

- The most significant change in technology in grain production during the period 1995-99 was the introduction of genetically modified (GM) crops such as so-called "Bt-corn" with specific input characteristics. Although widely planted and used within the United States, opposition to GM crops in the EU and other foreign countries has adversely affected U.S. corn exports, and has led to bilateral trade issues. Within the United States, the use, trade and production of GM crops are subjects of extensive regulatory review and public attention.

- In 1997 (the latest year for which data are available), the United States had a reported 463,000 cash grain farms, with about 180 million acres harvested. U.S. production of grain amounted to nearly $26 billion in crop-years 1999/00 at the farm level; corn accounted for 66 percent of this value; wheat, 23 percent; rice, 5 percent; sorghum, 4 percent, and oats, 1 percent. The value of U.S. grain production has been volatile, dropping $14 billion in 4 years from a record $40 billion in 1996/97, to $26 billion in 1999/00.

- U.S. Government assistance programs for grain farmers provide safety net farm loans and payments under the Federal Agriculture Improvement and Reform (FAIR) Act. USDA also provides credit guarantees and assistance for U.S. grain exports. In 1999, Congress provided about $11 billion in direct USDA payments to U.S. crop farmers.

- U.S. imports during 1995-99 rose to a record $984 million in 1997, and then fell back in 1999 to $731 million, about the 1995 level. Most imported grain consists of wheat, rice, and oats with 98 percent coming from Canada, Thailand, and the EU. About 3 percent of U.S. grain consumption was imported during 1995-99.

ABSTRACT—*Continued*

- Foreign markets for U.S. grain purchased an average 35 percent of the value of U.S. grain production during 1995-99. Nearly half of the $10 billion of U.S. grain exports in 1999 consisted of corn, 35 percent of wheat, 9 percent of rice, and 5 percent of sorghum. U.S. grain exports fell sharply from a record $17 billion in 1996 to $10 billion in 1999. However, the volume of U.S. grain exports declined negligibly from 92 million to 90 million metric tons during 1996-99.

- The U.S. general duties on grain covered in this report averaged about 1 percent ad valorem in 1999, with 74 percent entering free of duty. Under NAFTA, Canadian grain has duty-free entry to the U.S. market. U.S. grain exports to Mexico, the second-leading market, benefit from similar low or duty-free access under NAFTA.

INTRODUCTION

This summary report provides information on all commonly known grains or cereals,[1] such as wheat, corn, rice, sorghum, barley, and oats; it also includes certain milled rice products classified for tariff purposes under chapter 10 of the Harmonized Tariff Schedule of the United States (HTS). Grain seed for planting and nearly all milled grain products, such as wheat flour (except for certain milled rice), are excluded, and are covered in separate summaries.[2]

The primary industry covered in this summary is the grain farm sector. That includes commercial farmers who grow grain that is transported to grain elevators, to rail or port terminals, or directly to livestock growers, grain mills, and food processors (figure 1). Grain ultimately reaches domestic and foreign consumers in a variety of forms (figure 2). This report presents information on the structure of the U.S. and foreign grain-farming sectors, domestic and foreign tariff and nontariff measures, and competitive conditions in domestic and foreign grain markets. The analysis particularly covers the period 1995-1999.

The structure of the U.S. grain industry is shown in figure 2. The North American Industry Classification System (NAICS) categories applicable to the industry are found in the four-digit industry group number 1111, (Oilseed and Grain Farming); under that category are the five-digit groups--11114 (Wheat Farming); 11115 (Corn Farming); 11116 (Rice Farming); and 11119 (Other Grain Farming).

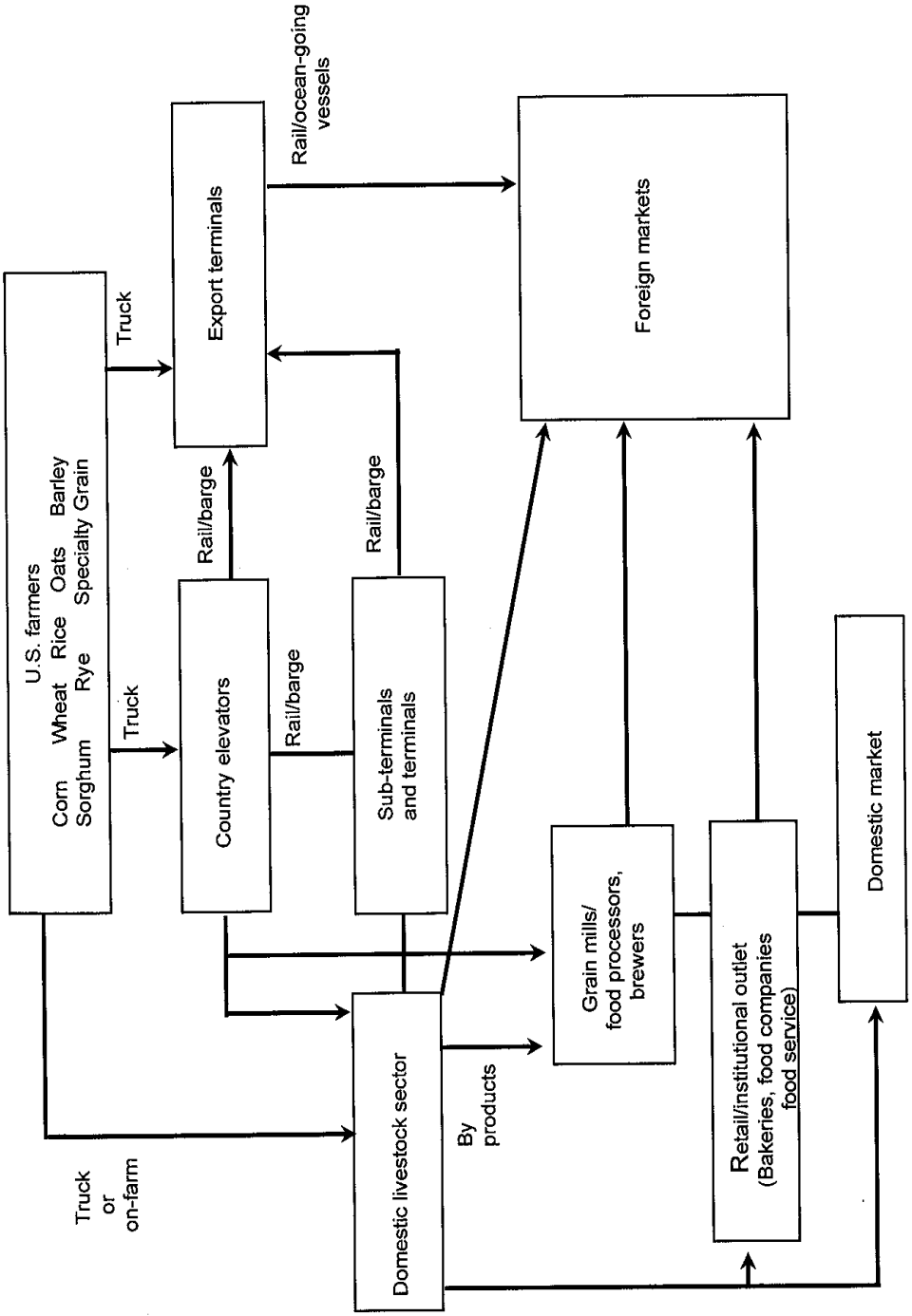
U.S. grain farmers grow the various grain crops, most of which are transported off the farm through a complicated marketing system (figure 1). The leading crops, corn, wheat, rice, sorghum, and barley, typically move by truck to country elevators or export terminals, or are kept on-farm or trucked to nearby feeding operations for livestock.

U.S. production of grain covered in this report amounted to about $26 billion at the farm level in crop-years 1999/00. Corn accounted for about 66 percent of such production; wheat, 23 percent; rice, 5 percent; sorghum, 4 percent; barley, 2 percent; oats, 1 percent, and miscellaneous grains, such as rye, buckwheat, and wild rice, less than 1 percent. Cereals are used chiefly to produce milled grain products, such as flour, which in turn are used to produce food products, and to feed animals (chiefly poultry, hogs, and cattle). The U.S. Government, through the U.S. Department of Agriculture (USDA), operates a number of farm programs, such as production flexibility payments (PFC), and the commodity loan program, to assist U.S. farmers in grain production. These programs are currently authorized through the Federal Agriculture Improvement Reform Act of 1996 (FAIR Act).

[1] The terms “grains” and “cereals” are used interchangeably in this report.

[2] USITC, *Industry and Trade Summary on Seeds* (USITC publication 2859), May 1995, and *Industry and Trade Summary on Milled Grain, Malts, and Starches* (USITC publication 3095), Mar. 1998.

Figure 1
U.S. grain: Channels of distribution



Source: USITC staff

Figure 2
Grain: Structure of the U.S. industry

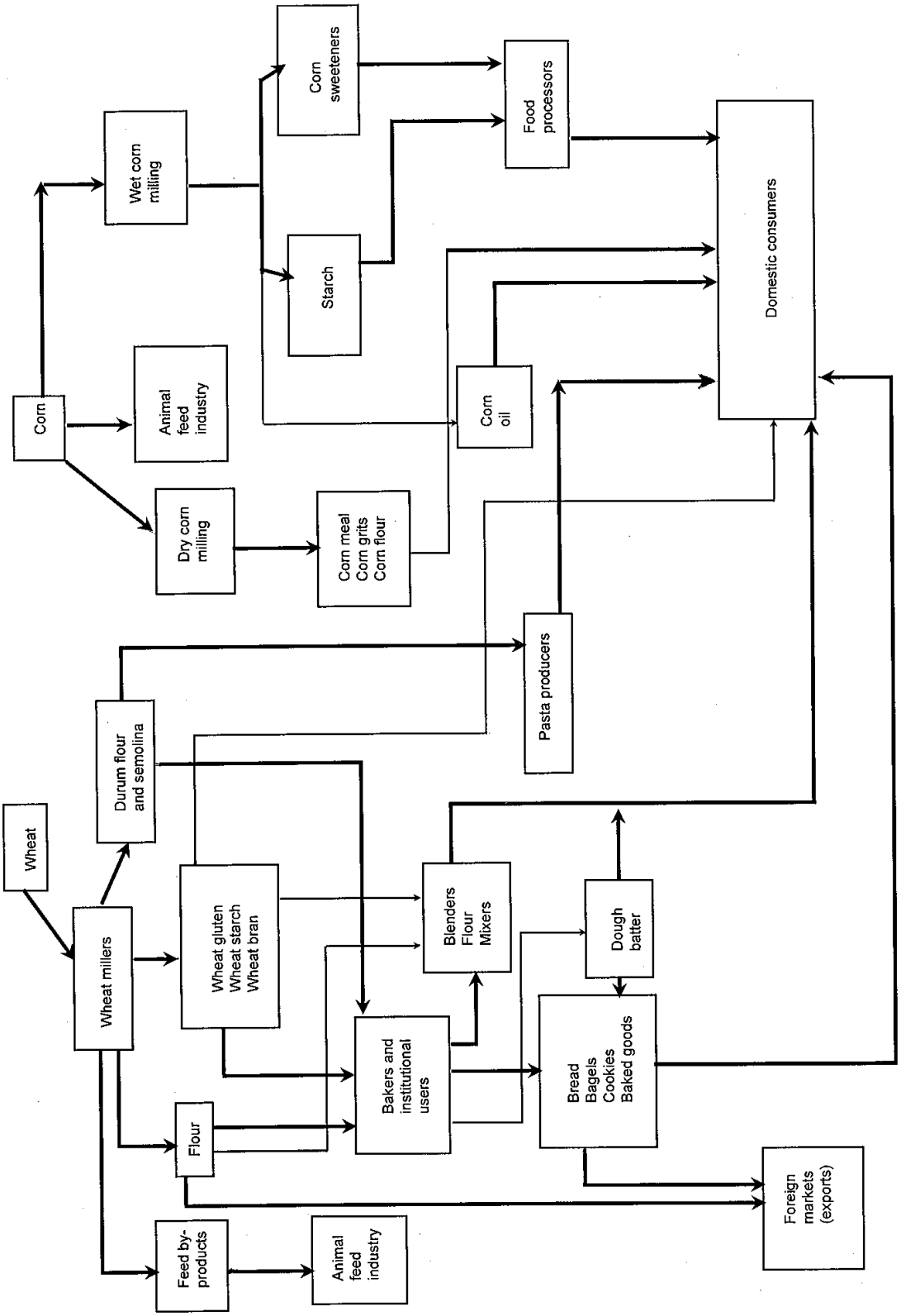
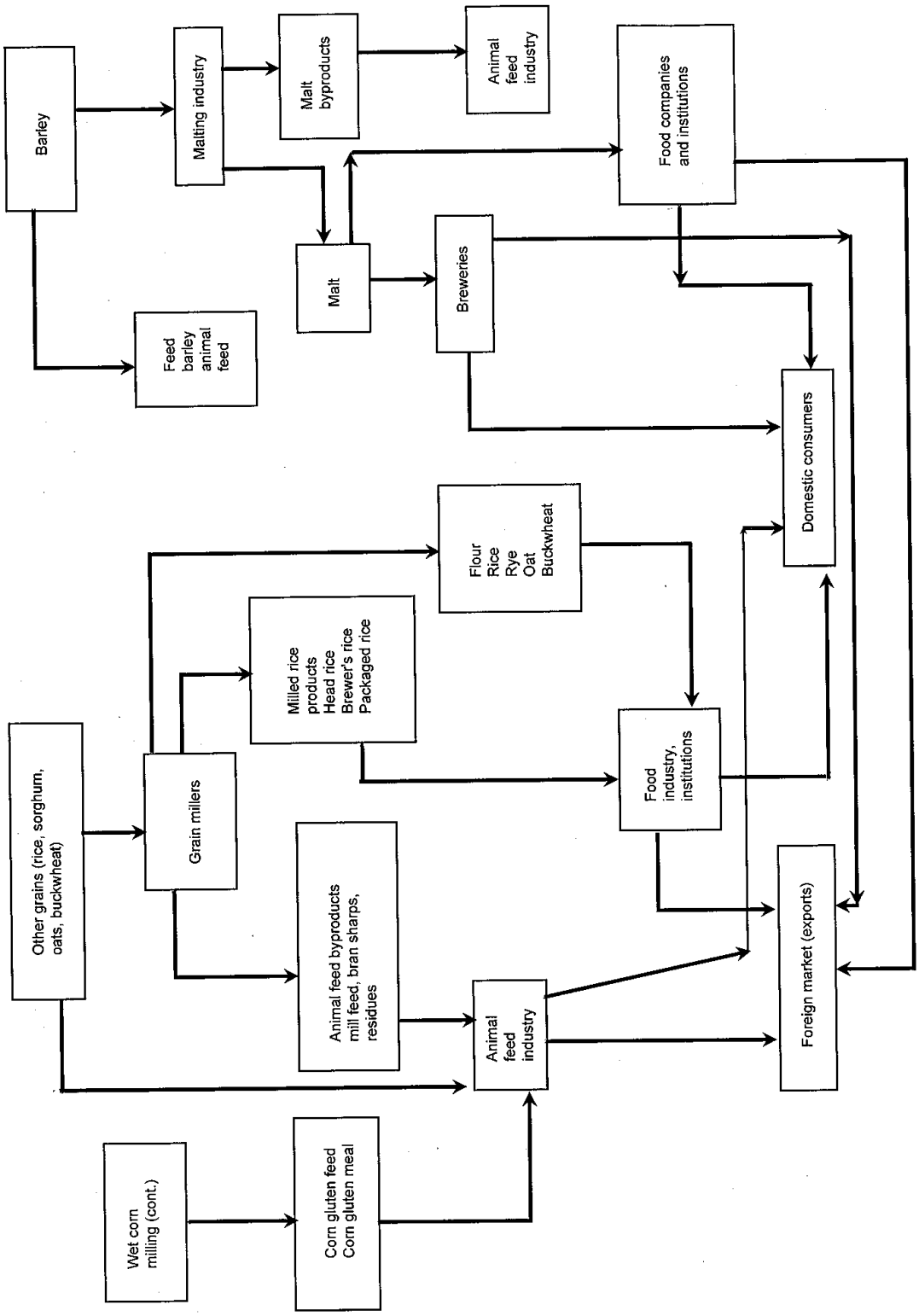


Figure 2—*Continued*
Grain: Structure of the U.S. industry



Source: USITC staff.

Foreign markets are important for U.S. grain, directly purchasing, on average, 35 percent of domestic output; however, U.S. grain exports fell sharply during the period 1995-99. Corn, wheat, and rice are the principal U.S. grain exports. U.S. imports supplied 3 percent of average U.S. grain consumption, rising slightly during the period 1995-99; the U.S. imports of significant quantity are Canadian wheat and oats, Thai rice, and European oats.

U.S. grain exports fell by about 40 percent during the period 1995-99 from a record $17 billion in 1996 to around $10 billion in 1999, a decline underscoring the volatility of world and domestic grain markets. The volume of U.S. grain exports fluctuated from 103 million metric tons (mmt) in 1995 to 76 mmt in 1996, a 26-percent drop. Total world exports of grain rose steadily from 243 to 262 mmt during crop-years 1995/96 to 1999/00. As a result, the U.S. share of world exports declined from 34 to 29 percent for wheat and from 68 to 54 percent for world coarse grain between crop-years 1995/96 to 1999/00. Other competitive exporters, Canada, Australia, the EU, Argentina, and China, increased their shares of world grain exports.

During 1995-99, overall conditions of competition in grain markets shifted from a "grain boom" to a "grain glut," characterized by low farm prices, high inventories, and farmers under financial stress.

Globally ending inventories of grain rose by nearly 35 percent between crop-years 1995/96 and 1999/00 as world wheat and corn prices each dropped by nearly 50 percent, and world grain trade and production rose 8 percent each. The United States as the world's leading grain exporter has been particularly affected, although higher expenditures for U.S. Government farm safety-net programs have mitigated some of the adverse domestic effects.
The retrenchment of key Asian grain markets during the period 1996-98, and the shift in China from a net importer to a major net exporter of grain contributed to the world grain glut. Except for Mexico, most leading U.S. markets purchased less grain (in value terms) during the period 1995-99.

During the period, there have been sharp trade policy differences between the United States and Canada over wheat and barley. The differences affect phytosanitary requirements, operations of the Canadian state trading corporation (the Canadian Wheat Board), and licensing. The United States imposed a 1-year tariff rate quota on U.S. imports of wheat (most of which came then from Canada) in crop-years 1994/95 because the imports were undercutting USDA farm support operations. In 1998, the governors of five Northern states used state powers to detain and block trucks carrying Canadian wheat. The United States and Canada then reached a record of understanding (ROU) in December 1998, ending these individual State actions, and liberalizing certain Canadian regulations barring or impeding U.S. exports of wheat. The following is a brief description of the key cereals cited in this report.

Wheat

Wheat (genus *Triticum*), the seed of an annual cereal grass, is the leading food grain of the temperate climatic regions of the world; among U.S. grains, wheat ranked second only to corn in terms of value of production (table A-1). Wheat is generally categorized as hard or soft wheat on the basis of kernel characteristics. In addition, wheat varieties are distinguished depending on when the wheat is planted: spring or fall. Winter wheat is sown in the fall and starts growing before cold weather halts activity. After lying dormant during the winter, the wheat plants resume growth in the spring. Spring wheat is sown in the spring as soon as the ground can be worked, and grows until harvested. The composition of the 1999 U.S. wheat crop, according to USDA data, was as follows:[3]

Classes	Percentage of U.S. wheat crop
Hard red winter	46
Hard red spring	19
Soft red winter	20
White	11
Durum	4
Total	100

Durum Wheat

Durum wheat is a hard wheat, grown mainly in the spring, and is generally milled into a coarser meal (called semolina) rather than a flour. Durum's principal applications are in the production of semolina, a meal used for making macaroni, spaghetti, vermicelli, and similar pasta products.[4]

Hard Wheat

Hard wheat has a kernel that is high in protein and gluten content.[5] It is produced in areas with hot summers and moderate rainfall. The flour made from hard wheat readily absorbs water and produces an elastic and tenacious dough well suited to commercial bread baking. Wheat cereal breakfast foods to be prepared by the consumer, such as farina, are also generally made from hard wheat. The principal classes of hard wheat grown in the United States are Hard Red Winter wheat and Hard Red Spring wheat. Hard White wheat is a hard wheat grown in small commercial volume in the United States.

[3] The 1999 crop was grown during crop-years 1999/00; U.S. crop-years run from June 1 to May 31.

[4] Defined in 21 CFR 137.320.

[5] According to *Webster's New World Dictionary*, "gluten is a gray, sticky, nutritious protein substance containing gliadin, found in wheat and other grains; it gives dough its tough, elastic quality." Gluten is also extracted from wheat, and sold commercially to wheat millers for blending with low-protein flour.

Soft Wheat

Soft wheat has a kernel relatively low in protein content, and is grown in areas of abundant rainfall and moderate temperature. The flour made from soft wheat is used primarily for baking cakes, crackers, biscuits, and pastry. Prepared breakfast foods, such as wheat flakes, are made from soft wheat. Soft Red Winter wheat is the leading soft wheat, and Soft White wheat the second-leading soft wheat.

USDA Standards

USDA recognizes eight classes of wheat: Hard Red Winter, Hard Red Spring, Soft Red Winter, Soft White, Durum, Hard White, Unclassed, and Mixed wheat. The classes Hard Red Spring wheat, Soft White wheat, and Durum wheat are further divided into subclasses. There are no other subclasses.

Each class and subclass is divided into five U.S. numerical grades and U.S. Sample grade, with grade No. 1 being the highest quality and Sample grade the lowest. The five USDA numerical grades are distinguished by test weight per bushel, and the percentage of damaged kernels, foreign material, shrunken and broken kernels, defects, and wheat of other classes.[6]

Protein content levels are frequently specified in contracts in both domestic and international transactions for U.S. wheat. Millers and bakers usually need specific and constant protein levels, depending on their customers' needs. The protein level of wheat produced varies greatly depending on growing conditions.[7] In years when the protein level in either the Hard Red Winter wheat crop or the Hard Red Spring wheat crop is lower than normal, flour millers frequently purchase the other hard class to "blend-up" the average protein level of the flour. The price premium that millers pay (the "protein premium") can be quite high in years when the overall protein level of the wheat crop is low. After receiving the wheat, millers typically perform their own quality tests, and may blend wheats together before milling in order to meet customer specifications.

Uses

These five primary U.S. wheat classes vary considerably in the end uses to which they are put.

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[6] Special grades may be further provided to emphasize special qualities or conditions affecting the value of wheat. Special grades are added to and made a part of the USDA grade designation, but do not affect the numerical grade designation. The protein level (as a percentage of the total grain weight) may be used to distinguish a special grade.

[7] Walter Heid, Economic Research Service (ERS), USDA, *U.S. Wheat Industry*, Aug. 1979, p. 13.

In general, all wheat (with the exception of wheat grown expressly for seed for planting) is planted with the expectation that it will end up being milled and used in food, although often an eighth or more of each year's crop ends up being fed to livestock. Therefore, desirable milling qualities strongly influence wheat characteristics. The primary uses of these five wheat classes are shown below:[8]

Classes	Qualitative factors	Primary food use
Hard Red Winter	Good milling and baking characteristics, wide range of protein levels	All flours, but primarily bread flour, blended with weaker wheats for bread flour, whole wheat breads
Soft White	Low protein	Breakfast cereals, noodles, crackers, donuts, layer cakes, foam cakes
Soft Red Winter	Low protein	Flour for cakes, pastries, quick breads, crackers, snack foods
Hard Red Spring	Excellent protein level and milling qualities	All flours, primarily bread flour, white bakers' bread and rolls
Durum	Highest protein level	Semolina for pasta products

There is a high degree of substitution between Hard Red Spring and Hard Red Winter, depending on the protein levels.

In the United States, most wheat is milled into flour and meal and further processed to make products for human consumption. Wheat is also used in significant quantities for seeding and as livestock feed, and in small amounts for the manufacture of starch, gluten, and some industrial products. The "feed and residual" use of wheat has been quite volatile, with animal feeding of wheat rising during years when wheat quality is low, or when large crops render wheat feeding cost-competitive to such alternative feedgrains as sorghum or corn.

Corn

Corn or maize (corn *Zea mays, L.*) is the most important grain produced in the United States, in terms of acreage planted, quantity produced, and value of production (table A-1). There are many types and varieties of corn that differ greatly in growth and grain characteristics. Corn is a warm weather plant, but various strains have adapted to wide ranges of climate. Some strains grow less than 2 feet tall and mature in 60 to 70 days; others grow more than 20 feet tall and need more than 300 days to mature.

The grain kernel is the part of the plant normally used for food and feed. However, parts of the entire above-ground plant often are used for animal forage or ensilage, and the immature ears and kernels of certain types of corn are used as vegetables. Corn ensilage and vegetable corn (sweet corn on the cob, canned sweet corn, and so forth) are not included in this

[8] *The Wheat Grower*: *Wheat Facts, 1998*, p. 9, and Joy Harwood, Mack Leath, and Walter Heid, USDA, ERS, *The U.S. Milling and Baking Industries*, Dec. 1989, p. 17.

summary. There are seven corn groups or types, based on kernel characteristics–dent, flint, flour, sweet, pop, waxy, and pod corns.

Dent corn is by far the most important type of corn produced in the United States. Dent corn kernels have a dent or depression in the kernel crown as a result of shrinkage of the deposit of soft starch at the crown during ripening. The soft starch is surrounded on the sides by hard (horny) starch which shrinks less than the soft starch. Unless otherwise specified, the term "corn," as used in this summary, refers to "yellow dent corn."

Other types of corn have been developed with specific characteristics, such as high-lysine corn or high-oil corn. In addition, genetically modified types, such as "BT-corn" (described later under "Research and Development"), have also been developed, especially during the past 5 years. Popcorn, a specialty dent corn, is discussed separately below.

In the United States, corn is used principally as a feedgrain. For such use, it is suitable for all classes of farm animals. It is lower in protein content than most other feedgrains, but has a higher total digestible nutrient content, and is the standard to which other feed grains are compared.

Large quantities of corn are used by the wet-milling industry in the production of starch, dextrine, adhesives, and corn sweeteners. The recent commercial development of new processes to produce high-fructose corn syrup-U.S. usage, which has captured a significant share of the market for sweeteners in liquid products (particularly soft drinks), has led to a rapid increase in corn usage by wet millers.

Sorghum

Grain sorghum (or "milo") is a cereal grass having broad cornlike leaves and a tall pithy stem bearing the grain in a dense terminal cluster. The principal value of sorghum in the United States is as a feed for livestock; sorghum ranks as the fourth-leading U.S. grain in terms of value (table A-1). Sorghum has about 95 percent of the feeding value of corn, on a pound-for-pound basis. Small amounts of sorghum may be milled into starch, made into alcohol, or used for seed. Some grain, stalks, and leaves are fed to livestock as silage or forage. Although sorghum in the United States plays a negligible role in the human food chain, it is consumed extensively by the peoples of Asia and Africa, in the form of bread, porridge, and in the manufacture of an alcoholic beverage similar to beer.

Rice

Rice is the primary food for more than one-half of the world's population, and the third-leading grain produced in the United States, in terms of the value of output in recent years (table A-1). The major use for rice is directly as food, and secondarily in the United States, as a constituent in the production of beer.

Paddy or rough rice is the term used for rice after is has been threshed, but before the hulls have been removed. Most paddy rice is milled for food or industrial use; relatively little is utilized as seed or feed.

Brown rice is rough or paddy rice from which the hull has been removed but which retains the bran layers and most of the germ. Basmati rice is an aromatic, long-grain brown variety grown principally in Pakistan and domestically in small quantities in Texas. Basmati rice is considered a premium grade of rice and sells at prices above those of other types of brown or white rice. Other types of brown rice, whether long, medium or short grain, have grown in popularity in the United States as a result of rising consumer nutritional awareness. However, brown rice consumption in recent years represented only about 1 percent of total food use of rice.

Most brown rice is further processed to remove the bran layers and the germ and is then known as milled, polished, or cleaned rice. Milled rice is usually coated with glucose, vitamins, and talc to produce common enriched white rice. This is the most popular form of rice ordinarily marketed in the United States for food.

Production of parboiled or converted rice occurs when rough rice is soaked in water, steamed under pressure, dried, and then milled in the usual manner. All rice used in soups and similar processed preparations is parboiled. Milled rice that is further cooked or boiled is known as instant or precooked rice.

In the milling process, some of the kernels are broken, resulting in several grades of rice. In the terminology of the trade, head rice is that which consists mostly of whole kernels; second heads comprise the largest pieces of broken kernels; screenings are the next smaller sized pieces; and brewers' rice are the smallest pieces of broken kernels. Head rice is usually boiled for consumption as a table food. It is also used in various breakfast food products. Broken rice kernels are used as food for livestock, in making fermented beverages, and as a source of starch and flour. In the production of beer, brewers' rice is a malt adjunct (or additive) used principally to produce a more durable beer retaining its desired qualities longer, and a beer lighter or cleaner in color than that brewed from other grains.

This summary excludes certain milled rice products classified under HS chapter 11, such as rice flour and meal (HS subheadings 1102.30.00 and 1103.14.00).[9] Byproducts and wastes of rice milling, such as rice bran, polish, and hulls, are used primarily as animal feeds and not covered in this report.[10]

[9] USITC, See *Industry and Trade Summary on Milled Grains, Malts, and Starches*, USITC publication 3095, Mar. 1998.

[10] USITC, See *Industry and Trade Summary on Animal Feeds*, USITC publication 3275, Jan. 2000.

Oats

Oats are the seed of an annual cereal grass, and are used largely as feed for livestock. Oats are the sixth-leading grain in the United States (table A-1). Oats are also used for seed, and in the manufacture of breakfast foods and of flours. During crop-years 1995/96 to 1999/00, an average of 64 percent of domestically consumed oats were used in feed, 32 percent in food, alcohol, and industrial use, and 5 percent as seed.

Milled oat products are contained in a separate summary. Milled oat products fit for human consumption include rolled oats and hulled oats. After being hulled, white oats are either steamed and rolled into thin flakes, called rolled oats, or ground into oatmeal and oat flour.

Barley

Barley is the seed of an annual grass. During the years 1995-99, it was the fifth-leading grain crop produced in the United States, by value, behind corn, wheat, rice, and sorghum (table A-1).

The major use (49 percent of average consumption from crop-years 1995/96 to 1999/00) for barley is as feed for livestock. Barley is interchangable, to some degree, with other grains such as corn, sorghum, and wheat as a livestock feed. About one-half the barley used as feed is consumed on the farms on which it is grown and the remainder, used by feed manufacturers or livestock feeders, is purchased from other farms.

The second-leading use (47 percent of 5-year average consumption between 1995/96 and 1999/00) of barley is in making malt, which consists of good-quality grain germinated under controlled conditions and then dried. It is then separated from the sprouts (which are used as an animal feed). The malt, which looks identical to barley, has a distinctive odor and flavor; it contains an enzyme (diastase) capable of converting starch to sugar. Malt is used principally in making beer and distilled alcoholic beverages. Other uses include nonalcoholic beverages and beverage preparations, breakfast foods, candy, and other food preparations.

Barley malt is usually produced in the United States and Canada from six-row barley; in Europe it is generally made from two-row barley. The barley head, or spike, consists of a zigzag stem (rachis) with groups of three kernels (spikelets) arranged alternately on opposite sides of the rachis. In six-row varieties all three spikelets at each rachis joint are fertile, whereas in the two-row varieties only the central spikelet develops. Malt made from six-row varieties is preferred by most U.S. brewers because of its higher diastatic power, which allows the use of more malt adjuncts (usually corn grits or brewers' rice) in the manufacture of beer and distilled alcoholic beverages. European malt has a higher extraction rate (i.e., it yields more sugar from the malted grain) then U.S. malt.

In addition to its use as livestock feed and as malt, barley is milled into edible and inedible products. Some barley is kept for seed. The principal milled barley food products are pearl barley and barley flour. Barley that has simply been ground, rolled, or flaked is used almost exclusively as livestock feed and is considered unfit for human consumption.

Specialty Grains

Buckwheat

Buckwheat is a herbaceous plant, whose seeds are used as bird feed, ground into flour, or made into groats, i.e., hulled kernels. Buckwheat groats are used in soups, gravies, and in ethnic dishes such as kasha (an Eastern European dish). Buckwheat flour, usually mixed with wheat or corn flour and a leavening substance, is used for the preparation of pancakes. Buckwheat flour is also mixed with other flours to produce a cereal breakfast food. In Japan, buckwheat is used for the manufacture of noodles; the Japanese also manufacture a liqueur from buckwheat.

Industry sources indicate that domestically about 95 percent of buckwheat is used in food: 70 percent is made into groats, and 25 percent into flour. Buckwheat is rarely used for animal feed; some buckwheat is used in wild bird feed.

Popcorn

Popcorn is a type of flint corn originally cultivated by Native Americans hundreds of years before Europeans arrived in the Americas.[11] Popping results from rapid expansion of moisture in individual starch particles as the popcorn is heated, followed by a sudden release of the resulting pressure as the kernel bursts. The popped corn may be up to 35 times the volume of the original popcorn. Popcorn is sold either as a plain or flavor-added product, in moisture-proof containers ranging from plastic bags and glass jars to ready-to-use packages for microwave ovens.

[11] P.R. Carter, D.R. Hicks, et al., "*Popcorn," Alternative Field Crops Manual*, University of Wisconsin-Extension, found at http://www.hort.purdue.edu/newcrop/afcm/popcorn.html, retrieved Feb. 2, 2000.

Canary seed

Canary seed is the seed of an annual grass (Phalaris canariensis); the seed is used solely as a feed component, alone or in mixtures, for caged or wild birds.[12] However, the plant also serves a very valuable function in forming good sod in poorly drained areas because it can stand in water a relatively long period of time. The growing season is from late spring to July, if cut for forage, or to August, if grown for seed.

Canary seed is grown principally on fallowed wheat land in the Dakotas and Montana and in poorly drained areas. The U.S. production of canary seed varies from year to year, based on growers' needs in terms of sod formation, and based on prospects for monetary return relative to that of other crops. Canary seed production is most often a minor part of a growers' total operation. The seed varies in quality according to size, gloss, hardness of the seed coat, and percentage of foreign material. Canary is sold in bulk or in bags; it is then typically blended with millet, safflower, flaxseed, and/or canola to produce commercial bird feed.

Rye

Rye is a widely cultivated cereal grass, the seeds of which are used for making flour and whiskey. Rye is also used as a livestock feed. In many parts of the world rye is an important bread grain because of its adaptability to poorer soils and cooler climates. In the United States, about two-fifths of the acreage planted to rye is harvested for the grain. The remainder of the crop is used either for pasture, as silage, or as a winter cover crop (particularly in the Southern States). The bulk of U.S. rye is harvested in the Great Plains States.

Rye grain is used in the United States primarily in milling and for the manufacture of distilled spirits. It is also used for seeding and as a feedgrain. The bulk of imported ryes are used for making whiskey and for milling into flour. Rye grain for use as feed is often ground because animals can utilize it more efficiently in that form. This report does not include the byproducts or wastes resulting from the milling of rye, or milled rye products for human consumption, such as rye flour and rye meal.[13] Rye is generally milled into the following flour types:

Type	Color	Grind
White flour	White	Fine
Medium flour	Light grayish-brown	Medium
Dark flour	Light grayish-brown	Coarse

[12] Government of Saskatchwuan, *Farmfacts: Canary seed in Saskatchwuan*, Mar. 1996, found at http://www.agr.sk.ca/saf/farmfact, retrieved May 5, 1999.

[13] See the *Industry and Trade Summary on Milled Grains, Malts and Starch,* USITC publication 3095, Mar. 1998, and on *Animal Feeds,* USITC publication 3275, Jan. 2000.

Wild Rice

Wild rice is a native North American cereal, grown principally in the United States and Canada. Wild rice (of the genus Zizania) is not a true rice, but an annual marsh grass that is cultivated or grown wild in shallow, fresh-water lakes and streams. Traditional harvesting of natural wild rice has been done from boats or canoes (canoe-and-flail method).

Development of more shatter-resistant wild rice allowed mechanical harvesting and encouraged more production in the 1960s and 1970s.[14] Commercial production of wild rice in paddies, and mechanical harvesting, is mainly practiced in Minnesota and California.[15] In paddy rice production, wild rice is planted and flooded, with the water level controlled, which results in a larger portion of the crop maturing at the same time. It is then mechanically harvested. Wild rice is typically grown in a paddy for 5 years, and then rotated with other, nonflooded crops, such as potatoes, oats or barley.[16]

After harvest, the wild rice is taken to a processing plant, where it is cured, or fermented from 4 to 5 days. The browned kernel is then parched (dried). Parching loosens the hulls and gives the grain a roasted flavor; the wild rice is then cleaned and hulled, exposing the shiny black seeds. One hundred pounds of unprocessed wild rice yields 40 pounds of processed grain.[17]

Wild rice is used primarily in mixtures with brown rice, as a stuffing for fowl, and/or as a separate dish served with meat. It is occasionally used alone. Other minor uses are as a breakfast cereal and in pancake mixes; it is usually a specialty dish or delicacy.

Millet

Millet is one of the oldest cultivated crops of the world, the term "millet" applying to various grass crops whose seeds are harvested for food or feed. There are five millet species of commercial importance–proso, foxtail, barnyard, browntop, and pearl.[18] Proso millet (*Panicum miliaceum* L.) and foxtail millet (*Setaria italica* L.) are the dominant millets grown in the United States. Proso millet is a feed component for wild and domestic birdseed, with the large seeds preferred for premium priced caged birdseed. Proso millet is fed to livestock in similar ways as oats and barley. Foxtail millet is usually grown for hay or silage.

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[14] E.A. Oelk, et. al., *"Wild Rice," Alternative Field Crops Manual*, University of Wisconsin-Extension, found at http://www.hort.edu/newcrop/afcm/wildrice.html, retrieved Feb. 2, 2000.

[15] USDA, Office of Pest Management, *Policy Crop Profile for Wild Rice in Minnesota*, prepared Jan. 2000, found at http://cipm.ncsu.edu/cropprofiles, retrieved Feb. 2, 2000.

[16] Ibid.

[17] E.A. Oelk, et. al., *"Wild Rice," Alternative Field Crops Manual*, University of Wisconsin-Extension, found at http://www.hort.edu/newcrop/afcm/wildrice.html, retrieved Feb. 2, 2000.

[18] E.A. Oelke, et. al., *"Millets," Alternative Field Crops Manual*, University of Wisconsin-Extension, found at http://www.hort.purdue.edu/newcrop/afcm/millet.html, retrieved Feb. 2, 2000.

Triticale

Triticale is a crop species resulting from a cross between wheat (*Triticum*) and rye (*Secale*), hence the name triticale (*Triticale hexaploide* L.). Plant breeders in the United States and Canada developed commercial varieties of triticale, and up to 250,000 acres were planted in the 1960s in the United States, but a lack of markets abated commercial interest and plantings. Most triticale planted in the United States is used as a feedgrain, particularly in the Western States, or as a forage crop grown in the winter in Southern States for grazing.[19]

Emmer and Spelt

Emmer (*Triticum dicococon* Schrank) and spelt (*Triticum spelta* L.) are subspecies of common wheat that have been grown in Europe for hundreds of years, and were introduced into the United States in the 1890s.[20] Emmer is a member of the subspecies of wheat that includes durum wheat. Emmer is similar to oats, and is planted in the spring in the United States for use as a feedgrain, replacing either oats or barley. Little or no emmer is used presently in food products in the United States, according to Stallknecht.[21]

Many of the same species of spelt have been planted in the United States since the 1900s, although in the 1990s advanced spelt cultivars with better milling and food use characteristics were introduced in the United States. Ground spelt is mainly used as an alternative feedgrain to oats and barley. After dehulling, ground spelt can be used in pasta or high-fiber breakfast cereals or in flour or baked goods to replace soft red winter wheat flour. Spelt products are available through organic health food outlets as grain, whole grain, and white flours, and in processed products such as pasta, cold and hot cereals, and pre-packaged bread and muffin mixes.

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[19] E.A. Oelke, et. al., "Triticale," *Alternative Field Crops Manual*, University of Wisconsin-Extension, and University of Minnesota, Extension Service, found at http://www.hort.purdue.edu/newcrop/afcm/triticale.html,retrieved Feb. 3, 2000.

[20] E.S. Oplinger, et. al., "Spelt," *Alternative Field Crops Manual*, University of Wisconsin-Extension, and University of Minnesota, Extension Service, found at http://www.hort.purdue.edu/newcrop/afcm/spelt.html, retrieved Feb. 3, 2000.

[21] G.F. Stallknecht, et. al., "Alternative Wheat Cereals as Food Grains," in *Progress in New Crops*, J. Janick, editor, 1996, found at http://www.hort.purdue.edu/newcrop/proceedings1996/V3-156html, retrieved Feb. 3, 2000.

U.S. INDUSTRY PROFILE

Industry Structure

The number of U.S. grain producing entities declined by 2.1 percent annually from about 1,078,000 in 1992 to 867,000 in 1997 (the only years for which official U.S. data are available) (table A-2). However, adding together the separate grain farms sharply inflates the actual number of farms since many produce several grains. Excluding these double-counted farms, USDA reported that the total number of grain and oilseed farms (under NAICS category 1111) was 463,000 in 1997, with 180 million harvested acres out of 285 million acres owned.[22] The average grain and oilseed farm thus harvested about 389 acres of these crops; no data were reported for earlier years.[23]

In 1997, there were 431,000 corn farms, 244,000 wheat farms, 90,000 oats farms, 49,000 sorghum farms, and 42,000 barley farms (table A-2). Similarly, there were 9,000 rice farms, and about 12,000 farms producing specialty grains, the leading ones being millet, popcorn, and rye (table A-3).

Corn

Corn is the leading grain, accounting for about two-thirds of the 1999 value of domestic production of grain (table A-1), and 49 percent of the harvested acreage of the leading grain crops (table A-4). In 1997, the average U.S. corn farmer harvested 162 acres of corn. Small farms (those with fewer than 250 acres of corn) supplied 33 percent of U.S. corn production in 1997 (table A-2); medium-sized farms (ranging in size from 250 to 1,000 acres each) accounted for 52 percent of U.S. corn output in 1997. The largest corn farms (with over 1,000 acres each) produced 15 percent of the output in that year.

Corn is grown in commercial quantities is most States; however, 5 states (Iowa, Illinois, Nebraska, Minnesota, and Indiana) accounted for 64 percent of the 1999 crop, and the top-10 corn producing states accounted for 84 percent of corn production (table A-5). The Corn-Belt States and adjacent Great Plains States (Kansas) dominate corn production, in part because of their favorable rainfall and soils. Corn is typically grown in rotation with soybeans or wheat in a complementary pattern; farms in the Corn Belt States have gradually become two-crop producers of corn and soybeans, and occasionally soft wheat. In addition, hog operations on cash grain farms have been sharply curtailed as hog and cattle production has shifted to large, concentrated animal feed operations. Corn farms also grow other grains, such as sorghum or oats, depending on rainfall and soil types.

[22] U.S. Department of Agriculture, *1997 Census of Agriculture*, vol. 1, part 51, Mar. 1999.

[23] The U.S. Department of Commerce reported in 1992 under SIC classification 011, that there were 405,000 "cash grain farms," with 245 million acres owned and 159 million acres of harvested cropland. U.S. Dept. of Commerce, Census Bureau, *1992 Census of Agriculture*, vol.1. pt. 51, table 18.

Wheat

Wheat, the second-leading cereal, accounted for 23 percent of the 1999 value of domestic grain production (table A-1), and 38 percent of the harvested grain acreage (table A-4). In 1997, the average U.S. wheat farm harvested 241 acres of wheat; as with corn, the small farms (each with fewer than 250 acres) supplied 24 percent of U.S. wheat production in 1997 (table A-2). The larger farms (with over 500 acres) accounted for 58 percent of U.S. wheat production.

Wheat is grown mainly in the Great Plains, the Northern Tier along the Canadian border, and in the Pacific Northwest, although some Corn Belt states have significant wheat production as well (table A-6). The top six states (Kansas, North Dakota, Montana, Oklahoma, Washington, and Texas) accounted for more than half of U.S. wheat production during 1995/96 to 1999/00. The Great Plains States (Kansas) and The Northern Tier States (North Dakota, Montana, Idaho, and Washington) dominate U.S. wheat production, due to their favorable climate, soil types, and ease of tillage. The planting of wheat is typically rotated with that of other cereals (particularly oats and barley), certain oilseeds (such as sunflower seed, canola, or soybeans) in order to reduce insect and plant disease problems, and improve soil conservation.

Rice

Rice is the third-leading cereal, accounting for 5 percent of the 1999 value of domestic production (table A-1), and 3 percent of the harvested acreage (table A-4). In 1997, the average U.S. rice farm harvested 347 acres of rice; medium-sized farms (of 250 to 1,000 acres each) supplied 61 percent of production (table A-2).

Rice is grown mainly along the States bordering the lower Mississippi River and the Gulf of Mexico, and in California; six States (Arkansas, California, Louisiana, Mississippi, Texas, and Missouri) account for virtually all commercial rice production in the United States (table A-7). Arkansas and California accounted for about two-thirds of production between crop-years 1995/96 and 1999/00. Because most rice is irrigated in the United States, access to irrigation water and a relatively warm climate favor rice production in those States. Rice farms do produce other crops, soybeans for example.

Sorghum

Sorghum, the fourth-leading cereal, accounted for 4 percent of the 1999 value of domestic grain production (table A-1), and 6 percent of the harvested acreage (table A-4). In 1997, the average U.S. sorghum farmer harvested 173 acres of sorghum. Small farms (fewer than 250 acres) supplied 40 percent of the sorghum production in 1997 (table A-2). Kansas, Texas, and Nebraska dominate the production of sorghum, accounting for 81 percent of U.S. production in 1999 (table A-8). Sorghum's resistance to variable rainfall makes it a more resilient feedgrain than corn in these states.

Oats and barley

Barley and oats are the fifth- and sixth-leading grains in the United States (table A-1). Both crops are grown in rotation with wheat in the Northern Tier States (North Dakota, Montana, Idaho, Washington, Minnesota, Wisconsin, and South Dakota). In 1997, the average U.S. oats farm harvested 30 acres of oats, and the average barley farm harvested 142 acres of barley (table A-2). Oats are mainly a small-farm crop, with 89 percent of the output grown on farms with fewer than 250 acres; barley production more closely follows the pattern for wheat, with 62 percent of U.S. barley grown on farms of 250 or more acres (table A-2).

Oats and barley are primarily grown for use as feedgrains, although most producers also sell a portion of their crop for higher value use as food-grade oats or malting barley, if the crop attains that level of quality. Historically, oats and barley were important rotational crops for wheat (for soil conservation and to break disease cycles), and as feed crops for farm animals (draft horses).

Specialty grains

All of the specialty grains (millet, rye, popcorn, buckwheat, wild rice, triticale, emmer, and spelt) were grown on a combined 11,640 farms on about 1 million acres in 1997 (table A-3). Millet is the leading specialty grain, followed by rye, and popcorn. Average acreage harvested per farm for these grains was 91 acres per farm. Millet is grown chiefly in South Dakota, Colorado, and New Mexico, which together supplied 94 percent of the 1997 production. The second-leading specialty grain, rye, is widely dispersed throughout the United States: Oklahoma, Georgia, South Dakota, Michigan, and Minnesota were the top five suppliers with a 30 percent share of the 1997 output.

Popcorn, the third-leading specialty crop, is grown mainly in Nebraska, Indiana, Illinois, and Ohio, which together supplied 71 percent of 1997 production. The average popcorn farm had 144 harvested acres in that year (table A-3).

Buckwheat was grown on fewer than 500 farms in 1997, most of which were in the Dakotas, Minnesota, Washington, and New York. Another specialty grain, triticale, is grown mostly in wheat-growing areas of the Southwest, Colorado, Utah, and New Mexico. Emmer and spelt are grown mostly on small farms in Ohio, Pennsylvania, and Michigan. Triticale is grown on a few thousand acres mostly in the Western Plains States; some triticale is planted as a winter forage crop in certain Southern States.[24]

[24] E.A. Oelke, et. al., "Triticale," *Alternative Field Crops Manual*, University of Wisconsin=Extension, and University of Minnesota, Extension Services, found at http://www.hort.purdue.edu/newcrop/afcm/triticale.html, retrieved Feb. 3, 2000. There are not official U.S. Government data reported on triticale.

Employment

Data on total employment in the U.S. cereals industry are not available because the farm labor used to produce these crops typically produces a variety of other field crops or livestock at the same time. A considerable amount of actual farm labor is "unpaid" farm labor of farm family members. As indicated previously, there were a reported 463,000 farms (generally each with at least one farmer) in 1997. In addition to their own labor, farmers also employ hired labor, either seasonally or permanently, to aid in planting, harvesting, cultivating or applying farm chemicals. Hired labor is used relatively infrequently in corn production, for example, accounting in 1998 for 2 percent of cash expense in producing corn. However, hired labor costs are more important for wheat farming, accounting for about 8 percent of the cash cost of wheat production in 1998.[25] The USDA indicates that for rice, hired labor is even more important, accounting for 11 percent of 1998 cash farm production expenses.[26]

Labor Intensity, Skill Levels, Level of Productivity

Farm labor involves a multitude of mechanical, horticultural, and managerial skills. For most grain farmers, economic returns can be attributed to their own labor, managerial abilities, returns on capital (such as machinery) and land, as well as returns on risk taking. The growing of each grain is a relatively land-intensive and capital-intensive activity that has become, over the past several decades, a highly mechanized operation in the United States.

Most grain farmers operate as sole or family proprietors (owning the land they farm). Production patterns for the $47 billion worth of total U.S. cash grain and oilseed sales in 1997 are as follows: 68 percent from owner-operated individual or family farms, 18 percent from partnership operations, and 14 percent from corporations.[27] Most farmers are full or part owners of the land they farm. In 1997, 71 percent of harvested cropland was owned by the farmer or farm family, 16 percent in a partnership, and the remaining 12 percent by a corporation (94 percent of these being family-owned corporations).[28]

In grain farming, a commonly accepted measure of productivity is the crop yield. In the United States, grain yields on a per-acre basis have generally increased during the past several decades because of better cultivation, chemical application, and plant varieties. Wheat yields rose by 44 percent from an average 27.5 bushels per acre during 1965-69[29] to an average 39.5 bushels during 1995-99 (table A-4). There was a 64-percent yield gain for corn from 78.5 bushels per acre during 1965-69 to 128.7 bushels per acre in 1995-99. Yield gains for rice

[25] USDA, ERS, *Costs of Producing–Major Field Crops*, 1998. In 1998, total cash expenses for wheat were estimated at $68 per acre with hired labor costing $5.40 per acre; for corn, total expenses were $158/acre with $3.19/acre for hired labor. Unpaid labor was valued at $31 per acre for corn and $11 per acre for wheat.

[26] Rice farming had an estimated per acre cash expense in 1998 of $38, and total expenses of $350. Unpaid labor in rice production was valued at $30 per acre. Source: USDA, ERS, Ibid.

[27] USDA, *1997 Census of Agriculture*, vol. 1, pt. 51, p. 63.

[28] Ibid.

[29] USDA, ERS, *Wheat: Background for 1995 Farm Legislation*, Apr. 1995, app. table 1; *Feed Grains: Background for 1995 Farm Legislation*, Apr.l 1995, app. table 1; and *Rice: Background for 1995 Farm Legislation*, Apr. 1995, app. table 1.

rose by 34 percent from 4,370 hundredweight per acre to 5,843 hundredweight per acre, respectively.

However, annual crop yields vary widely since weather is a key factor in year-to-year changes. During 1995-99, corn yields fluctuated from 122 bushels per acre in 1996 to 134 bushels per acre in 1998, a 10-percent variation (table A-4). Nonetheless, weather conditions were generally good in the United States during the years 1995-99, and this was reflected in the excellent average yields.

Vertical and Horizontal Integration

Grain farmers, as indicated above, are numerous and decentralized, with the majority of farmers either full or part owners of a single farm. There is little direct foreign ownership of U.S. farms, and few U.S. farmers operate abroad.

As a way to obtain higher prices and to more efficiently market their grain, many farmers have formed or joined cooperatives. Cooperatives provide various services for their members, including marketing crops to elevators and mills. Cooperatives also own and operate wheat and rice mills. By acting as the sole agent for many farmers at once, cooperatives may be able to obtain greater bargaining leverage for farmers. Cooperatives play an important role in the marketing of soybeans and grain, accounting for over one-third of all such farm-level marketing, and a significant share of exports.

Marketing and Pricing Practices

The important factors that characterize the marketing of grain are first, the uniformity of the products themselves (within a grade and type); second, the importance of foreign markets; third, the involvement in export trade by a relatively small number of companies; and fourth, the importance of transportation in marketing channels used by grain farmers (as shown in figure 2). Farmers can either market their crops to export markets or sell to U.S. mills or feed operations.

Grain is a bulk, largely homogeneous, fungible commodity for which price is often an overriding factor in the purchase decision. Within U.S. regions, prices differ by the cost of transport (mostly rail or river barge) to common market areas, such as an export terminal (the "basis").[30] Rail is the dominant mode of transportation of grain from primary grain elevators to end users, there being seven major railroads (so-called "Class I") carrying grain in the United States in 1999.[31]

[30] For further elaboration, see Robert Oehrtman and L.D. Schnake, "Marketing Channels and Storage," *Grain Marketing* (Gail Cramer and Eric Wailes, editors), 1993, pp. 61-120.

[31] Data of the Assoc. of American Railroads, and the Interstate Commerce Commission, quoted in, "BNSF-CN Deal Brings Rail Mergers Front and Center," *Feedstuffs*, Mar. 18, 2000, p. 1.

As a bulk product, U.S. grain prices are heavily dependent on the transportation and grain-trading sector. Because the transportation of grain is relatively costly and time-consuming, farmers generally sell their grain within a limited geographic area surrounding their farms, usually to a country elevator, although farmers located near a river, rail or port elevator sometimes bypass the country elevator and ship their grain directly to an export terminal or subterminal.[32] Farmers market their crops to competitive grain elevators located within a "draw area."[33]

Grain trading is also concentrated among a relatively few companies in the United States and abroad. The merger of Cargill and Continental Grain Co.'s grain operations in 1999 created the largest U.S. grain company, with nearly 15.5 million tons of licensed storage capacity in 318 U.S. locations.[34] The storage capacity of the 10-largest U.S. grain elevator, milling and processing companies in 1999 totaled 2.2 billion bushels of which Cargill/Continental had a 29-percent share, and the second largest company, ADM, had a 28-percent share.[35] Three farm cooperatives, Farmland Grain Division, Cenex Harvest State Cooperative, and Riceland Foods, together accounted for about 19 percent of this storage capacity in 1999. With regard to concentration of sales of U.S. grain exports in 1999, the four-leading firms accounted for 81 percent of U.S. corn exports, and 47 percent of U.S. wheat exports, according to USDA data.[36]

Farmers have three basic price strategies available to them: a forward cash contract, in which quantity and price arrangements are made prior to delivery from the field or storage facility; a cash market under which a given quantity is sold for immediate delivery at the current market price; and a price-later contract, which provides for immediate delivery but at a price to be determined at a later date. In 1996, 60 percent of U.S. producers with sales of $250,000 or more used forward contracts and about 45 percent used future or options, according to a USDA survey.[37]

Prices for future delivery may be based either on the current cash-market or futures-market price quoted by the Chicago Board of Trade, depending on the particular arrangement. Most U.S. farmers typically deliver slightly over half of their crop immediately after harvest to an off-farm location, such as a grain elevator or mill, and store the remaining crop on-farm for marketing during the following winter or spring.

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[32] See United States of America (U.S. Department of Justice (DOJ)), Plaintiff, v. Cargill, Incorporated and Continental Grain Company, defendants, *Competitive Impact Statement*, Case No. 1:99CV01875, July 23, 1999, found at www.usdoj.gov/atr/cases/f2500/2584.htm, retrieved Aug. 9, 1999, p. 3.

[33] The cited U.S. Department of Justice in a 1999 antitrust case involving the merger of two of the largest U.S. grain-trading companies defined four separate U.S. geographic regions as "draw" areas.

[34] "Merging Two Grain Giants," *World Grain*, Jan. 1999, p. 30; and Marvin Hayenga and Robert Wisner, "Study Evaluated Cargill's Purchase of Continental Grain's Grain Business," *Feedstuffs*, Feb. 8, 1999, p. 1.

[35] Ibid., table 2.

[36] Ibid., table 4.

[37] Joy Harwood and Craig Jagger, "Agriculture's Safety Net," *Choices*, 4h qtr. 1999, p. 59; USDA, ERS, and Joy Harwood, et al., *Managing Risk in Farming*, ERS Ag. Econ. Rep. 774, Mar. 1999.

U.S. Government Programs

U.S. farm programs are extensive and complex. This section summarizes the key provisions of the support program and highlights those provisions that are believed to influence U.S. grain production significantly, especially the loan program. Another U.S. Government program, that affects U.S. exports of grain, is the U.S. Department of Agriculture's (USDA) export program summarized below.

U.S. grain farmers have the option of placing their crop as collateral for USDA loans, called nonrecourse loans, which can be redeemed by the farmer prior to maturity with funds from the market sale of the product.[38] If market prices are below the loan repayment rate, the farmer may default on the loan obligation and forfeit the product that then becomes Government property, or repay the loan at the prevailing world market price. If market prices exceed loan rates, a farmer can sell the product, pay off the loan and interest, and retain the difference. The farmer may also agree not to exercise the loan option and receive a "loan deficiency payment (LDP)," the difference between the current market price and the USDA fixed loan rate.

The Federal Agriculture Improvement and Reform Act (FAIR) of 1996 was signed into law in April 1996.[39] The FAIR Act provides fixed payments no longer linked to current planting, farm prices, or the volume of the crops produced; these payments are called Production Flexibility Contract (PFC) payments. The Act allows participating farmers planting flexibility, the marketing assistance loans (nonrecouse loans) including LDPs explained above, and environmental/conservation provisions. Under the FAIR Act, total PFC payments for grain amounted to $5.5 billion in 1999 (table A-11).

Thereafter, Congress separately provided for emergency and disaster relief under the Omnibus Consolidated and Emergency Supplemental Appropriations Act of Fiscal Year 1999 and the Appropriations Act of Fiscal Year 2000, which increased the PFC payments as well as made direct relief grants to affected farmers. Congress provided $2.4 billion for crop loss assistance under the 1999 Appropriations Act,[40] and in the Appropriations Act of 2000, an additional $5.5 billion to double the PFC payments. In the 2000 act, Congress also doubled the amount a single farm operation can receive from crop subsidies from $150,000 to $300,000, meaning that with PFC payments, a single farm operation could receive up to $460,000.[41]

[38] USDA, Economic Research Service (ERS), *Provisions of the Federal Agriculture Improvement and Reform Act (FAIR) of 1996*, bulletin No. 729, Sept. 1996, pp. 9-12.

[39] Ibid., p. ii.

[40] The 1999 appropriation Act included as well $1.4 billion in disaster relief (including $200 million for livestock producers); total 1999 spending for farm support was an additional $8.7 billion. Office of Chief Economist, USDA, *USDA Agricultural Baseline Projections to 2009*, Feb. 2000, pp. 32-33.

[41] In 1999, about 550 farms reached the maximum amount of total benefits under the program.

Production flexibility contract payments (PFC)

To be eligible for this voluntary program, farmers must have enrolled in a production flexibility contract (PFC) for the 1996-2002 period during the one-time enrollment held in 1996. Eligible contract acreage must either have been included in the prior USDA acreage reduction program for at least one out of the last five crops, or have been "considered planted." An owner or producer who entered into a contract may subsequently reduce, but not add to, the quantity of contract acreage covered by the contract.[42] Except for fruits and vegetables, any commodity or crop may be planted on contract acreage on a farm. The planting for harvest of fruits and vegetables (other than lentils, mung beans, and dry peas) is prohibited on contract acreage, except in a few situations.

Annual payments are made no later than September 30 of each of fiscal years 1996 to 2002. During FY 1997 to 2002, 50 percent of the annual payment can be made at the option of the owner or producer on December 15 or January 15 of the fiscal year. The marketing assistance loan rates and the PFC payment rates are shown in table A-12 (in dollars per hundredweight), as compiled from official statistics of USDA.

In the 1999 Appropriations Act, Congress further provided $2.9 billion for market loss assistance (MLA) payments to be paid in FY 1999 to farmers eligible for PFC payments in FY 1998.[43] These MLA payments were proportional to the 1998 PFC payments and were equivalent to slightly less than 50 percent of the PFC payments.

Marketing assistance

Farmers may repay the nonrecourse loan plus interest anytime prior to maturity and then sell the pledged crop or forfeit the collateral to the government as full payment within the 9-month loan period.[44] The loan repayment rate will be lower than the loan rate plus interest when the posted country price or PCP (for wheat, and feedgrains) or the prevailing world market price (for rice) is below the loan rate. When a farmer repays the loan rate at this lower rate, the difference between the original loan rate and the repayment is called a "marketing loan gain" (any accrued interest is waived). The loan program thereby provides an "effective" price floor at the loan rate for farmers eligible to place their crops under loan, but does not establish a floor for actual market prices since grain can enter the market at prices below the loan rate.

In those cases when the PCP or prevailing world market price is below the loan rate, eligible producers may opt for a loan deficiency payment (LDP) instead of taking out a nonrecourse loan.[45] The LDP is the difference between the PCP and the loan rate. Once the LDP is paid, the crop cannot later go under the loan program. A producer may immediately sell the crop and receive the LDP, effectively receiving the equivalent revenue of the loan rate.

Although loan rates were established in 1996 at levels then well below prevailing market

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[42] USDA, ERS, *Provisions of the FAIR Act,* Sept. 1996, p. 5.

[43] USDA, Office of the Chief Economist, *USDA Agricultural Baseline Projections to 2009,* Feb. 1999, p. 24.

[44] USDA, ERS, *Provisions of the FAIR Act,* Sept. 1996.

[45] Ibid.

prices, the sharp decline in market prices to levels at or below the loan rates has accelerated the importance of the LDPs and the nonrecourse loans. During crop-years 1995/96 to 1997/98, season average prices received by farmers were well above the loan rates for the respective grains, but by crop-years 1998/99, market prices fell below the loan rates, triggering the LDPs for most farmers. The LDP essentially functions as the so-called "deficiency payment" did under the 1990 FACT Act, supporting farm income, but not the market price.[46] For the 1998 crop (the most recent crop for which data are available), USDA indicated that the marketing loan gains and the LDPs added between 1 and 12 percent to the average season prices farmers received for their 1998 crop:[47]

Item	Season average price	Marketing loan benefit[1]	Average per-unit revenue	Commodity loan rate	Ratio of marketing benefit to average price
		Dollar (*per bushel*)			*Percentage*
Wheat	2.65	0.19	2.84	2.58	7
Corn	1.95	.14	2.09	1.89	7
Sorghum . . .	1.70	.12	1.82	1.74	7
Barley	1.98	.23	2.21	1.56	12
Oats	1.10	.12	1.22	1.11	11
		Dollar (per cwt)			
Rice	8.83	0.07	8.90	6.50	1

[1] Weighted average benefit per unit, based on the portions of the crop receiving marketing loan gains, loan deficiency payments, and no benefits.

Total LDPs on grain totaled $2.4 billion on December 13, 1999. Producers collected $1.4 billion in LDPs covering $4.7 billion bushels of corn (49 percent of the 1999 crop), $115 million on sorghum (covering 62 percent of the 1999 crop), $32 million on barley (covering 60 percent of the 1999 crop), and $25 million on oats (covering 73 percent of the 1999 crop).[48] Wheat producers had outstanding loans in mid-December 1999 on 107 million bushels of wheat, with loans totaling $274 million ($2.57 per bushel), while wheat LDPs totaled $851 million on 8.1 billion bushels (77 percent of the 1999 crop).[49]

[46] Mitchell Morehart et al., USDA, ERS, "U.S. Farm Income Decline in 2000 to be Tempered by Government Payments," *Agricultural Outlook*, Jan.-Feb. 2000, pp. 6-8.

[47] The 1998 crop as affected in fiscal year 1999. Paul Westcott, "Ag Policy: Marketing Loan Benefits Supplement Market Revenues for Farmers," *Agricultural Outlook*, Dec. 1999, p. 4, data through Nov. 17, 1999.

[48] USDA, ERS, *Feed Outlook*, Dec. 14, 1999, p. 3, found at ers@jan.mannlib.cornell.edu, received Dec. 14, 1999. The average loan value was $1.84/bushel for corn, $1.71/bushel for sorghum, $1.69 for barley, and $1.08 for oats.

[49] USDA, ERS, *Wheat Outlook*, Dec. 14, 1999, p. 2, found at ers@jan.mannlib.cornell.edu, received Dec. 14, 1999.

Conservation reserve program

The 1996 FAIR Act also provided a wide range of environmental and conservation programs for U.S. grain producers, the two most important provisions being the Conservation Reserve Program (CRP) and the Environmental Quality Incentives Program (EQIP). The CRP was continued from the 1990 Act, and provided for a maximum of 36.4 million acres of environmentally sensitive land to be withdrawn from production, under a voluntary agreement between the owner and USDA for a 5-year period.[50] In crop-years 1999/2000, there was a total of 31.1 million acres enrolled under the CRP, about 10 million acres being formerly planted in wheat, and 4 million acres formerly in corn.[51] The EQIP provides for technical, education and cost-share assistance and payments to crop and livestock producers to protect soil and water resources, with half of the $1.3 billion fund going to crop producers and half to livestock producers.

Export Enhancement Program

Congress created the Export Enhancement Program (EEP) in 1985 under the 1985 Farm Bill and then amended it in the 1990 Farm Bill, the 1994 Uruguay Round Agreements Act, and the 1996 FAIR Act. The purpose of the EEP program was initially to allow U.S. agricultural exporters to lower their export prices in selected markets characterized by unfair competition, particularly from the European Union (EU), and since 1996, to encourage market development abroad.[52] Although USDA has chosen not to provide EEP bonuses for grain exports in recent years, total EEP expenditures for all agricultural exports up to $579 million are allowed in FY 2000.[53]

Exporters receive bonuses that allow them to reduce the price of the U.S. agricultural product in the designated foreign market.[54] Since the program's inception, the vast majority of EEP sales have been of wheat, followed by feedgrains (barley), wheat flour, and vegetable oil.[55]

However, from August 1995 through the end of fiscal year 1999, USDA paid no EEP bonuses for grain and milled grain product exports, except for a 25,000 metric ton sale of barley in

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[50] USDA, ERS, *Provisions of the FAIR Act*, Sept. 1996, pp. 11-12.

[51] In 1999/2000, the enrolled CRP acreage (in millions of acres) was as follows: wheat, 9.8; corn 4.0; upland cotton 1.1; sorghum 1.3; barley, 0.8; oats, 0.5; soybeans 3.2; fallow 3.4; and other cropping pattern 7.0. Source: USDA, Office of Chief Economist, *op. cit*. Feb. 1999, p. 32.

[52] USDA, ERS, "Provisions of the 1996 Farm Bill—the Federal Agriculture Improvement and Reform (FAIR) Act," *Agriculture Outlook*, Apr. 1996, p. 15, and USDA, *Farmline*, July 1991, p. 4.

[53] USDA, ERS, "Provisions of the 1996 Farm Bill—the Federal Agriculture Improvement and Reform (FAIR) Act," *Agricultural Outlook*, Apr. 1996, p. 15; and USDA, Office of Chief Economist, p. 29.

[54] USDA, Office of Public Affairs, "USDA Changes Payment Mechanism for EEP and DEIP," Nov. 6, 1991.

[55] Karen Ackerman and Mark Smith, USDA, ERS, Commercial Export Assistance, May 1993; and "The Export Enhancement Program," Outlook for U.S. Agricultural Exports, May 27, 1993.

fiscal year 1998.[56] EEP assistance had previously been available for a wide variety of grain and milled grain products, including wheat and wheat flour, rice, barley, malting barley, and barley malt. In August 1995, EEP bonuses were halted as higher world prices for wheat and wheat flour and lower EU export restitutions (subsidies) made these bonuses unnecessary.[57]

Export credit guarantee and U.S. food aid programs

USDA also provides a guarantee of private credit used to finance the purchase of U.S. grain and other eligible agriculture products, and administers programs to donate grain and other agricultural products abroad for relief or humanitarian assistance under Public Law 480, the World Food Program, and the Food Aid Initiative (section 416 exports).[58] The GSM-102 (Export Credit Guarantee Program) provides credit for loans of up to 3 years, and the GSM-103 (Intermediate Export Credit Guarantee Program) provides credit for loans of 3 to 10 years in duration. Credit guarantee programs focus on maintaining U.S. sales levels abroad by assisting U.S. exporters with sales in countries with foreign exchange constraints.[59]

In recent years, Mexico, Korea, the Pacific Rim, and other developing regions have been the leading markets for U.S. grain exports under the credit guarantee program. In fiscal year 1999, the export credit guarantee program covered $2.8 billion of U.S. agricultural, fishery and forest products of which $1.4 billion was grain, according to USDA data.[60] The GSM-102 and GSM-103 programs covered 13 MMT of U.S. grain exports, valued at $1.4 billion in FY 1999:

	FY 1999		FY 1995	
Type of grain	Quantity	Value	Quantity	Value
	1,000 metric tons	*Million dollars*	*1,000 metric tons*	*Million dollars*
Rice	346	90	345	77
Sorghum	1,234	116	1,564	172
Wheat	3,900	482	4,214	654
White corn	772	99	239	36
Yellow corn	6,635	608	4,262	438
Total	12,887	1,395	10,624	1,377

With U.S. grain exports of about $10 billion annually during 1998-99, U.S. grain exports under the GSM programs thus accounted for about 14 percent of all grain exports in FY 1999. The value of grain exports under the GSM programs was about the same in FY 1995 and FY 1999, but the volume of grain exported rose by 21 percent.

U.S. food aid abroad includes grain as well as other foods such as milled grain products

[56] USDA, ERS, Wheat Situation and Outlook Yearbook, Mar. 1997, p. 13; and USDA, Office of Chief Economist, USDA Agricultural Baseline Project to 2008, Feb. 1999, p. 29, and USDA, *Outlook for U.S. Agriculture Exports*, Aug. 28, 1998, p. 11.

[57] USDA, ERS, *Wheat Situation and Outlook Yearbook*, Mar. 1997, p. 13.

[58] Under Section 416 (b) of the 1949 Agriculture Act.

[59] ERS, USDA, *Provisions of the FAIR Act*, Sept. 1996, p. 108.

[60] FAS, USDA, "GSM Credit Guarantee System Report No. MJB712," Feb. 3, 2000.

(wheat flour, corn soy blends, cornmeal), meat, dairy products, and oilseeds and oilseed products (vegetable oil). In FY 1999, U.S. food aid totaled $2.5 billion, according to USDA.[61] U.S. grain food aid (corn, rice, sorghum and wheat) during FY 1995-98 remained below $400 million annually, but then rose sharply to $995 million in FY 1999, as shown in the following tabulation, compiled from official USDA data.[62]

Fiscal year	Value of U.S. grain aid	Volume of U.S. grain aid
	Million dollars	*Thousand metric tons*
1995	367	2,365
1996	330	1,496
1997	313	1,860
1998	352	2,345
1999	995	7,036

The 7 MMT of U.S. grain aid exports in FY 1999 included 5.3 MMT of wheat. Food aid exports represented about 10 percent of the value and 8 percent of the volume of U.S. exports of grain in 1999. The large increase in food aid exports occurred under the Food Aid Initiative begun in July 1998 when the United States donated approximately 5 MMT of wheat to countries where food needs were greatest, including 1.5 MMT of wheat to Russia.[63]

Research and Development

During 1995-1999, without a doubt the most significant change in research and development affecting the grain sector has been the development of genetically engineered (GM) crops with input traits for pest management. USDA defines "genetic engineering," as "the genetic modification of organisms by recombinant DNA techniques."[64]

The development and production of so-called *Bacillus thurgineiensis* (Bt)-corn in particular has been widely reported and analyzed. Corn and other crops containing a gene derived from the soil bacterium produce their own toxin that protects the entire plant against such pests as the European corn borer.[65] The Food and Drug Administration (FDA), the Environmental Protection Agency (EPA), and the USDA authorized the commercial production and release of certain GM corn in the mid 1990's. Since then, Bt corn has been planted on 25 million acres, or about 35 percent of the 1999 U.S. crop.[66] Similarly, GM soybeans and cotton have

[61] Foreign Agriculture Service, USDA, "Planned U.S. Food Aid for FY 1995-99," facsimile transmission, Feb. 8, 2000.

[62] Ibid.

[63] USDA, *Outlook for U.S. Agricultural Exports*, Feb. 22, 1999, p. 12.

[64] 7 CFR 340: 340.1. See USDA, ERS, "Agricultural Biotechnology Concepts and Definitions," and "Genetically Engineered Crops for Pest Management," found at www.econ.ag.gov/whatsnew/issues/gmo/terms.htm, retrieved Nov. 24, 1999.

[65] USDA, ERS, *Feed Situation and Outlook Yearbook,* Apr. 1999, p. 9.

[66] Ibid., p. 4, and p. 9.

also been approved in the United States, although acceptance in other countries, particularly the EU and Japan (see later section on Trade Disputes), has not been universal.

The safety of GM crops has been sharply evaluated and scrutinized including the National Academy of Science, but their acceptance has been questioned by European Governments and U.S. consumer groups and members of Congress. U.S. regulation of GM crops is under review at this time, including an independent scientific review of the USDA and EPA biotechnology regulatory systems, and the creation of a USDA advisory committee on biotechnology.[67] A National Academy of Sciences panel concluded in April 2000 that there is no scientific evidence that GMO crops are unsafe to eat, but that there are unresolved scientific issues of potential risks arising from substances inadvertently transferred into biotech crops that can cause allergic reactions, and the threat to the environment that may be posed by the flow of spliced genes to other plant species.[68]

The opposition to GM crops has caused domestic grain traders to require the segregation of GM crops from non-GM crops, particularly for those grain elevators or grain processors exporting to the EU or Japan. In early 2000, about 18 percent of U.S. grain elevators indicated they would not purchase GM corn and 12 percent would not purchase GM soybeans.[69] About 30 percent of elevators in the heart of the Corn Belt (Iowa, Illinois and Indiana) planned to segregate GMO corn in 2000, according to the survey.

Seed breeders have also developed through conventional breeding methods specialty corn such as high-oil corn, white corn, hard endosperm corn, waxy corn, and nutritionally dense corn. This specialty corn is geared toward industrial and food uses, although some goes into animal feed as well.[70] A large portion of the high-oil and white corn is exported. USDA estimates that less than 5 percent of the total U.S. corn acreage in 1998 was planted in specialty corn, which also includes popcorn.

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[67] "USDA and Biotechnology," p. 6, retrieved from the worldwide web www.aphis.usda.gov/biotechnology/faqs.html, Apr. 5, 2000; and "Remarks by Secretary of Agriculture Dan Glickman, before the Advisory Committee on Biotechnology Opening Meeting, Washington, DC - Mar. 29, 2000," found at www.usda.gov/news/releases/2000/03/0103, retrieved Apr. 5, 2000.

[68] Marc Kaufman, "Biotech Crops Appear Safe, Panel Says," *Washington Post*, Apr. 6, 2000, p. A-10; and Paul Raeburn, "Biotech Foods Aren't Out of the Woods Yet," *Business Week*, Apr. 17, 2000, p. 56.

[69] Sarah Muirhead, "Survey Shows Majority of Elevators Plan to Accept Biotech Grain Next Fall," *Feedstuff* Feb. 21, 2000, p. 1.

[70] ERS, USDA, Apr. 1999, p. 9.

U.S. MARKET

Consumer Characteristics and Factors Affecting Demand

Characteristics of consumers or users

Grain is principally used in food or food products, as livestock feed, or for planting seed. Secondary amounts are used industrially to make alcohol (industrial alcohol, beer, and distilled spirits), starches, adhesives, and other inedible products. The three major categories of grain are wheat corn and other feedgrains (coarse grains), and rice. Animal feed is discussed in a recently published separate summary.[71]

Wheat markets are mainly driven by demand for food in the form of wheat flour (bread, baked goods) and secondarily for semolina (in pasta). About 71 percent of the wheat consumed in the United States during 1995/96 to 1999/00 was used in food products, about 22 percent in feed, and 7 percent as seed (table A-13). Wheat use varies among the five major types of wheat (durum, hard winter, hard spring, soft red, and white) (tables A-14-18). Wheat flour millers are the major processors of wheat; other direct users are food companies, and industrial users (wheat gluten and wheat starch). Direct competition with wheat by other grains, except in feed use, is limited. For the most part, wheat is priced higher than other grains. The milling sector is discussed in a separate summary.[72] Feed use of wheat varies by year depending on protein quality of the particular crop; during the 5 most recent crop-years, wheat accounted for 4 percent of the average 199 million metric tons of U.S. feed concentrates.[73]

Animal feed constitutes the principal market for corn, although demand for food products (such as high-fructose corn syrup, corn oil, corn meal, and for brewing) impacts the corn market. In the five most recent years for which data are available, approximately 75 percent of corn consumption was for animal feed, 25 percent for food, alcohol and industrial uses, and less than 1 percent for seed (table A-19). Corn is the preferred grain for most animal rations (except for horses for which oats are preferred). Corn accounted, on average, for 65 percent of livestock feed concentrates in the United States during the 5 most recent years for which data are available.[74]

Popcorn, except for small amounts used for seed, is used exclusively for either home or commercial preparation of popcorn (table A-20). Demand for popcorn has declined slightly despite the emergence of microwave popcorn a decade ago. Demand for popcorn fell on a

[71] *Industry and Trade Summary on Animal Feeds*, USITC Publication 3275, Jan. 2000.

[72] *Industry and Trade Summary on Milled Grains, Malts, and Starches*, USITC Publication 3095, Mar. 1995.

[73] Average tons of feed concentrates during crop-years 1993/94 to 1997/98. Source: USDA, ERS, *Feed Yearbook*, Apr. 1999, p. 105.

[74] Ibid.

per capita basis from 3.3 pounds in 1992 to 2.7 pounds in 1999, according to USDA and Commerce data.[75]

The use of corn in the milling sector is discussed in the summary on milled grains cited previously. In recent years, of the 1.8 billion bushels of corn used annually in the United States in food and industrial products, about 31 percent was for high-fructose corn syrup (HFCS), 27 percent for alcohol for fuel, 15 percent for glucose and dextrine for food, 14 percent for starch, 8 percent for breakfast cereal and other food, and the remainder (less than 6 percent) for alcohol for beverages (beer, whiskey, distilled spirits).[76]

The other feedgrains (sorghum, oats, and barley) are used mainly as animal feed although oats and barley are in strong demand for certain food products (breakfast cereals and beer, respectively) (table A-21-23). Sorghum supplied 5 percent, and barley and oats each about 2 percent of average volume of U.S. livestock feed concentrates during the 5 most recent years.[77]

Over the five most recent crop years for which data are available, barley was consumed in the following proportions: 49 percent as feed, 48 percent as malt, food and industrial products, and the remainder as seed (table A-23). Similarly, most oats were consumed as animal feed (64 percent of average U.S. consumption during 1995/96 to 1999/00), while 32 percent was used in the production of food, alcohol, and industrial products (table A-21). Nearly 90 percent of average U.S. consumption of sorghum, the other leading domestic feedgrain, was for animal feed during the 5 years ending 1999/00; there has been some increased use of sorghum for industrial uses, alcohol, and food during this period (table A-22). Rye, another miscellaneous grain, is mainly used in the distilled spirits industry (whiskey), and rye flour milling, with the remainder used as animal feed and seed.

Rice markets in the United States and abroad are mainly oriented to the use of rice in food, as rice's high price relative to other grain precludes its inclusion in most feed rations. In the United States during the 5 market years ending with 1999/00, an average of 76 percent of annual rice consumption was directed toward food uses, while 14 percent was consumed as an input by the brewery industry (table A-24). Approximately 4 percent of rice was used for seed.

Direct food use by final consumers is considerably more important than the use of rice in processed foods by food manufacturers. In 1996/97 (the latest crop-years for which data are available), 63 percent of the 103 million hundredweight of milled rice consumed was used directly by U.S. consumers, and 21 percent was used in processed foods, such as breakfast cereals, soup, and package mixes.[78]

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[75] Based on Commission staff adjustment of USDA data for 1996 and USDOC (U.S. Census) data for 1992 (see table A-19). Resident U.S. population was estimated at 255 million in 1992 and 271 million in 1999 *(Statistical Abstract of the United States).*

[76] *Industry and Trade Summary on Milled Grains, Malts, and Starches*, USITC publication 3095, Mar. 1995, table A-7, based on USDA official data.

[77] USDA, ERS, *Feed Yearbook*, Apr. 1999, p. 105.

[78] USDA, ERS, *Rice Situation and Outlook Yearbook*, Sept. 1998, appendix table 15. Total direct food use includes imports that are mainly prepared rice.

Factors influencing the demand for grain

Two separate food markets influence the demand for grain: milled grain products (such as flour for bread), and meat products (meat, poultry, eggs, and dairy products). A higher preference for milled grain products in the United States has increased per capita demand for wheat, rice, and most other grain during the past decade, while population growth has added to the total demand.

Changing U.S. demographic composition spurred grain consumption: For example, rice demand was boosted by larger Asian and Hispanic segments within the U.S. population whose per capita rice consumption far exceeds the U.S. average.[79] Dietary changes raised per capita wheat flour and semolina (pasta) consumption in the United States as well, prompted by dietary preferences and changes in lifestyle.[80] With increasing population in the United States, total demand for milled grain products has risen consistently over the past 10 years, although the rate of increase during the past 5 years has slowed somewhat from the trend in the early 1990s.

Higher levels of domestic consumption of meat, poultry, eggs, and dairy products boosted U.S. demand for feedgrain during 1995-99. Grain generally comprises two-thirds or more of the volume of commercial feed rations for poultry and hogs. U.S. per capita and total consumption of both meat and poultry rose during 1995-99: total consumption of all red meat and poultry by 8 percent and per capita consumption by 5 percent,[81] with most of the increase attributed to increased poultry consumption.

Historically, U.S. demand for grain and milled grain products tends to be relatively price and income inelastic.[82] Per capita consumption of wheat and other cereals has been rising generally over the past two decades, particularly for wheat, setting a record in 1997/98, mostly a result of higher wheat flour consumption. Total wheat consumption in food rose slightly during 1998/99 to 1999/00.

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[79] USDA, ERS, *Rice Yearbook*, Dec. 2, 1999, pp. 11-12.

[80] See *Industry and Trade Summary: Milled Grains, Malts, and Starches*, USITC publication 3095, Mar. 1998, p. 24. Many also credit the population of the "food pyramid" "triangle" increased U.S. consumption of grain products.

[81] USDA, *Agricultural Outlook*, table 10, Dec. 1998 and Dec. 1999. Per capita annual U.S. consumption of red meat and poultry rose from 210 pounds in 1995 to 221 pounds in 1999, while egg consumption rose from 236 to 255. Of the 11-pound increase in red meat and poultry consumption during these 5 years, 8 pounds was poultry meat.

[82] USDA found the price elasticity for U.S. wheat demand historically to be relatively inelastic (-0.35) with respect to its own price, and inelastic with respect to the price of corn and the other feedgrains (+0.15 and +0.10, respectively). Walter Gardiner, Vernon Roningen, and Karen Liu, *Elasticities in the Trade Liberalization Database*, USDA, ERS, May 1989, table 5. At the retail level, the demand for wheat flour and the other milled grain products (considered food "staples") is even more price inelastic (-0.078), according Kuo S. Huang, *A Complete System of U.S. Demand for Food*, USDA, ERS, Technical Bulletin No. 1821, Sept. 1993, table 3. The income (expenditure) elasticity of demand for wheat flour is also inelastic (0.13), as compared to the higher elasticities for fresh fruits and vegetables, meat and fish, and nonfood grocery items (1.17), according to the 1993 study.

The demand elasticity for U.S. corn was estimated to be inelastic (-0.21) with respect to the corn price, and very inelastic (+0.04, and +0.05) with respect to the price of wheat and the other feedgrains.[83] Demand for corn is primarily a function of the supply and demand conditions in livestock markets.

Demand in the United States for rice is also relatively price inelastic at the wholesale level (-0.25) according to the USDA,[84] although shifts in U.S. demographic composition and changes in tastes have increased the demand for all types of rice, both domestic and imported, over the past decade.[85]

Consumption

Trends and import-penetration levels

Apparent U.S. consumption of grain rose during the 5 years by18 percent to 253 million metric tons (mmt) in 1999/00, according to USDA data.[86] The import-penetration ratio for all grain on a value basis averaged between 3 and 4 percent annually during 1995-99 (table A-28). On a quantity basis, this ratio varied in 1999/00 by type: 60 percent of domestic oats consumption, 8 percent of domestic barley consumption, 9 percent of domestic rice consumption, 7 percent of wheat consumption, and negligible amounts (less than 0.5 percent) of corn, sorghum and popcorn consumption (tables A-13 and A-19-24). The largest change in the import penetration ratio was for oats which rose from 29 to 60 percent between 1995/96 and 1999/00 (table A-21). Wheat imports as a share of domestic consumption also rose, from 6 percent to 7 percent, during this period (table A-13).

During the period, U.S. consumption of feedgrains rose substantially between 1995/96 and 1999/00. Apparent consumption of corn, the leading feedgrain, rose by 20 percent from 6.3 billion bushels to 7.6 billion bushels (table A-19) as production surged upward to a record level in 1998/99 and low prices stimulated animal feeding. Consumption of barley and oats declined during these 5 years (table A-21 and A-23), while that of sorghum rose (table A-22).

During this period, wheat consumption rose by 17 percent to 1,335 million bushels, with peak consumption in 1998/99 (table A-13). The largest consumption gain among the five principal types of wheat (Durum, hard winter, hard spring, soft red, and white) was for soft red wheat (tables A-14 to A-18). Food use (milling) of wheat rose irregularly by 4 percent to 920 million bushels in 1999/00 (table A-13).
Domestic rice consumption increased by 10 percent between crop-years 1995/96 and 1999/00.

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[83] Walter Gardiner, Vernon Roningen, and Karen Liu, *Elasticities in the Trade Liberalization Database*, USDA, ERS, May 1989, table 5.

[84] Ibid.

[85] At the retail level, the price elasticity of demand for rice is price inelastic (-0.067), and similar to the price elasticity of demand for wheat flour and potatoes. The income (expenditure) elasticity for rice at retail is inelastic (0.15), and similar to that for wheat flour (0.13). Kuo S. Huang, *A Complete System of U.S. Demand for Food*, USDA, ERS, Technical Bulletin No. 1821, Sept. 1993, table 3.

[86] *World Agricultural Supply and Demand Estimates*, Nov. 10, 1997, and June 9, 2000, total use of grains. Total use rose by 39 mmt during the 5 years; a 30-mmt rise occurred from 1995/96 to 1996/97 as domestic production recovered from the drought in 1995/96.

Consumption of rice in food rose by about 15 percent to 90 million hundredweight (table A-24), with the largest increase occurring in consumption of long-grain rice (rather than medium and short-grain rice) (tables A-25 and 26). Domestic brewers' use of rice remained unchanged because of the greater popularity of "lite beers," (which are produced using other grains), little or no growth in domestic beer output, and higher imports of beer.[87]

Popcorn consumption declined on a volume basis by 1 percent during the 5 years, to 743 million pounds in 1999 (table A-20). In 1999, U.S. retail sales of popcorn exceeded $2.7 billion, according to published industry estimates.[88]

Conditions of competition between foreign and U.S. grain

The key competitive factors in grain trade have been price, quality, transportation, stocks, and costs of production. Government support policies (particularly in China, the EU, and the United States) have also affected world trade as did the retrenchment of key Asian grain markets during the Asian financial collapse in 1996-98.[89] During 1995-99, overall conditions of competition in grain markets have shifted from a "grain boom," during the early to mid 1990s (characterized by high prices and short supplies), to a "grain glut" by the end of the 1990s (low prices and high inventories). World ending stocks rose by 36 percent between crop-years 1995/96 and 1999/00, a shift reflected in the nearly 50-percent drop in world wheat and corn export prices, and a 36-percent drop in world rice prices during the period (table A-27). The effects of the grain glut may have also contributed, within the United States, in part to the mergers of domestic grain merchants (described earlier), and to consolidation of cash grain farms in the Midwest and Great Plains States.

World grain production from crop-years 1995/96 to 1999/00 rose by about 8 percent, world trade by 8 percent, total use by 6 percent, and ending world stocks by 35 percent (table A-27). A price rise during the mid 1990s, and a shift in government policy in three key grain areas (the United States, the EU and China) brought forth much larger production which was not offset by rising consumption.[90] This resulted in the burdensome inventories, and subsequent adverse effects on U.S. grain farmers.

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[87] USDA, ERS, *Rice Yearbook*, Dec. 2, 1999, pp. 11-12.

[88] Nielsen, all measured retail outlets, quoted in, "General Mills Plans 2000 Earnings Growth," *Milling and Baking News*, Aug. 31, 1999, p. 16.

[89] Office of Chief Economist, USDA, *USDA Agricultural Baseline Projections to 2009*, Feb. 2000, pp.1-5 for a description of these factors in grain markets.

[90] Office of Chief Economist, USDA, *USDA Agricultural Baseline Projections to 2009*, Feb. 2000, pp. 1-5.

Production

The value of U.S. grain production rose to nearly $40 billion in 1996, and then steadily declined to about $26 billion in 1999, reflecting the influence of falling crop prices (table A-1). On a volume basis, U.S. production and harvested acreage of grain followed a different pattern, peaking in crop-years 1998/99 and 1996/97, respectively, as shown in the following tabulation (as compiled from official statistics of the USDA):[91]

Crop year	Production	Harvested acreage	Yield
	Million metric tons	*Million hectares*	*Metric ton/ hectares*
1995/96	275	59	4.7
1996/97	333	65	5.1
1997/98	334	64	5.2
1998/99	347	61	5.7
1999/00	333	58	5.7

U.S. grain production rose by 21 percent, peaking in 1998/99; the harvested acreage fluctuated, but remained flat during the 5 years, having peaked in 1996/97. A 6 million-hectare jump in acreage occurred in 1996 after passage of the FAIR Act eliminated acreage controls on U.S. grain farmers, and the strong corn price in 1995/96 of $3.19 per bushel elicited increased feedgrain acreage. The extremely favorable weather during this period is reflected in the rising crop yields, that reached about 5.7 metric tons per hectare in 1999/00.

Corn

U.S. production of corn rose from a drought-affected level of 7.4 billion bushels in crop-years 1995/96 to 9.2 billion bushels in the following year, and then to 9.4 billion bushels in 1999/00 (table A-19). Corn yields rose from 114 bushels per acre in 1995/96 to a peak 135 bushels per acre in 1999/00 (table A-5). After the sharp increase in 1996/97, the annual harvested acreage in corn has varied little during the ensuing 3 crop-years, having remained within a range of 71-73 million acres. Although the supply elasticity for U.S. corn production is believed to be perfectly elastic in the long run, the 44-percent drop in prices from $3.24 to $1.80 per bushel elicited only a small decline in planting.[92]

U.S. popcorn production declined by about 9 percent between 1995 and 1999 to 949 million pounds (table A-20). Harvested popcorn acreage rose from 321,000 to 337,000 acres between 1992 and 1997, but the yield per acre dropped from 3,470 pounds to 2,955 (table A-3). Most popcorn is grown under contract to a processor; the planted acreage is thus adjusted to processors' estimated annual needs.[93]

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[91] USDA, *World Agricultural Supply and Demand Estimates, and Grain: World Markets and Trade*, various editions.

[92] The supply elasticity of corn with respect to its own price was found to be 0.48 in Walter Gardiner, et al., USDA ERS, *Elasticities in the Trade Liberalization Database*, May 1989.

[93] P.R. Carter and D.R. Hicks, "Popcorn," *Alternative Field Crops Annual*, University of Minnesota Extension Service and University of Wisconsin Extension, found at www.hort.purdue.edu/newcrop/afcm/popcorn.html, retrieved Feb. 2, 2000.

Wheat

U.S. production of wheat fluctuated between 2.2 billion and 2.5 billion bushels annually between crop-years 1995/96 and 1999/00 as reduced acreage was offset by rising yields (tables A-4 and A-13). Harvested wheat acreage peaked at 63 million acres in 1996 and 1997, and then began a steady decline to 54 million acres in 1999. Meanwhile, favorable growing conditions led to much higher yields, peaking at 43 bushels per acre in 1998. The decline in wheat prices from $4.55 to $2.55 per bushel did reduce the acreage harvested, but higher yields offset this effect on production levels.

Rice

U.S. rice production has risen more or less steadily by 21 percent between crop-years 1995/96 and 1999/00, from 174 million hundredweight to 211 million hundredweight (table A-24). A 16-percent increase in harvested acreage accounted for most of the production increase as annual yield tends to be more stable for rice than other field crops because most rice is irrigated. Farm rice prices peaked in crop-year 1996/97 at $9.96 per cwt, and remained high through 1997/98, when they began to fall sharply to a projected $6 per cwt in 1999/00 (table A-24).

Sorghum

Sorghum production followed a pattern similar to the leading feedgrain (corn), peaking in 1996/97 at 795 million bushels (tables A-1 and 22). The sorghum price fell steadily during the 5-year period from 1995 to 1999, and harvested acreage declined from 12 million acres in 1996/97 to 8.5 million acres in 1999/00 (table A-8).

Barley, oats, and specialty grain

Barley and oats production dropped during the period as did production of most specialty grains (buckwheat, emmer and spelt, popcorn, proso millet, rye, triticale, and wild rice). Barley production dropped as smaller acreage harvested was somewhat offset by higher yields (tables A-4 and 23). Barley production is closely related to that of wheat so that declining wheat planting frequently lowers barley output. Barley prices dropped at the farm level by 29 percent between 1995/96 and 1999/00 (table A-23). Oats production declined by 10 percent in the period and harvested acreage by17 percent (tables A-4 and 21).

U.S. production of specialty grain generally declined during 1992-97 (table A-3). In terms of the volume of production, popcorn and rye production fell, and millet production rose. Production of the other grains (buckwheat, emmer and spelt, triticale, and wild rice) were all lower.

U.S. TRADE

Overview (U.S. Trade Balance)

During 1995-99, the U.S. trade surplus in cereals dropped by nearly one-third, from $14 billion in 1995 to $9 billion in 1999 (table A-29). During 1995-99, U.S. exports declined by 31 percent to $10.1 billion, and U.S. imports remained steady at about $0.7 billion (table A-30). The volume of U.S. exports of grains declined by 13 percent, in line with the decline in the value of such exports (table A-31).

During 1995-99, U.S. grain imports rose from $685 million in 1995 to $984 million in 1997, and then fell to $731 million in 1999 (table A-32). Canada supplied about 73 percent of imports, Thailand about 15 percent, and the EU about 5 percent.

Japan was the leading foreign market for U.S. grain during 1995-99 (table A-30). Mexico was the only leading market for U.S. grain that expanded during 1995-99. There were sharp contractions in Korea, Egypt, Taiwan and EU grain purchases, and China virtually disappeared as a U.S. grain market of note.

U.S. Imports

Principal suppliers and import levels

The sources and composition of U.S. grain imports during 1995-99 are shown in tables A-32 and A-33. About 37 percent of the value of imports in 1999 consisted of wheat; 22 percent was rice, 20 percent was oats (mostly food-grade oats), and 11 percent was barley (table A-35). The remaining products included mostly corn and rye.

During 1995-99, the value of U.S. grain imports peaked in 1997, and then retreated, reaching $731 million in 1999, only 7 percent above the level in 1995 (table A-32). A large jump in imports occurred in 1997 when wheat imports rose to $354 million. In that year, buoyant domestic feed and wheat mill demand and high domestic prices stimulated imports.[94] Then in 1998-99, lower U.S. prices and more abundant domestic stocks lowered wheat imports to $272 million in 1999.

U.S. rice imports rose by more than one-half from $120 million in 1995 to $185 million in 1999, as the volume of rice rose by 58 percent to 353,000 metric tons in 1999 from 223,00 mt in 1995 (tables A-33 and A-35). The buoyant demand for aromatic rice (Basmati and Thai rice) in the United States led to the increased rice imports.

[94] See Gene Hasha, ERS, USDA, "U.S.-Canada Wheat Trade the Intersection of Geography and Economics," *Agricultural Outlook*, June-July 1999, pp. 9-14.

The value of U.S. imports of oats peaked in 1997, and then declined in 1998 and 1999 as lower prices offset the higher volume of imports. U.S. imports of oats began to rise in the early 1990s, particularly from Canada and the EU; falling U.S. oat production encouraged large EU shipments of food-grade oats. For 1995-99, the volume of U.S. oats imports rose by 9 percent to 1,653,000 metric tons (table A-33).

Canada, Thailand, and the EU, the three leading suppliers, accounted for approximately 94 percent of U.S. grain imports during 1995-99 (table A-32). Canada has been by far the leading U.S. grain supplier with an average 73 percent share during the 5 years.

Canada supplied chiefly wheat, oats, and barley to the United States during 1995-99, with over half of its exports being wheat. U.S. grain imports from Canada rose sharply until 1997, but then fell back below the 1995 level by 1999 (to $490 million).

The second leading supplier, Thailand, supplied chiefly rice to the United States. The value of imports of Thai grains similarly peaked in 1997, and then fell back in 1998 and 1999 to 30 percent above the 1995 level.

The EU countries supplied chiefly oats (81 percent of 1999 imports), and prepared rice (7 percent). U.S. grain imports from the EU rose irregularly from $26 million to $49 million during 1995-99.

U.S. trade measures

Tariff and nontariff measures

Table A-36 shows the column 1 rates of duty, as of January 1, 2000, for the articles included in this summary (including both general and special rates of duty) and for U.S. exports and imports for 1999. The aggregate trade-weighted average rate of duty for all products covered in this summary, based on 1999 imports, was 0.7 percent ad valorem equivalent; the average trade-weighted rate of duty for the dutiable products was 2.7 percent ad valorem equivalent. About 74 percent of the $731 million of imports included here were duty-free in 1999. On January 1, 1994, the United States, Canada, and Mexico implemented the North American Free Trade Agreement (NAFTA).

There were no identified significant nontariff measures (NTMs) or sanitary and phytosantiary measures (SPS) affecting U.S. imports of grains during the period. However, there have been bilateral disputes over SPS and licensing measures with Canada (as elaborated below); since 1995, the United States has required certificates of origin on imports of Canadian wheat and barley since Canada also required this on similar U.S. exports to Canada.[95]

[95] This provision is required under the provisions of the NAFTA Act.

U.S. Government trade-related investigations

During 1993-94, at the request of the President, the Commission conducted an investigation under section 22(a) of the Agriculture Adjustment Act (7 U.S.C. 624(a)) to determine whether wheat classified in HTS heading 1001, wheat flour classified in HTS heading 1101, and semolina classified in HTS subheading 1103.11.00 are being or are practically certain to be imported into the United States under such conditions and in such quantities as to materially interfere with the price support, payment, and production adjustment program conducted by USDA. The Commission reported its findings to the President in July 1994. Subsequently, the President imposed tariff-rate quotas (TRQs) on all wheat imports (all of which came from Canada) into the United States from September 1994 through September 1995. The TRQs expired on September 11, 1995, but monitoring of Canadian wheat continued.

After the expiration of the wheat quota, there continued to be bilateral differences over wheat, barley, and oats trade between the United States and Canada. There are also differences over the operations of the Canadian Wheat Board over its pricing of Canadian wheat in the U.S. market, over Canadian phytosanitary requirements and end-use requirements for U.S. wheat and barley access to the Canadian market.[96]

As a result, in 1998, the governors of five States (Minnesota, Montana, North Dakota, South Dakota, and Idaho) used State inspectors and highway patrols to detain and block trucks carrying Canadian wheat and livestock entering their respective States.[97] In September 1998, Canada held bilateral negotiations with the United States under NAFTA and the WTO, arguing that the States' actions violated those agreements.

In December 1998, the United States and Canada reached an agreement, a "Record of Understanding," (ROU) regarding various aspects of agricultural trade between the two countries.[98] The ROU covered livestock, grain and potatoes and provided that:

- U.S. farmers from Montana and North Dakota could ship grain directly to Canadian grain elevators with few regulatory obstacles;
- Canadian testing for karnal bunt would be eliminated for U.S. wheat from the 14 U.S. States deemed free of that disease;
- Rail shipments of U.S. grain would be accepted for transshipment through Canada;
- Canada would provide exports sales forecasts and quarterly export levels to allow the United States to monitor imports of Canadian grain, and scrutinize Canadian pricing practices in the U.S. market.

The ROU also provided for an advisory group of U.S. and Canadian growers and State and

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[96] See for example, "U.S., Canada Clash on Market Access, Wheat Board Pricing Audit," *Inside U.S. Trade*, Apr. 3, 1998.

[97] See for example,"U.S. farmers block Canadian farm goods at the border, " *Reuters*, Sept. 22, 1998; William Clairborne, "Blockades Challenge Trade With Canada," *Washington Post*, Sept. 25, 1998, p. A-3; and Courtney Tower, "Range war with Canada may end up at the WTO," *Journal of Commerce*, Sept. 28, 1998.

[98] Office of the United States Trade Representative (USTR), "USTR, USDA Announce Series of New Measures to Open Canadian Farm Markets," press release No. 98-107, Dec. 4, 1998.

Provincial authorities to meet and provide advice to the two countries on livestock and grain trade.

In 1999 as part of the ROU, Canada further liberalized its phytosanitary regulations by making three U.S. States (Montana, Minnesota, and North Dakota) eligible for certificates of origin for 550,000 metric tons of wheat, oats, and barley transshipped on Canadian rail either back to the United States or abroad.[99] The Canadian Government permitted 29 licensed primary grain elevators in Western Canada to handle U.S. wheat purchased directly from U.S. farmers. On April 1, 1999, Canada eliminated testing for the presence of karnal bunt in each individual export shipment of U.S. wheat from the 14 states free of that plant disease.

U.S. Exports

Principal markets and export levels

During 1995-99, foreign markets purchased 35 percent of the value of U.S. production of grain (table A-28). U.S. grain exports fell by 31 percent from $15 billion to $10 billion in the period. In 1999, the composition of U.S. exports of grain consisted almost solely of corn (49 percent by value), wheat (35 percent), rice (9 percent), and sorghum (5 percent) (table A-34). Barley and the combined specialty grains together provided less than two percent of the value of 1999 U.S. grain exports. Corn is even more important in terms of export volume: U.S. corn supplied 58 percent of the 90 MMT of U.S. grain exports in 1999; wheat 32 percent; sorghum 6 percent; and rice 3 percent (table A-31).

The importance of foreign markets to domestic grain varies by type: for wheat, 46 percent of the volume of U.S. wheat production during 1995/96 to 1999/00 was exported (table A-13). Exports accounted for 21 percent of U.S. corn production during the 5 years, whereas 45 percent of U.S. rice and 34 percent of sorghum production was exported (tables A-19, A-24, and A-22). For the specialty grains, relatively little oats and barley were exported (1 and 13 percent of U.S. production tables A-21 and A-23), as contrasted to almost one-quarter of U.S. popcorn output during 1995-99 being exported (table A-20). Buckwheat exports represented about 44 percent of U.S. production in 1997 (tables A-3 and A-31).

Corn

U.S. corn exports peaked in 1996 at $8.5 billion, and then declined to about $5.0 billion in 1999 (table A-34). On a volume basis, U.S. corn exports during 1995-99 peaked in 1995 at 60 million metric tons (MMT), and then declined to 41MMT during 1997-98, before recovering to 52 MMT in 1999 (table A-37). The top five markets, Japan, Korea, Mexico, Taiwan, and Egypt purchased about two-thirds of average U.S. corn exports during 1995-99

[99] USDA, FAS, *Canada's Progress Report: ROU on Agricultural Trade, 1999*, U.S. Embassy, Ottawa, Dec. 14, 1999.

(table A-37). Mexico was the only major market to increase its purchases of U.S. corn during the 5 years, whereas most of the other top markets decreased their purchases.

U.S. corn exports to Korea fell by $0.7 billion from $1.3 billion in 1996 to $0.6 billion in 1999, while corn exports to Taiwan fell by $0.5 billion during that same time. U.S. corn exports to the EU plummeted from $435 million to $19 million during 1995-99 owing in part to GMO corn barriers, and to weaker EU feed markets.

Another weak market for U.S. corn during this period was China where U.S. exports dropped from $629 million in 1995 to about $16 million in 1999, a drop of over $600 million (table A-37). A sharp policy reversal in Chinese trade policy shifted China from being a net importer of corn to being a substantial net corn exporter during this period.

Wheat

A similar trend for U.S. wheat exports occurred as exports peaked in 1996 at $6.3 billion, and then steadily declined to $3.6 billion in 1999 (table A-38); the volume of U.S. wheat exports fell from 32 MMT in 1995 to 28 MMT in 1999. The five leading markets for U.S. wheat were Egypt, Japan, the Philippines, Mexico, and Korea, which together purchased 41 percent the value of U.S. wheat exports during 1995-99. Each of the five leading markets except Mexico purchased less U.S. wheat each year between 1995 and 1999. Similar to corn, China's purchases of U.S. wheat slipped from $500 million in 1995 to less than $33 million in 1999 (table A-38) as Chinese imports of wheat from all countries plummeted. Meanwhile, U.S. wheat exports to the EU more than doubled from 0.6 MMT to 1.4 MMT during 1995-99, making the EU the sixth leading U.S. wheat market in 1999.

Rice

U.S. rice exports averaged about $1 billion annually during 1995-99, and peaked at $1.2 billion in 1998 because of a jump in sales of U.S. rough (unmilled) rice to drought-impacted Latin American rice producing countries (table A-39). With the return to more normal growing conditions in those rice producing countries, 1999 U.S. exports of rice, at $944 million, in 1999 were slightly below the 1995 level. On a volume basis, the trend was similar, with annual U.S. rice exports increasing from 3.3 MMT in 1994 to 3.7 MMT in 1998, and then falling back in 1999 to about 2.9 MMT (table A-39). U.S. rice exporters briefly enjoyed a surge in sales because the United States exports rough or unprocessed rice, unlike the principal exporter, Thailand, which exports processed rice. Rice-producing countries facing a shortfall often import rough rice to keep their rice mills operating.

The EU, Japan, Mexico, Canada, and Haiti were the leading markets for U.S. rice during 1995-99, accounting for 44 percent of the value of U.S. rice exports. Japan's opening of its rice markets under the WTO provided substantially more market opportunities as U.S. rice exports rose almost four-fold by $113 million in 1995-99. The second-leading market the EU purchased $123 million in 1999, a rise of 26 percent from 1995 (table A-39).

Sorghum

Sorghum exports followed the pattern of corn, the leading feedgrain, peaking in 1996 at $739 million, and declining to $539 million in 1999 (table A-40). Mexico and Japan were the two leading markets that together purchased 84 percent of total U.S. sorghum exports during the period 1995-99. The EU and Israel were the only other markets of note for sorghum during 1995-99.

About 44 percent of the U.S. buckwheat crop was exported in 1997. About two-thirds of average U.S. exports went to Japan during 1995-99. U.S. buckwheat exports declined from $6 million to $3 million during the period as a recessionary Japanese economy and strong competition from lower priced Chinese exports weakened Japanese demand for U.S. buckwheat exports.[100]

Foreign trade measures

Since the United States is the world's leading grain exporter, foreign trade measures affecting third-country markets as well as trade practices of competing grain exporters have been important to the U.S. grain industry. U.S. grain exports during 1995-99 went to many countries; Japan, Mexico, Korea, Egypt, and Taiwan were the five leading markets for U.S. grain, having purchased on average about one-half (53 percent) of annual U.S. exports of $13 billion during 1995-99 (table A-30). Other leading grain markets were the Philippines, Colombia, Russia, Canada, and Saudi Arabia.

Foreign trade-related measures of competing grain exporters, particularly the EU, Canada, China, and Australia, have adversely affected U.S. grain exports. These measures include export credit, food aid, and state-trading enterprises (STEs). Agricultural and other commodity export credit is covered under the Organization for Economic Cooperation and Development Treaty (OECD) of which the United States and other leading developed countries are members. In 1997, the OECD Arrangement on Guidelines for Officially Supported Export Credits placed limitations on the terms and conditions of government export credit financing, including agriculture.[101] At the present time, government agricultural export credit is identified as a form of subsidy by the WTO, but not subject to WTO disciplines.[102] The EU did propose in December 1999 that the WTO disciplines be extended to cover such credit.[103]

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[100] "The World Buckwheat Market," *Northeast Buckwheat Growers Newsletter*, No. 7, June 1999, fount at http://www.nysaes.cornell.edu/hort, retrieved Mar. 2, 2000.

[101] USTR, "Export Credits," *2000 Trade Policy Agenda and 1999 Annual Report of the President of the United States on the Trade Agreements Program*, vol. 3, p.161, found at www.ustr.gov/reports/tpa/2000/index.html, retrieved Apr. 18, 2000.

[102] Jonathan Coleman, "Agriculture in the WTO: The Seattle Ministerial and Beyond," *Industry Trade and Technology Review*, Office of Industries, USITC, publicaton 3293, Mar. 2000, p. 29.

[103] Ian Elliott, "U.S. Leader Wants No Link in Export Subsidies, Credits," *Feedstuffs*, Feb. 21, 2000, p. 21.

Given the key importance of grain to food security, most grain producing countries provide substantial tariff protection and direct support for their domestic grain producers. In some cases, countries produce only one major type of grain (for example, rice, but not corn), and thus protect only that portion of the grains market. Japan provides heavy protection for its rice producers, but relies almost entirely on imports of corn and other coarse grains for animal feed.[104] Canada protects its wheat and barley producers, but imports all of its rice needs.[105]

Tariff rate quotas (TRQs)

Tariffs and tariff-rate quotas (TRQs) provide substantial protection for many grain markets of the world. TRQs to protect domestic grain producers in foreign countries are widely applied and permitted under the WTO, provided that the WTO has been notified of the TRQ and as long as the applied tariffs are at or below bound WTO tariff rates.[106] Among the leading grain markets or grain exporters using TRQs are Canada, the EU, Japan, Brazil, Mexico, and South Korea.

WTO-member countries were required to provide minimum access to their markets under the Uruguay Round and to "tarifficate" grain quotas (that is replace the prior absolute quota or licensing requirement with a stated rate of duty). Countries must allow a specified quantity of grain imports to enter (the minimum access level) at a reduced Normal Trade Relations (NTR) duty rate, but may (and generally do) apply a prohibitively high rate of duty for imports above that quantity. Variable tariff rates, such as in the EU, Chile, and the Andean Pact countries (the latter two using their "price band system"), further protect domestic growers. In certain markets, licensing of grain imports (often related to TRQs, such as wheat imports into India) may restrict import access.

Foreign government farm support

Government farm support policy in the form of export subsidies, state trading enterprises (STEs), and domestic assistance programs for farmers are important trade measures that were explicitly covered under the Uruguay Round Agreements and under the WTO beginning in 1995.[107] Export subsidies have long been an issue in grain markets, although during 1995-97 (when world grain prices were quite high) significant use of grain subsidies was limited mostly to the EU, according to data filed with the WTO.[108]

Government policy and support, in the form of STEs, also play a significant role in grain trade internationally in both grain exporting and importing countries. The STEs that have important roles in world grain trade include Japan's Food Agency, the Canadian Wheat Board, the Food Corporation of India, the Australian Wheat Board, the Indonesia Logistics Agency (BULOG), and Korean STEs.[109]

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[104] World Trade Organization, *Trade Policy Review Japan 1998*, June 1998, pp. 96-100.

[105] FAS, USDA, *Grain and Feed Annual Report: Canada*, U.S. Embassy Ottawa, Report No. CA8019, Apr. 20, 1998, for example.

[106] USITC, *Potential Impact on the U.S. Economy and Industries of the GATT Uruguay Round Agreements*, Inv. No. 332-353, June 1994.

[107] Ibid., pp. II-73 to II-86.

[108] Export subsidy commitments from WTO, *The Results of the Urguay Round 1996* (CDROM), and export subsidy utilization found at http://www.wto.org/wto/online/ddf.htm.

The EU, the United States, Japan, Korea, Switzerland, and Brazil have the largest amount of support for grain producers in the world, according to data provided to the WTO.[109] The EU has had the most direct effect on world exports through its common agricultural policy (CAP) that includes direct income payments to farmers, intervention (support) prices for grain, set-aside payments for farmland, and export subsidies to move EU grain into world markets (since typically, internal EU prices are higher than world prices), according to data provided to the WTO.

In July 1995, the United States filed a complaint under the WTO on the EU's implementation of its market access concessions on grain. In July 1996, USTR announced a Grains Agreement with the EU that eliminated the basis for the market access complaint by creating a European TRQ for malting barley.[110] As part of the compensation package to third-country rice-exporters (like the United States) in return for Austria, Finland, and Sweden joining the EU in 1998, the EU created in 1999 additional duty-free and reduced duty access for 39,000 metric tons of U.S. milled rice, 7,600 metric tons of U.S. brown rice, and 7,300 metric tons of U.S. broken rice.[111]

In 1999, the EU changed its CAP under its "Agenda 2000" and reduced intervention prices, but increasing direct income payments to grain farmers. By 2002, the EU payments and support should total the equivalent of $180 per ton of wheat, as compared to the $119 per ton of support in the United States, according to USDA.[112]

Japan also provides high support for its rice, wheat and barley farmers and significant import protection, according to WTO data.[113] According to the WTO, unlike the EU and the United States, Japan has implemented only minor changes in its support for agriculture over the past two decades, having primarily altered the set aside rate for the amount of planted acreage, in order to control a chronic oversupply of rice. Although Japan provided minimum import access to its domestic rice market under the WTO, imports have contributed little to increases in domestic rice consumption and represent only a fraction of Japanese rice production and large stocks.[114]

Other foreign trade measures

There have been a series of bilateral disputes between the United States and Canada over trade measures affecting wheat, barley, and oats. Canada has used certain licensing and SPS measures to reduce U.S. access to the Canadian market. In 1997, Canada lifted its TRQs

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[109] Based on unpublished WTO notifications cited in USDA, ERS, *Agriculture in the WTO,* Dec. 1998, p. 18.

[110] USTR, "USTR Initiates 301 Investigation of European Union Subsidy Practices," press release 97-18, Mar. 10, 1997; and USDA, FAS, *EU Grain and Feed Annual 2000,* U.S. Mission, Brussels, Report No. e20035, Mar. 31, 2000, p. 12.

[111] USDA, ERS, *Rice Yearbook,* Dec. 2, 1999, p. 56.

[112] USDA, FAS, "EU's Grain Sector Could See Big Changes from Agenda 2000 Reforms," *Grain: World Markets and Trade,* Apr. 1999, pp. 7-9.

[113] WTO, *Trade Policy Review, Japan,* (Geneva: 1998), p. 222.

[114] FAS, USDA, *Japan Grain and Feed Annual Report,* Report No. JA9013, U.S. Embassy, Tokyo, Feb. 8, 1999, pp. 2-11.

affecting U.S. barley and barley-containing products.[115] As discussed earlier, under the 1998 ROU, Canada agreed to reduce licensing requirements and phytosanitary standards for U.S. wheat, barley and oats.[116] Under NAFTA, on January 1, 1998, Canada eliminated duties on qualifying U.S. grain exports to Canada.[117]

Sanitary and phytosanitary measures (SPS) play an important role in world grain trade, and virtually all countries conduct grain inspection for both milling and animal feed. The SPS measures are covered under the WTO agreement on the application of sanitary and phytosanitary measures which requires that these measures be based on scientific analysis and risk assessment, and that countries recognize equivalency, and specific regional disease areas within a particular country.[118] Major SPS disputes affecting U.S. grain exports (other those with Canada mentioned above) have been GMO corn to the EU, and the wheat fungus TCK (*Tilletia Controversa Kuhn*) as it affects U.S. wheat exports to Brazil and China.[119]

FOREIGN INDUSTRY PROFILE

Foreign Market Profile

Most grain is consumed and grown within the same region or country; in 1999/00, world grain trade accounted for about 14 percent of world grain consumption.[120] However, many countries depend on grain imports for a sizable proportion of their domestic consumption or for supply in those years of domestic crop failure. This market analysis concentrates on world imports (grain trade) rather than on total domestic markets for grain.[121]

Recent demand for grain imports has been driven largely by growth in per capita income in certain lower or middle-income countries of the world, particularly in the Pacific Rim, where grain demand as a derived input demand has been stimulated by a growing demand for meat and livestock products (requiring large feedgrain supplies). The very poor countries of the world (lesser developed developing countries (LDDCs)), such as in Sub-Saharan Africa, receive sizable amounts of food aid or assistance in the form of grain exports from the grain exporting countries, but such food aid from the developed countries in the form of

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[115] USTR, "USTR Charlene Barshefsky Announces Agreement With Canada on Barley TRQ," press release 97-83, Sept. 8, 1997.

[116] USTR, "USTR, USDA Announce Series of New Measures to Open Canadian Farm Markets," press release 98-107, Dec. 4, 1998; and FAS, USDA, *Canada's Progress Report: ROU on Agricultural Trade 1999*, Report No. CA9137, U.S. Embassy, Ottawa, Dec. 14, 1999.

[117] *North American Free Trade Agreement, Annex 302.2, Schedule of Canada*.

[118] See USITC, *Potential Impact on the U.S. Economy and Industries of the GATT Uruguay Round Agreements*, USITC publication 2790, June 1994, p. II-14.

[119] USDA, FAS, *Grain: World Markets and Trade*, Dec. 1998, p. 9.

[120] In 1999/00, world grain trade (exports) of 260 MMT represented about 14 percent of world total use of 1,858 MMT, according to USDA data, W*orld Agricultural Supply and Demand Estimates*, Dec. 1999.

[121] India for example has a very large domestic market for wheat and grain that has been virtually cut off from imports. Although a potentially large market for imports, India has imported little over the past two decades.

concessional grain has been sharply reduced since the 1980s,[122] and has been replaced in part by commercial sales.

World grain markets

During 1995/96 to 1999/00, overall world grain trade rose 9 percent to 264 MMT in 1999/00, as did world grain production, to 1,865 MMT (table A-27).[123] Continuing expansion of the world population and rising per capita incomes supporting consumer demand for meat, eggs, and poultry buttressed world demand for the rising grain production. Falling prices and expanding stocks aided rising world trade.

Wheat

In volume of world grain imports, wheat is the leading grain traded. World imports of wheat averaged about 100 MMT annually during 1995/96 to 1999/00, but trade was extremely dispersed, with the six leading importing countries purchasing only about one-third of the total (table A-41). Egypt, Brazil, Iran, Japan, Algeria, and South Korea were the largest markets for wheat during these 5 years. Egypt relies extensively on food-aid wheat from the United States as do a number of smaller LDDC markets.[124]

Corn and feedgrain

During 1995/96 to 1999/00, world corn imports averaged about 67 MMT annually with the six leading markets purchasing over one-third of this amount (table A-42). Japan is by far the leading corn market, followed by South Korea, Mexico, Egypt and Taiwan. The EU, despite being a sizable exporter of coarse grain (barley), imports corn. Barley imports averaged about 16 MMT annually during 1995/96 to 1999/00, going principally to Saudi Arabia, China, and Japan (table A-43). Total world coarse grain imports (corn, barley, oats, sorghum, and rye) averaged about 92 MMT annually during the 5 years, with Japan again the leading market (table A-44).

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[122] For example, total world grain food aid declined from 11 MMT in 1989/90 to 8 MMT in 1995/96, according to USDA. USDA, ERS, *Food Aid Needs Assessment*, Nov. 1996., p. 11.

[123] USDA, WASDE, Ibid., various issues.

[124] For a description of concessional grain exports, see ERS, USDA, *Food AID Needs Assessment Situation and Outlook Series*, Dec. 1999.

Rice

World rice imports averaged about 23 MMT annually (milled rice basis) during 1995/96 to 1999/00 (table A-45). As with wheat imports, trade is scattered among many countries of the world, most of which are also sizable rice producers that import sporadically. The largest rice markets during this period were Indonesia, Bangladesh, Brazil, the Philippines, Iran, Saudi Arabia, and Nigeria, together purchasing about 41 percent of the average 23 MMT imported annually.

Major World Producers

The United States accounted for about 21 percent of total world grain production during crop-years 1995/96 to 1999/00, and 40 percent of world exports, based on USDA data.[125] A large number of countries are essentially self-sufficient in grain (except in isolated years of drought), but do not have significant marketable excess supplies to trade.

World Producers' Involvement in Export Markets

With regard to wheat and coarse grains, the dominant exporters are the United States, Canada, the EU, Australia, Argentina, and more recently China. Significant, consistent rice exporters are limited to Thailand, Vietnam, the United States, China, India, and Pakistan, although many rice producers will export in years of exceptionally high output.

World exports of wheat, the leading traded grain, averaged about 102 MMT annually during 1995/96-1999/00, and the 5 leading exporters supplied 85 percent of total exports during the period (table A-46). The five leading suppliers were the United States, with a 29-percent share, Canada with 17 percent, Australia with 15 percent, the EU with 15 percent, and Argentina with 8 percent. Annual world average wheat exports remained relatively steady at about 102 MMT, but the U.S. share of wheat exports fluctuated between 26 and 34 percent of the total during the 5 years.

During the same period, world corn exports averaged about 67 MMT annually, with the United States, Argentina, and China supplying 92 percent of the total (table A-47). The EU, Australia, and Canada dominate export sales of the other leading feedgrain, barley, with more than three-quarters of total exports of barley between 1995/96 and 1999/00 (table A-48). Total world coarse grain imports (including corn, barley, oats, sorghum, and rye) averaged 92 MMT annually during the period, with the U.S. share at 58 percent (table A-49).

[125] Average annual world production of grain was 1,558 MMT and annual exports 215 MMT, with U.S. production averaging 325 MMT and U.S. exports 86 MMT. USDA, FAS, *Grain: World Markets and Trade*, Nov. 1999, p. 3.

World rice exports averaged 23 MMT annually (milled rice basis) between 1995/96 and 1999/00, with Thailand, Vietnam, the United States, and India being the four leaders, having together 67 percent of total exports (table A-50). World rice exports rose sharply in 1998, a year with adverse growing conditions (El Nino) occurring in many rice-producing countries. These countries generally do not import rice, except in years of crop shortages.

APPENDIX A
STATISTICAL TABLES

Table A-1
Grain: U.S. production of and price received for the leading U.S. grain crops, by type, crop-years 1995-99

Crop year beginning	Wheat	Corn	Sorghum	Rice	Oats	Barley	Total
		Million bushels		*Million cwt*	*Million bushels*		*Million metric tons*
1995	2,183	7,374	460	174	162	360	275.1
1996	2,277	9,233	795	172	155	392	333.2
1997	2,482	9,207	634	183	167	360	333.7
1998	2,547	9,761	520	188	166	352	347.0
1999[1]	2,302	9,537	596	211	146	282	332.7
			Value (*million dollars*)				
1995	9,933	23,892	1,470	1,592	270	1,040	38,190
1996	9,791	25,021	1,860	1,713	300	1,070	39,750
1997	8,389	22,373	1,401	1,775	270	860	35,070
1998	6,750	19,034	884	1,660	180	700	29,200
1999	5,870	17,200	920	1,270	160	580	26,000
			Price received by farmers (*dollars*)				
		Per bushel		*Per cwt*	*Per bushel*		*Per metric ton*
1995	$4.55	$3.24	$3.19	$9.15	$1.67	$2.89	$136
1996	4.30	2.71	2.34	9.96	1.96	2.74	117
1997	3.38	2.43	2.21	9.70	1.60	2.38	103
1998	2.65	1.95	1.70	8.83	1.10	1.98	83
1999	2.55	1.80	1.55	6.00	1.10	2.05	78

[1] Forecast Feb. 2000.

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

Table A-2
Grain: Operating characteristics of leading U.S. grain farms, by type of grain, 1997

Crop	Number of farms	Harvested acreage	Production	Percentage of production accounted for by farms each with harvested acreage of:				
	1,000	*1,000 acres*		*Under 250 acres*	*250-500 acres*	*500-1,000 acres*	*Over 1,000 acres*	*Total*
Wheat (*million bu*shels)	244	58,836	2,204	24	18	24	34	100
Corn for grain or seed (*million bushels*)	431	69,797	8,579	33	27	25	15	100
Sorghum (*million bushels*)	49	8,470	559	40	25	19	15	100
Barley (*million bushels*)	42	5,945	336	38	25	22	15	100
Oats (*million bushels*)	90	2,681	151	89	7	3	1	100
Rice (*million cwt*)	9	3,122	182	19	31	30	20	100
Popcorn (*pounds, shelled*)	2	337	996	47	25	27	([1])	100
Total	867	[2]149,188	([3])	([3])	([3])	([3])	([3])	([3])

[1] Less than 1 percent.
[2] The number of farms are double counted.
[3] Not applicable.

Note.—A bushel contains 60 pounds of wheat, 56 pounds of shelled corn, 56 pounds of sorghum, 48 pounds of barley, and 32 pounds of oats.

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

Table A-3
Specialty grain: U.S. acreage harvested, number of farms, yield, and production, 1992 and 1997

Item/unit of measure	Harvested acreage		Number of farms		Yield		Production	
	1992	1997	1992	1997	1992	1997	1992	1997
	— *1,000 acres* —		—— *Number* ——		*Units/acre*		– *1,000 units* –	
Buckwheat (bushels) . . .	65	25	1,030	450	4	3	900	733
Emmer and spelt (bushels)	9	5	620	400	61	51	543	285
Popcorn (pounds shelled)	321	337	3,260	2,340	3,470	2,955	1,114,000	996,000
Proso millet (bushels) . .	240	354	1,870	1,840	4	6	6,619	10,560
Rye (bushels)	336	268	9,830	6,330	16	12	9,286	6,501
Triticale (bushels)	22	17	400	200	5	6	639	508
Wild rice (pounds)	34	29	90	80	34	29	23	17
Total	1,027	1,035	17,100	11,640	([1])	([1])	([1])	([1])

[1] Not meaningful.

Note.—Totals may vary because of rounding. A bushel contains 48 pounds of buckwheat, 40 pounds of emmer and spelt, 50 pounds of proso millet, and 56 pounds of triticale.

Source: USDA, *1997 Census of Agriculture*, vol. 1, part 51, table 26.

Table A-4
Grain: Harvested acreage, and yield of the leading U.S. crops, by type, crop-years, 1995-99

Type	1995	1996	1997	1998	1999
	Harvested acreage (*million acres)*				
Wheat	60.9	62.9	62.8	59.0	53.9
Corn	65.2	72.6	72.7	72.6	70.9
Sorghum	8.3	11.8	9.2	7.7	8.5
Rice	3.1	2.8	3.1	3.3	3.6
Oats	3.0	2.7	2.8	2.8	2.5
Barley	6.1	6.4	6.2	5.9	4.8
Total	146.1	160.2	156.8	151.3	143.8
	Yield *(per acre)*				
Wheat (bushels)	35.8	36.3	39.5	43.2	42.7
Corn (ditto)	128.6	122.2	126.6	133.9	133.1
Sorghum (ditto)	55.6	67.5	69.2	67.3	69.7
Rice (pounds)	5,621.0	6,121.0	5,897.0	5,669.0	5,908.0
Oats (bushels)	54.7	57.8	59.5	60.2	60.0
Barley (ditto)	57.3	58.5	58.1	60.0	59.5

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Feb. 2000.

Table A-5
Corn: U.S. corn for grain, harvested acreage, yield, and production, by 12 leading States, crop years 1995/96 to 1999/00

State	1995/96	1996/97	1997/98	1998/99	1999/00
	Area harvested (million acres)				
Iowa	11.4	12.4	11.9	12.2	11.8
Illinois	10.0	10.8	11.0	10.4	10.6
Nebraska	7.7	8.3	8.6	8.6	8.3
Minnesota	6.2	7.0	6.4	6.8	6.6
Indiana	5.3	5.6	5.8	5.6	5.7
Wisconsin	3.0	3.2	3.0	3.0	2.9
Kansas	2.0	2.4	2.6	2.9	3.0
Ohio	3.1	2.8	3.6	3.3	3.2
South Dakota	2.5	3.7	3.4	3.6	3.2
Missouri	1.5	2.6	2.6	2.5	2.6
Texas	1.9	1.8	1.8	1.8	1.8
Michigan	2.2	2.4	2.2	2.0	2.0
All other	8.3	9.6	9.8	9.9	9.2
Total	65.2	72.6	72.7	72.6	70.9
	Yield (*bushels per acre*)				
Iowa	123.0	135.0	138.0	145.0	149.0
Illinois	113.0	135.0	129.0	141.0	140.0
Nebraska	110.9	142.1	132.0	145.0	139.0
Minnesota	118.0	117.0	132.0	153.0	150.0
Indiana	112.8	116.8	122.0	137.0	132.0
Wisconsin	115.9	107.0	132.0	137.0	143.0
Kansas	122.1	142.0	143.0	147.0	141.0
Ohio	121.0	106.0	134.0	141.0	126.0
South Dakota	77.4	88.8	96.0	121.0	113.0
Missouri	99.9	128.0	115.0	114.0	97.0
Texas	114.0	95.0	138.0	100.0	129.0
Michigan	113.4	92.0	117.0	111.0	130.0
All other	106.0	111.6	115.0	107.0	110.0
Average	113.5	127.1	126.7	134.4	134.5
	Production (*million bushels*)				
Iowa	1,402.2	1,674.0	1,642.2	1,769.0	1,758.2
Illinois	1,130.0	1,458.0	1,425.4	1,473.4	1,491.0
Nebraska	854.0	1,179.8	1,135.2	1,239.8	1,153.7
Minnesota	731.9	819.0	851.4	1,032.8	990.0
Indiana	598.0	654.0	701.5	760.4	748.4
Wisconsin	347.7	342.4	402.6	404.2	407.6
Kansas	244.3	340.8	371.8	419.0	420.2
Ohio	375.1	297.0	475.7	470.9	403.2
South Dakota	193.6	328.5	326.4	429.6	367.2
Missouri	149.9	332.8	299.9	285.0	247.4
Texas	216.6	171.0	241.5	185.0	228.3
Michigan	249.6	220.9	255.1	227.6	253.5
All other	907.2	1,414.4	1,078.3	1,064.3	1,068.6
Total	7,400.1	9,232.6	9,207.0	9,761.0	9,537.3

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Jan. 2000.

Table A-6
Wheat: U.S. wheat harvested acreage, yield, and production, by 11 leading States, crop-years, 1995/99 to 1990/00

State	1995/96	1996/97	1997/98	1998/99	1999/00
	Area harvested (*million acres*)				
Kansas	11.0	8.8	10.9	10.1	9.2
North Dakota	11.1	12.5	11.1	9.6	8.7
Montana	5.4	6.4	5.8	5.3	5.3
Oklahoma	5.2	4.9	5.3	5.1	4.3
Washington	2.6	2.7	2.6	2.6	2.3
Texas	2.8	2.9	4.1	3.9	3.4
Colorado	2.7	2.3	2.8	2.6	2.5
Idaho	1.3	1.6	1.4	1.3	1.4
Nebraska	2.1	2.1	1.9	1.8	1.8
Minnesota	2.2	2.5	2.4	2.0	2.0
Missouri	1.2	1.3	1.1	1.2	0.9
All other	13.2	14.9	13.4	13.5	12.1
Total	60.9	62.9	62.8	59.0	53.6
	Yield (*bushels per acre*)				
Kansas	26.0	29.0	46.0	49.0	46.0
North Dakota	27.0	31.6	24.3	32.0	28.0
Montana	36.3	27.3	31.1	32.0	29.0
Oklahoma	21.0	19.0	32.0	39.0	35.0
Washington	59.3	66.5	64.0	61.4	54.2
Texas	27.0	26.0	29.0	35.0	36.0
Colorado	39.0	32.8	32.8	39.6	43.8
Idaho	79.5	74.5	79.6	80.0	77.4
Nebraska	41.0	35.0	37.0	46.0	48.0
Minnesota	32.6	42.6	32.0	40.6	39.8
Missouri	40.0	37.5	54.0	46.0	48.0
All other	49.0	46.0	43.9	48.6	55.1
Average	35.8	36.3	39.5	43.2	42.7
	Production (*million bushels*)				
Kansas	286.0	255.2	501.4	494.9	423.2
North Dakota	300.3	395.1	269.3	307.7	242.1
Montana	195.8	175.0	181.5	168.8	154.3
Oklahoma	109.2	93.1	169.6	198.9	150.5
Washington	153.8	182.7	165.1	157.4	124.1
Texas	75.6	75.4	118.9	136.5	122.4
Colorado	105.3	75.5	90.1	103.7	104.4
Idaho	103.3	119.2	113.8	102.4	104.5
Nebraska	86.1	73.5	70.3	82.8	86.4
Minnesota	71.8	106.6	77.3	80.4	79.2
Missouri	48.0	48.8	58.3	57.5	44.2
All other	647.4	676.9	588.7	656.3	667.1
Total	2,182.6	2,277.4	2,481.6	2,547.3	2,302.4

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Jan. 2000.

Table A-7
Rice: U.S. rice harvested acreage, yield, and production, by 6 leading States, crop-years 1995/96 to 1999/00

State	1995/96	1996/97	1997/98	1998/99	1999/00
	Area harvested (*million acres*)				
Arkansas	1.3	1.2	1.4	1.5	1.6
California	0.5	0.5	0.5	0.5	0.5
Louisiana	0.6	0.5	0.6	0.6	0.6
Mississippi	0.3	0.2	0.2	0.3	0.3
Texas	0.3	0.3	0.3	0.3	0.3
Missouri	0.1	0.1	0.1	0.1	0.2
Total	3.1	2.8	3.1	3.3	3.6
	Yield (*pounds per acre*)				
Arkansas	5,450	6,150	5,700	5,800	5,900
California	7,600	7,490	8,250	6,840	7,260
Louisiana	4,600	4,870	4,630	4,530	5,000
Mississippi	5,400	6,000	5,800	5,800	5,650
Texas	5,600	6,200	5,500	5,600	6,000
Missouri	5,300	5,550	5,300	5,200	5,400
Average	5,621	6,121	5,897	5,669	5,929
	Production (*million cwt*)				
Arkansas	73.0	71.9	79.2	88.4	97.0
California	35.4	37.5	42.5	32.7	38.9
Louisiana	26.2	26.0	27.0	28.1	30.8
Mississippi	15.6	12.5	13.8	15.5	18.2
Texas	17.8	18.5	14.2	15.8	15.6
Missouri	6.0	5.0	6.2	7.4	9.9
Total	174.0	171.3	183.0	188.1	211.0

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Feb. 2000.

Table A-8
Sorghum: U.S. grain sorghum harvested acreage, yield, and production, by 10 leading States, crop-years 1995/96 to 1999/00

State	1995/96	1996/97	1997/98	1998/99	1999/00
	Area harvested (*million acres*)				
Kansas	3.1	4.6	3.5	3.3	3.4
Texas	2.4	3.9	3.2	2.3	3.0
Nebraska	0.9	1.0	0.7	0.6	0.5
Missouri	0.5	0.7	0.4	0.3	0.3
Louisiana	([1])	([1])	([1])	0.1	0.2
Oklahoma	0.3	0.4	0.4	0.3	0.4
Colorado	0.2	0.2	0.1	0.2	0.2
Arkansas	0.2	0.2	0.2	0.1	0.1
Illinois	0.1	0.2	0.2	0.1	0.1
South Dakota	0.1	0.2	0.1	0.1	0.1
All other	0.1	0.2	0.2	0.3	0.2
Total	8.3	11.8	9.2	7.7	8.5
	Yield (*bushels per acre*)				
Kansas	56.0	76.0	78.0	80.0	76.0
Texas	54.0	49.0	59.0	46.0	63.0
Nebraska	63.1	90.0	81.0	94.0	91.0
Missouri	71.6	85.4	92.0	83.0	71.0
Louisiana	70.0	76.0	75.0	60.0	82.0
Oklahoma	42.7	62.5	50.0	45.0	45.0
Colorado	23.0	42.0	40.0	57.0	42.0
Arkansas	65.5	79.5	74.5	53.0	78.0
Illinois	117.0	85.0	91.0	74.0	95.0
South Dakota	48.0	44.0	71.0	71.0	58.0
All other	([2])	([2])	([2])	([2])	([2])
Average	55.6	67.3	69.2	67.3	70.1
	Production (*million bushels*)				
Kansas	173.6	349.6	265.2	264.0	258.4
Texas	129.6	191.1	185.8	105.8	185.8
Nebraska	56.8	90.0	60.8	56.4	42.8
Missouri	35.8	59.8	36.8	26.6	22.0
Louisiana	5.9	12.0	6.6	7.5	19.3
Oklahoma	12.8	25.0	22.5	15.3	18.0
Colorado	4.6	8.4	6.0	10.5	8.6
Arkansas	13.1	15.9	11.1	6.9	9.8
Illinois	11.7	17.0	10.5	7.9	9.2
South Dakota	4.8	8.8	11.4	9.9	4.6
All other	11.7	19.2	16.8	9.1	16.7
Total	458.6	795.3	633.5	519.9	596.0

[1] Less than 50,000 acres.
[2] Not available.

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Feb. 2000.

Table A-9
Oats: U.S. oats harvested acreage, yield, and production, by 10 leading States, crop-years 1995/96 to 1999/00

State	1995/96	1996/97	1997/98	1998/99	1999/00
	Area harvested (*million acres*)				
North Dakota	0.5	0.4	0.4	0.4	0.3
Minnesota	0.4	0.3	0.3	0.3	0.3
Wisconsin	0.3	0.3	0.3	0.3	0.3
South Dakota	0.3	0.4	0.3	0.3	0.2
Iowa	0.2	0.2	0.2	0.2	0.2
Pennsylvania	0.2	0.2	0.2	0.2	0.1
Ohio	0.1	0.1	0.1	0.1	0.1
Michigan	0.1	0.1	0.1	0.1	0.1
Texas	0.1	0.1	0.1	0.1	0.1
Nebraska	0.1	0.1	0.1	0.1	0.1
All other	0.7	0.5	0.7	0.7	0.7
Total	3.0	2.7	2.8	2.8	2.5
	Yield (*bushels per acre*)				
North Dakota	48.0	50.0	44.0	60.0	51.0
Minnesota	45.0	50.3	58.0	63.0	59.0
Wisconsin	62.3	58.0	63.0	61.0	62.0
South Dakota	38.3	54.0	55.0	67.0	64.0
Iowa	65.0	68.0	73.0	59.0	65.0
Pennsylvania	59.0	56.0	58.0	53.0	55.0
Ohio	69.0	57.0	74.0	65.0	70.0
Michigan	57.0	60.0	61.0	48.0	65.0
Texas	42.0	34.0	52.0	53.0	44.0
Nebraska	50.0	71.0	65.0	56.0	62.0
All other	67.0	84.0	66.0	57.0	57.0
Average	54.6	57.7	59.5	60.2	59.7
	Production (*million bushels*)				
North Dakota	21.6	19.0	18.7	25.2	16.8
Minnesota	18.0	15.1	17.4	19.5	17.7
Wisconsin	18.7	17.4	20.2	18.3	18.6
South Dakota	11.5	21.6	14.8	20.1	12.8
Iowa	14.6	12.9	16.8	10.9	11.3
Pennsylvania	9.4	7.6	9.0	8.5	8.0
Ohio	6.9	5.1	6.7	6.5	7.0
Michigan	5.1	3.6	4.9	4.8	4.9
Texas	5.0	3.4	6.8	6.9	4.8
Nebraska	4.5	7.4	5.8	5.3	4.7
All other	46.7	42.2	45.9	40.0	39.6
Total	161.1	153.2	167.2	166.0	146.2

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Feb. 2000.

Table A-10
Barley: U.S. barley harvested acreage, yield, and production, by 9 leading States, crop-years 1995/96 to 1999/00

State	1995/96	1996/97	1997/98	1998/99	1999/00
	Area harvested (*million acres*)				
North Dakota	2.3	2.6	2.2	1.9	1.2
Montana	1.2	1.2	1.2	1.2	1.2
Idaho	0.8	0.7	0.8	0.8	0.7
Washington	0.3	0.4	0.5	0.5	0.5
Minnesota	0.6	0.5	0.5	0.4	0.2
Colorado	0.1	0.1	0.1	0.1	0.1
Oregon	([1])	0.1	0.1	0.1	0.1
California	0.2	0.2	0.1	0.1	0.1
Wyoming	0.1	0.1	0.1	0.1	0.1
All other	0.5	0.5	0.6	0.7	0.5
Total	6.3	6.7	6.2	5.9	4.8
	Yield (*bushels per acre*)				
North Dakota	45.0	55.0	45.0	55.0	48.0
Montana	52.0	43.0	53.0	48.0	50.0
Idaho	80.0	73.0	79.0	78.0	78.0
Washington	72.0	62.0	74.0	65.0	59.0
Minnesota	50.0	64.0	51.0	55.0	47.0
Colorado	100.0	108.0	108.0	115.0	84.0
Oregon	76.0	64.0	69.0	62.0	51.0
California	70.0	60.0	57.0	60.0	64.0
Wyoming	89.0	86.0	80.0	84.0	86.0
All other	91.0	53.2	82.0	57.4	87.2
Average	57.2	58.5	58.1	60.0	59.2
	Production (*million bushels*)				
North Dakota	101.3	143.0	101.2	106.2	59.5
Montana	62.4	51.6	61.0	57.6	57.5
Idaho	60.8	53.3	59.2	59.3	53.8
Washington	20.9	27.3	35.5	33.8	28.9
Minnesota	29.0	33.3	23.5	22.8	8.5
Colorado	10.0	9.9	9.6	9.4	9.0
Oregon	7.2	9.6	8.0	8.1	6.9
California	14.0	12.0	8.6	7.5	8.0
Wyoming	8.5	10.3	8.4	7.1	7.3
All other	45.3	42.1	44.9	40.3	42.5
Total	359.4	392.4	359.9	352.1	281.9

[1] Less than 500,000 acres.

Source: Compiled from official statistics of the U.S. Department of Agriculture, as of Feb. 2000.

Table A-11
USDA support for crop farmers: Production flexibility contract payments under the 1996 FAIR Act, 1996-2000

Commodity	Commodity share of year 2000	1996	1997	1998	1999	2000
	Percentage	*Million dollars*				
1996 Farm Act gross contract payments:						
Wheat	26.26	1,463	1,414	1,523	1,471	1,347
Corn	46.22	2,574	2,489	2,681	2,590	2,371
Sorghum	5.11	285	275	296	286	262
Barley	2.16	120	116	125	121	111
Oats	0.15	8	8	9	8	8
Upland cotton	11.63	648	626	675	652	597
Rice	8.47	472	456	491	475	435
Total payments, unadjusted	100	5,570	5,385	5,800	5,603	5,130
Adjusted contract payments, before payment limitations:[1]						
Wheat	26.21	1,976	1,426	1,534	1,483	1,347
Corn	46.13	1,771	3,434	2,695	2,603	2,371
Sorghum	5.10	206	347	298	288	262
Barley	2.16	140	117	126	122	111
Oats	0.16	9	8	9	9	8
Upland cotton	11.62	746	639	689	665	597
Rice[2]	8.62	472	461	498	480	443
Total adjusted payments	100.0	5,321	6,433	5,848	5,650	5,139
Projected contract payments after payment limitations and other adjustments:						
Wheat	26.34	1,941	1,397	1,497	1,462	1,328
Corn	46.51	1,745	3,384	2,633	2,574	2,345
Sorghum	5.08	201	338	287	282	256
Barley	2.14	137	113	120	118	108
Oats	0.16	9	8	9	8	8
Upland cotton	11.27	699	597	637	634	568
Rice	8.53	455	448	478	466	430
Total payments	100.0	5,186	6,286	5,661	5,544	5,042

[1] Adjusted for prior-year earned deficiency payments paid in these years, repayments of unearned 1995 deficiency payments, and repayments of prior-year PFC payments. These adjusted contract payments are used for payment rate calculations.

[2] 1996 Farm Act includes additional rice payments of $8.5 million annually, FY 1997 through FY 2002.

Note.—FY 1999 appropriations for agriculture provide $3.057 billion for market loss assistance, with $2.857 billion to be paid to farmers eligible for production flexibility payments in the previous year.

Source: USDA, Office of Chief Economist, *USDA Baseline Projections*, Feb. 1999, and Feb. 1997.

Table A-12
The FAIR Act of 1996: Loan rates and contract payment rates, by crop, crop-year 1995/96 to 1999/2000

Item	1995/96	1996/97	1997/98	1998/99	1999/00[1]
	Dollars per unit				
Marketing assistance loan rates:					
Corn	1.89	1.89	1.89	1.89	1.89
Sorghum	1.80	1.81	1.76	1.74	1.75
Barley	1.54	1.55	1.57	1.56	1.58
Oats	0.97	1.03	1.11	1.11	1.14
Wheat	2.58	2.58	2.58	2.58	2.58
Rice	6.50	6.50	6.50	6.50	6.50
	Dollars per unit[2]				
Production flexibility contract payment rates:					
Corn	0	0.25	0.49	0.38	0.36
Sorghum	0	.32	.54	.45	.44
Barley	0	.33	.28	.28	.27
Oats	0	.03	.03	.03	.03
Wheat	0	.87	.63	.66	.64
Rice	3.22	2.77	2.71	2.92	2.82

[1] Market loss assistance payment rates, to be paid in FY 1999 to farmers eligible for production flexibility payments in the previous year, are: wheat, $0.33; corn, $0.187; sorghum, $0.225; barley, $0.141; oats, $0.016; and rice, $1.45.

[2] In 1995/96, deficiency payments under the FACT Act of 1990.

Note.—Units for marketing assistance loan rates and production flexibility payment rates are dollars per bushel except for rice (per hundredweight).

Source: USDA, Office of the Chief Economist, *USDA Agricultural Baseline Projections to 2008*, Feb. 1999, table 5, and *Agricultural Baseline Projections to 2005, Reflecting the 1996 Farm Act*, Feb. 1997, tables 6-7.

Table A-13
Wheat: U.S. production, imports, exports, beginning stocks, and apparent consumption, crop-years 1995/96 to 1999/00

Year beginning June 1–	Production	Exports	Imports	Beginning stocks	Apparent consumption				Ratio of exports to production	Season average price received by farmers
					Food	Feed	Seed	Total		
	Quantity (*million bushels*)								*Percentage*	*Dollars per bushel*
1995/96	2,183	1,241	68	507	883	154	104	1,140	57	$4.55
1996/97	2,277	1,002	92	376	891	308	102	1,301	44	4.30
1997/98	2,482	1,040	95	443	914	250	92	1,257	42	3.38
1998/99	2,547	1,042	103	722	908	396	81	1,385	41	2.65
1999/00[1]	2,302	1,090	94	946	920	325	90	1,335	47	2.50

[1] Forecast, June 2000.

Note.—Imports and exports include flour and other products expressed in bushel equivalents. Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. "Feed" includes residual use.

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

Table A-14
Durum wheat: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption	Ratio of exports to production	Season average price received by farmers
	Quantity (*million bushels*)					*Percentage*	*Per bushel*
1995/96	26	102	39	19	82	38	$5.65
1996/97	25	116	38	24	96	33	4.45
1997/98	31	88	57	29	65	65	4.86
1998/99	26	138	40	34	103	29	3.11
1999/00[1]	55	99	40	32	84	41	2.70

[1] Forecast, Feb. 2000.

Note.—Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Imports and exports include flour and other products expressed in wheat equivalent.

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

Table A-15
Hard winter wheat: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption				Ratio of exports to production	Season average price received by farmers[1]
					Food	Seed	Feed/ residual	Total		
	Quantity (*million bushels*)								*Percentage*	*Per bushel*
1995/96	194	825	384	0	346	40	95	481	47	$4.80
1996/97	154	759	286	0	320	38	127	485	38	4.28
1997/98	143	1,098	362	1	379	36	158	573	33	3.20
1998/99	307	1,180	453	1	385	35	179	599	38	2.50
1999/00[2]	435	1,055	490	1	([3])	([3])	([3])	539	46	2.34

[1] Central and South Plains.
[2] Forecast, June 2000.
[3] Not available.

Note.—Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Imports and exports include flour and other products expressed in wheat equivalent.

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

Table A-16
Hard spring wheat: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption				Ratio of exports to production	Season average price received by farmers[1]
					Food	Feed/ residual	Seed	Total		
	Quantity (*million bushels*)								*Percentage*	*Per bushel*
1995/96	193	475	330	30	231	27	4	262	69	$4.63
1996/97	106	631	300	53	260	32	32	324	48	4.31
1997/98	166	491	240	57	225	24	5	254	49	3.53
1998/99	220	486	247	58	230	36	18	284	51	3.02
1999/00[2]	239	448	230	59	([3])	([3])	([3])	303	51	2.89

[1] Central and South Plains.
[2] Forecast, June 2000.
[3] Not available.

Note.—Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Imports and exports include flour and other products expressed in wheat equivalent.

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

Table A-17
Soft red wheat: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption				Ratio of exports to production	Season average price received by farmers[1]
					Food	Seed	Feed/ residual	Total		
	Quantity (*million bushels*)								*Percentage*	*Dollars per bushel*
1995/96	37	456	250	0	150	23	34	207	55	$4.36
1996/97	35	420	140	0	150	19	101	270	33	3.85
1997/98	45	472	180	0	155	20	82	257	38	3.11
1998/99	80	443	105	0	150	18	114	282	24	2.25
1999/00[2]	136	453	160	0	([3])	([3])	([3])	283	35	[4]2.13

[1] Corn Belt States.
[2] Forecast, June 2000.
[3] Not available.
[4] June-Feb. average.

Note.—Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Imports and exports include flour and other products expressed in wheat equivalent.

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

Table A-18
White wheat: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption				Ratio of exports to production	Season average price received by farmers[1]
					Food	Seed	Feed/ residual	Total		
	Quantity (*million bushels*)								*Percentage*	*Dollars per bushel*
1995/96	57	325	238	19	77	7	24	108	73	4.74
1996/97	55	352	237	15	85	7	34	126	67	4.26
1997/98	59	332	205	8	80	6	18	104	62	3.41
1998/99	90	301	198	10	75	6	35	116	66	2.60
1999/00[2]	87	247	160	6	([3])	([3])	([3])	96	65	[4]2.77

[1] Pacific Northwest States.
[2] Forecast, June 2000.
[3] Not available.
[4] June-Feb. average.

Note.—Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Imports and exports include flour and other products expressed in wheat equivalent.

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

Table A-19
Corn: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, and apparent consumption, crop-year 1995/96 to 1999/00

Year beginning Sept. 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption			Ratio of exports to production	Season average price received by farmers
					Feed	Food, alcohol and industrial	Total		
	Quantity (*million bushels*)							*Percentage*	*Dollars per bushel*
1995/96	1,558	7,400	2,228	16	4,713	1,608	6,320	30	$3.24
1996/97	426	9,233	1,797	13	5,297	1,692	6,991	20	2.71
1997/98	883	9,207	1,504	9	5,502	1,782	7,287	16	2.43
1998/99	1,308	9,759	1,981	19	5,491	1,822	7,318	20	1.94
1999/00[1]	1,787	9,437	1,900	15	5,670	1,880	7,580	20	1.80

[1] Forecast, Apr. 2000.

Note.—Apparent consumption is calculated as the sum of production, imports and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Feed use includes residual uses and seed.

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

Table A-20
Popcorn: U.S. production, exports of domestic merchandise, imports for consumption, apparent consumption, and price, 1995-99

Year	Production	Exports	Imports	Apparent consumption	Ratio of exports to production	U.S. export price[1]
	Million pounds				*Percentage*	*Cents per pound*
1995	1,043	290	([2])	753	28	22
1996	1,020	269	([2])	751	26	28
1997	996	212	15	799	21	35
1998	973	220	([2])	753	23	30
1999	949	206	([2])	743	22	29

[1] Export unit value, f.a.s., U.S. port of export.
[2] Less than 500,000 pounds.

Note.—Apparent consumption is calculated as the sum of production and imports less exports. Production during 1998-99 are Commission staff estimates.

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

Table A-21
Oats: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption				Ratio of imports to consumption	Season average price received by farmers
					Feed	Food, alcohol, industrial	Seed	Total		
	(*Million bushels*)								*Percentage*	*Dollars per bushel*
1995/96	101	161	2	81	195	67	12	274	29	1.67
1996/97	66	153	2	98	172	63	13	248	39	1.96
1997/98	67	167	2	98	185	59	13	256	38	1.60
1998/99	74	166	2	108	196	57	12	265	41	1.10
1999/00[1]	81	146	2	100	180	57	11	248	57	1.10

[1] Forecast, Apr. 2000.

Note.—Apparent consumption is calculated as the sum of production, imports, and beginning stocks for the period, less the sum of exports and beginning stocks of the following period. Feed includes residual uses.

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

Table A-22
Sorghum: U.S. production, imports of domestic merchandise, exports for consumption, beginning stocks, and apparent consumption, crop-year 1995/96 to 1999/00

Year beginning Sept. 1–	Production	Exports	Imports	Beginning stocks	Apparent consumption			Ratio of exports to production	Season average price received by farmers
					Feed	Food, alcohol, industrial	Total		
	Quantity (*million bushels*)							*Percentage*	*Dollars per bushel*
1995/96	459	198	0	72	295	17	314	43	3.19
1996/97	795	205	0	18	517	44	561	26	2.34
1997/98	634	212	0	48	366	54	420	33	2.21
1998/99	520	197	0	49	263	44	307	38	1.70
1999/00[1]	595	235	0	65	326	54	380	39	1.55

[1] Forecast, Apr. 2000.

Note.—Feed includes residual and seed use.

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

Table A-23
Barley: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and season average price, crop-year 1995/96 to 1999/00

Year beginning June 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption				Ratio of imports to consumption	Season average price received by farmers
					Feed and residual	Food, alcohol, and industrial	Seed	Total		
	(*Million bushels*)								*Percentage*	*Dollars per bushel*
1995/96	113	360	62	41	179	160	12	351	12	2.89
1996/97	100	392	31	37	217	161	11	389	10	2.74
1997/98	109	360	74	40	144	162	10	316	13	2.38
1998/99	119	352	28	30	161	161	9	331	9	1.98
1999/00[1]	142	282	30	25	125	162	10	297	8	2.05

[1] Forecast, Apr. 2000.

Note.—Apparent consumption is calculated as the sum of production, imports, and beginning stocks for the period, less the sum of exports and beginning stocks of the following period.

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

Table A-24
Rice: U.S. beginning stocks, production, imports, exports, and apparent consumption, crop-year 1995/96 to 1999/00

Year beginning Aug. 1–	Beginning stocks	Production	Imports	Exports			Apparent consumption				Ratio of exports to production	Season average price received by farmers
				Rough	Milled	Total	Food	Seed	Brewing	Total		
	Quantity (*million cwt*)										*Percentage*	*Dollars per cwt*
1995/96	31	174	7	11	72	83	78	4	16	106	48	9.15
1996/97	25	172	10	13	66	78	81	4	15	103	45	9.96
1997/98	27	183	9	26	62	88	84	4	16	105	48	9.70
1998/99	28	188	10	26	59	85	87	4	16	119	45	8.83
1999/00[1]	22	211	11	16	69	85	90	4	16	117	40	6.00

[1] Forecast, Feb. 2000.

Note.—Cwt of rough rice equivalent. Total consumption include unreported residual losses.

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

Table A-25
Long-grain rice: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption and price, crop-year 1995/96 to 1999/00

Year beginning Aug. 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption	Ratio of exports to production	Price, U.S. long-grain, Houston, exports
	Quantity (*million cwt*)					*Percentage*	*Dollars per metric ton*
1995/96	14	122	65	6	67	53	414
1996/97	10	114	56	9	62	49	450
1997/98	14	124	72	8	60	58	415
1998/99	14	142	71	9	80	49	369
1999/00[1]	14	154	70	10	77	45	302

[1] Forecast, Feb. 2000.

Note.—Consumption includes unreported loss and residual use. One metric ton equals 22.046 cwt.

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

Table A-26
Medium and short-grain rice: U.S. beginning stocks, production, exports of domestic merchandise, imports for consumption, apparent consumption, and price, crop-year 1995/96 to 1999/00

Year beginning Aug. 1–	Beginning stocks	Production	Exports	Imports	Apparent consumption	Ratio of exports to production	Price, U.S. medium-grade, California
	(*Million cwt*)					*Percentage*	*Dollars per metric ton*
1995/96	16	52	18	1	37	35	445
1996/97	14	58	22	1	39	38	415
1997/98	12	58	16	1	44	28	396
1998/99	12	46	15	2	39	33	470
1999/00[1]	7	56	16	1	40	29	465

[1] Forecast, Feb. 2000.

Note.—Consumption includes unreported loss and residual use.

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

Table A-27
Grain: World supply and use, by principal marketing type, crop-year 1995/96 to 1999/00

Type/year	Production	Total supply[1]	Trade[2]	Total use	Ending stocks	World export price[3]
			Million (*metric tons*)			*U.S. dollars per metric tons*
Wheat:						
1995/96	539	655	114	551	105	209
1996/97	583	689	125	577	113	184
1997/98	609	723	123	584	139	143
1998/99	589	728	121	591	136	119
1999/00[4]	587	723	126	597	126	108
Coarse grains:						
1995/96	802	938	108	843	95	169
1996/97	907	1,004	107	878	127	121
1997/98	883	1,011	100	875	136	109
1998/99	891	1,022	107	871	157	93
1999/00[4]	875	1,033	114	882	151	91
Rice, milled:						
1995/96	371	421	20	371	49	362
1996/97	380	430	20	380	50	338
1997/98	387	438	27	383	55	302
1998/99	394	449	27	389	60	284
1999/00[4]	403	462	23	400	62	230
Total grains:						
1995/96	1,711	2,014	243	1,765	249	-
1996/97	1,870	2,124	252	1,834	290	-
1997/98	1,880	2,174	252	1,844	329	-
1998/99	1,873	2,205	255	1,851	353	-
1999/00[4]	1,865	2,218	264	1,879	339	-

[1] Production plus beginning stocks.
[2] Exports.
[3] Wheat price: U.S. wheat, No. 2, Hard Red Winter, ordinary protein f.o.b., U.S. Gulf Ports; U.S. coarse grain price: U.S. corn, No. 2, yellow, U.S. Gulf Ports; Milled rice price: Thai milled rice, 100-percent, Grade B, f.o.b. Bangkok, nominal price quote.
[4] Projected July 2000.

Source: Compiled from official statistics of the U.S. Department of Agriculture, *World Agricultural Supply and Demand Estimates* (various issues), *Rice Outlook*, July 13, 2000; *Wheat Outlook*, July 14, 2000; and *Feed Outlook*, July 14, 2000.

Table A-28
Grain: U.S. production, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1995-99

Calendar year	U.S. production	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of exports to production
		Million dollars			*Percentage*
1995	34,700	14,683	685	20,700	42
1996	38,200	16,760	791	22,330	44
1997	39,750	11,120	984	29,600	28
1998	35,070	10,002	772	25,840	29
1999	29,200	10,157	731	19,771	35

Note.—Changes in stocks are not accounted for in consumption. Production are for the prior crop year, ending in the year shown.

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

Table A-29
Grain: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1995-99

Source	1995	1996	1997	1998	1999
			Million dollars		
U.S. exports of domestic merchandise[1]:					
Japan	2,732	3,504	2,886	2,244	2,194
Mexico	873	1,813	880	1,285	1,242
Korea	1,372	1,609	678	689	794
Egypt	1,036	1,090	763	706	770
Taiwan	934	1,199	862	533	602
EU-15	792	684	565	444	383
Colombia	202	297	209	255	242
Philippines	331	405	325	258	248
Russia	63	46	20	5	219
Canada	191	227	214	208	174
Saudi Arabia	244	253	254	176	168
All other	5,907	5,635	3,461	3,139	3,121
Total	14,684	16,671	11,120	10,002	10,157
U.S. imports for consumption[1]:					
Japan	(2)	(2)	(2)	(2)	(2)
Mexico	1	1	2	6	7
Korea	(2)	(2)	(2)	(2)	(2)
Egypt	(2)	(2)	(2)	(2)	(2)
EU-15	26	18	54	68	49
Taiwan	(2)	(2)	(2)	(2)	(2)
Colombia	0	(2)	(2)	(2)	(2)
Philippines	(2)	(2)	(2)	(2)	(2)
Russia	(2)	(2)	(2)	(2)	(2)
Canada	541	620	723	513	490
Saudi Arabia	(2)	(2)	(2)	(2)	(2)
All other	117	151	204	184	185
Total	685	791	984	772	731
U.S. merchandise trade balance:					
Japan	2,732	3,504	2,886	2,244	2,194
Mexico	872	1,812	878	1,279	1,235
Korea	1,372	1,609	678	689	794
Egypt	1,036	1,090	763	706	770
Taiwan	934	1,199	862	533	602
EU-15	766	666	511	376	334
Colombia	202	297	209	255	242
Philippines	331	405	325	258	248
Russia	63	46	20	5	219
Canada	-351	-393	-509	-305	-316
Saudi Arabia	244	253	254	176	168
All other	5,798	5,484	3,260	3,015	2,936
Total	13,999	15,880	10,136	9,230	9,426

[1] Imports are customs value; exports are f.a.s., U.S. port of export.
[2] Less than $500.000.

Note.—Totals may not add to the totals shown because of rounding.

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

Table A-30
Grain: U.S. exports of domestic merchandise, by principal markets, 1995-99

Market	1995	1996	1997	1998	1999
			Million dollars		
Japan	2,732	3,504	2,886	2,243	2,194
Mexico	873	1,813	880	1,285	1,242
Korea	1,372	1,609	678	689	794
Egypt	1,036	1,090	763	706	770
Taiwan	934	1,199	862	533	602
EU	792	684	565	444	383
Philippines	331	405	325	258	248
Colombia	209	297	209	255	242
Russia	63	46	20	5	219
Canada	191	227	214	208	174
Saudi Arabia	244	253	254	176	168
All other	5,907	5,635	3,461	3,139	3,121
Total	14,684	16,761	11,120	10,002	10,157

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

Table A-31
Grain: Volume of U.S. exports of domestic merchandise, by principal type, 1995-99

Type	1995	1996	1997	1998	1999
	Quantity (*1,000 metric tons*)				
Wheat except seed:					
Durum wheat	1,103	1,003	1,451	1,319	1,161
Wheat, except durum	31,214	29,943	23,813	25,570	27,296
Subtotal all wheat	32,317	30,946	25,264	26,889	28,457
Rye	1	1	1	2	4
Barley, except seed:					
For malting purposes	150	351	224	254	227
Other barley	1,085	698	1,402	308	466
Subtotal, all barley	1,235	1,049	1,626	562	693
Oats, except seed	19	40	26	28	21
Corn, except seed:					
Yellow dent corn:					
U.S.1	447	465	401	633	504,311
U.S.2	30,402	25,427	19,111	18,952	27,904
U.S.3	26,646	23,944	20,584	19,174	21,051
U.S.4	2	2	12	52	2
Other	1,545	1,127	946	1,131	728
Popcorn	131	122	96	99	93
Other corn	976	1,212	550	1,175	1,585
Subtotal, all corn	60,149	52,299	41,700	41,216	51,867
Rice:					
Rice in the husk (paddy or rough)	553	576	609	1,744	779
Husked (brown) rice:					
Basmati	3	5	4	3	18
Other:					
Long-grain	253	289	248	223	226
Medium-grain	122	132	87	200	290
Short-grain	2	6	18	12	13
Mixtures of the above	3	7	10	42	49
Semi-milled or wholly milled rice:					
Parbroiled:					
Long-grain	665	676	534	437	463
Other and mixtures	131	56	74	166	84
Other:					
Long-grain	911	562	416	557	733
Medium-grain	545	456	404	224	139
Short-grain	6	11	18	36	39
Mixtures of the above	8	23	21	24	18
Broken rice	73	40	66	52	88
Subtotal, all rice	3,275	2,839	2,509	3,720	2,939
Grain sorghum except, seed	5,522	4,807	5,077	4,906	5,790
Buckwheat	18	15	7	9	10
Millet	54	48	66	64	44
Canary seed	10	18	18	18	18
Wild rice	1	1	1	1	1
Other cereals, n.s.p.f.	9	5	6	10	13
Grand total	102,609	92,068	76,301	77,425	89,685

[1] Less than 500 metric tons.

Note.—Totals may vary because of rounding.

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

Table A-32
Grain: U.S. imports for consumption, by principal sources, 1995-99

Source	1995	1996	1997	1998	1999
	Million dollars				
Canada	541	620	723	513	490
Thailand	90	109	147	126	117
EU	26	18	54	68	49
India	20	29	30	40	41
China	([1])	([1])	1	([1])	9
Australia	0	0	([1])	([1])	7
Mexico	1	1	2	6	7
Pakistan	5	4	4	8	7
Italy	4	6	5	5	5
All other	2	10	23	11	4
Total	685	791	984	772	731

[1] Less than $500,000.

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

Table A-33
Grain: Volume of U.S. imports for consumption, by principal type, 1995-99

Type	1995	1996	1997	1998	1999
	Quantity (*1,000 metric tons*)				
Wheat except seed:					
Durum wheat	306	245	427	422	643
Wheat, except durum	1,196	1,042	1,770	1,567	1,551
Subtotal all wheat	1,502	1,287	2,197	1,989	2,194
Rye	107	95	144	94	82
Barley, except seed:					
For malting purposes	708	642	706	592	597
Other	334	148	155	128	22
Subtotal, all barley	1,042	790	861	720	619
Oats, except seed	1,519	1,339	1,897	1,735	1,653
Corn, except seed:					
Yellow dent corn	258	332	234	210	277
Popcorn	([1])	([1])	7	([1])	([1])
Other corn	8	6	13	15	52
Subtotal, all corn	266	338	254	225	329
Rice:					
Rice in the husk (paddy or rough)	0	0	([1])	([1])	0
Husked (brown) rice:					
Basmati	8	10	12	19	20
Other:					
Long-grain	1	1	1	5	8
Medium-grain	([1])	([1])	([1])	([1])	([1])
Short-grain	([1])	([1])	([1])	1	1
Mixtures of the above	([1])	([1])	([1])	([1])	([1])
Semi-milled or wholly milled rice:					
Parbroiled:					
Long-grain	([1])	([1])	([1])	1	([1])
Other and mixtures	([1])	([1])	([1])	([1])	([1])
Other:					
Long-grain	158	196	208	204	201
Medium-grain	30	34	35	32	84
Short-grain	4	4	4	5	6
Mixtures of the above	19	19	17	21	14
Broken rice	3	10	34	8	19
Subtotal all rice	223	274	311	296	353
Grain sorghum except, seed	([1])	([1])	([1])	([1])	([1])
Buckwheat	2	2	3	2	2
Millet	1	1	1	([1])	1
Canary seed	16	18	15	19	17
Wild rice	1	1	1	1	1
Other cereals, n.s.p.f.	5	3	2	3	2
Grand total	4,684	4,148	5,686	5,084	5,253

[1] Less than 500 metric tons.

Note.—Totals may vary because of rounding.

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

Table A-34
Grain: Value of U.S. exports of domestic merchandise, by principal type, 1995-99

Type	1995	1996	1997	1998	1999
	Value (*million dollars*)				
Wheat except seed:					
Durum wheat	225	212	285	224	179
Wheat, except durum	5,215	6,052	3,810	3,473	3,427
Subtotal all wheat	5,440	6,264	4,095	3,697	3,606
Rye	([1])	([1])	([1])	([1])	([1])
Barley, except seed:					
For malting purposes	35	92	39	42	36
Other	142	118	172	33	48
Subtotal, all barley	177	210	211	75	84
Oats, except seed	3	6	3	4	3
Corn, except seed:					
Yellow dent corn:					
U.S.1	58	84	49	76	52
U.S.2	3,764	4,156	2,398	2,047	2,664
U.S.3	3,174	3,853	2,534	1,981	1,937
U.S.4	([1])	([1])	1	4	([1])
Other	177	146	112	125	74
Popcorn	64	76	75	66	58
Other corn	130	165	78	148	189
Subtotal, all corn	7,367	8,480	5,247	4,447	4,974
Rice:					
Rice in the husk (paddy or rough)	109	138	143	416	157
Husked (brown) rice:					
Basmati	1	2	1	1	5
Other:					
Long-grain	77	103	98	76	70
Medium-grain	37	48	34	84	110
Short-grain	1	3	7	5	5
Mixtures of the above	1	3	4	14	15
Semi-milled or wholly milled rice:					
Parbroiled:					
Long-grain	243	294	245	190	181
Other and mixtures	40	20	28	63	39
Other:					
Long-grain	299	214	173	221	254
Medium-grain	166	175	155	93	54
Short-grain	3	5	9	17	20
Mixtures of the above	3	8	8	9	6
Broken rice	17	16	26	18	26
Subtotal all rice	997	1,029	931	1,207	942
Grain sorghum except seed	670	739	594	532	539
Buckwheat	6	5	2	3	3
Millet	11	11	14	12	10
Canary seed	3	7	5	5	6
Wild rice	3	4	5	5	5
Other cereals, n.s.p.f.	7	6	9	13	16
Grand total	14,684	16,761	11,120	10,002	10,157

[1] Less than $500,000.

Note.—Totals may vary because of rounding.

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

Table A-35
Grain: Value of U.S. imports for consumption, by principal type, 1995-99

Type	1995	1996	1997	1998	1999
	(*Million dollars*)				
Wheat except seed:					
Durum wheat	65	55	84	76	86
Wheat, except durum	170	187	270	204	185
Subtotal all wheat	235	242	354	280	272
Rye	11	13	21	11	7
Barley, except seed:					
For malting purposes	93	107	104	78	74
Other	30	21	21	14	3
Subtotal, all barley	123	128	125	92	77
Oats, except seed	154	185	239	166	144
Corn, except seed:					
Yellow dent corn	29	51	27	21	25
Popcorn	(1)	(1)	3	(1)	(1)
Other corn	2	2	4	4	9
Subtotal, all corn	31	53	34	25	34
Rice:					
Rice in the husk (paddy or rough)	(1)	(1)	(1)	(1)	0
Husked (brown) rice:					
Basmati	7	9	11	18	18
Other:					
Long-grain	1	1	1	3	4
Medium-grain	(1)	(1)	(1)	(1)	(1)
Short-grain	(1)	(1)	(1)	(1)	(1)
Mixtures of the above	(1)	(1)	(1)	(1)	(1)
Semi-milled or wholly milled rice:					
Parbroiled:					
Long-grain	(1)	(1)	1	(1)	(1)
Other and mixtures	(1)	(1)	(1)	(1)	(1)
Other:					
Long-grain	83	110	137	124	111
Medium-grain	14	18	24	19	32
Short-grain	3	3	3	3	3
Mixtures of the above	11	13	15	16	13
Broken rice	1	2	8	2	4
Subtotal all rice	120	156	200	185	185
Grain sorghum except, seed	(1)	(1)	(1)	(1)	(1)
Buckwheat	1	1	1	1	1
Millet	2	2	2	1	1
Canary seed	5	7	5	6	4
Wild rice	2	2	1	2	2
Other cereals, n.s.p.f.	1	1	1	1	1
Grand total	685	791	984	772	731

[1] Less than $500,000.

Note.—Totals may vary because of rounding.

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

Table A-36
Grain: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 2000; U.S. exports, 1999; and U.S. imports, 1999

HTS subheading		Description	Column 1 rate of duty, as of Jan. 1, 2000 General	Special[1]	Bound duty, Uruguay Round[2]	U.S. exports, 1999	U.S. imports, 1999
						— *Million dollars* —	
		Wheat and meslin:					
1001.10.00		Durum wheat	0.65¢/kg	Free (A+,CA,E,IL,J) 0.2¢/kg (MX)	0.65¢/kg		
		Other than seed				179	86
		Grade 1:					
	91	Having a specified dark hard vitreous kernel content exceeding 84%				([5])	39
	92	Having a specified dark hard vitreous kernel content not exceeding 84%				([5])	32
		Grade 2:					
	95	Having a specified dark hard vitreous kernel content exceeding 84%				([5])	4
	96	Having a specified dark hard vitreous kernel content not exceeding 84%				([5])	8
	99	Other				([5])	2
1001.90.20		Other wheat and meslin, except seed	0.35¢/kg	Free(A+,CA,E,IL,J,MX)	0.35¢/kg	3,427	185
		Canadian western extra strong hard red spring (CWES/HRS) wheat				([5])	2
		Other:					
		Red spring wheat:					
		Grade 1					
	11	Having a specified protein content not exceeding 12.9% by weight				([5])	9
	12	Having a specified protein content exceeding 12.9% but not exceeding 13.3% by weight				([5])	17
	13	Having a specified protein content exceeding 13.3% but not exceeding 13.6% by weight				([5])	1
	14	Having a specified protein content exceeding 13.6% but not exceeding 13.9% by weight				([5])	5
	16	Having a specified protein content exceeding 13.9% but not exceeding 14.2% by weight				([5])	17

See footnotes at end of table.

Table A-36—*Continued*
Grain: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 2000; U.S. exports, 1999; and U.S. imports, 1999

HTS subheading		Description	Column 1 rate of duty, as of Jan. 1, 2000 General	Special[1]	Bound duty, Uruguay Round[2]	U.S. exports, 1999	U.S. imports, 1999
						— *Million dollars* —	
1001.90.20 (con).		Red spring wheat (con.):					
	19	Having a specified protein content exceeding 14.2% by weight				([5])	19
		Grade 2					
	21	Having a specified protein content not exceeding 12.9% by weight				([5])	13
	22	Having a specified protein content exceeding 12.9% but not exceeding 13.3% by weight				([5])	3
	23	Having a specified protein content exceeding 13.3% but not exceeding 13.6% by weight				([5])	1
	24	Having a specified protein content exceeding 13.6% but not exceeding 13.9% by weight				([5])	5
	26	Having a specified protein content exceeding 13.9% but not exceeding 14.2% by weight				([5])	24
	29	Having a specified protein content exceeding 14.2% by weight				([5])	43
	35	Other red spring wheat				([5])	2
	40	White winter wheat				([5])	11
	50	"Canadian" western red winter wheat				([5])	3
	60	Soft white spring wheat				([5])	1
	96	Other				([5])	11
1002.00.00	90	Rye	Free	([3])	Free	([4])	5
1003.00		Barley:					
1003.00.20	00	For malting purposes	0.1¢/kg	Free(A+,CA,E,IL,J,MX)	0.1¢/kg	36	74
1003.00.40		Other	0.15¢/kg	Free(A+,CA,E,IL,J,MX)	0.15¢/kg		
	90	Other than seed				48	3
1004.00.00		Oats	Free	([3])	Free	3	145
	20	Mixed feed oats, except seed				([5])	18
	90	Other, except seed				([5])	127

See footnotes at end of table.

Table A-36—*Continued*
Grain: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 2000; U.S. exports, 1999; and U.S. imports, 1999

HTS subheading		Description	Column 1 rate of duty, as of Jan. 1, 2000 General	Special[1]	Bound duty, Uruguay Round[2]	U.S. exports, 1999	U.S. imports, 1999
						— *Million dollars* —	
1005		Corn (maize):					
1005.90		Other than seed:					
1005.90.20	00	Yellow dent corn	0.05¢/kg	Free(A*,CA,E,IL,J,MX)	0.05¢/kg	4,727	25
1005.90.40		Other	0.25¢/kg	Free (A*,CA,E,IL,J,MX)	0.25¢/kg		
	40	Popcorn				58	([4])
	60	Other				189	9
1006		Rice:					
1006.10.00		Rice in the husk (paddy or rough)	1.8¢/kg	Free(A+,CA,E,IL,J) 0.8¢/kg (MX)	1.8¢/kg	157	0
1006.20		Husked (brown) rice:					
1006.20.20	00	Basmati	0.83¢/kg	Free(A+,CA,E,Il,J) 0.3¢/kg (MX)	0.83¢/kg	5	18
1006.20.40		Other	2.1¢/kg	Free(A+,CA,E,IL,J) 0.9¢/kg (MX)	2.1¢/kg		
	20	Long grain				70	4
	40	Medium grain				110	([4])
	60	Short grain				5	([4])
	80	Mixtures of any of the above				15	([4])
1006.30		Semi-milled or wholly milled rice, whether or not polished or glazed:					
1006.30.10		Parboiled	11.2%	Free(A*,CA,E,IL,J,MX)	11.2%		([4])
	20	Long grain				181	([4])
	40	Other, including mixtures				39	([4])
1006.30.90		Other	1.4¢/kg	Free(A+,CA,E,IL,J) 0.6¢/kg (MX)	1.4¢/kg		([4])
	10	Long grain				254	111
	20	Medium grain				54	32
	30	Short grain				20	3
	40	Mixtures of any of the above				6	13
1006.40	00	Broken rice	0.44¢/kg	Free(A+,CA,E,IL,J) 0.2¢/kg	0.44¢/kg	26	4

See footnotes at end of table.

Table A-36–*Continued*
Grain: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 2000; U.S. exports, 1999; and U.S. imports, 1999

HTS subheading		Description	Column 1 rate of duty, as of Jan. 1, 2000 General	Special[1]	Bound duty, Uruguay Round[2]	U.S. exports, 1999	U.S. imports, 1999
						— *Million dollars* —	
1007.00.00		Grain sorghum	0.22¢/kg	Free(A*,CA,E,IL,J,MX)	0.22¢/kg		
	40	Other than seed				539	([4])
1008		Buckwheat, millet and canary seed; other cereals (including wild rice):					
1008.10.00	00	Buckwheat	Free	([3])	Free	3	1
1008.20.00	00	Millet	0.32¢/kg	Free(A+,CA,E,IL,J,MX)	0.32¢/kg	10	1
1008.30.00	00	Canary seed	0.12¢/kg	Free(A,CA,E,IL,J,MX)	0.12¢/kg	6	4
1008.90.00		Other cereals (including wild rice)	1.1%	Free(A+,CA,E,IL,J,MX)	1.1%		
	20	Wild rice				5	2
	40	Other				16	1

[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); North America Trade Agreement (NAFTA), goods of Canada (CA); NAFTA, goods of Mexico (MX); Caribbean Basin Economic Recovery Act (E); United States-Israel Free Trade Area (IL); and Andean Trade Preference Act (J).
[2] Bound rates of duty were obtained from the Office of the U.S. Trade Representative, *Uruguay Round*, *Draft Uruguay Round Tariff Schedules of the United States, Vol. 1 Agriculture*.
[3] Not applicable since the column 1 rate of duty is free.
[4] Less than $500,000.
[5] Not separately reported.

Note.—The products specified in the headings of chapter 10 are to be classified in those headings only if grains are present, whether or not in the ear or on the stalk. Chapter 10 does not cover grains which have been hulled or otherwise worked. However, rice, husked, milled, polished, glazed, parboiled or broken remains classified in heading 1006. Heading 1005 does not cover sweet corn (chapter 7). The term "durum wheat" means wheat of the *Triticum durum* species and the hybrids derived from the interspecific crossing of *Triticum durum* which have the same number (28) of chromosomes as that species.

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

Table A-37
Corn: U.S. exports of domestic merchandise, by leading markets, 1995-99

Source	1995	1996	1997	1998	1999
			1,000 metric tons		
Japan	15,965	14,893	15,418	13,996	14,999
South Korea	8,960	7,969	3,341	4,398	6,050
Mexico	2,877	6,333	2,584	5,266	5,068
Taiwan	6,062	5,722	5,440	3,466	4,732
Egypt	2,267	1,988	2,168	1,917	3,092
Colombia	890	1,231	1,213	1,151	1,587
Saudi Arabia	951	840	1,033	1,001	1,176
Venezuela	828	639	682	887	1,108
Canada	1,037	872	1,045	1,179	983
EU	3,540	1,858	1,587	346	42
China	5,357	108	([1])	367	108
All other	11,416	9,847	7,189	7,241	12,921
Total	60,150	52,300	41,700	41,215	51,866
			Million dollars		
Japan	1,906	2,455	1,915	1,484	1,426
South Korea	1,110	1,260	450	465	575
Mexico	364	1,012	329	600	535
Taiwan	771	962	693	377	464
Egypt	274	312	260	188	283
Colombia	113	201	150	122	150
Saudi Arabia	117	137	128	109	109
Venezuela	103	105	94	92	105
Canada	118	144	127	126	92
EU	435	329	213	55	19
China	629	14	([2])	44	16
All other	1,428	1,549	888	786	1,200
Total	7,368	8,480	5,247	4,448	4,974

[1] Less than 500 metric tons.
[2] Less than $500,000.

Note.—Excludes seed corn, and all milled corn products.

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

Table A-38
Wheat: U.S. exports of domestic merchandise, by leading markets, 1995-99

Source	1995	1996	1997	1998	1999
			1,000 metric tons		
Egypt	4,834	4,046	3,504	4,253	4,439
Japan	2,886	2,918	3,194	3,125	3,207
Philippines	1,807	1,551	1,806	1,542	1,741
Mexico	791	1,554	1,067	1,591	1,824
South Korea	1,461	1,613	1,309	1,503	1,664
EU	623	652	1,029	1,258	1,357
Nigeria	596	744	622	1,030	1,201
Russia	323	136	51	35	1,170
Taiwan	819	941	909	932	908
Colombia	518	421	320	463	786
China	3,649	2,214	296	316	258
All other	14,010	14,156	11,157	10,841	9,902
Total	32,317	30,946	25,264	26,889	28,457
			Million dollars		
Egypt	760	775	502	514	487
Japan	511	637	554	472	453
Philippines	299	325	308	223	235
Mexico	145	325	176	214	215
South Korea	260	328	222	216	210
EU	126	136	196	208	204
Nigeria	96	157	101	136	147
Russia	53	29	9	4	140
Taiwan	156	216	161	151	137
Colombia	98	88	50	59	91
China	500	426	44	46	33
All other	2,437	2,823	1,766	1,454	1,254
Total	5,441	6,265	4,089	3,697	3,606

Note.—Excludes wheat seed and all milled wheat products.

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

Table A-39
Rice: U.S. exports of domestic merchandise, by leading markets, 1995-99

Source	1995	1996	1997	1998	1999
			1,000 metric tons		
Japan	66	224	225	253	339
EU	338	352	298	367	367
Mexico	308	390	385	396	411
Canada	167	168	171	170	181
Haiti	192	167	172	181	215
Saudi Arabia	176	142	115	144	119
Indonesia	93	([1])	([1])	66	173
All other	1,936	1,396	1,142	3,145	1,133
Total	3,276	2,839	2,508	3,722	2,938
			Million dollars		
Japan	31	98	114	116	144
EU	98	139	122	143	123
Mexico	74	95	93	91	88
Canada	67	75	79	73	74
Haiti	58	62	66	61	70
Saudi Arabia	82	71	56	67	59
Indonesia	30	([2])	([2])	24	52
All other	556	489	402	633	334
Total	996	1,029	932	1,208	944

[1] Less than 500 metric tons.
[2] Less than $500,000.

Note.—Includes all rice products classified under HS heading 1006

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

Table A-40
Sorghum: U.S. exports of domestic merchandise, by leading markets, 1995-99

Source	1995	1996	1997	1998	1999
			1,000 metric tons		
Mexico	2,150	1,971	2,136	3,205	4,027
Japan	1,862	1,747	2,233	1,273	1,291
EU	906	382	127	204	197
Israel	253	338	406	66	141
All other	351	370	174	159	135
Total	5,522	4,808	5,076	4,907	5,791
			Million dollars		
Mexico	255	299	250	349	376
Japan	218	269	263	134	118
EU	122	61	15	24	19
Israel	31	56	46	7	13
All other	44	54	20	18	13
Total	670	739	594	532	539

Note.—Excludes sorghum seed.

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

Table A-41
Wheat: World imports, by leading markets, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
			Million metric tons		
Egypt	6	7	7	7	6
Brazil	6	6	6	7	7
Iran	3	7	4	3	7
Japan	6	6	6	6	6
Algeria	4	4	5	4	4
South Korea	3	4	4	5	6
All others	71	70	72	68	69
Total	99	104	104	100	104

[1] Projected Feb. 2000.

Note.—Totals may vary because of rounding. Data include wheat flour and other milled wheat products. Marketing year, beginning July 1.

Source: Compiled from official statistics of the USDA.

Table A-42
Corn: World imports, by leading markets, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
			Million metric tons		
Japan	16	16	16	17	16
South Korea	9	8	8	8	9
Mexico	6	3	4	6	5
Egypt	2	3	3	4	4
Taiwan	6	6	4	5	5
EU	3	3	2	3	2
All others	22	28	26	26	29
Total	64	67	63	69	70

[1] Projected Feb. 2000.

Note.—Totals may vary because of rounding. Marketing year, beginning Oct. 1.

Source: Compiled from official statistics of the USDA.

Table A-43
Barley: World imports, by leading markets, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
			Million metric tons		
Saudi Arabia	4	6	4	5	5
China	1	2	1	2	2
Japan	2	1	1	1	1
Iran	([2])	1	([2])	1	1
All others	6	8	7	8	8
Total	13	18	13	17	17

[1] Projected Feb. 2000.
[2] Less than 500,000 metric tons.

Note.—Totals may vary because of rounding. Marketing year, beginning Oct. 1.

Source: Compiled from official statistics of the USDA.

Table A-44
Coarse grain: World imports, by leading markets, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
	Million metric tons				
Japan	21	21	21	20	20
South Korea	10	9	8	8	9
Mexico	9	5	8	9	9
Saudi Arabia	5	7	5	6	6
Taiwan	6	6	5	5	5
Egypt	2	3	3	4	4
EU	4	3	2	3	3
China	3	2	3	3	3
All others	27	39	31	38	39
Total	87	95	86	96	98

[1] Projected Feb. 2000.

Note.—Totals may vary because of rounding. Marketing year, beginning Oct. 1.

Source: Compiled from official statistics of the USDA.

Table A-45
Rice: World imports, by leading markets, 1996-2000

Country/region	1996	1997	1998	1999	2000[1]
	Million metric tons				
Indonesia	1	1	6	3	2
Bangladesh	1	([2])	2	2	1
Brazil	1	1	1	1	1
Philippines	1	1	2	1	1
Iran	1	1	1	1	1
Saudi Arabia	1	1	1	1	1
Nigeria	([2])	1	1	1	1
All others	14	13	13	15	15
Total	20	19	27	25	23

[1] Projected Feb. 2000.
[2] Less than 500,000 metric tons.

Note.—Totals may vary because of rounding.

Source: Compiled from official statistics of the USDA.

Table A-46
Wheat: World exports, by leading suppliers, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
	Million metric tons				
United States	34	27	28	29	29
Canada	17	18	21	15	18
Australia	12	18	15	16	18
EU	13	18	14	16	16
Argentina	4	10	10	9	10
All others	19	13	16	15	13
Total	99	104	104	100	104

[1] Projected Feb. 2000.

Note.—Totals may vary because of rounding. Data include wheat flour and other milled wheat products. Marketing year, beginning July 1.

Source: Compiled from official statistics of the USDA..

Table A-47
Corn: World exports, by leading suppliers, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
			Million metric tons		
United States	53	47	38	52	48
Argentina	7	10	13	8	8
China	([2])	4	6	4	8
All others	4	6	6	6	6
Total	64	67	63	69	70

[1] Projected Feb. 2000.
[2] Less than $500 metric tons.

Note.—Totals may vary because of rounding. Marketing year, beginning Oct. 1.

Source: Compiled from official statistics of the USDA.

Table A-48
Barley: World exports, by leading suppliers, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
			Million metric tons		
EU	2	6	3	8	9
Australia	3	4	3	4	3
Canada	3	3	2	1	2
All others	5	5	5	4	3
Total	13	18	13	17	17

[1] Projected Feb. 2000.

Note.—Totals may vary because of rounding. Marketing year, beginning Oct. 1.

Source: Compiled from official statistics of the USDA.

Table A-49
Coarse grain: World exports, by leading suppliers, crop-years 1995/96 to 1999/00

Country/region	1995/96	1996/97	1997/98	1998/99	1999/00[1]
			Million metric tons		
United States	59	53	44	58	54
EU	4	8	5	10	12
Argentina	8	11	14	9	9
Canada	4	6	3	3	4
China	([2])	4	6	3	8
All others	16	13	14	13	11
Total	87	95	86	96	98

[1] Projected Feb. 2000.
[2] Less than 500,000 metric tons.

Note.—Totals may vary because of rounding. Marketing year, beginning Oct. 1.

Source: Compiled from official statistics of the USDA.

Table A-50
Rice: World exports, by leading suppliers, 1996-2000

Country/region	1996	1997	1998	1999	2000[1]
	Million metric tons				
Thailand	5	5	6	6	6
Vietnam	3	3	4	4	4
United States	3	2	3	3	3
China	([2])	1	4	3	3
India	4	2	4	3	2
Pakistan	2	2	2	2	2
All others	3	4	4	4	3
Total	20	19	27	25	23

[1] Projected Feb. 2000.
[2] Less than 500,000 metric tons.

Note.—Totals may vary because of rounding.

Source: Compiled from official statistics of the USDA.

APPENDIX B
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

TARIFF AND TRADE AGREEMENT TERMS

In the ***Harmonized Tariff Schedule of the United States*** (HTS), chapters 1 through 97 cover all goods in trade and incorporate in the tariff nomenclature the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate 8-digit product subdivisions, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; 10-digit administrative statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989.

Duty rates in the ***general*** subcolumn of HTS column 1 are normal trade relations rates, many of which have been eliminated or are being reduced as concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. Column 1-general duty rates apply to all countries except those listed in HTS general note 3(b) (Afghanistan, Cuba, Laos, North Korea, and Vietnam) plus Serbia and Montenegro, which are subject to the statutory rates set forth in ***column 2***. Specified goods from designated general-rate 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 rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at column 1-general rates. The HTS does not enumerate those countries as to which a total or partial embargo has been declared.

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 for 10 years and extended several times thereafter, applies to merchandise imported on or after January 1, 1976 and before the close of September 30, 2001. Indicated by the symbol "A", "A*", or "A+" in the special subcolumn, the GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 4 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. Indicated by the symbol "E" or "E*" in the special subcolumn, the CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries, as set forth in general note 7 to the HTS.

Free rates of duty in the special subcolumn followed by the symbol "IL" are applicable to products of Israel under the ***United States-Israel Free Trade Area Implementation Act*** of 1985 (IFTA), as provided in general note 8 to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the ***Andean Trade Preference Act*** (ATPA), enacted as 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 11 to the HTS.

Preferential free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the ***North American Free Trade Agreement***, as provided in general note 12 to the HTS and implemented effective January 1, 1994 by Presidential Proclamation 6641 of December 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Other special tariff treatment applies to particular ***products of insular possessions*** (general note 3(a)(iv)), ***products of the West Bank and Gaza Strip*** (general note 3(a)(v)), goods covered by the ***Automotive Products Trade Act*** (APTA) (general note 5) and the ***Agreement on Trade in Civil Aircraft*** (ATCA) (general note 6), ***articles imported from freely associated states*** (general note 10), ***pharmaceutical products*** (general note 13), and ***intermediate chemicals for dyes*** (general note 14).

The ***General Agreement on Tariffs and Trade 1994*** (GATT 1994), pursuant to the Agreement Establishing the World Trade Organization, is based upon the earlier GATT 1947 (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) as the primary multilateral system of disciplines and principles governing international trade. Signatories' obligations under both the 1994 and 1947 agreements focus upon most-favored-nation treatment, the maintenance of scheduled concession rates of duty, and national treatment for imported products; the GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, dispute settlement, and other measures. The results of the Uruguay Round of 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. Pursuant to the **Agreement on Textiles and Clothing** (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the **Multifiber Arrangement** (MFA)). Under the MFA, which was a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could take unilateral action in the absence or violation of an agreement. Quantitative limits had been established on imported textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 over a ten-year period, or by Jan. 1, 2005.

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