loan rate of $6.50 per cwt, while less than 5 percent had variable costs above the target price (fig. 16).

The bottom 25 percent had the highest average levels of total farm sales, government payments, net cash income, and net farm income. Producers with the lowest cost per cwt, on average, planted larger acreage and had higher yields per acre.

Regional Cost Structure

Regional differences in crop growing conditions and production practices also have influenced production costs. Most low- and mid-cost rice farms are located in the Arkansas nondelta and the Mississippi River Delta regions. In the gulf coast region, high costs for water and custom operations raise variable costs above the national average, while in California above average costs for drying, custom operations, chemicals, and the economic value of land combine to raise costs.

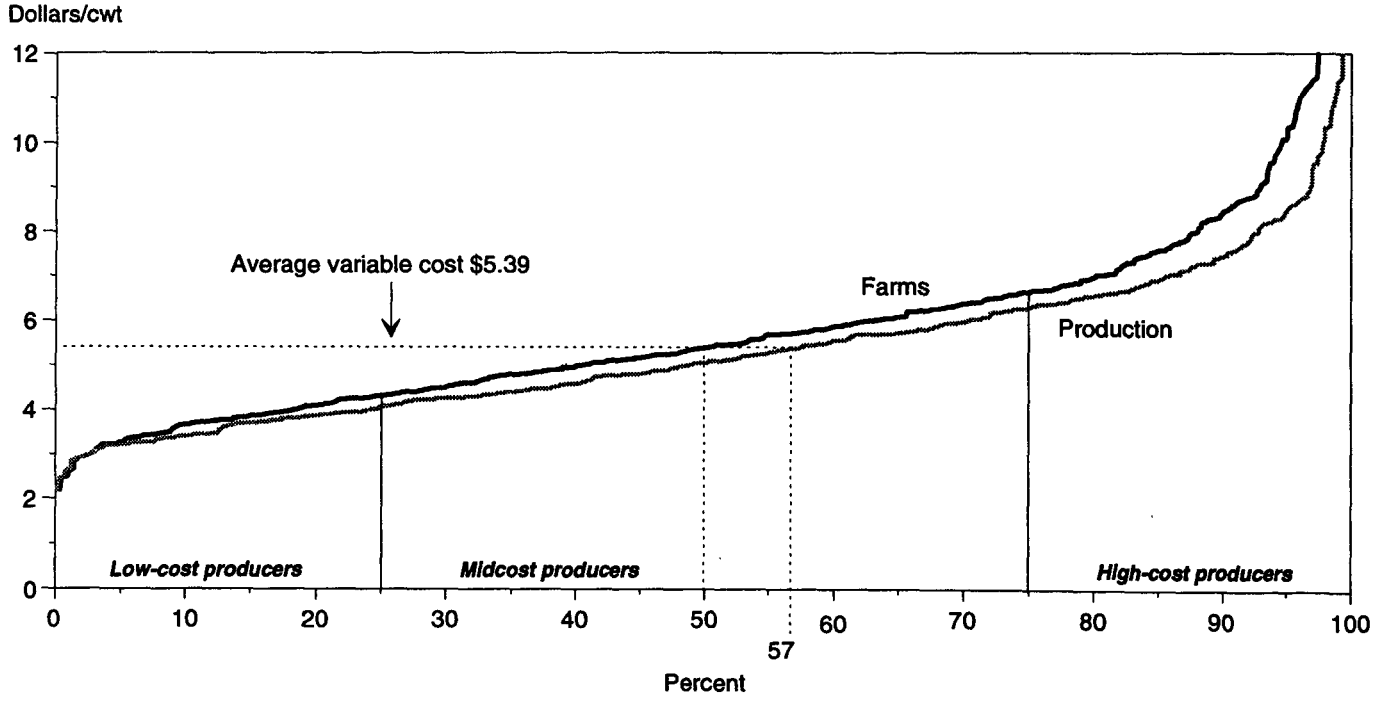
The Mississippi River Delta and the Arkansas nondelta regions are more cost-efficient at growing rice. Both regions were able to profitably produce rice independent of government programs in 1992, while California and the gulf coast regions required government programs in order to show positive returns after cash expenses.

California and gulf coast rice farmers have shown a higher dependence over time on Government programs than Delta and nondelta Arkansas rice farmers. In the gulf coast region, this dependence appears to be increasing, rising from 37 percent of total gross revenues attributable to direct government payments in 1988 to 40 percent in 1992. In California, the dependence on direct government payments as a share of total gross revenue declined to 41 percent in 1992 from 44 percent in 1988, but remains the highest of all rice-growing regions (table 9).

When considering the best overall allocation of society's resources (that is, economic costs), on the average, none of the regions' rice sectors demonstrated long-term stand-alone viability without government programs, according to the 1984, 1988, and 1992 FCRS's. California and the gulf coast rice-growing sectors also failed to demonstrate long-term viability even with government programs.

This narrow approach ignores both rotational and off-season economic opportunities of the rice land, as well as possible exports of California japonica rice to Japan and South Korea as negotiated under UR-GATT. In California and, to a lesser extent, the gulf coast region, off-season waterfowl hunting fees represent important returns to rice acreage.

Figure 16
Distribution of rice variable cash expenses, 1992



Source: USDA, ERS, 1992 Farm Costs and Returns Survey.

The visible consequence of rice farming's changing cost structure since 1985 have been a gradual shift of harvested area out of the gulf coast to more cost-efficient areas of the Delta States and nondelta Arkansas (fig. 3).

Maintaining government programs at current levels would probably encourage a continuation of the gradual shifting of area out of the gulf coast regions and into the Delta and upper-Mississippi River regions. Any reduction from current government programs would likely accelerate this process.

Although California's rice acreage declined in the 1980's, the California rice industry's high-quality product has helped developed a strong domestic base, reversing the acreage trend in the early 1990's. Acreage jumped sharply in 1994 when Japan entered the world market to purchase 2.3 million tons of rice (including 500,000 tons of California rice). The implementation of the UR-GATT minimum access requirements for Japan and South Korea portend further planting incentives for California producers of japonica rice beginning in 1995 and expanding through the year 2000.

Problems Faced by Gulf Coast and California Rice Farmers

California and the gulf coast rice-growing regions are confronting severe water and environmental constraints. Barring major technological breakthroughs, the severity of these constraints is likely to worsen with time, threatening the regions' ability to competitively produce rice even with government programs maintained at current levels.

Gulf Coast[14]

There are four principal factors generating Texas' high costs of production: (1) lack of a feasible production alternative to include in a crop rotation, thus preventing the spread of fixed costs across the enterprise; (2) abbreviated time periods for critical field operations due to weather; (3) above-average pest management problems, including weeds, insects, and diseases, resulting in higher costs than occur in other States; and (4) higher than average water pumping and distribution costs as well as increasing municipal, industrial, and recreational competition for scarce water resources.

[14]Refer to Texas Rice Task Force (1993) for further information on this subject.

California[15]

Above-average costs of production in California are due to high variable costs for custom operations, drying, and storage costs; as well as significantly above-average costs for general farm overhead, taxes, and insurance.

In addition to high production costs, California rice growers face the most stringent air and water pollution controls in the Nation. Four important problems confront the economic viability and expansion of California's rice industry: (1) competition with urban users for an increasingly scarce water supply; (2) water quality issues, particularly concerning pesticide runoff; (3) restrictions imposed on the burning of rice straw; and (4) urban growth. Higher water-user costs and increased regulatory pressure concerning pesticide runoff and straw burning are likely to further raise the costs of rice production. Rapid urban growth directly converts rice land to urban uses. Indirectly, urban growth puts competing demands on water and increases the need for greater regulation on aerial application of pesticides as well as the level of pesticide runoff from irrigation water.

From Farm to Consumer

The U.S. domestic rice market has been growing more than 4 percent a year for the past 25 years and has now overtaken the international market as the principal outlet for U.S. rice. Behind this growth is a rapidly rising per capita consumption rate, an expanding market structure, and a diversification of new rice food products.

Defining the Product

Nearly all rice is traded in some processed form, but government programs treat only the farm product. Thus, it is important to distinguish between rough or paddy rice (the farm product) and milled rice (the traded commodity). Physical characteristics, demand, and prices vary considerably between the farm and consumer.

Rough, or paddy, rice contains the hull and bran. Rough rice value is based on milling yield of whole kernels, class, and other quality factors including variety. Discounts and premiums are applied to reflect the presence or absence of certain quality characteristics (such as smut or peck) in the rough or milled rice.

[15]Refer to Agricultural Issues Center (1994) for further information on this subject.

Depending on the extent of the milling process, four different products can be produced from rough rice. Rough rice may be parboiled, a process of soaking and pressure-cooking that causes the bran to blend with the inner kernel and also unifies kernels that may have broken inside the hull. From an economic position, millers can salvage what otherwise would be sold as broken-kernel milled rice. In general, only long-grain rice is parboiled. The shorter grains are too gummy for parboiling equipment.

Whether the rice is parboiled or not, the next stage of milling is removing the hull. This produces an intermediate product called brown rice. The final stage of milling removes the bran, leaving white milled rice.

Many of the kernels are cracked during harvest or broken when rice is milled. These pieces of rice are referred to as brokens and are classified and priced according to their length: second heads (the longest), screenings, and brewers (the shortest). Brokens are generally used in processed foods, primarily cereal, candy, and pet food, or in beer brewing where length of grain and appearance may be less important.

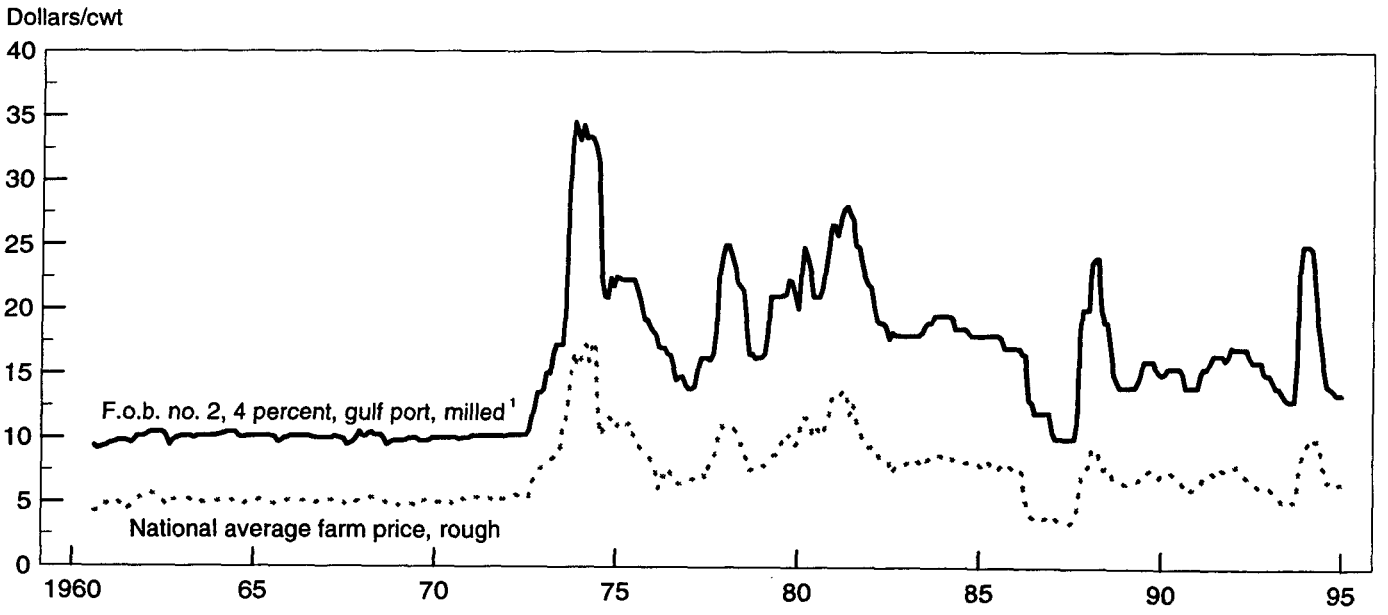
Thus, there are four types of final products: parboiled, brown, milled, and broken rice. Rice is usually referred to by the length of grain and the milling process: long-grain parboiled, medium brown, or short milled, and so on. However, broken kernels lose their class identity and are often sold simply as brewers or screenings.

Long-grain rice traditionally received a premium price relative to medium- and short-grain, while whole kernels are always worth more than brokens. However, in recent years long-grain rice's premium over medium- and short-grain rice has changed to a discount. Medium-grain's premium can be expected to continue with the implementation of the UR-GATT. Parboiled rice ordinarily sells at a premium to white rice since it is usually processed for specific domestic and export markets.

Prices: Farmgate vs. F.O.B. Mills and Retail

Prices for milled rice (f.o.b. mills) are roughly two to three times the farm prices (figs. 17 and 18). This margin partly reflects the actual costs incurred in milling rough rice plus subsequent bagging and delivery charges. But it also reflects the costs of obtaining

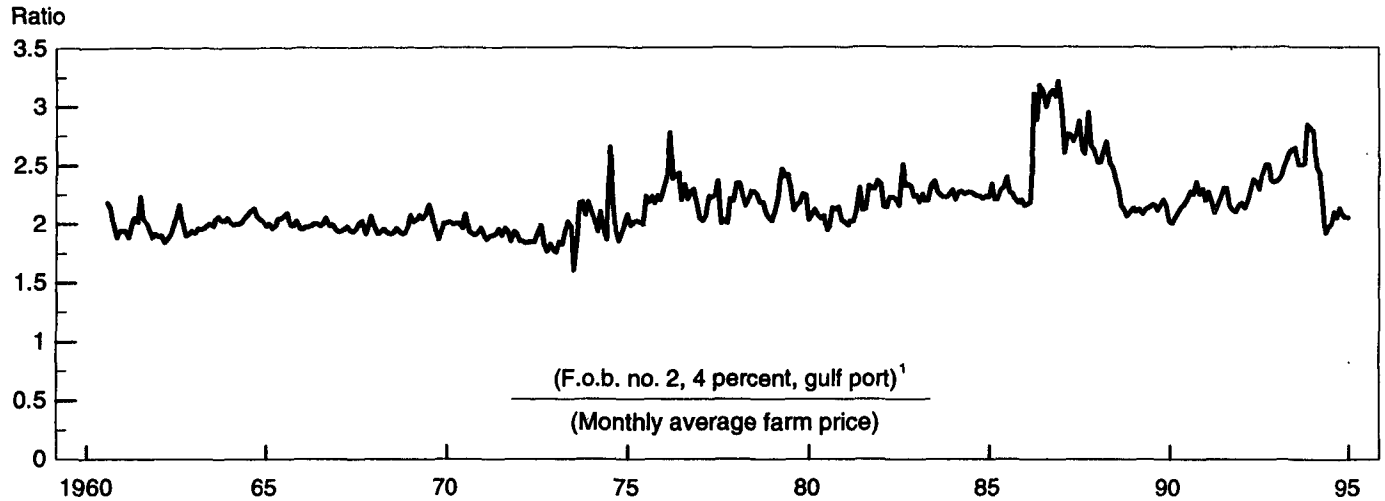
Figure 17
Export vs. farm price, monthly, January 1961-October 1994



[1]No. 2, 4 percent = high-quality, grade 2, maximum of 4 percent broken rice.

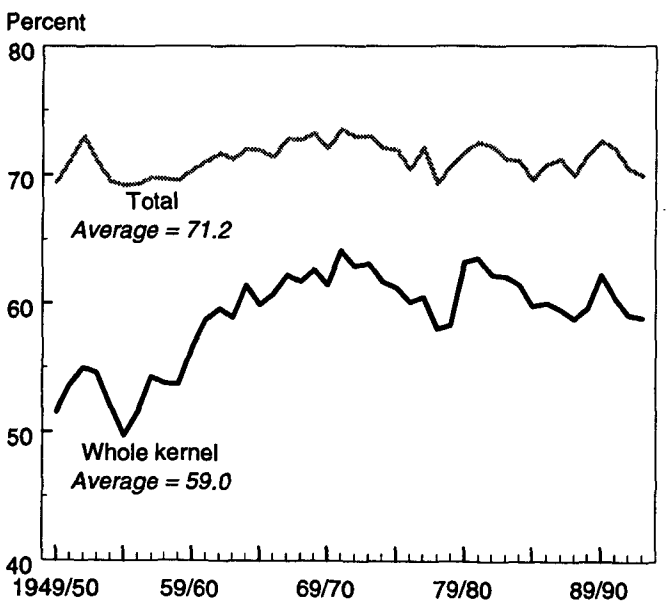
Source: USDA.

Figure 18
Ratio of f.o.b. export to farm price, monthly, January 1960 to January 1995



[1] No. 2, 4 percent = high quality, grade 2, maximum of 4 percent broken rice.
Source: USDA.

Figure 19
U.S. rice milling yields



Source: Rice Millers Association.

whole kernels. On average, the whole kernel yield from milling is 58-63 percent, although it was lower before 1960 (fig. 19). The rest will be hulls, bran, and broken pieces. On average, at least 140 pounds of rough rice must be processed to obtain about 100 pounds of milled, edible rice. If the milled rice is to be all whole kernels, about 165 pounds of rough rice would be required. Thus, if rough rice costs $6.00 per cwt, about $10 worth of such rice is needed to produce a cwt of edible, whole-kernel rice. To that cost must be added the cost of milling, packaging, and shipment. These costs vary but generally add $4 to $5 per cwt to the price of milled rice.

The farm-value share of the retail price of rice averaged 19 percent from 1985 to 1993, compared with 58 percent for eggs and only 7 percent for bread in 1992 (table 10). The more highly processed table-ready foods are, the more they cost overall, and generally the smaller the farm share. Cereal products start at a grain elevator, continue through cleaning, milling, and manufacturing into the desired shape and variety, and go on through packaging and distribution. Also, the highly competitive cereal makers engage in expensive advertising and promotion of cereal products.

For most foods, the marketing spread, the difference between the farm value and retail price of food, consistently contributes more to price increases than do volatile farm prices. This is clearly the case for rice where the farm value actually decreased by 27 percent between 1985 and 1993, while the retail price rose 9 percent, resulting from 17 percent growth in the marketing margin. Increases in the marketing margin mainly reflect rising costs incurred by the food industry.

Table 10—Rice, long grain: Retail price, farm values, farm-to-retail price spread, and farm value share of retail price

Item	Retail price per pound	Farm value[1]	Farm-to-retail margin	Farm value share
	Dollars			*Percent*
1985	0.47	0.11	0.36	23
1986	0.45	0.07	0.38	16
1987	0.40	0.06	0.34	15
1988	0.48	0.11	0.37	23
1989	0.50	0.10	0.40	20
1990	0.50	0.10	0.40	20
1991	0.50	0.10	0.40	20
1992	0.53	0.10	0.40	19
1993	0.51	0.08	0.43	16
Average, 1985-93	0.48	0.09	0.39	19
Percent change, 1985-93	9	-27	19	-33
Other foods:[2]				
Eggs, Grade A large, 1 dozen	0.91	0.53	0.38	58
Beef, choice, 1 lb	2.93	1.64	1.29	56
Pork, 1 lb	1.98	0.73	1.25	37
Chicken, broiler, 1 lb	0.89	0.48	0.41	54
Potatoes, 10 lbs	3.48	0.81	2.67	23
Sugar, 1 lb	0.39	0.14	0.25	36
Flour wheat, 5 lbs	1.17	0.33	0.84	28
Bread, 1 lb	0.75	0.05	0.70	7

[1]Payment to farmers for 1.53 lbs of rice, minus the value of rice-mill products accounted for by the byproducts of table rice. [2]Calculated using 1993 data.

Source: Denis Dunham (1994) and working notes from Denis Dunham.

Trends in Domestic Use

Domestic use of rice is small compared with other grains. Very little rough and no milled rice is used as a livestock or poultry feed. Instead, U.S. rice consumption is divided into three principal categories: direct food use, processed food, and beer. Domestic use of rice (rough-equivalent basis), including brewers' use, has increased dramatically from 28 million cwt in 1970/71 to an estimated 84 million cwt in 1994/95 (table 11). With this expansion in demand, domestic use has now eclipsed the once-dominant export market.

During the 1950's, domestic consumption (food and brewers' use combined) grew at a 1.6-percent annual pace before accelerating to a 2.9-percent rate in the 1960's (fig. 20). The rate of consumption further grew in the 1970's and 1980's to 3.9 and 5.8 percent, respectively, before slowing to an estimated 3.2 percent in the first 4 years of the 1990's. The growth of the 1990's comes despite a decline in both the per capita consumption rate and the absolute level of brewers' use since 1988/89.

Brewers' use appears to be slowing for a number of reasons, including the aging of the baby boom population, increasing health consciousness, and the growth

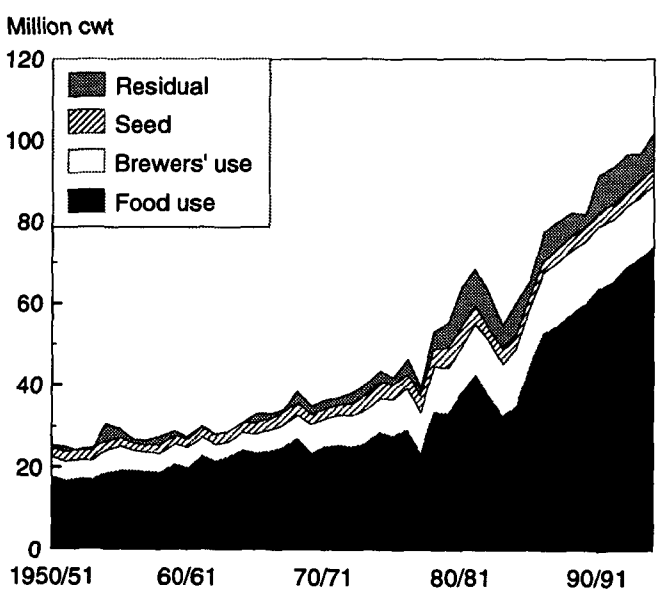
Table 11—Domestic food use, brewers' use, and per capita consumption (PCC) rates[1]

Item	Food[2]	PCC[3]	Brewers'	Total	PCC[4]
	Million cwt	*Pounds*	----------*Million cwt*----------		*Pounds*
Selected years:					
1950/51	12.8	5.9	4.9	17.6	8.2
1955/56	13.9	5.8	6.0	19.9	8.3
1960/61	15.9	6.2	4.9	20.8	8.1
1965/66	19.7	7.2	4.7	24.4	8.9
1970/71	21.5	7.6	6.8	28.3	10.0
1975/76	21.8	7.1	9.1	30.9	10.0
1980/81	34.5	10.9	11.0	45.5	14.4
1985/86	39.1	11.6	14.1	53.2	15.7
1990/91	58.7	16.8	15.3	74.0	21.2
1994/95	69.0	18.8	15.0	84.0	22.9
Averages:					
1950/51-1959/60	13.1	5.6	5.0	18.1	7.7
1960/61-1969/70	19.4	7.2	5.0	24.4	9.1
1970/71-1979/80	22.8	7.6	9.0	31.9	10.5
1980/81-1989/90	40.8	12.1	13.9	54.7	16.3
1990/91-1994/95	63.9	17.6	15.2	79.1	21.8
			Percent		
Growth rates:[5]					
1950/51-1959/60	2.0	-0.1	0.5	1.6	-0.5
1960/61-1969/70	2.5	1.4	4.5	2.9	1.9
1970/71-1979/80	3.1	1.7	5.9	3.9	2.5
1980/81-1989/90	6.6	5.5	3.5	5.8	4.7
1990/91-1994/95	4.2	2.9	-0.7	3.2	1.9

[1]All numbers are on a rough basis, except per capita consumption which is on a milled basis. [2]Excludes shipments to overseas territories. [3]PCC excluding brewers' use. [4]PCC including brewers' use. [5]Growth rates are calculated using trend regression for the relevant period.

Source: USDA database.

Figure 20
U.S. total domestic rice use



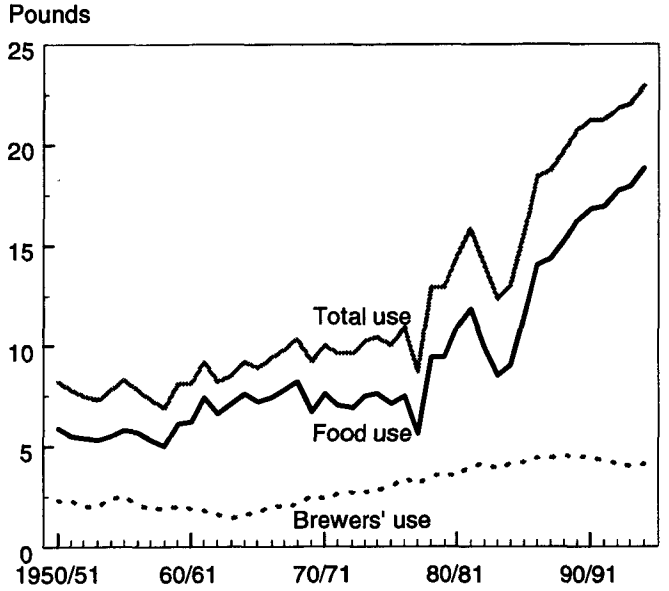
Source: USDA.

in demand for "lite" beers that require less rice in their brewing process.

Per capita consumption rates have paralleled the growth in total consumption (fig. 21). Domestic per capita consumption, including brewers' use, has grown from only 10 pounds in 1970/71 to nearly 23 pounds in 1994/95. After no growth in the 1950's, per capita consumption achieved a steady rate of growth in the 1960's and 1970's (1.9 and 2.5 percent, respectively) before accelerating at a 4.7-percent clip in the 1980's. So far in the 1990's domestic growth in per capita consumption has slowed to a 1.9-percent rate as declining brewers'-use demand partially offsets continued strong growth in domestic food-use demand.

Several factors point to continued expanding U.S. consumption of rice during the rest of the 1990's. These factors include favorable demographics, the growing perception of rice as a low-fat, highly nutritious food, greater convenience in preparing rice, an expanding selection of prepared rice dishes and flavored rice

Figure 21
U.S. rice per capita consumption rates



Source: USDA.

Table 12—Per capita consumption of selected foods, selected years[1]

Year	Rice[2]	Wheat flour[3]	Potatoes[4] Fresh	Potatoes[4] Frozen	Corn products[5]
			Pounds		
1970	6.7	110.9	12.8	59.3	11.1
1975	7.6	114.5	18.6	50.5	10.8
1980	9.4	116.9	17.7	49.1	12.9
1985	9.0	124.6	22.7	44.5	17.1
1990	16.2	135.6	25.1	43.9	21.7
1991	16.8	136.6	25.6	44.6	21.9
1992	16.9	138.1	25.5	47.0	21.9
1993	17.5	139.4	25.7	49.8	22.1

[1]Calculations used in this source differ slightly from those of table 11, but are retained for consistency in comparison across foods. [2]Milled basis, excluding brewers' use. [3]White, whole, and durum flour. [4]Retail-level consumption. [5]Flour and meal, hominy and grits, and starch.

Source: Putnam and Allshouse (1994).

mixes, and adaptation of rice byproducts, such as brokens, bran, and rice-bran oil, to new consumer uses.

Despite tremendous growth in domestic consumption of rice for food use during the past two decades, rice's average per capita consumption remains low relative to other staples, suggesting room for further growth. In 1993, the average American consumed 139.4 pounds of wheat flour, 25.7 pounds of fresh potatoes, 49.8 pounds of frozen potatoes, 22.1 pounds of corn products, and only 17.5 pounds of rice for food use (table 12).

Direct food use is the largest single domestic outlet, averaging 58 to 64 percent of total domestic disappearance since the late 1950's (table 13). Beer and processed foods account for the balance. Beer's share has been falling steadily since the mid-1970's, while processed foods' share has risen. Processed foods include soups, cereals, pet foods, rice cakes, and baby foods. Most of the direct food use is long-grain rice. Processors and brewers usually use medium-grain, short-grain, and brokens. However, all rice used in soups and about one-third of rice used in cereals is long-grain rice. Because the rice will be processed further and starch content is an important factor to many food processors, these groups tend to use the shorter, stickier grains. Processors are also more price-sensitive than direct food users because substitution among classes is feasible in some processed products such as candy and cereals, and the shorter grains tend to be cheaper than the long grains.[16]

The predominant consumption of rice is still table use, often called direct food use. This category excludes all products for which rice is used as an ingredient in the manufacture of another product. Direct food use of milled rice has more than doubled since 1975/76, growing to over 31 million cwt in 1990/91, the last year of available distribution data.

With numerous new products and effective marketing, processed foods are the fastest growing domestic market for U.S. rice. Processed food use accounted for 21 percent of total domestic demand for milled rice in 1990/91, up sharply from 14 percent in 1984/85.

Domestic rice demand is generally insensitive to changes in farm and retail rice prices. Statistical analysis indicates that a 10-percent change in the retail rice price is associated with a 1.8-percent change

[16]Based on preliminary results of USDA's 1990/91 milled rice distribution survey. Although medium-grain has moved to a substantial premium over long grain since 1991, little information is available concerning any consequent shifts in the composition of domestic use.

Table 13—U.S. rice domestic use by outlet (milled basis), selected years[1]

Market year	Direct food	Processed food	Beer	Total	Direct food	Processed food	Beer
	Million cwt				*Share as a percentage*		
1955/56	8.1	1.5	3.2	12.8	63	12	25
1966/67	11.1	3.0	3.1	17.2	64	17	18
1969/70	13.1	3.0	5.1	21.2	62	14	24
1971/72	13.6	3.5	5.4	22.5	60	16	24
1973/74	13.3	3.4	5.9	22.6	59	15	26
1975/76	13.0	2.9	6.4	22.2	59	13	29
1978/79	15.3	3.7	7.9	26.9	57	14	29
1980/81	18.9	4.5	8.0	31.4	60	14	25
1982/83	19.7	3.3	9.6	32.6	60	10	29
1984/85	22.3	5.4	9.7	37.4	60	14	26
1986/87	24.7	7.6	10.7	43.0	57	18	25
1988/89	27.7	8.6	11.2	47.5	58	18	24
1990/91	31.5	11.5	11.0	54.0	58	21	20

[1]Totals may not add due to rounding.

Source: Childs (1993).

in the opposite direction in food use (Grant, Beach, Lin, 1984). The demand response to changes in farm prices is also very low. Changes in prices of potatoes, corn, and wheat products have been estimated to have almost no effect on domestic rice demand.

Population and income are more important than price in determining food demand for rice. A 5-percent increase in U.S. per capita income has been estimated to cause per capita food use to rise by about 3 percent (Grant, Beach, Lin, 1984). Rice consumption is very much influenced by ethnic demographics. An increase in the Asian, and to a lesser extent Hispanic, population in the United States has been a factor in the upward trend of rice consumption.

Rice is consumed at a much higher rate by Asian-Americans and Hispanic-Americans than by the U.S. population as a whole. Some consumer surveys indicate Asian-Americans eat about 150 pounds of rice a year, compared with the national average estimated at 19 pounds in 1994/95. Asian-Americans currently are the fastest growing ethnic group in the United States, and this has contributed to increasing per capita rice consumption. Similarly, Hispanic-American and African-American ethnic groups are fast-growing populations that consume rice at rates above the national average.

Health benefits associated with increased consumption of rice and effective marketing are also considered important factors increasing per capita consumption of rice in the United States. Moreover, slowly changing tastes and preferences probably have more influence on the demand for rice than do price or availability.

Two other reasons for this stable domestic rice market are a simple marketing process and the lack of much exposure to volatile feed markets. Only rice millfeed—a mill byproduct consisting of bran and hulls—is fed to animals.

Domestic use is forecast to remain above exports due to continued strong growth in the domestic market. The U.S. rice industry will be challenged in the future to continue to produce adequate supplies for this rapidly growing domestic market.

Imports

U.S. rice imports have increased with the overall increase in the domestic rice market. Between 1975/76 and 1979/80, U.S. rice imports averaged a meager 0.1 million cwt (rough basis) and were less than 1 percent

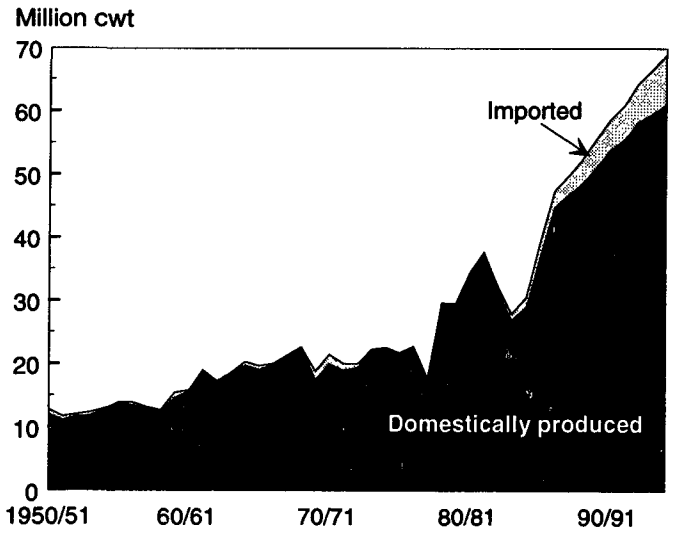
of the U.S. domestic food market. However, since 1980/81, U.S. rice imports have risen rapidly to an estimated 6.9 million cwt (or a 10-percent share of the U.S. domestic food market) in 1993/94 (fig. 22).

The principal factor behind this dramatic rise in import demand has been a strong preference for aromatic varieties (particularly jasmine from Thailand and basmati from India and Pakistan) from the rapidly growing Asian-American ethnic group. The demand for foreign, especially Asian, food and meals has also increased as Americans have developed a more sophisticated awareness of alternative rice types. These factors have given rise to a growing market niche, which U.S. production generally has not supplied.

Varieties with special characteristics, which are not produced domestically, such as Indian basmati and Thai jasmine, have distinctive cooking features (taste, aroma, grain separateness, grain length) that make them identifiably different products from U.S. long-grain rice. Despite much research, U.S. varietal development programs have shown only limited success at reproducing all of the distinctive features; however, the market potential for a consumer-acceptable, U.S.-grown aromatic variety is huge.

Regular milled rice, including Thai jasmine, has accounted for over 90 percent of imports since 1982. However, jasmine rice is not identified by U.S. Census trade data. Thus, its actual share of imports is indistinguishable from nonaromatic rice. However, most of Thailand's exports to the United States, which are identified simply as milled rice, are likely jasmine. This is an important distinction because imports of specialty varieties, including aromatic varieties, contribute to market growth, whereas imports of nonaromatic high-quality milled rice, which is produced domestically, are competitive and reflect the likelihood that lower priced imports have displaced domestic supplies.

Figure 22
U.S. domestic rice food use, by source



Source: USDA.

Since 1991, domestic and international market forces have increased the price gap between relatively expensive U.S. rice and less expensive foreign rice, making the U.S. high-quality rice market an attractive target for low-cost foreign producers like Thailand and Vietnam (fig. 23). As imports increase, such countries can be expected to play an arbitrage role in keeping U.S. prices more in line with world prices.

U.S. Exports and the International Rice Market

The United States depends on exports for over 40 percent of total annual rice disappearance. However, U.S. rice traditionally trades at a significantly higher price than foreign rice. As a result, some rice importing countries view the United States as a residual supplier, implying that international trading patterns and prices strongly affect the U.S. supply and use situation.

International Rice Market Characteristics

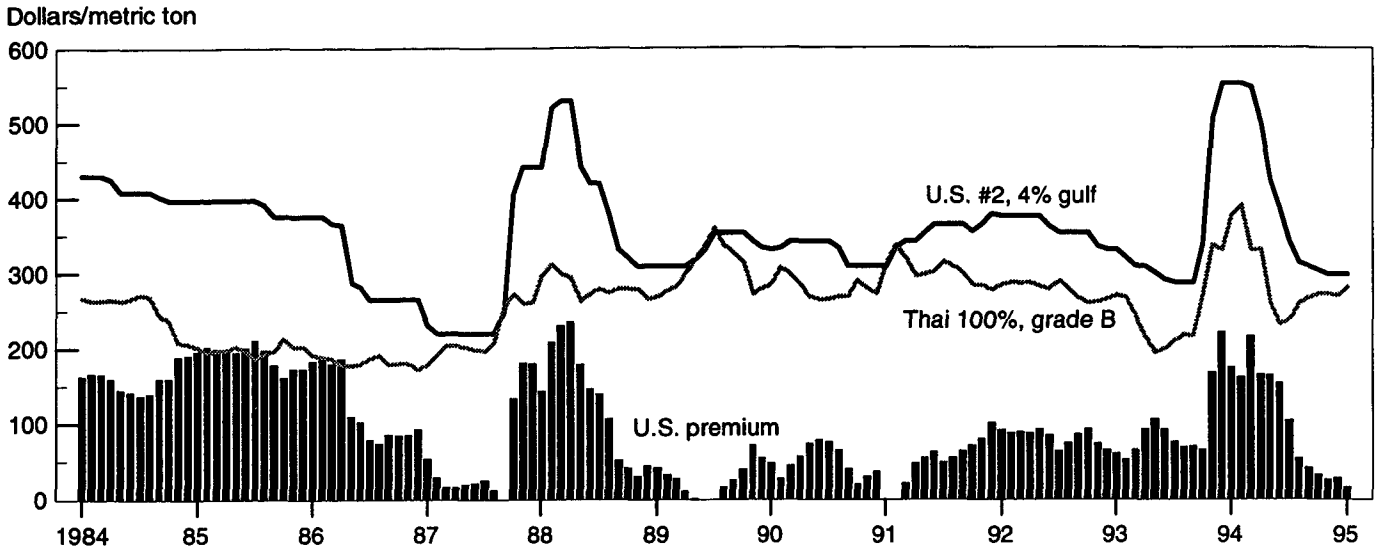
The international rice market has several characteristics that set it apart from other cereal markets. These characteristics influence price formation, trading patterns, and ultimately U.S. exports and prices.[17]

High Price and Trade Variability

World rice trade volume and prices generally fluctuate more from year to year than those of other grains for several reasons. First, a low volume of world production, less than 5 percent, is traded. Second, while rice is grown in many countries, over 90 percent of the world's rice is grown and consumed in Asia.. This concentration of production in Asia makes the rice market highly vulnerable to weather shocks. Third, in the major consuming countries, rice consumption exhibits a very low responsiveness to prices (much lower than for other cereals) due, in part, to a lack of acceptable substitutes and to the limited use of rice for feed. Fourth, the inter-

[17]For more detail concerning international rice market characteristics and their effect on trade, refer to Barker, Herdt, and Rose (1985), Childs and Lin (1989), Jayne (1993), and Schnepf (1994).

Figure 23
Monthly f.o.b. high-quality price quotes, January 1994 to January 1995[1]



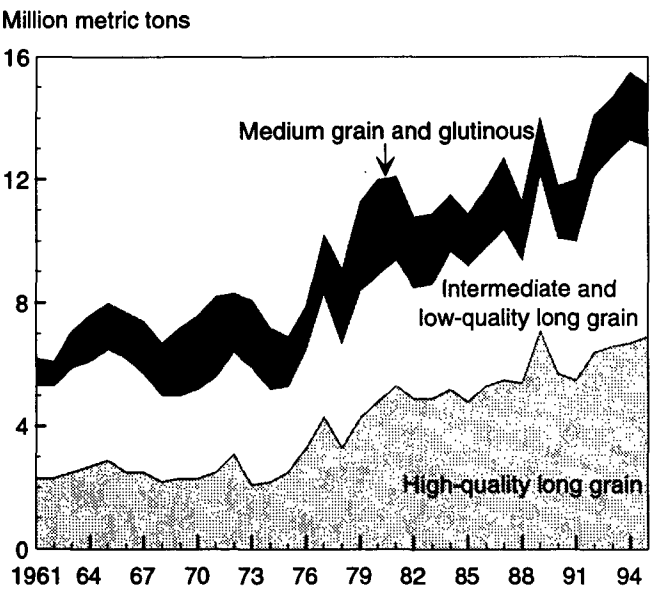
[1]Thai 100 percent, grade B and U.S. no. 2, 4 percent are comparable high-quality long grain.
Source: USDA.

national rice market has no major stockholder, a price-stabilizing function the United States performs for corn and wheat (with the European Union). Finally, price formation is generally not transparent because there exists no internationally accepted marketplace or set of standards for grading rice entering the world market.[18]

Market Segmentation by Type and Quality

The international rice market is highly segmented according to well-defined preferences in consumption. International trade in rice can be differentiated by both quality (high, intermediate, and low) and type (long-grain, medium-grain, glutinous, and aromatic). Rice quality is generally defined by its degree of milling and the percent of brokens which, in turn, is a function of a country's milling capability, grading and standardization procedures, and varietal development.

Figure 24
World rice trade, by type



Source: USDA.

[18]First-tier exporters such as Argentina, Australia, the EU, Pakistan, Thailand, Uruguay, and the United States are reliable suppliers in terms of quality and grade. However, second-tier exporters such as Burma, China, Guyana, India, and Surinam are less reliable. As a result, an international buyer of rice assumes a greater search cost and a higher degree of product risk than is the case for other grains, particularly when buying from a second-tier or nontraditional exporter.

In recent years world rice trade has been predominantly long-grain rice (indica and aromatic varieties) (fig. 24). A rough estimate suggests that during 1991-1993, total trade in rice was about 40 percent high-quality long-grain (10 percent or fewer brokens), 23 percent intermediate-quality long-grain (10 to 20 percent brokens), and 22 percent low-quality long-grain (more than 20 percent brokens). Medium-grain trade (principally japonica) has only been about 13 percent, although it gains in importance with occasional import surges by South Korea and Japan. Specialty rices, predominantly glutinous, are the remainder.

The United States competes primarily with Thailand and Vietnam for high-quality long-grain markets. Thailand also is a strong competitor in intermediate- and low-quality long-grain markets where its major competitors are Burma, China, Pakistan, and Vietnam.

Medium-grain rice is preferred in the East Asian regions of north China, the Korean peninsula, Japan, and Taiwan, along with several of the countries bordering the Mediterranean Sea (Algeria, Egypt, Israel, Jordan, Syria, and Turkey). The United States, Australia, Spain, Italy, and more recently China compete for the medium-grain markets.

The United States and China are the only two major rice-producing countries that grow significant amounts of both medium- and long-grain rice. The European Union (EU) imports high-quality long-grain, while exporting medium-grain.

Rice importers can be grouped into two fundamental categories. First are the regular, steady importing countries that lack sufficient domestic production capacity to meet internal consumption needs. Major importing regions in this group include the Middle East, the Western Hemisphere (excluding the United States, Argentina, Guyana, Surinam, and Uruguay), Eastern and Western Europe, sub-Saharan Africa, as well as Hong Kong, Malaysia, and Papua New Guinea from Asia.

Canada, Western Europe, Saudi Arabia, the Republic of South Africa, and the United States almost exclusively import high-quality (often aromatic) long-grain varieties. Latin America, the Caribbean, and the rest of the Middle East are more price-sensitive markets taking high-quality long grain when the price permits, but often buying intermediate grades of rice when funds are limited. The Mediterranean countries are emerging as strong growth markets for medium-grain rice. Eastern Europe appears to consume either medium- or long-grain varieties, depending on price and availability. The slow economic growth in sub-Saharan Africa usually restricts these countries' rice imports to low-quality long-grain.

The second group of importers includes the major consuming countries that import rice only when domestic production shortfalls produce consumption deficits. Major participants in this group include Indonesia, India, Japan, the Philippines, and South Korea. This second group transmits most of the price shock to the international rice marketplace.

Under the recently completed Uruguay Round of the GATT, Japan and South Korea have agreed to gradually open their markets to rice imports through a market access provision. As a result, medium-grain rice market share and price are expected to increase substantially beginning in 1995.

World long-grain rice trade (all qualities) is projected to show strong, steady growth through the year 2005 driven by population and income growth, particularly in Africa, Latin America, and the Middle East, but also in the industrialized countries of Canada, the United States, and Western Europe.[19] Trade volume is projected to grow 2.4 percent per year through the remainder of the 1990's, and 2.9 percent for 2000 through 2005, compared with only 1.1 percent for the 1980's.

This represents strong growth in commercial import demand for rice over the coming decade, and suggests the potential for higher prices if production is unable to expand as rapidly as demand. Sub-Saharan Africa's rapid population growth is projected to maintain its status as the world's leading source of import demand for low-quality long-grain rice. However, exporter government assistance may be needed for sub-Saharan African markets for several more years.

In light of the expected growth in world import demand, nominal world rice prices will increase throughout the next decade. Thailand, Burma, and China are expected to be the primary beneficiaries of the expanding trade. Other major exporters are expected to show only limited responses to higher world prices due to constraints on production (Australia and the United States) or to rapid increases in domestic demand (India and the United States).

[19]World Agricultural Outlook Board (1995).

Market Segmentation by Processing and Packaging

Long-grain preferences already defined by quality can be further distinguished by degree of processing as most of the rice importing and exporting countries want to perform as much as possible of the "value-added" milling stage in-country, while certain countries have strong preferences for parboiled rice, rather than white milled rice.

The most important examples include the following: (1) the EU imports predominantly parboiled, brown long-grain rice from the United States; (2) the Republic of South Africa, Nigeria, and Saudi Arabia prefer high-quality parboiled, milled long-grain rice; (3) Mexico and Brazil prefer to import rough rice to meet domestic milling capacity; and (4) Bangladesh, India, and Sri Lanka prefer to import intermediate- to low-quality parboiled long-grain rice. Argentina, the United States, and Uruguay appear to be the only countries willing to export rough rice to satisfy international demand. Thailand, Vietnam, and many other major rice exporters have laws expressly forbidding the export of rough rice.

Packaging distinctions are also an extremely important aspect of rice marketing as importers often have highly varying specifications for the type of packaging and shipping required for their import markets ranging from plastic, weather-proof packages in small sizes to 100-kilogram hemp bags to bulk shipment.

An exporting country's inability to adequately grade and mill its rice represents an important obstacle to gaining market share in high-value rice importing markets such as the EU, Japan, and Saudi Arabia. Among major exporters, Burma and India still have inadequate milling facilities, thus limiting their ability to compete in the high-quality long-grain (nonaromatic) markets. Vietnam has recently shown marked progress in improving its milling capabilities and is beginning to compete aggressively in the intermediate- and high-quality rice markets.

The U.S. Position in the World Rice Market

The United States has a reputation as an exporter of high-quality long- and medium-grain rice. From 1989 to 1992, the United States supplied nearly 19 percent of all rice traded internationally. During this period, U.S. exports were 70 percent long-grain, 13 percent medium- and short-grain rice, and the remainder rough, mixed, and brokens (table 14).

Table 14—U.S. census rice exports by type, by product weight, by value, and by unit-value

Item	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
						1,000 metric tons						
Total volume	2,274	2,358	2,025	1,938	2,857	2,330	2,881	2,596	2,422	2,241	2,555	2,626
Rough	26	147	145	75	372	53	179	72	221	296	233	165
Long	1,542	1,429	1,291	1,366	1,952	1,568	2,052	1,872	1,693	1,374	1,679	1,487
Medium/short	627	641	443	313	385	463	406	337	321	351	298	657
Mixed	73	104	99	104	143	93	162	249	144	146	197	188
Broken	6	38	47	80	6	153	81	65	43	74	147	128
						Million dollars						
Total value	868	917	716	612	622	723	912	869	746	751	754	925
Rough	6	28	18	9	51	8	34	14	42	63	39	31
Long	654	652	545	484	470	546	698	658	555	500	536	509
Medium/short	187	197	115	80	70	121	121	114	97	123	95	293
Mixed	21	32	30	30	30	23	40	68	43	49	54	65
Broken	1	8	8	9	1	25	19	15	10	17	30	27
						Dollars/metric ton						
Unit-value	382	389	354	315	218	310	316	335	308	335	295	352
Rough	218	193	126	117	136	151	188	195	189	212	168	190
Long	424	456	422	354	241	348	340	351	328	364	319	446
Medium/short	297	308	259	256	182	260	298	338	303	350	319	446
Mixed	283	302	300	283	214	248	244	275	296	335	275	343
Broken	236	204	165	113	186	165	236	227	225	225	201	210

[1]Data are presented on a U.S. marketing year (August-July) basis.

Source: U.S. Department of Commerce, Bureau of the Census.

Three principal factors influence the ability of the United States to export rice in the international rice market: price competitiveness, U.S. Government export programs, and international nonprice factors.

U.S. Price Competitiveness

Unlike most other rice exporting countries, the United States has a rice industry that services a large, high-valued domestic market that generally tends to bid the U.S. price well above competitors' prices. This price premium is most often measured by monitoring the difference between the United States' No. 2, 4 percent, milled long-grain rice, f.o.b. Houston, and Thailand's 100 percent grade B, milled long-grain white rice, f.o.b. Bangkok (fig. 23).[20]

U.S. rice exports traditionally compete very well with a $30 to $50 premium per ton. As the premium rises above $50 per ton, price-sensitive markets, particularly in the Middle East, Latin America, and the Caribbean, begin to search for alternate sources of supply.

The 1985 farm act's rice marketing loan provision, initiated in April 1986, was designed to restore competitiveness to U.S. rice exports after several years of high U.S. prices and large stock accumulations. Although the marketing loan helped to eliminate the staggering $200 plus premium that existed from 1982 until 1986, several factors have since combined to again drive U.S. prices significantly above foreign prices.

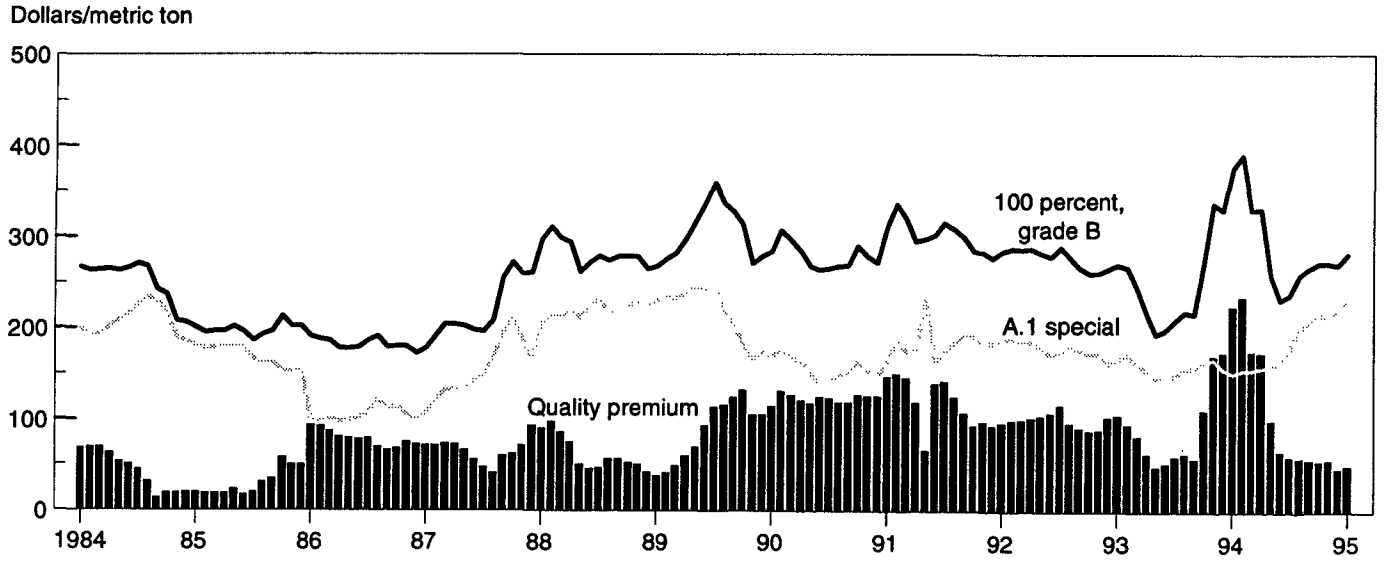
First, high quality standards and strict grading procedures for U.S. rice reduce buyer risk frequently found in foreign markets. U.S. exports are generally all of high-quality and dependable delivery, factors meriting a price premium from buyers.

Second, the U.S. rice industry has demonstrated an ability to meet the most sophisticated and varying specifications of an importer. The U.S. rice industry can export both long- and medium-grain rice at any stage of processing (rough, brown, milled, or parboiled), at any level of quality (as a percent of brokens), and in practically any form of packaging or shipping. This flexibility further enhances product acceptability.

Third, the entrance of Vietnam as a major player in the world rice market has generated a surge in foreign lower quality rice exports since 1989 which, in turn, has pressured Thailand's high-quality rice prices. Thailand competes actively in high-, intermediate- and low-qual-

[20]These are high-quality rice grades containing 4 percent or less broken rice.

Figure 25
Thai f.o.b. monthly price quotes[1]



[1]100 percent, grade B is a high-quality long grain; A.1 special is low-quality all-broken rice.
Source: USDA.

ity markets. As a result, its prices are closely linked and tend to run parallel to each other (fig. 25). The United States, on the other hand, exports very little low-quality rice and generally does not attempt to compete in low-priced markets because the United States generally does not produce low-quality milled rice.

Fourth, there is a general reluctance on the part of U.S. trading companies and mills to import large amounts of nonaromatic, high-quality foreign rice, thus preventing imports from performing the role of arbitrage.

Under perfectly functioning markets, only the first and second factors (lower buyer-risk and enhanced marketability) could be expected to generate any price premium in excess of transportation costs. With the U.S. price premium for high-quality long-grain rice often near $100 per ton, there is a significant profit opportunity for an importer of foreign rice.

U.S. Government Programs

The U.S. Government relies on three principal export programs for assisting rice exports: the Export Enhancement Program (EEP), Commodity Credit Corporation (CCC) credit programs, and Public Law-480 (PL-480) sales and donations.[21] U.S. government export programs, particularly the PL-480 program, have provided an additional outlet for U.S. rice production during periods of slack demand and large stocks.

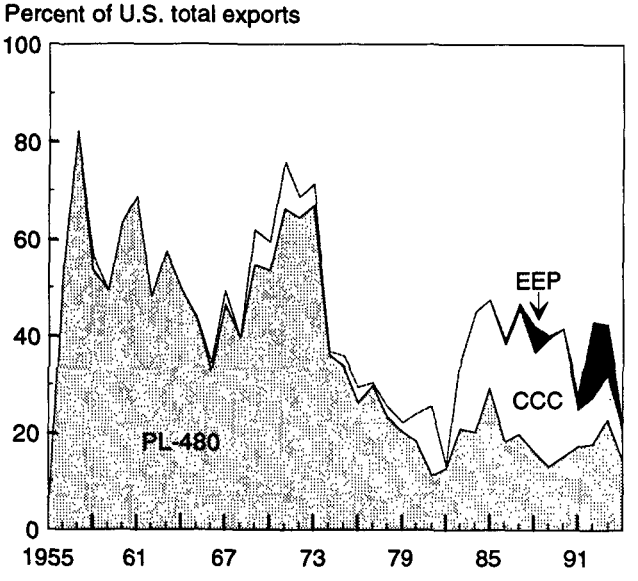
EEP sales are used to permit U.S. rice to compete with the subsidized rice exports of the EU. The use of EEP is restricted to countries importing subsidized EU rice (usually medium-grain markets). These markets include Eastern Europe, the former Soviet Union, and countries bordering the Mediterranean Sea (Algeria, Israel, Jordan, Lebanon, Morocco, and Turkey).

During the 1960's and 1970's, U.S. government export programs were a factor in nearly 50 percent of all U.S. rice exports. This share fell to 36 percent during the 1980's. Since 1990, the program-assisted share has fluctuated between 22 and 43 percent (fig. 26 and appendix table 10).

This variability is partly attributable to changing market conditions. During a period of rising international prices, U.S. program exports decline due to higher domestic prices under fixed budget amounts.

[21]For details, refer to Ackerman and Smith (1990).

Figure 26
U.S. government program-assisted share of total rice exports, fiscal years 1955-94



Source: USDA.

International Nonprice Factors: Policy and Politics

Under free market conditions, the principal factor in determining any country's international competitiveness is its comparative advantage in production. The key components in determining comparative advantage in rice production are agronomic conditions (such as climate, soil, and water) and input availability and cost (labor, fertilizers, and pesticides). The best indicator of comparative advantage is cost of production. Reliable cost-of-production data are lacking for most rice-growing countries.

However, the Southeast Asian countries of Burma, Thailand, Cambodia, and Vietnam encompassing the three major river systems of the Irrawady, the Chao Phraya, and the Mekong have tremendous comparative agronomic advantages over the rest of the world for rice production (with the sole exception of China whose huge population has prevented signficant expansion of its rice exports). Each of these countries has an abundant labor supply, but small domestic markets relative to its production potential. Excluding Cambodia, whose geopolitical barriers prevent normal rice production activity, these countries set the standard for other rice exporting countries' ability to compete in international markets.

However, over the past three decades, the United States has witnessed three other factors not directly related to comparative advantage in production dramatically affect its international rice trading patterns. These three factors include (1) changing agricultural and trade policy by major rice consuming countries; (2) geopolitical forces; and (3) international trade agreements, in particular, the GATT.

As a result of frequent policy-induced trade shocks and resultant shifting trade patterns, the U.S. rice industry has had to constantly re-orient its export initiatives.[22]

Agriculture and Trade Policy of Major Rice Consuming Countries

In many Asian countries, rice is more than just a food, it is a way of life encompassing cultural and religious mores that transcend the marketplace. During the 1960's and 1970's, as populations expanded and demand grew, many of the major Asian rice consuming countries were forced to import large quantities to meet domestic needs. These imports were politically very unpopular and led to the evolution of rice "self-sufficiency" policies in many Asian countries. The pervasiveness of these "self-sufficiency" policies in the international marketplace has created an artificial environment within which most of the world's rice is traded.

International prices are kept artificially low by rigid trade and production policies, including restrictive trade barriers, high domestic support prices, input subsidies, and export subsidies in a significant number of major rice consuming countries. These policies have combined to decrease import demand from the EU, India, Indonesia, Japan, Malaysia, the Philippines, South Korea, and Taiwan while increasing exportable supplies from Australia, Burma, the EU, Thailand, and Vietnam.

In the EU, Japan, South Korea, Taiwan, China, India, Malaysia, the Philippines, Indonesia, Thailand, and Vietnam, trade is either strictly controlled by state authorities or is regulated by highly restrictive import-control mechanisms set in place by state authorities. Japan, South Korea, Taiwan, Thailand, and Vietnam have strict bans on the import of foreign rice with exceptions made only in time of crisis. Japan and South Korea have agreed to minor market minimum access criteria under the UR-GATT of 4 percent growing to 8 percent over 5 years, and 1 percent growing to 4 percent over 10 years, respectively. The EU applies a highly restrictive variable import levy (VIL) on foreign rice imports. In China, India, and Indonesia, the government rigidly controls external trade in food grains, particularly rice, through a variety of mechanisms, including import licenses, quotas, and minimum import and export prices.

The development of these market-interfering policies has been sporadic, rendering the international trade environment volatile and often unstable, particularly for countries that depend on trade for determining prices, absorbing surplus production, or meeting domestic needs.

During the 1960's and 1970's, Indonesia was the world's top rice destination, importing over 23 million tons between 1961 and 1984. U.S. rice exports accounted for 18 percent, or 4.2 million tons, of the total. However, by 1985 Indonesia attained self-sufficiency under a policy of high domestic support prices and input subsidies, accompanied by strict import controls. From 1985 through 1993, U.S. rice exports to Indonesia were only 94,000 tons.

In Japan, limited area and a rapidly growing population led to significant rice imports during the mid-1960's. This was countered by setting in place a policy of rice self-sufficiency that included a virtual ban on imports accompanied by the most extreme commodity price support program in the world. By 1994, Japan's state-controlled farm support price for rice had risen to over $2,730 per ton, more than 19 times higher than the U.S. loan rate (table 15).

From 1967 to 1982, South Korea imported nearly 8 million tons of rice. U.S. rice exports accounted for 5.2 million tons, 65 percent of all rice entering South Korean markets during this period. Then, in 1983 the South Korean government implemented agricultural policies designed to attain rice self-sufficiency. As in Japan, a strict ban on imports was combined with high producer support prices which, by 1993, were over 14 times higher than the U.S. loan rate. In the 11 years since South Korea implemented its rice self-sufficiency policy, only 28,000 tons of rice have been imported (of which 13,000 tons were from the United States).

The European Union's Common Agricultural Policy (CAP) supports the rice production of its member nations through a system of support prices, production subsidies, and export subsidies. The CAP protects its domestic rice industry through variable import levies (VIL's) imposed at the border to enforce minimum import prices. Over the past 5 years, the VIL for brown, parboiled long-grain rice (the principal type of U.S. rice exported to the EU) has averaged $536 per

[22]More prominent instances include the following lost markets: Cuba in 1959, Japan in 1967, Iran in 1981, South Korea in 1982, Indonesia in 1985, and Iraq in 1990.

Table 15—Comparison of U.S. loan rate for rice to foreign government producer support prices from Japan, South Korea, and the European Union

Market year	Japan[1]	South Korea[2]	EU[3]	U.S. loan rate[4]	Support prices to U.S. loan rate		
					Japan	S.K.	EU
	U.S. dollars/metric ton				*Ratio*		
1988/89	2,218	1,519	399	146	14.9	10.4	2.7
1989/90	2,023	1,885	428	143	14.1	13.2	3.0
1990/91	1,899	1,968	459	143	13.3	13.7	3.2
1991/92	2,028	2,032	459	143	14.2	14.2	3.2
1992/93	2,157	2,024	456	143	15.1	14.1	3.2
1993/94	2,457	2,068	439	143	17.1	14.4	3.1
1994/95	2,677	2,065	466	143	18.7	14.4	3.3
						1,000 metric tons	
Average annual consumption from 1988/89-1993/94:					9,564	5,463	1,691

[1]Source: Japan country reports (various issues), USDA, FAS. [2]Source: South Korea country reports (various issues), USDA, FAS. [3]Source: Europe Situation and Outlook Series, WRS-94-5, Economic Research Service, USDA, Sept. 1994. [4]USDA, Consolidated Farm Service Agency. The U.S. support price (or loan rate) excludes the income-support deficiency payments, which are based on the target price (currently $10.71 per cwt or $236 per metric ton).

ton, pushing the average Rotterdam price to over $900 per ton for equivalent grade U.S. rice, while the VIL for milled white long-grain rice has been prohibitive at greater than $800 per ton. The EU intervention price (guaranteed purchase price) has averaged over three times higher than the U.S. loan rate.

Between 1970 and 1985, EU rice imports showed strong growth. Traditionally, the EU has been a net importer of rice. However, by type the EU has been a small net exporter of medium-grain and a big net importer of long-grain varieties. To reduce overall net imports, the EU established a long-grain production subsidy in 1987 to increase the acreage planted to long-grain rice. The subsidy was initially set at $444 per planted hectare with the subsidy declining over time until its expiration in 1992. However, the subsidy has never been allowed to expire and was still in effect for the 1993/94 crop at $141 per hectare. The subsidy has had the effect of increasing EU long-grain production from negligible amounts prior to 1987, to over 400,000 tons by 1992, while effectively reducing EU long-grain imports by an equivalent amount.

Given the policy-dominated international trade environment, the U.S. rice industry is in a "holding" position, enabled by government subsidies to financially "hang on" while waiting for the international marketplace to liberalize.

Under conditions of open markets and universal free and fair trade, the import demand coming from the high-income East Asian countries of Japan, South Korea, and Taiwan alone could range from 3 to 8 million tons, Indonesian demand could range from 1 to 3 million tons, while the EU could add 500,000 tons or more of high-valued demand. World trade in 1995 is estimated at 15.5 million tons.[23] An infusion of added import demand ranging from 4.5 to 11 million tons would be sufficient to drive international prices considerably above current levels, significantly lowering the cost of U.S. government program activities, and increasing the role of the marketplace in pricing U.S. rice.

Geopolitical Forces

The United States has been shut out of important rice importing countries due to geopolitical events completely beyond the control or influence of the U.S.

[23]USDA, Foreign Agricultural Service (1995).

rice industry. The two most prominent examples of this are Iran and Iraq. Iran's Islamic revolution of 1979 branded the United States as the "great Satan" and ended a history of important rice trade between the two countries. Iran was the top value and volume importer of U.S. rice from the mid-1970's up to the rupture in diplomatic relations in 1979, averaging 383,000 tons and $142.3 million in annual sales between 1976/77 and 1978/79. Likewise, Iraq's invasion of Kuwait in August 1990 and the subsequent Gulf War of 1991 closed what had been the United States' largest market since 1984/85. From 1981/82 through 1989/90, Iraq imported over 3.4 million tons of rice from the United States for a value of $1.2 billion.

Uruguay Round Agreement[24]

The principal effect of the Uruguay Round Agreement of the General Agreement on Tariffs and Trade (UR-GATT) on world trade is the opening of the previously closed East Asian high-income markets of Japan and South Korea.[25] These two countries have strong preferences for japonica rice. As a result, the dominant UR-GATT-related price effect occurs in the medium-grain rice market.

Minimum access import quotas are established for both Japan and South Korea under the UR-GATT. The combined market openings represent an initial 436,000 tons of new imports, but grow to nearly 1 million tons by 2005, thus, challenging the world's ability to produce such a large surplus of high-quality japonica.

As a major exporter of medium-grain rice, the United States will benefit significantly as U.S. prices and export values rise, but the full extent of the gain depends on U.S. capacity to expand production and exports on a sustainable basis. California, the most efficient U.S. producer of japonica rice, faces perhaps the strictest environmental restrictions on expanding acreage and yields.

Higher U.S. farm prices under UR-GATT are projected to reduce program costs as U.S. domestic prices rise well above the loan rate. Also, higher international prices, projected to rise near the U.S. loan rate by 2000, imply marketing loan payment gains falling to modest levels.

Besides lower U.S. program costs, the UR-GATT agreement implies potential shifts in U.S. domestic use and export composition as both processors and traders adjust their usage rates to reflect a rising price premium of medium-grain over long-grain rice.

World rice trade is expected to remain predominantly long grain under UR-GATT. Despite significant export gains made in East Asian markets (particularly Japan) under UR-GATT, the overall level of U.S. exports will not rise by the same amount due to a widening export price premium which implies that the United States will lose some of its long-grain exports in the more "price-sensitive" markets and lower program-assisted exports resulting from higher domestic prices under fixed budget amounts.

Recent Trends and Developments in the U.S. Export Market

Since the entrance of Vietnam as a major rice exporter in 1989, the world market has shown increased price sensitivity. This heightened price sensitivity has forced high-priced U.S. exporters to aggressively seek out and develop new markets, resulting in important changes in U.S. rice export patterns.

Heightened Price Sensitivity Since 1989

Since 1990, world trade in rice has been expanding 7 percent per year. However, much of the expanded trade has been in lower-priced, low-quality rice from China, Pakistan, and Vietnam destined for sub-Saharan Africa and Latin American markets.

This growth in trade has taken place in a setting of expanding global supplies and heightened price competitiveness. Stagnant global economies have made pricing the dominant factor in shifting trade patterns. The United States will lose market share in this new environment if U.S. prices exceed competitors' prices.

Thailand and Vietnam, the United States' major competitors in the world market for long-grain rice, have low costs of production. In the medium-grain market, the United States' principal competitors include Australia (with high costs of production) and China with perhaps the world's lowest costs of production.

Since the entrance of Vietnam as a major exporter in the international rice market in 1989, the international market has shown a tendency for excess supply, strong

[24]For further details see USDA, Office of Economics, and Economic Research Service (1994) and Cramer, Wailes, Goroski, and Phillips (1991).

[25]Taiwan is not a member of the World Trade Organization (WTO) created by the UR-GATT, but is expected to join during 1995 (contingent on WTO membership by the People's Republic of China). Once a member, Taiwan will also be subject to minimum access criteria. If Taiwan's minimum access criteria are similar to Japan's, they would involve rice imports of about 70,000 tons initially, growing to 135,000 tons by 2000.

competition, and low prices. Expanding supplies in Burma and Pakistan (both low-cost producers) have further added to supplies. The principal exception to this pattern is 1994's bull market generated by Japan's record imports of 2.3 million tons following a weather- related crop failure.

Aggressive export pricing in the early 1990's from China and Vietnam in the low-quality market has undercut Thailand's traditional share of low-quality rice exports. Subsequently, Thailand has been forced to reorient its export initiatives more aggressively towards the intermediate- and high-quality rice markets where it competes directly with the United States. As part of its campaign to increase high-quality market share, Thailand has expanded government-to-government sales involving easy credit terms and soft prices. These actions imitate export subsidies and clearly place the U.S. rice industry at a competitive disadvantage.

A large U.S. price premium again developed in the 1990's, despite the marketing loan, hurting the United States' competitive position and dampening both exports and market share since 1989 (fig. 23).

In 1991 and 1992, U.S. rice exports averaged only slightly above 2.1 million tons each year compared with 2.5 million tons the previous 5 years. U.S. market share fell from 21 percent in 1989 to only 15 percent in 1992, its lowest level in 30 years. Aggressive use of EEP and large U.S. supplies in 1992/93 closed the price premium and helped exports recover in 1993, while Japan's unexpected record imports aided U.S. market share in 1994. But future cuts under GATT in the U.S. export-assistance budgets are projected to begin eroding U.S. competitiveness.

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Appendix table 1--U.S. rice acreage, yield, and production

Market year[1]	Planted	Harvested	Yield	Production
	1,000 acres		Cwt/acre	Million cwt
1960/61	1,614	1,595	34.2	54.6
1961/62	1,618	1,589	34.1	54.2
1962/63	1,789	1,773	37.3	66.0
1963/64	1,785	1,771	39.7	70.3
1964/65	1,797	1,786	41.0	73.2
1965/66	1,804	1,793	42.6	76.3
1966/67	1,890	1,967	43.2	85.0
1967/68	1,982	1,970	45.4	89.4
1968/69	2,367	2,353	44.3	104.1
1969/70	2,141	2,128	43.2	90.9
1970/71	1,826	1,815	46.2	83.8
1971/72	1,826	1,818	47.2	85.8
1972/73	1,824	1,818	47.0	85.4
1973/74	2,181	2,170	42.7	92.8
1974/75	2,550	2,531	44.4	112.4
1975/76	2,833	2,818	45.6	128.4
1976/77	2,489	2,480	46.6	115.6
1977/78	2,261	2,249	44.1	99.2
1978/79	2,993	2,970	44.8	133.2
1979/80	2,890	2,869	46.0	131.9
1980/81	3,380	3,312	44.1	146.2
1981/82	3,827	3,792	48.2	182.7
1982/83	3,295	3,262	47.1	153.6
1983/84	2,190	2,169	46.0	99.7
1984/85	2,830	2,802	49.5	138.8
1985/86	2,512	2,492	54.1	134.9
1986/87	2,381	2,360	56.5	133.4
1987/88	2,356	2,333	55.6	129.6
1988/89	2,933	2,900	55.1	159.9
1989/90	2,731	2,687	54.5	154.5
1990/91	2,897	2,823	55.3	156.1
1991/92	2,878	2,775	56.7	157.5
1992/93	3,176	3,132	57.4	179.7
1993/94	2,920	2,833	55.1	156.1
1994/95[2]	3,355	3,300	59.5	196.5

[1]The marketing year runs August 1 through July 31. [2]Preliminary.
Source: National Agricultural Statistics Service, USDA.