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# The World Rice Market—Government Intervention and Multilateral Policy Reform

Nathan W. Childs

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By Nathan W. Childs, Commodity Economics Division, Economic Research Service,  
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### Abstract

The world rice market is characterized by the relatively small share of production traded compared with other major grains and substantial price variability. These characteristics are primarily due to the uncertainties associated with the timing of the Asian monsoon, concentration of production in South Asia and Southeast Asia, and domestic and trade policies conducted by most Asian countries that ban or restrict imports and support production. In addition, developed exporters and some developing exporters support domestic producers and/or assist exports. The combination of policies conducted by major producers and traders, especially Japan's and South Korea's complete ban on imports of rice, have lowered trading prices and reduced trade volumes. If all trade-distorting policies were eliminated, world price and trade would increase, while production and consumption would decline. The United States could lose some of its lower quality indica markets to Asian producers, but would likely expand japonica trade with Japan and South Korea and higher quality indica trade with the EC and the Middle East. This report describes world rice production and trade, catalogs the trade and domestic policies of the major producing, consuming, and trading countries, and examines the potential effects of a liberalized trade environment on the world and domestic rice markets.

**Keywords:** Rice, trade, production, indica, japonica, domestic policies, trade policies, trade liberalization

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## Foreword

This report is a product of the trade liberalization project conducted in the Commodity Economics Division (CED) of the Economic Research Service (ERS). Eleven commodity monographs in the series "World Commodity Markets: Government Intervention and Multilateral Policy Reform" are anticipated from this study. The objectives of this series are to describe the role of individual commodities in world agricultural markets, to provide an overview of current policies for specific commodities throughout the world, and to evaluate the effects of a reduction in government supports and artificial barriers that hinder free competition among countries in the production and trade of commodities.

The monographs draw on earlier and ongoing analyses of government intervention and trade liberalization conducted by ERS in support of the Uruguay Round of multilateral trade negotiations, particularly calculations of producer and consumer subsidy equivalents and analyses of multilateral liberalization based on ERS's Static World Policy Simulation Model (SWOPSIM). The commodity reports build on these efforts and others in the agricultural economics profession to bring a commodity focus to ERS's work on global policy reform.

CED's study has been coordinated by Nicole Ballenger and Kate Buckley. Pat O'Brien, Tony Grano, and Mack Leath provided vision, direction, and support. Alden Manchester coordinated the outside reviews. Other anticipated commodity reports and authors include:

Beef--Bill Hahn, Terry Crawford, Linda Bailey, and Shayle Shagum  
Coarse Grains--Bengt Hyberg, Stephanie Mercier, and Lin Hoffman  
Dairy--Don Blayney and Dick Fallert  
Fruits, Vegetables, Wine, and Tropical Beverages--Kate Buckley  
Oilseeds--Tom Bickerton and Joe Glauber  
Poultry--Bob Bishop, Stephanie Mercier, Lee Christensen, and Larry Witucki  
Pork--Shayle Shagam  
Rice--Nathan Childs  
Sugar--Ron Lord and Bob Barry  
Tobacco--Verner Grise  
Wheat--Joy Harwood and Kenneth Bailey

The coordinators and author are grateful to the numerous analysts in CED, the Foreign Agricultural Service (FAS), and the Office of the U.S. Trade Representative (USTR) who provided input into and review of this report and to Jim Sayre, Linda Hatcher, Brenda Powell, and others who participated in the publication process. Additional thanks are given to Warren Grant, Sermin Hardesty, Thomas Slayton, Milo Hamilton, and Charlie Moore for their input and expertise as industry reviewers. Information from FAS was used extensively in this report. Cindy Tough (FAS), Craig Thorne (FAS), and Barbara Chattin (USTR) were especially helpful.

For a current listing of ERS work in support of the Uruguay Round, see Bibliography of Research Supporting the Uruguay Round of the GATT, Agriculture and Trade Analysis Division, Economic Research Service, U.S. Dept. Agr., AGES 89-64, Dec. 1989.

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## Summary

The uncertainties of the timing of the Asian monsoon, the concentration of rice production and consumption in Asia, and extensive use of policies by most Asian countries aimed at banning imports and supporting domestic production combine to reduce the share of output traded and add to world price variability. For these reasons and others, many importing countries, most notably Japan, South Korea, and Taiwan, have pursued policies to ban or restrict imports of rice through a combination of support prices, border protection, input subsidies, state control of trade, and long-term structural support. The EC, Australia, and the United States also support rice production. The aggregate effect of these policies has been lower trading prices and more thinly traded volumes. Rice production is larger than market forces alone would yield in the developed countries and in several developing countries (most importantly South Korea, Indonesia, and Malaysia). Low trading prices and policy may discourage production in several developing exporting countries such as Burma and Pakistan.

Economic theory postulates that free trade would increase both trade volumes and world prices. Empirical modeling efforts analyzing numerous agricultural trade liberalization scenarios indicate that Japan's entry into the world market as a large buyer of japonica rice would be the primary factor responsible for these two changes. Some substitution away from japonica rice to indica rice in certain markets would cause the price of indica to rise also. Although world prices are expected to rise, the results of numerous empirical modeling efforts demonstrate that producer prices will be lower under free trade than current incentive prices in many developed countries, including Japan, the EC, the United States, and in certain developing countries, specifically South Korea, Taiwan, Indonesia, and Malaysia, where production is also supported.

The magnitude of the expected increase in world rice prices will be somewhat dependent on the type of treatment developing countries receive under the General Agreement on Tariffs and Trade (GATT). If developing countries fully participate in agricultural reform, trade and price would increase more than if only developed countries liberalize. This is because more countries, most importantly those in Asia, will eliminate border protection and domestic support and turn to the world market.

Under free trade, aggregate production in the developed countries would be less than if current programs were continued. Japan, which has the highest level of support for its rice farmers, would experience large decreases in production and account for most of the increase in world price and trade. In the United States, a possible decrease in indica production would be partially or even fully offset by an expansion of japonica rice in both California and certain southern producing States. The EC would grow very little rice. Australia would likely expand output and trade of japonica rice, the primary variety grown there, but decrease production of indica rice.

Developing rice-exporting countries could expand production and trade if governments allow higher world prices to be transmitted to producers. This could be especially true for Thailand, Pakistan, and Vietnam (although Vietnam is not a GATT member). Certain developing GATT contracting parties are expected to import larger quantities of rice under liberalization. South Korea, whose level of support to rice producers is second only to Japan, would account for the largest increase. Malaysia and Indonesia are also in this



category. However, the poorest developing countries (Sub-Saharan Africa and Bangladesh) could experience a decrease in welfare due to higher world rice prices unless alternative and increased means of support are found.

The U.S. rice sector could experience a resource shift from rice farming under free trade because producer prices are expected to decline. However, for producers of high-quality japonica rice in California, the increase in world price and lower per unit production costs would compensate for much of the lost revenue due to the elimination of producer support. California could even increase production and export virtually all of its rice to Japan. Net returns to the higher cost indica producers on the gulf coast could decrease due to lower producer prices and elimination of target prices. Some indica rice growers in the Delta may switch to producing japonica rice for the domestic and export markets. Arkansas, a low-cost producer of both indica and japonica rice, could supply much of the domestic demand for indica rice and expand exports of high-quality indica to Europe, the Middle East, and the Republic of South Africa. The size and composition of future food aid will affect the level of U.S. indica rice exports after trade liberalization. Bona fide food aid will be allowed under any post-trade liberalization scenario.

# The World Rice Market—Government Intervention and Multilateral Policy Reform

Nathan W. Childs

## Introduction

Unusual interest in agriculture in recent multilateral trade negotiations reflects widespread recognition of the high cost of trade barriers and domestic farm programs worldwide. Trade barriers and domestic agricultural policies insulate producers in many countries from international competition, encourage inefficient production, and discourage supply adjustments. While these programs protect farmers, they do so at significant cost to consumers and taxpayers.

Trade barriers and domestic programs can simultaneously discourage production in other more efficient countries by their depressing effect on world prices and through the added price instability they transfer to countries linked directly to the world market. Limited opportunities for expanding world trade in the 1980's have heightened tension between importers and exporters regarding market access and among exporters regarding market share. Underlying this tension in many areas is the use of trade-distorting policy instruments.

## Effects of Current Policy

The various domestic rice programs and trade policies in effect in both importing and exporting countries have several effects on the world rice market. Production subsidies, export assistance, and import restrictions have reduced the world price. They have also isolated producers from the world market. They have discouraged countries with a competitive advantage in rice production from fully entering the world market, such as Brazil, Colombia, and Ecuador, and restricted imports in many countries, most importantly Japan, South Korea, Indonesia, Malaysia, and Taiwan. Hence, these policies have reduced trade volumes.

Because producers are insulated from changes in world prices, protective policies make the world market more unstable and magnify price changes in response to production shortfalls or windfalls and changes in demand. Importers maintain domestic stocks at levels that are higher than necessary because they feel less than confident about sources of supply (as well as for political reasons). And many exporters accumulate large stocks temporarily rather than expose their producers to world market pressures. These stocks are eventually exported with subsidies or some other means is found to get rid of the stocks.

Thus, a different set of policies, more in line with comparative advantage, would contribute to a stronger world economy. The cost of rice programs and the potential payoff on more efficient allocation of the resources in question support this view.

### Need for Trade Liberalization

Several factors emerged in the 1980's that encouraged trade liberalization. First, budgetary pressure associated with rising farm program costs in the EC (European Community), Japan, and the United States have provided momentum for trade liberalization by the industrial market economies. U.S. farm program costs rose from less than \$5 billion in the early 1980's to about \$26 billion in 1986 before falling to \$12 billion in 1989. Deficiency payments to U.S. rice producers increased from \$267 million in 1982/83 to a record \$570 million in 1988/89. The budget cost of farm subsidies and related supports in the EC about doubled over the same period, reaching \$30 billion in 1989, although outlays for rice are an extremely small share of the EC total.

Second, rising retail prices in Japan (and to a lesser extent the EC) for rice have led to consumer dissatisfaction with current agricultural policies. Third, the operation of the world rice market was hindered by the expansion of government programs designed to manipulate imports and exports. World trade in rice stagnated in the 10-13 million metric ton range in the early and mid-1980's, increasing competition and friction between importers and exporters. And finally, declining income elasticities with respect to rice consumption in many developing Asian countries have hindered increases in demand, especially during the 1980's, thus having a depressing effect on world rice prices and encouraging suppliers to push for trade liberalization.

### Purpose and Objectives

This report:

- o Summarizes GATT (General Agreement on Tariffs and Trade) principles and recent negotiations, as they affect rice.
- o Describes world production and trade by type of rice.
- o Catalogs trade and domestic policies in major producing and trading countries and emphasizes effects.
- o Analyzes the effects of both developed country and global trade liberalization on the world and domestic rice markets.
- o Examines the welfare implications of both developed country and global free trade in agriculture.

### Agriculture and the GATT

GATT was negotiated at the end of World War II to provide an international forum to promote reduced government interference in all international trade. However, the seven rounds of liberalization talks completed to date have focused heavily on manufactured goods, with little attention afforded agriculture. For the first time in history, agricultural policies are being seriously discussed within the GATT framework. Moreover, many governments have come to recognize that many agricultural trade problems, such as low world prices, are deepened by domestic food and farm policies, in addition to export subsidies or import restrictions.

## Comparative Advantage and Trade

According to classical economic theory, a nation will sell goods it can produce more cheaply than other nations and buy other goods which can be purchased for less than it costs to produce at home. Under these circumstances, a nation is said to have an absolute advantage in that good which it can produce for less.

Even if a country has an absolute advantage in the production of several goods, it could still be to a country's benefit to trade. The theory of comparative advantage, first postulated by David Ricardo in the early 1800's, states that, in a simple two-good world, a country can improve welfare by shifting resources to the production of the good it can produce at the lowest cost relative to other countries. The increased production of this good can then be exported in exchange for a larger quantity of the other good than has been lost by the shift of resources. Comparative advantage is based on the concept of "opportunity cost" within nations, defined as the value of a reduction in the output of one product releasing inputs necessary to increase the production of another good. Resource allocation is at the core of this theory. Since individual nations are endowed with different resource bases, labor forces, climates, and technological inputs, opportunity costs for production vary among nations. Mutually advantageous trade can arise among nations as long as differences in opportunity costs exist.

Policies to support agriculture tend to change the input and output prices that would normally prevail in a free-market economy, and distort the set of opportunity costs the farmer faces. Under such conditions, trade that would normally lead to benefits to both parties in the transaction may not occur.

## The Current Policy Environment and the Uruguay Round

The world agricultural trade environment may see substantial policy reforms. In the communique issued from Punta del Este, in September 1986 at the start of the Uruguay Round of multilateral trade negotiations, participating nations publicly stated for the first time that domestic farm programs have an important distorting effect on world agricultural trade. In deciding to form an agricultural negotiating group so early in the round, GATT members sent a sharp signal to the world about their serious intention to deal with problems caused by agricultural support and protection.

The midterm ministerial review in Montreal in early December 1988 ended in a deadlock between the United States and the EC on agriculture. In the December meetings, the EC refused to accept any language in agreements implying a total elimination of trade-distorting farm programs and the United States balked at settling for anything less.

In the followup meetings in Geneva in early April 1989, the United States and the EC exhibited increased flexibility and the parties eventually reached an agreement calling for "substantial, progressive reductions in agricultural protection" in the long term, which also froze protection at current levels for 1989. A framework was thus established for further negotiations, and dialogue will continue, with high hopes for achieving substantial progress in agriculture.

Nine countries or country groups submitted comprehensive proposals in late 1989 to be considered by the GATT agricultural negotiating group in the

Uruguay Round. Table 1 summarizes six of these submissions. Most of the proposals were quite lengthy and complicated, and they represented a wide variety of approaches. At one end of the continuum are the proposals of the United States and the Cairns Group (Argentina, Australia, Brazil, Canada, Chile, Colombia, Fiji, Hungary, Indonesia, Malaysia, New Zealand, the Philippines, Thailand, and Uruguay) which favor eliminating policies that distort trade.

At the other end is the EC plan, which offers only minor changes in existing programs. Proposals by Japan, the Nordic countries (Finland, Iceland, Norway, and Sweden), the group of net food importing countries (Egypt, Mexico, Jamaica, and Peru), Austria, Switzerland, and South Korea advocate varying degrees of reform.

Any changes in agricultural support programs that might result from GATT negotiations scheduled to conclude in December 1990 will have a substantial effect on world rice trade, since rice is both heavily traded and heavily dependent on government support at this time.

Table 1--Main elements of major proposals to GATT

---

**United States** (submitted October 25, 1989)

- Replace nontariff barriers with tariffs, to be phased out over 10-year period (tariffication).
- Phase out export subsidies over 5-year period.
- Assign domestic policies to three groups: to be phased out (payments tied to output), to be disciplined (input, investment subsidies), and permitted (income support, environmental, disaster assistance, research, education).
- Treatment of less-developed countries based on level of development in each.

**European Community** (submitted December 20, 1989)

- Reduce support and protection in order to re-establish market-oriented agricultural trading system.
- Tariffication seen as not viable alternative to present regime. Border protection converted to fixed and variable components; fixed component reduced to supply management unit level and variable component to fluctuate according to market conditions. Deficiency payments to be included in tariffication.
- Flexibility in application of GATT rules to less-developed countries according to actual level of development.

**Cairns Group** (submitted November 20, 1989)

- Prohibit measures not explicitly provided for in GATT rules (includes variable levies and quantity restraints).
- All tariffs bound at low levels or zero.
- Prohibit new and phase out existing export subsidies.
- Reduce internal support through use of an aggregate measure of support where calculable, otherwise through commitments to reductions in support prices and budget expenditures.
- Similar internal policy categories to U.S. proposal.
- Measures in less-developed countries which encourage development to be exempt.

**Japan** (submitted November 27, 1989)

- Emphasizes special nature of agriculture and food security. Insists on countries' right to support certain level of self-sufficiency in "basic foodstuffs."
- Export subsidies should be reduced and eliminated.
- Domestic support with no (or negligible) trade-distorting effects should be permitted; other policies reduced through commitments based on an aggregate measure of support.
- Allow less-developed countries longer time frame to achieve Uruguay Round goals.

**Nordic Group** (submitted December 19, 1989)

- Support gradual change in level and form of border protection.
- Tariffication is among feasible alternatives.
- Objective needs of individual less-developed countries must be considered.

**Net Food Importing Developing Countries**

- Negotiators should consider interests and problems of importers.
  - Should continue food aid and special treatment of less-developed countries.
  - Stricter discipline applied to export subsidies.
-

## The World Rice Market

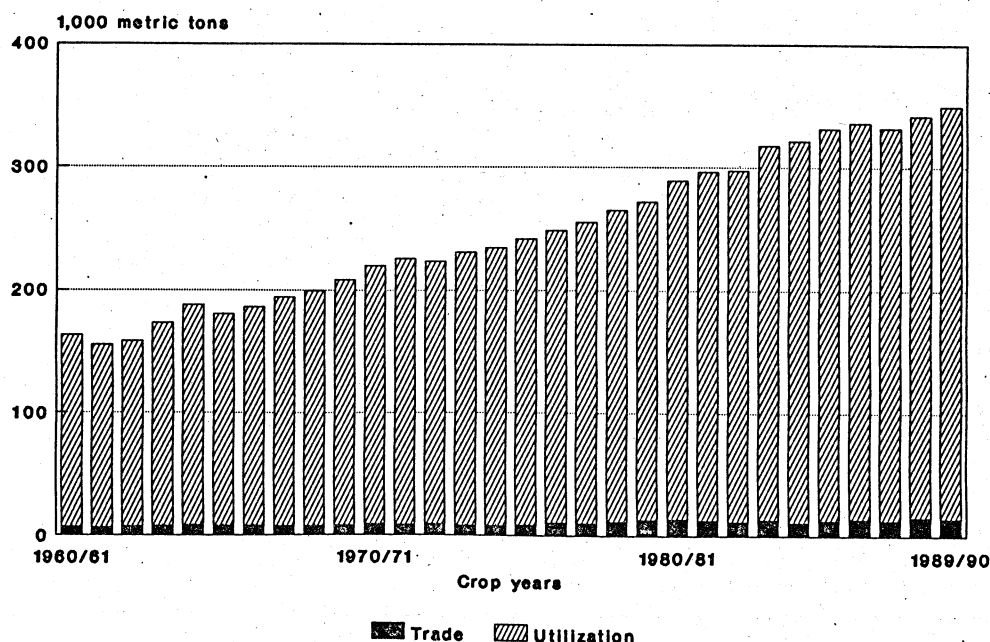
Although rice is crucial in the diet of many people in the developing world, particularly in Asia, trade has accounted for less than 4 percent of total rice consumption in the 1980's (compared with about 20 percent for wheat) (fig. 1). Thus, most rice is consumed within the producing country in which it is grown. In addition to only a small share of production traded, the world rice market experiences more price and trade variability than most other grains. To protect consumers and producers from this weather-induced price variability, and for political reasons, many governments pursue policies that effectively isolate the domestic rice market from international market signals. Overall, these programs have reduced traded volumes and price variability in the world rice market. Table 2 indicates major world rice producers and consumers.

### World Production

More than 90 percent of the world's rice production, over 400 million tons each year since 1982, is concentrated in Asia (fig. 2). China, India, Indonesia, and Bangladesh are the world's largest producers of rice, accounting for over 70 percent of world production in 1987. China alone has accounted for roughly 35-40 percent of world production and India almost 20 percent during the 1980's. Growth in production is also heavily concentrated. Rice yields in China almost tripled between 1960 and 1987. India's production grew by almost 75 percent since 1960, mostly due to increased acreage.

Other major Asian producers include Vietnam, Thailand, Japan, and Burma. These four countries have at times accounted for about 20 percent of world

Figure 1  
World rice utilization and trade



Aggregate of local marketing years.  
1989/90 data are forecast.  
Source: USDA, FAS, 1990b.

Table 2--Major world rice producers and consumers, marketing years, 1983-89

Country/region	1983	1984	1985	1986	1987	1988	1989 <u>1/</u>
<u>Million metric tons, rough basis</u>							
Major producers:							
China	168.9	178.3	168.6	172.2	173.9	169.1	180.1
India	90.2	87.5	95.7	90.6	85.3	106.0	105.0
Indonesia	35.3	38.1	39.0	39.0	41.5	42.3	44.8
Bangladesh	21.8	21.9	22.6	23.1	23.1	23.3	26.6
Thailand	19.6	19.9	20.3	18.9	18.0	21.1	21.0
Vietnam	14.7	15.5	15.9	16.0	15.3	16.8	18.0
Burma	14.3	14.3	11.5	11.8	11.4	12.5	13.5
Japan	13.0	14.8	14.6	14.6	13.3	12.4	12.9
World total	452.4	468.2	468.6	468.5	462.8	487.6	505.0
<u>Million metric tons, milled basis</u>							
Major consumers:							
China	113.6	120.9	122.4	123.1	123.3	122.0	122.9
India	58.2	56.7	62.1	60.1	59.3	65.8	69.3
Indonesia	25.3	25.2	26.2	27.5	27.2	28.2	28.2
Bangladesh	14.9	14.9	15.2	15.8	15.9	16.1	17.2
Vietnam	9.8	10.3	10.7	10.6	10.0	9.6	10.2
Japan	10.2	10.2	10.2	9.7	9.8	9.5	9.4
Thailand	8.1	8.8	8.6	8.3	8.4	8.3	8.5
Burma	8.2	8.5	6.3	6.5	6.6	6.7	7.1
World total	285.9	304.5	319.5	322.8	319.8	327.6	335.5

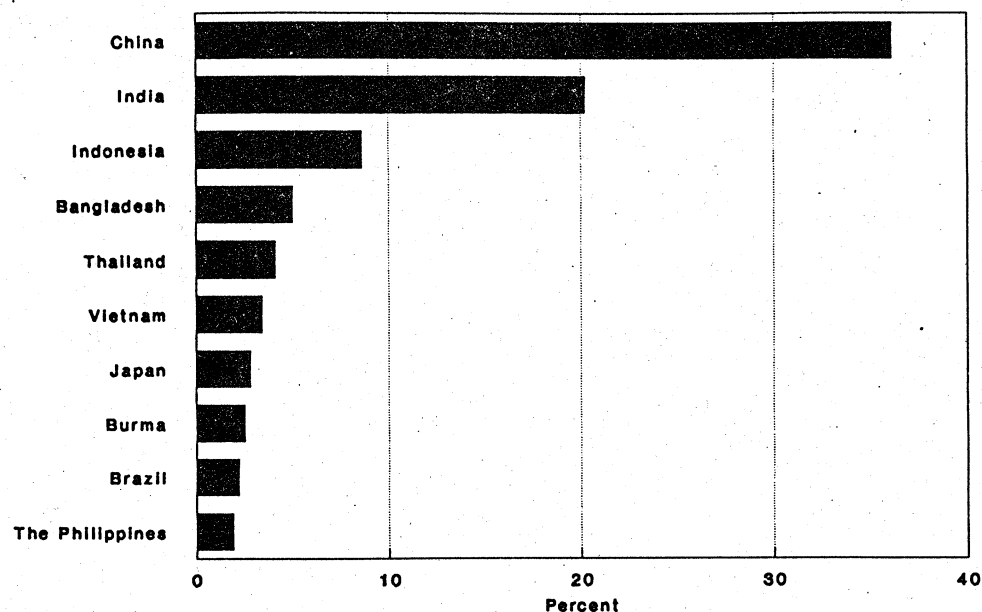
1/ Forecast.

Sources: USDA, FAS, 1990a and 1990b.

production. However, the pattern of growth in this second tier of countries has been mixed. Rice production peaked in the late 1960's in Japan. Riceland diversion programs were partly responsible for the subsequent decline. Vietnam's share of world production declined due to the effects of war and government policy, yet has expanded significantly in the late 1980's. However, rice production in Burma and Thailand, both major exporters, more than doubled between 1960 and 1984. Increased acreage was almost totally responsible for Thailand's growth in rice production while Burma's growth was due to a combination of increases in acreage and yield. Other major Asian rice-producing countries include the Philippines, South Korea, and North Korea.

Brazil is the largest non-Asian rice producer, accounting for a little over 2 percent of world production. The United States accounts for roughly 1.5-2.0 percent of the world production, and its share has risen since 1960. The EC-12, primarily Italy and Spain, and Australia are the only other developed

**Figure 2**  
**Major world rice producers' share of**  
**world production, 1985-89 average**



Aggregate of local marketing years.  
 1989/90 data are forecast.  
 Source: USDA, FAS, 1990a.

countries producing any significant quantities of rice. These countries together account for less than 1 percent of world production.

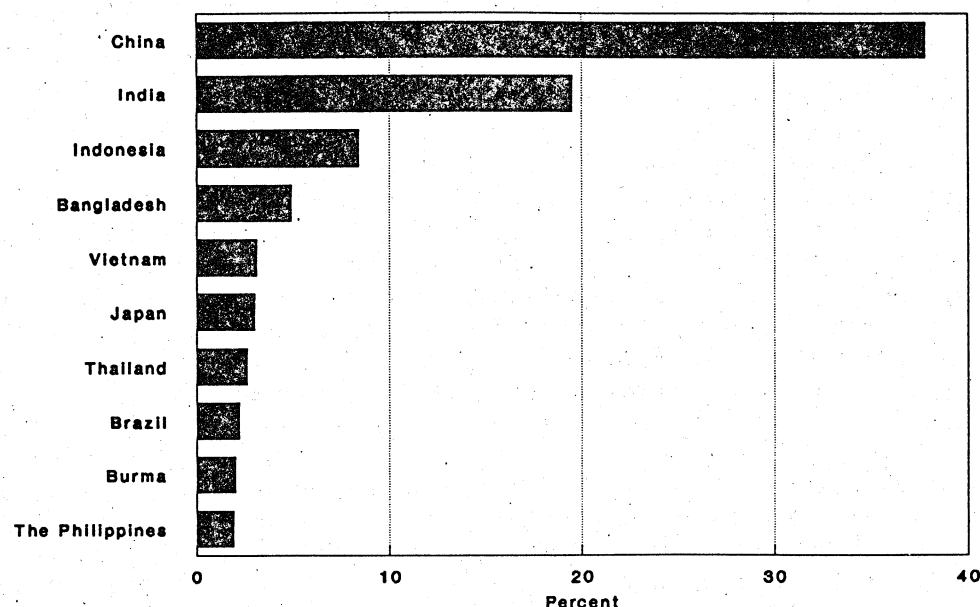
#### World Consumption

Almost 90 percent of rice is consumed in Asia (fig. 3). Cereal grains account for two-thirds of the calories in the average Asian diet, with rice alone providing 40 percent of the total and wheat another 15 percent (Barker and others, 1985). With the exception of Pakistan, rice is still the dominant food grain in Asia, and total consumption continues to increase primarily as a result of population growth and, to a lesser extent, rising incomes.

However, per capita rice consumption has increased in some countries, remained stable in others, and declined in still others. The factors behind these trends vary from one country to another, with income and price two critical factors affecting per capita consumption. Wheat prices are typically lower and often can displace rice in countries importing wheat or countries with local wheat supplies. This has been true of most Sub-Saharan African countries as well as Bangladesh. Wheat has a higher income elasticity than rice in most of Asia and some substitution is underway. Among the Asian countries, Japan, South Korea, Malaysia, Singapore, Nepal, Taiwan, and Thailand have achieved per capita income levels where increases in income are associated with decreases in per capita rice consumption. In addition, estimates of income elasticities for per capita rice consumption have been declining in most other Asian countries since the early 1960's (Ito and



Figure 3  
Major world rice consumers' share of  
world consumption, 1985-89 average



Aggregate of local marketing years.  
1988/89 data are forecast.  
Source: USDA, FAS, 1990b.

others, 1989). Thus, increasing incomes in Asia will not have a substantially positive effect on per capita rice consumption.

China, India, Indonesia, and Bangladesh are the largest consumers of rice, accounting for almost 70 percent of total consumption of rice in the 1980's. Other major consuming countries include Vietnam, Japan, Thailand, Burma, and Brazil. All of these major consuming countries are important producers.

Rice consumption in Japan peaked in the late 1960's and has declined since. Two factors have contributed to this decline. First, domestic rice prices in Japan are supported substantially above world levels which discourages consumption. Second, rising incomes have shifted food demand toward meat and vegetables.

Since the 1960's, Asia's share of world rice consumption has declined slightly. Increased rice consumption by Middle Eastern and African countries has been largely responsible for this shift. Consumption by the Middle East more than doubled between 1961 and 1981, and the region's share of total consumption doubled. This was largely a result of rising incomes from oil sales. The Middle East imports most of its rice. Consumption of rice by Sub-Saharan Africa has also increased since the 1960's, almost doubling between 1970 and 1987. The region's share of total consumption also increased. Whether the increase in consumption in Africa and the Middle East is due to a short-term phenomenon caused by attractive prices and food aid shipments or to a longer term and more stable change in tastes and preferences is not certain.

Rice is not a staple food in developed Western countries and is most often served as a side dish. Although rising, per capita rice consumption is much lower in the United States, Canada, Australia, and the EC than in Asia. Processed foods and beer accounted for much of the increase in rice use in the United States during the 1980's. Hence, developed Western countries provide a small, but stable, market for rice.

#### Characteristics of the World Rice Market

These production and consumption patterns combine with technical characteristics and government policies to shape the world market for rice. Four characteristics are particularly important: trade accounts for a small share of production, annual price variability exceeds that experienced by other grains, producers are unable to escape the risks associated with price variability, and rice is strongly stratified by type and quality. In addition, many effects of the large-scale government intervention that is prevalent in the world rice market substantially compound these characteristics.

The world rice market can be characterized as thin in terms of the small volume of trade relative to production. Trade has typically accounted for 3-4 percent of production since 1960. Thus, the effects of normal year-to-year fluctuations in production of 2-3 percent can generate substantial world price variability if changes in production are shifted to the world market.

The world rice market is thin compared with other grain markets for several reasons. First, the uncertainties associated with the timing of the Asian monsoon and the concentration of production in South and Southeast Asia discourage countries from relying on imports for much of their domestic needs. Second, government programs aimed at self-sufficiency further diminish the role of an international market for rice.

Rice trade volumes and prices are highly variable. Because about 90 percent of the world's rice crop is produced in Asia and half the crop is not irrigated, the world rice supply depends critically on the timing of the Asian monsoon and is therefore more variable than other major grains. Moreover, because rice is a large share of their diets (as well as for political reasons), many rice-consuming countries maintain large stocks. But with many of these stocks not available for use and the world market only a small share of production, these policies do little to cushion supply shocks. And because there is only a small and somewhat limited international exchange for rice, this variability in trade volumes and prices generally ends up being absorbed by producers and consumers in a few countries tied directly to the world market.<sup>1</sup>

Price and trade variability in the world rice market also relates to the small share of production available for export. Variability is reflected in shortrun price fluctuations of often 10-20 percent between marketing years and more broadly in the uncertainty that traders face in negotiating prices.

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<sup>1</sup> Although exchange markets for rice have periodically existed, they have not been effective in reducing risk to producers. The small volume of rice traded compared with total consumption and the further thinning of trade volumes by stratification according to type and quality may severely reduce the effectiveness of future exchanges for rice.

There were generally four net exporters of rice prior to 1989--Thailand, United States, Pakistan, and China--which accounted for about 70 percent of world trade from 1985 to 1988. Vietnam returned to the world market in 1989 as the third largest exporter and is expected to remain a major exporter in 1990.

Government intervention in rice trade and production is pervasive and contributes to the small share of production traded and world price variability. Most Asian countries maintain domestic rice price stabilization policies and pursue stringent rice import controls. Most rice-importing countries make concerted efforts to stabilize domestic prices and thus transmit fluctuations in supply and demand to the world market. Many exporters also intervene to further domestic policy goals.

The world rice market's size and price variability are exacerbated by the stratification of the rice market according to types. Tastes and preferences can be as important as prices in buyers' considerations. In addition to limited substitution in demand between various types of rice, there are also limits to substitution in production among the various types and classes.

There are basically four types of rice: glutinous, aromatic, indica, and japonica. The bulk of world rice trade and production is in indica rice. Indica rice is generally considered a long-grain rice and is grown principally in tropical regions such as China, South and Southeast Asia, and the Southern United States. Indica rice has a medium-to-high amylose content, and cooks up fluffy, with a good volume expansion and grain separation.

But this market is further segmented. The world indica market is composed of a demand for regular milled and parboiled rice, each defined by quality based on percentages of brokens, translucency of the grain, chalkiness, and uniformity. There is little substitution between parboiled and regular milled rice. Parboiled rice accounts for about 10 percent of world trade and typically sells at a premium. The United States and Thailand are the principal suppliers of parboiled rice.

Japonica rice is typically a medium-grain rice grown in temperate regions, primarily Japan, North Korea, South Korea, Taiwan, northern China, southern Brazil, Australia, the Mediterranean area, and parts of the United States. Japonica rice, with a fairly low amylose content, is semi-sticky and moist when cooked. The average annual traded volume of japonica rice in the early and mid-1980's was roughly 1.9 million metric tons (Bateman, 1988).

Japonica rice accounted for 10-11 percent of world production and almost 16 percent of world trade during the early and mid-1980's (table 3). Japan, China, North Korea, and South Korea are the primary consumers and producers of japonica rice. Together, these four countries account for about three-fourths of total consumption and production of japonica rice, which annually averaged about 35 million metric tons (milled basis) during the early and mid-1980's (Bateman, 1988). Indica rice normally sells at a premium on the world market. But in some domestic markets, such as Taiwan, japonica commands a premium over indica. There is little substitution among Japanese and Korean consumers between indica and japonica rice, although enough substitution occurs in some areas to cause indica and japonica prices to generally move together.

There are two other types of rice that account for only a small portion of production and consumption: glutinous and aromatic. Glutinous rice is also

Table 3--Japonica rice: Typical estimated production, use, and trade data, 1980-86 average

Country/region	Production	Consumption	Exports	Imports
<u>1,000 metric tons, milled basis</u>				
Australia	420	35	385	0
Brazil	700	700	0	0
China	9,100	8,950	150	0
Indonesia	0	600	0	600
EC-12	1,150	675	475	0
Japan	9,500	9,500	0	0
North Korea	3,860	3,610	250	0
South Korea	4,400	4,400	0	0
Taiwan	1,560	1,510	250	0
United States	950	640	325	0
USSR	1,250	1,450	0	200
Others	1,650	2,685	60	1,095
World total	34,540	34,755	1,895	1,895

Source: Bateman (1988).

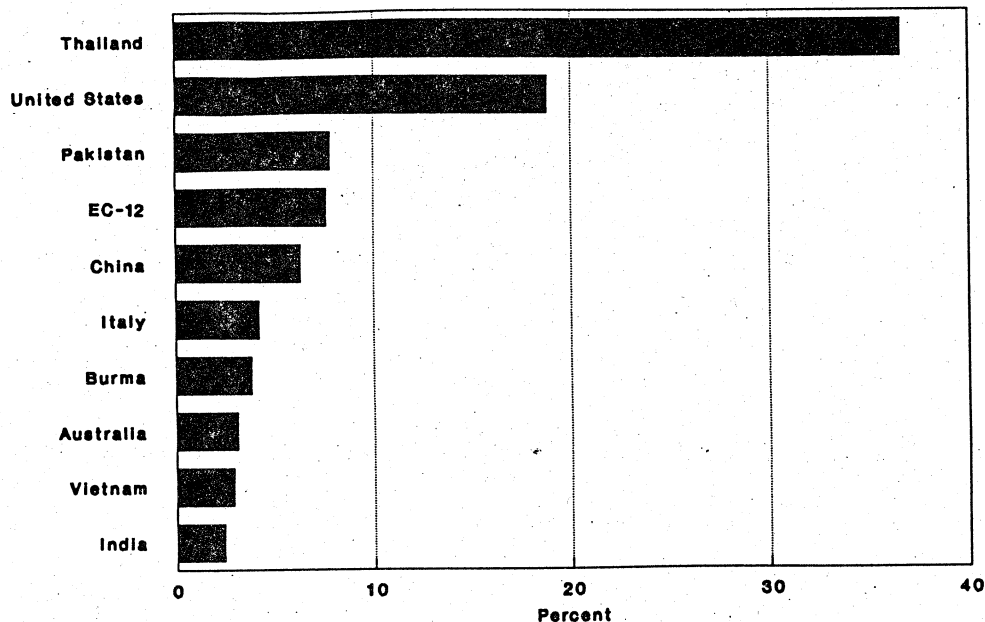
known as waxy or sweet rice and has a very low amylose content. When cooked, it forms a gelatine-like mass with little distinct grain separation. Most rice-consuming areas in Asia produce small amounts of glutinous rice for use in desserts, ceremonial foods, and sweet dishes. However, in northeast Thailand and Laos, it is a staple food. Thailand is the principal trader of glutinous rice. Less than 100,000 tons of glutinous rice are usually traded worldwide. It is generally sold at a discount to nonglutinous rice with the same amount of brokens. Indonesia, Laos, Japan, and China are the principal importers.

Aromatic, or scented rice, is grown mostly in the Punjab area of central Pakistan and northern India and is often referred to as basmati rice. When cooked, basmati grains double in length, remain completely separate, and have a distinctive odor. Annual trade volume is light, about 300,000 to 400,000 tons. Aromatic is usually sold at prices roughly twice that of high-quality, long-grain rice. Higher income Middle Eastern countries are the major buyers of basmati. Small quantities are also grown in Thailand and sold to Hong Kong, the United States, and Singapore.

#### Major Exporters

Thailand and the United States are the two largest rice exporters, accounting for roughly half the rice traded over the last 5 years (fig. 4). These two countries, plus Pakistan, China, and Burma, accounted for over 70 percent of world exports from 1983 to 1989 (table 4). The EC-12 (mostly Italy), Australia, Uruguay, Argentina, and Taiwan are also significant exporters of rice. The United States and Australia are viewed as the most reliable trading

Figure 4  
Major world rice exporters' share of  
world exports, 1985-89 average



Calendar year.  
Source: USDA, FAS, 1990b.

partners because rice is not a staple domestic food and 100 percent of the crop is irrigated, insuring a predictable supply. Thailand is the low-cost producer of the major exporters. Thailand's producers are responsive to market prices and have been able to adapt efficiently to changing market conditions.

China was a net importer of rice prior to World War II, but was the fourth or fifth largest exporter during most of the 1980's. (China was a major net importer in 1989 and is forecast to be a minor net importer again in 1990.) Because wheat can be purchased on the world market at a lower price than rice, the Chinese have attempted to import wheat and export rice to increase total food grain availability. This trade stance has improved their foreign exchange position.

Domestic price policies and political turmoil in Burma have substantially reduced that country's rice exports since the late 1960's. Burma's rice exports have not exceeded 1 million metric tons since 1965 or even 500,000 tons in recent years. Pakistan exports have increased substantially since the late 1960's and the country is typically the third largest exporter. Although heavily taxed, Pakistan exports of rice averaged about 1 million tons between 1980 and 1989 and included high-value basmati rice. Vietnam re-emerged as a major exporter in 1989, exporting 1.4 million tons.

The price of U.S. rice has consistently been well above the world average generally due to higher quality. Australian rice is also very high quality

Table 4--World rice exporters and importers, calendar years 1983-89

Country/region	1983	1984	1985	1986	1987	1988	1989
<u>Million metric tons, milled basis</u>							
<b>Major exporters:</b>							
Thailand	3.70	4.53	3.99	4.32	4.36	4.79	6.04
United States	2.33	2.13	1.91	2.40	2.44	2.25	2.97
Pakistan	1.30	1.05	.91	1.15	1.23	.95	.78
China	.58	1.16	1.01	.95	1.02	.70	.32
Burma	.75	.73	.45	.66	.49	.37	.46
EC-12	.85	.76	.89	1.14	.98	.92	.96
Australia	.28	.37	.45	.40	.34	.42	.45
Taiwan	.53	.21	.04	.17	.24	.10	.07
Vietnam	.14	.08	.06	.13	.15	.10	1.40
World total	11.90	12.60	11.40	12.61	12.93	11.93	15.17
<b>Major importers:</b>							
EC-12	1.05	1.25	1.26	1.34	1.16	1.18	1.24
Iraq	.47	.49	.48	.50	.53	.60	.57
Iran	.68	.73	.60	.45	1.00	.40	1.00
Saudi Arabia	.49	.53	.50	.50	.50	.43	.53
Vietnam	.03	.30	.42	.48	.34	.18	.05
Malaysia	.36	.44	.48	.30	.28	.35	.36
Bangladesh	.08	.59	.25	.09	.75	.35	.40
Indonesia	1.18	.39	.03	.03	.16	.03	.41
China	.08	.10	.10	.32	.55	.31	1.40
World total	11.90	12.60	11.40	12.61	12.93	11.93	15.16

Sources: USDA, FAS, 1990a and 1990b.

and is comparably priced with U.S. rice. In contrast, Burma's and Vietnam's average export prices are much lower, reflecting the lower grades commonly shipped. A portion of Pakistan's exports includes an extremely high-quality rice, basmati, which sells for a price roughly twice that of U.S. long-grain rice. Little substitution occurs between basmati and regular milled white rice. China's exports are considered a low-quality rice, while Thailand exports both high- and low-quality rice.

The most traded rice is indica, with Thailand and the United States the largest exporters. Italy, Australia, and the United States are the principal exporters of japonica rice and together they account for about 60 percent of japonica exports. Japonica exports annually totaled approximately 1.9 million metric tons during the early and mid-1980's (Bateman, 1988). Australia exports most of its japonica rice, while the United States and Italy export over half their production. North Korea and Taiwan often export small quantities of japonica rice, depending on their domestic supply and demand

conditions. The quality of Taiwan's japonica rice is viewed as higher than that produced by China and North Korea, which produce a low-quality variety.

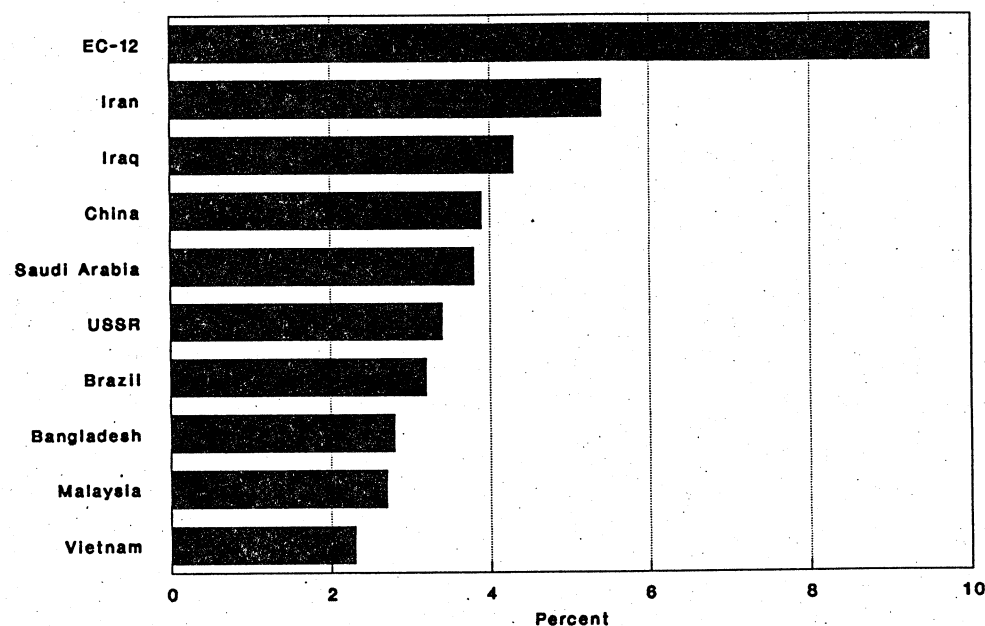
### Major Importers

The largest importers of rice in the 1980's were the EC-12, Iran, Iraq, Saudi Arabia, Malaysia, Bangladesh, the Philippines, Sri Lanka, and Indonesia (fig. 5). China and India were also major importers during the latter part of the 1980's. Policies to limit imports and subsidize production in South Korea and Indonesia have substantially restricted imports in these countries. These two countries were leading importers in the 1970's.

Although the developing nations have accounted for roughly two-thirds of rice imports since 1960, the breakdown by countries has changed considerably. The share accounted for by Asian countries declined during the early and mid-1980's, while the share accounted for by Middle Eastern and African countries increased throughout the decade. Asia's decline was due to the successful adoption of high-yielding varieties and government policies aimed at restricting imports and supporting domestic production. The shift in import demand to Africa and the Middle East has countered this decline somewhat and added some stability to the world rice market. While Asian imports are now primarily the result of unexpected domestic shortfalls in production, Middle Eastern and African countries regularly import rice.

Bangladesh, Sri Lanka, and Senegal are significant importers of low-quality rice. Their import needs are generally supplied by Burma, China, Pakistan, and Thailand. Importers of high-quality rice include the EC and the OPEC countries (Iran and Saudi Arabia). The United States is a major supplier to

Figure 5  
Major world rice importers' share of  
world imports, 1985-89 average



Calendar year.  
Source: USDA, FAS, 1990b.

the EC and certain Middle Eastern markets. Pakistan supplies basmati rice to the Middle East. Thailand exports both high- and low-quality rice to the Middle East (principally Iran) and Africa. Annual exports of aromatic rice from Thailand to the United States increased since 1980 from virtually none to over 100,000 metric tons by the end of the decade.

#### Market Shares

Thailand accounted for about 40 percent of total rice exports in 1988 and 1989. Increased Thai production, quality, and marketing expertise have primarily been responsible for Thailand's increasing export share since 1980. The United States has accounted for roughly 18 percent of total exports since 1986, down from almost 25 percent in the late 1970's. The provisions of the Agricultural and Food Act of 1981 and the rising value of the dollar were partly responsible for the abrupt and sharp decline in U.S. market shares in the early and mid-1980's. The provisions of the Food Security Act of 1985, which lowered support prices and mandated the marketing loan, and the declining dollar have allowed the United States to regain some of its lost export market since 1985.

Pakistan's export share of the rice market was normally between 7 and 9 percent during most of the 1980's. Its share almost tripled between 1972 and 1973. China's share of world exports vacillated between 7 and 9 percent during the mid-1980's, but China emerged as the world's largest importer in 1989. China exported larger amounts of rice in the late 1960's and early 1970's and its share of world trade was much greater then. Increased domestic demand and infrastructure deficiencies in China were responsible for reduced rice exports in the 1980's. China has also been a major importer of rice since 1980 and was a net importer in 1988 and 1989.

Burma also has played a leading role in the world market. Although Burma accounted for over one-fourth of total exports in 1962, the country's share averaged less than 5 percent in the 1980's and has been declining since 1986. Domestic price policies, political instability, and difficulties adopting high-yielding varieties have been responsible for Burma's declining export volume.

The EC-12, Taiwan, Australia, India, Uruguay, and Argentina together account for about 20 percent of world trade. The EC-12's share has fluctuated between 6 and 9 percent since the mid-1970's, with Italy, the primary exporter, normally accounting for 4-5 percent of world trade and about 20 percent of japonica trade. (These numbers include intra-EC trade.) Taiwan, whose export volume has fluctuated substantially, now accounts for roughly 1-2 percent of the rice trade. However, during some years in the late 1970's and early 1980's, government subsidies allowed Taiwan to capture 3-4 percent of the world market. In 1984, Taiwan signed an agreement with the United States limiting subsidized exports to 1.38 million metric tons from 1984 to 1988.

A net importer of rice until the mid-1970's, India accounted for about 2 percent of total exports during most of the 1980's. Australia's share of the international rice market is about 3.5 percent, which is about 3.5 times that country's share in 1961. Argentina and Uruguay, although each averaging about 1-2 percent of world exports in the 1980's, have been increasing their shares since the early 1960's. Although a regular exporter in the 1960's, Brazil vacillated between being a very small net exporter and a small net importer of rice in the 1970's and 1980's.



Policies are more disruptive on the import side of the world rice market, making it more variable. The import side is much less concentrated than the export side. While the rice imports were primarily a residual Asian source of demand until the early 1970's, significant changes have occurred since. Asia's share of total imports in the 1980's was smaller than in the 1960's and 1970's. Several large Asian rice-importing countries (Indonesia, Malaysia, India, Sri Lanka, and Bangladesh) all typically imported a substantially smaller portion of their rice supplies in the 1980's than in the 1960's. Import restrictions and successful adoption of high-yielding varieties in these countries were largely responsible for the decline in Asia's share of imports during the 1970's and most of the 1980's.

Indonesia was the largest importer of rice in the 1960's and 1970's, accounting for over 20 percent in some years. Yet, Indonesia's share of world trade did not exceed 2 percent between 1985 and 1988 (although its share was almost 3 percent in 1989). Malaysia's share declined somewhat less severely, from an average of almost 6 percent in the 1960's to around 3 percent in the 1980's. While accounting for an average of roughly 4 percent of total imports in the 1970's, the combination of high price supports and a ban on imports made South Korea self-sufficient in rice after 1984. India was a small net exporter of rice from 1978 to 1983 and from 1985 to 1987.

However, this trend toward self-sufficiency among Asian countries may be slowing. Indonesia imported 415,000 metric tons in 1989 and China imported 1.2 million metric tons, making China the largest single importer in 1989. Malaysia has backed away from its previous goal of 80 percent self-sufficiency. India was a major importer in 1988 and 1989.

In contrast, the Middle East and Sub-Saharan Africa shares of the import market have increased substantially since the late 1960's. The Middle East's share increased from an average of 5 percent in the 1960's to an average of over 19 percent in the 1980's. Sub-Saharan Africa's share of total imports averaged over 19 percent in the 1980's, up from 9 percent in the 1960's. The EC-12's share of imports also increased since the 1960's, from an average of roughly 7 percent in the 1960's to about 10 percent in the 1980's.

#### Trade Patterns

There have been some major changes in the trading patterns of rice since World War II. Most important, the three major rice exporters before the war--Burma, Thailand, and Vietnam--no longer completely dominate the trade. Vietnam was a net importer of rice from the mid-1960's until 1988, but exported 1.4 million tons in 1989 making it the third largest exporter that year. Burma's exports plunged abruptly in 1966 and have stayed below 1 million tons since. Of the three traditional rice-exporting countries, only Thailand has remained a dominate trader since World War II. New entrants, most notably the United States, Pakistan, and China, made up for the general decline in Vietnam's and Burma's exports during most of the 1970's and 1980's.

There has also been a substantial shift in the pattern of world imports since World War II. Prior to the war, Asia and Europe together accounted for more than 90 percent of imports. In 1960, the two accounted for 75 percent. But in the 1970's and 1980's, Middle East, Africa, and Latin America rice imports grew rapidly, particularly compared with those of Asia and Europe. Asia's share declined to about 50 percent in the late 1970's and early 1980's.

Three factors have accounted for the relative decline in the importance of Asian countries as import markets for rice: successful adoption of high-yielding varieties in most Asian rice-importing countries, import restrictions and producer support practiced by most Asian countries, and falling income elasticities. (The share of increased incomes in many Asian countries going toward rice consumption declined over most of the 1980's.)

The modern, short-stemmed, fertilizer-responsive, high-yielding varieties developed in the mid-1960's perform best under good water control and high solar energy, conditions the Asian delta areas lack. Burma, Thailand, and Vietnam, the major traditional exporters, cultivate their rice in the vast deltaic areas of mainland monsoon Asia. These regions enjoy a comparative advantage in the production of the traditional, low-yielding varieties of rice that require low-input technology. The modern, high-yielding varieties have been successful only in irrigated areas and require fertilizers and other agricultural chemicals. Major beneficiaries of the adoption of these varieties have been the principal Asian rice-importing countries: Indonesia, South Korea, Malaysia, the Philippines, China, India, and Pakistan.

Most Asian importing countries instigated policies that have included support prices for producers, input subsidies, and import bans and restrictions. Indonesia, Malaysia, India, and South Korea reduced their dependence on imports through producer support policies, and in the case of South Korea, a virtual ban on imports. The traditional exporting countries, on the other hand, saw little to be gained from promoting the new varieties, which performed relatively poorly in their environment. Nor did these countries see the sense in increasing production, since many of them appeared to be moving toward self-sufficiency.

Burmese agricultural policy set farm prices well below market levels and Vietnam rice production was severely hindered by decades of war. As a result of rice prices being high relative to wheat prices, a post World War II phenomenon, wheat has made significant inroads into the Asian rice market, especially among affluent East Asian countries. Most wheat is shipped unmilled to those countries while almost all rice is shipped milled. So, by importing wheat instead of rice, countries can satisfy domestic requirements for food grains with a much lower expenditure of foreign exchange. And they can capture the value added in milling. Lower relative wheat prices have, at times, encouraged India, Pakistan, and China to export rice and import wheat. In addition, increasing per capita incomes will have greater effects on wheat consumption because (1) wheat demand has a higher estimated income elasticity than rice demand and (2) rice demand has a negative or declining income elasticity in many Asian countries.

Because of the current policy structure, the growth areas in the rice export market during most of the 1980's was among countries outside of monsoon Asia that produce very little of their own domestic supply. A question arises as to whether this long-term growth in demand outside of Asia has been any more stable than the volatile residual demand of the monsoon Asian importers. Critical factors such as changing oil prices, interest rates, and foreign exchange rates have a significant effect on the import demands of these countries. With the complete removal of import restrictions and producer subsidies, especially import restrictions, Asia should again become a viable and more stable rice market.

## Domestic Policies of Major Market Players

Agricultural trade distortions are largely the result of the pursuit of domestic policy objectives and the measures implemented to achieve them. Distortions and tensions in agricultural trade arise because domestic policies, particularly those which restrict imports and raise prices, increase production and dampen consumption. These responses compound the long-term problems facing agriculture in developed countries caused by technologically induced productivity increases, the slowdown in population growth, and a low-income elasticity of demand for food. The trade sector partially becomes a residual market as a result of agricultural surpluses in those OECD countries with highly assisted agricultural sectors.

### Price Support and Income Policies

Producer price and income supports are the most common form of assistance practiced by the more developed rice-producing countries (the developed countries plus South Korea and Taiwan). Price supports account for over 85 percent of government intervention (table 5) in all countries except for the United States, which relies more on direct income payments. Strict import controls or outright bans and/or export subsidies typically accompany price support programs to prevent lower priced imports from undermining domestic price objectives or to dispose of surplus production. Hence, price supports in the developed countries (except the United States) are generally paid through higher consumer prices and, as such, require little or no budget outlays. They can, however, translate into large government outlays for export subsidies. Japan, South Korea, the EC, and Taiwan practice this type of price support policy.

Table 5--Sources of producer assistance in selected countries, 1982-86 averages

Policy	Australia	EC	Japan	United States	Taiwan	South Korea
	<u>Percent</u>					
Price/income support	89.7	99.5	85.7	87.7	93.0	92.4
Input subsidies	.9	0	10.7	7.6	1.2	0
Marketing	.9	0	3.4	.2	0	0
Long-term support <sup>1/</sup>	6.5	.5	0	4.8	5.9	7.1
Other	1.9	0	0	0	0	.2
<b>Total <sup>2/</sup></b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1/</sup> Long-term support includes infrastructure development, research, and extension service.

<sup>2/</sup> Numbers may not add to total due to rounding.

Source: USDA, ERS, (1988b).

Direct payment measures include items such as deficiency payments and other nonprice income guarantees. Unlike price support measures, border measures do not have to accompany direct income payments. Deficiency payments keyed from target prices influence producers to follow the program requirements in order to obtain benefits. This type of response affects supply and the resulting market price, although not nearly as much as price support. However, they can require large-scale government outlays at very visible government expenses.

Except in the United States, direct payments do not account for a substantial share of producer support in industrial market economies (table 6). When used by industrial market economies, direct payments are typically accompanied by supply control measures and producer price supports. Thus, the total effect on trade is not clear. For an importing country, direct payments to producers lower imports because they provide a production incentive. For an exporting country, direct payments allow exports to occur at a price lower than that received by producers, so the trade effect is similar to an export subsidy, except that domestic consumers and exporters receive the same benefit. Significant trade distortions also occur due to the production incentive arising from accompanying support prices. This is the factor which has the greatest potential trade effect. The total effect of direct income payments is more complex when production controls are in place.

### The United States

The deficiency payment scheme works by paying eligible and participating producers a payment rate equal to the difference between the announced target price and the higher of the loan rate or average market price during the first 5 months of the marketing year. Payment is made on acreage planted within the permitted level, but only for program yield. The Food Security Act of 1985 increased emphasis on deficiency payments instead of price supports to make U.S. exports more competitive in world markets and as a means to support rice farmers' income. In addition, the formula for adjusting the loan rate has been changed to allow the loan rate to move with trends in market prices instead of reflecting changes in cost of production.

The United States has a complex rice price support program consisting of nonrecourse loans, a target price, deficiency payments, a voluntary paid land diversion, marketing loan, and an acreage reduction program (ARP). Participating producers are eligible to place their entire crop in government storage at a guaranteed price (loan rate). If the market price exceeds the loan rate, producers may pay off the loan plus storage cost and receive their crop back. If the market price does not exceed the loan rate, farmers can forfeit their crop with no penalty at the end of the 9-month CCC loan contract and keep the loan payment. Hence, in the absence of the marketing loan, the loan rate acts as a floor price for U.S. producers, thus limiting commercial exports when market prices are below the loan rate as was true during most of 1985/86 and 1986/87.

Because of the prominent position of the United States in the world rice market, the loan rate operated as a price floor prior to the introduction of the marketing loan in 1986. The marketing loan essentially set the floor price low enough for U.S. rice to clear the world market, with frequent adjustments made to insure competitiveness.

Since 1982/83, mandatory ARP's have accompanied deficiency payments. The ARP's have restricted much of the acreage expansion that would have occurred

Table 6--Share of total producer support of different policy measures for selected countries, 1982-86 averages

Policy	Australia	EC	Japan	United States	Taiwan	South Korea
<u>Percent</u>						
Price/income support	11.2	46.4	75.6	39.5	26.1	66.6
Input subsidies	.1	0	9.5	3.4	.3	0
Marketing	.1	0	3.2	.1	0	0
Long-term <u>1/</u>	.8	.9	0	2.1	1.6	5.1
Other	.2	0	0	0	0	.1
Total <u>2/</u>	13.8	46.6	88.3	45.2	28.5	72.1
<u>Percent</u>						
	Brazil		Indonesia		Bangladesh	Thailand <u>3/</u>
Price/income support	12.8		3.5		6.7	0
Exchange rate overvaluation	-5.8		0		0	0
Export taxes	-13.0		0		0	-10.7
Input subsidies	29.9		3.4		1.8	4.8
Marketing	43.1		0		0	0
Long-term <u>1/</u>	0		5.1		0	0
Other	0		0		0	0
Total <u>2/</u>	51.3		11.0		7.4	-5.4
<u>Percent</u>						
	Pakistan (basmati)		Pakistan (white)		Nigeria	India
Price/income support	-77.9		1.0		9.3	-20.8
Exchange rate overvaluation	-37.8		-22.0		-54.6	0
Input subsidies	3.5		7.2		2.8	1.5
Marketing	0		0		0	0
Long-term <u>1/</u>	2.5		5.4		0	2.5
Other	0		0		0	0
Total <u>2/</u>	-109.8		-8.0		-42.6	-28.1

1/ Includes infrastructure development, research, and extension service.

2/ Numbers may not add to total due to rounding and exclusion of unmeasured support measures.

3/ Thailand removed the last of its export taxes on January 1, 1986.

Source: USDA, ERS (1988b).

with higher target prices and loan rates. As such, because U.S. policy produces contradictory effects on production, the net effect on the world price is reduced, suggesting U.S. policy has only a small effect on the world price. Thus, the direct cost of deficiency payments is borne by taxpayers (Tyers and Anderson, 1988).

### The EC

The EC's Common Agricultural Policy (CAP) uses a combination of import levies, threshold prices, domestic intervention, guaranteed minimum prices, and export restitution to support producer prices in the EC at levels often substantially above the world price. An import levy is imposed equal to the difference between the price of rice imported from nonmember countries and a threshold price fixed by the EC Commission. The threshold price is such that the imported rice may be sold at the same price as the corresponding quality and grade of EC rice, allowing for transport costs. Hence, the levy varies

according to the threshold price fixed within the EC, monetary fluctuations, and the world price in Rotterdam.

Domestic purchases at guaranteed prices (intervention price) and subsidized export disposal (export restitution) support producer prices and prevent the accumulation of surplus stocks. However, most price support in the EC is provided by export subsidies and import levies, not domestic intervention purchases. In addition to higher costs to consumers, these rice policies require budget outlays (for export restitution and domestic intervention buying).

### Japan

State control of all domestic and international marketing of rice is used in Japan to protect farm prices at 5-6 times the trading price for comparable high-quality rice and 8-10 times the average world rice trading level (ABARE, 1988). Strict border measures are employed to maintain these high producer prices. Every year, the Government establishes the "Basic Plan for Rice Control," which outlines program provisions, the supply and demand prospects, and the rice volume the Government plans to market for the coming year. Based on this, the quantity of rice each producer can sell is decided and booked. The Japanese Food Agency purchases this rice from producers at a price support based on costs of production for an average farm. It then sells the rice to wholesalers or users at prices allowing for various factors such as consumers' standard of living and costs of imports that put it below the price producers receive.

The Government also controls rice exports and imports. Rice imports are made under government licenses by authorized private firms. Any rice imports are subsequently resold to the Government. Japan imports from Thailand only very small quantities of glutinous rice that it cannot grow. Although consumers bear most of the cost of this price support program, the purchase price of rice for the Food Agency is higher than its resale (wholesale) price, requiring government outlay in addition to storage and handling costs.

The high rice producer price has stimulated production and restricted consumption, creating surpluses. Several adjustments have recently been made in this price policy to bring supply and demand into balance. While the state was previously required to purchase all rice produced by farmers, the Government now sets targets for maximum quantities to be purchased. Also, the nominal purchase price of rice was reduced 4.6 percent in 1987 and 5.6 percent in 1988. However, the actual price was basically unchanged due to the appreciation of the yen.

### Australia

Domestic rice prices ("home consumption prices") are maintained above the world level in Australia by the monopoly operation of the state marketing boards. Two-price schemes are indirect export subsidies. Because the marketing boards buy high and sell high and control all sales, the cost of price support in Australia is borne by consumers. This state monopoly is the main component of the rice program and supports prices considerably higher than for most other crops. Phytosanitary regulations also provide domestic producers some protection from imports.

## Developing Countries

High- and medium-income developing countries typically support producer prices above border prices while many lower income developing countries' price policies tax producers. State control of trade is the most widely used method of intervention. Trade policies that ban, limit, or restrict imports are used in conjunction with domestic policies designed to raise producer prices and prevent international rice from undermining national price objectives. In countries which set producer prices below border levels, policies that restrict or tax exports are used to lower domestic prices.

Producer price intervention policies in developing countries can be separated into three categories. First, policies conducted in high- and medium-income developing countries typically maintain producer prices substantially above world levels. Second, price policies practiced by poorer developing countries--such as Indonesia, Bangladesh, China, the Philippines, India, and Sri Lanka--establish producer prices a little below, or near, the world levels. And finally, the policies of the rice-exporting countries, principally Burma, Vietnam, Pakistan, and Thailand (prior to 1986) keep prices below world market levels.

Taiwan, South Korea, and Malaysia (high- and medium-income developing Asian countries) maintain domestic prices substantially above border prices. The Taiwanese Government purchases rice at prices two to three times the world level, but government procurement accounts for only about 20 percent of total production. The external market is completely controlled by the Taiwanese Government which does not permit imports. High producer prices have created overcapacity requiring subsidized exports.

South Korea maintains a dual price system whereby the Government purchases rice at approximately five times the world level and distributes it to consumers at prices below production and marketing costs. All rice imports are controlled by the South Korean Government where restrictive policies act as a virtual ban. The price differential is financed by the Government. Although South Korea held its support level constant between 1982 and 1986, the support level was raised by one-third in 1987 in response to election pressures and has been raised each year since 1987.

The Malaysian Government purchases all domestic rice at "floating" support levels established well above the world price. The Government is the sole importer of rice and imports only to compensate for domestic shortfalls. Budgetary pressure has forced Malaysia to back away from total self-sufficiency, and currently seeks only about 80 percent self-sufficiency in rice.

Although both countries' price policies historically taxed rice producers, Indonesia and Bangladesh have supported producer prices a little above the world levels in recent years. Producer prices are maintained primarily through government control of trade and, to a lesser extent, limited government procurement of rice in the domestic market. Government procurement accounts for a much smaller share of production in Indonesia and Bangladesh than in Japan or South Korea: 10 percent of production in Indonesia and between 6 and 7 percent in Bangladesh. Both countries' major policy goal is self-sufficiency. Most government-procured rice (including food aid) is distributed to consumers at below border prices in Bangladesh, a low-cost producer of rice. On the other hand, high consumer prices and budget outlays

are used to support producers in Indonesia, a high-cost rice producer. Declining oil revenues may reduce support in Indonesia for increased budget outlays to achieve self-sufficiency. Although Indonesia imported 412,000 tons of rice in 1989, it will probably import less than 100,000 tons in 1990 due to a good harvest. Floods and drought have hindered Bangladesh's attempts to increase production.

Although a high-income developing country, Brazil supports producer prices only slightly above border levels. Brazil's program is very similar to the U.S. nonrecourse loan program, with Brazil's loan rate slightly below the U.S. loan rate.

Several important rice-producing, low-income countries establish producer prices below world levels. The Philippines, China, India, and Sri Lanka provide support levels that averaged approximately three-fourths the world price between 1976-80 (Barker and others, 1985). However, producer prices are currently about equal to the border price in Sri Lanka and are about 90 percent of the border price in China and the Philippines. State control of all rice trade is the primary tool used to keep producer prices below border levels. Imports and exports are adjusted to maintain domestic prices at target levels. Government procurement of rice at below border levels in India and China also lower producer prices. These countries seek low and stable consumer rice prices and adequate incomes for producers. The Philippines has also tended to over-import rice, thus adding to downward pressure on prices.

China's and India's agricultural policies are designed to reduce their dependence on rice as a food staple and encourage more consumption of wheat. China's exports are unintended surpluses and India has one of the world's most isolated agricultural sectors. Input subsidies and government investment in agricultural infrastructure have historically compensated producers for low prices in these countries. Imports by India increased in the late 1980's due to bad weather in crop years 1986 and 1987 and low producer incentives designed to reduce larger than desired ending stocks in 1984 and 1985.

Burma, Pakistan, and Egypt maintain producer prices at less than one-half the world level. Producer prices are kept low in both Pakistan and Burma through complete government control of exports and government procurement. Low producer prices have accounted for much of Burma's decline in share of world rice trade since the late 1960's. The Government procures about 30 percent of Burma's total rice crop at prices substantially below the world level for distribution to the military and some members of the civil service. Farmers are free, with certain restrictions, to consume or market domestically the rest of their crop. In February 1988, Burma opened up export trade to qualified traders in order to increase export promotion efforts, but with little success so far.

Pakistan's exports have kept pace with demand and the support level for indica rice has been rising since the late 1970's. But an overvalued exchange rate severely hinders Pakistan's exports. Egypt, a very minor exporter now but a significant one in the 1960's, procures half its domestic production at prices half the market rate.

Thailand's export taxes and quotas depressed domestic prices and reduced returns to farmers. Thailand lowered its export taxes and quotas in the 1980's and eliminated both in 1986. Credit policies under the paddy mortgage scheme and direct government purchases of paddies are aimed at influencing



prices. Under the paddy mortgage scheme, the Bank for Agriculture and Agricultural Cooperatives (BAAC) loans farmers money at low interest to finance the holding of stocks. Farmers receiving the loans were required to pledge stocks of paddy fields as collateral for production credit. The credit enables farmers to buy seed and fertilizer, and hold the paddy for a few months after harvest when prices normally rise. Although 2.3 million tons of rice were pledged under the scheme in 1987, it was not used extensively again until 1989. In recent years, the Government has increasingly relied on direct purchases of paddy rice as a means to support domestic prices.

### Consumer Prices

Policies affecting consumer prices can also be separated by country based on per capita incomes. Except for the United States, policies in developed countries and higher income developing countries support consumer prices above border levels. Consumers in Japan and South Korea support self-sufficiency by paying very high retail prices for domestic rice as imports are banned. Taiwanese consumers pay prices substantially higher than border prices to support domestic producers, but these prices are not as high as those in Japan and South Korea. Consumers in the EC pay slightly higher than world prices as a result of trade measures. Because the United States relies primarily on direct income payments to support producers, consumer prices are not affected much by producer support. State marketing boards in Australia sell rice in the domestic market at prices above border levels.

Most lower income developing countries effectively reduce consumer prices through various policy measures. Iraq fixes the consumer price at less than border levels and has kept it constant in nominal terms since 1984. Saudi Arabia provides importers with a subsidy when the world price exceeds \$400 per metric ton and requires them to pass this on to consumers. Bangladesh, Egypt, and India provide some subsidized distribution. Buffer stocks and imports are used to establish price ceilings in Malaysia, India, and the Philippines. Currency overvaluation in Argentina, Brazil, and Pakistan has lowered the domestic price of traded goods, including rice.

Some developing countries pursue different policies for consumer prices. In contrast to other Asian countries, Sri Lanka in 1977 removed government controls on prices, distribution, and marketing which favored consumers and now sells rice on the open market. Consumers in Indonesia and Malaysia pay higher than border-level prices to support domestic production.

### Production Policies

Rice supply management schemes in many countries result in a level of production lower than would be the case if supply were unrestricted at the same price level. Such policies are generally implemented in conjunction with price and/or income support policies, and are rarely used for commodities in which a country is less than self-sufficient.

In isolation, supply management schemes raise prices and reduce the excess supply available for export. However, since supply management programs are almost always carried out in conjunction with price and income support, the net effect on trade is not obvious. In addition, the success of supply management schemes in controlling production is hindered by increased input use on productive land, increased acreage to compensate for set-aside, higher

yields associated with a smaller acreage, and lack of permanence associated with land diversion schemes.

### The United States

The United States is the only major rice-producing country to rely significantly on supply management as part of its producer programs. Loan eligibility and/or deficiency payments are conditional on compliance with acreage reduction schemes (either acreage reduction or paid land diversion) when these are in place. These schemes sometimes contain limitations on alternative uses of the idled land. Supply management has focused on area planted rather than on the level of production, limiting its effectiveness. By fixing the amount of land used in production, acreage reduction programs encourage more intensive input use.

The trade effects of these actions are extremely complex although the immediate result is generally reduced supply and strengthened prices. A particular feature of U.S. supply management policies is that they are used in response to anticipated short-term market situations. Also, it is the least productive land that is set-aside. Hence, the removal of set-asides is often accompanied by declining yields. However, the extent to which yield slippage applies to rice is less than other grains since riceland is more homogeneous in quality (for example, riceland is 100-percent irrigated).

### Japan

The high level of support provided to Japanese rice growers has encouraged them to increase production even though Japanese consumers are reducing the quantity of rice they consume. As a result, Japanese authorities have faced serious surpluses which were most pronounced in 1968-70 and 1975-80. Riceland diversion programs have been one of the measures introduced in an attempt to address this problem. There have been four such programs since 1971, the most recent beginning in 1987. All have been designed to decrease rice production and increase production of other priority crops such as wheat, barley, and soybeans.

These programs have been expensive and yet only marginally successful. This is because the programs have not contained provisions to prevent farmers from moving back into rice production after they have received the diversion subsidies. It may also be because Japan's rice producers are mostly part-time farmers who are not particularly flexible in altering their output mix since fixed costs are a relatively high proportion of total costs.

The latest version of the rice supply control program--the 1987-92 Paddy Field Farming Establishment Program--has some new features. There is a focus on improving productivity and farm structure. The target area of paddy fields to be diverted from rice cultivation to other crops was increased by 28 percent to 770,000 hectares, equivalent to roughly 36 percent of Japan's 1988 paddy fields with a production capacity of about 3.6 million tons. But, at the same time, diversion payments are reduced and restructured. However, the extent of adjustment remains limited because the Japanese market remains closed to imports and support prices still make rice farming profitable.

## The EC

The EC has also recently introduced voluntary set-asides, but this program has had virtually no effect on rice production. The EC set-aside, unlike the U.S. acreage reduction program, is an option granted to farmers for arable land, not a requirement for program participation. Farmers are entitled to receive financial compensation for the loss of income resulting from the set-aside for a period of 5 years. The EC does, however, offer a considerable production subsidy on long-grain rice. This subsidy was equal to 300 European Currency Units (ECU's) (or close to \$400/ha) in 1989.

## Input and Marketing Subsidies

Input subsidies for agricultural commodities in general include fertilizer, pesticides, fuel, water, and labor subsidies; tax concessions; and interest and other credit concessions. Marketing subsidies include processing, transportation, inspection, and sales promotion subsidies by governments, and marketing credits. Input subsidies enhance producers' net returns and hence encourage expanded production. They have the effect of altering relative input prices and may affect the overall resource allocation pattern within agriculture as well as the volume of resources used in agriculture. Certain marketing subsidies, like those on transportation, may enhance producer returns and stimulate production. The effects of other marketing subsidies on production are less clear. Marketing credits, for example, may raise wholesalers' incomes rather than producers'. Another feature of input subsidies is that they do not always involve budget outlays, but operate through revenues foregone, such as preferential interest rates, in some cases.

Input subsidies have had only very limited effects on rice production in the industrial market economies relative to other direct and individual price supports. However, almost all developing countries examined provide credit assistance of some kind and a large proportion provide tax exemptions for fuel used in agriculture. Low-cost credit has increased capital investment and enhanced productivity increases, further aggravating supply and demand imbalances.

## Developed Countries

Developed countries generally provide producers only a very small portion of their support through input and marketing subsidies. But, the United States provides producers with input subsidies in the form of low-cost commodity and input loans, storage payments, low-cost irrigation, and crop insurance. Based on USDA estimates of producer subsidy equivalents (PSE's) (USDA, ERS, 1988b), these input subsidies account for about 8 percent of total producer support from 1982 to 1986. Input subsidies account for less than 1 percent of producer assistance in Australia. Australia uses a quota system to provide irrigation water to rice producers at below market prices. Subsidies for credit, fertilizer, and diesel fuel are also provided. Japan provides producers with crop insurance and low-cost rural electrification. The Common Agricultural Policy (CAP) provides EC producers no input subsidies. (However, the CAP Guidance Fund does provide some support for structural development and EC national governments provide some input subsidies.) In Japan, the largest user of subsidies among industrial market economies, input subsidies account for about 10 percent of producer value and marketing subsidies account for about 3 percent.

## Developing Countries

Almost all developing rice-producing countries provide producers with some level of input subsidy. Production subsidies are typically higher in those developing countries which maintain lower producer prices. Developing countries began subsidizing fertilizer use and other modern inputs in the late 1960's to encourage adoption of high-yielding varieties. Because of the successful adoption of high-yielding varieties in Bangladesh, Pakistan, and the Philippines, these countries are phasing out or eliminating fertilizer subsidies. Fertilizer subsidies distort input prices and hence hinder efficient production practices.

Many Asian governments also invested heavily in large irrigation projects which made more land suitable to growing high-yielding varieties. Large flood control and drainage projects have also benefited rice producers. Operating and maintenance costs of these projects are typically subsidized by governments. The breeding and dissemination of higher yielding and faster maturing varieties have also assisted producers worldwide. The effect of these production policies has been to increase world production, especially through the adoption of higher yielding varieties.

Most low-income Asian countries which have achieved near self-sufficiency in rice have done so more through production policies than price policies. Indonesia, the world's largest importer of rice during the 1970's, achieved near self-sufficiency during most of the 1980's, primarily through substantial subsidies for irrigation operations, fertilizer, and credit combined with strict border measures. Technical assistance was also provided through an extension service. These programs assisted Indonesian producers in becoming early adopters of high-yielding varieties. However, because of lower oil revenues and the high budget outlays required for these programs, Indonesia is reducing its input subsidies and may again become a major importer.

The Muda Irrigation System, financed by the World Bank, and fertilizer subsidies assisted Malaysia in moving substantially toward self-sufficiency beginning in the late 1960's. However, Malaysia currently provides a fertilizer subsidy only to average- and below-average size farms for only income maintenance and equity purposes. Subsidized production inputs and government-controlled milling have created severe inefficiencies in Malaysia's rice-producing sector.

Sri Lanka invested heavily in large irrigation projects and provides operating and maintenance subsidies as well as fertilizer subsidies. Massive, government financed irrigation projects and extensive research and extension programs in India are responsible for increased production and less demand for imports. India also provides a small fertilizer subsidy and low-interest loans to agricultural producers.

In the late 1960's, the Philippines embarked on a self-sufficiency program titled "Masagana 99" to encourage adoption of high-yielding varieties. The early phases of the program relied on fertilizer subsidies and subsidized credit. These specific policies have been eliminated. Large investments in irrigation projects have also assisted Philippine producers.

Bangladesh uses irrigation operation and maintenance subsidies to support rice producers, but is phasing out its fertilizer subsidy. Unlike most low-income

Asian countries, Bangladesh relies more on output price policy than input policies to promote production.

The traditional Asian rice-exporting countries have only very small direct producer price and income programs. Producers are, however, affected by border measures. Pakistan invested heavily in irrigation and drainage projects but is phasing out input subsidies (mostly fertilizer). To improve efficiency, Pakistan is reducing overall government intervention, and input use and yields are low by Asian standards. Although an irrigation subsidy is the main form of producer support in Thailand, the Government also provides low-cost credit to exporters and producers. Fertilizer subsidies were once important but are declining because there is little use of high-yielding varieties. In addition, the Bank of Thailand subsidizes credit to millers and exporters for procurement, packing, and export which enables rice millers to buy additional paddy rice from farmers in order to support prices.

Burma conducts a comprehensive extension program designed to introduce modern cultivation methods, provide fertilizer and other inputs for high-yielding varieties, and provide credit assistance. However, Burma also records very low yields and lack of acceptance of high-yielding varieties.

Input policies are not as important as price policies in the higher income Asian countries. Over 90 percent of South Korean producer support is through output price policy. Additionally, there is extensive investment in irrigation systems in South Korea. Price policy is responsible for 95 percent of Taiwan's producer support. Internal infrastructure development, especially large-scale irrigation projects, make up most of South Korea's nonprice producer support.

#### Long-term Structural Support and Research

Long-term policies include government outlays allocated across commodities for both research and extension as well as structural development projects (table 6). Longer term structural measures tend to cause fewer trade-distorting effects in the short run than do price supports, direct income supports, and input and marketing subsidies. These forms of sectoral investment can significantly expand production and permanently lower unit production costs in the long run, but these benefits are often shared among countries. In addition, they lower consumer prices by increasing production and reducing costs. No GATT participant is calling for the elimination of research and extension programs.

In certain cases, expenditures that appear to be related to long-term structural development actually subsidize current production costs. In India, for example, rural development program costs include subsidized electricity costs. This type of support may be better thought of as an input subsidy, rather than long-term structural support.

Long-term support does not account for a large portion of rice support in the developed countries. Producers in Japan receive almost no long-term structural support. The European Agricultural Guidance and Guarantee Fund (EAGGF), the mechanism through which the Common Agricultural Policy is financed, provides EC producers some funds for long-term structural support through the Guidance Section. Most of the measures funded by this section are financed by the refund of part of member states eligible expenditure (indirect actions). This category includes socio-structural directives, most actions in

favor of the less-favored regions, and most measures linked to markets. The Guarantee Section, which is concerned with the provision of agricultural price support, including domestic intervention measures and export restitutions, receives the bulk of EC funding.

Australian producers receive some long-term support through research and extension services. About 5 percent of U.S. and 6.5 percent of Australian producer support is in the form of long-term structural support (table 5). The United States provides rice producers long-term assistance through research, pest and disease control, extension services, and land improvements. South Korea and Taiwan provide producers long-term structural support in the form of irrigation projects and infrastructure development.

The traditional Asian rice-importing countries have used long-term support and research to a greater degree than developed countries to promote self-sufficiency. Most long-term support for rice producers in developing countries involves large-scale irrigation projects, land improvement schemes, and research and extension programs. Malaysia has increased production through large-scale investment in massive irrigation (Muda Irrigation System). India, Sri Lanka, and Pakistan have also used large irrigation projects to increase production. Long-term research on the development and adoption of high-yielding varieties by the International Rice Research Institute (IRRI) in the Philippines has assisted many Asian countries in increasing production, most notably Indonesia and Malaysia. Among the developing exporting countries, Burma has instituted a comprehensive extension program to introduce modern cultivation methods and high-yielding varieties.

#### Trade Policies of Major Market Players

Trade policies are normally enacted in support of or in response to domestic measures affecting the level of supply and demand of the commodities in question. Effects of trade policies are generally more measurable than the effects of domestic production and price policies.

#### Import Policies

Net importing countries tend to rely on import control measures (tariffs, levies, quotas, and state control of trade). These measures involve little budgetary cost, are administratively easy to apply, and also contribute to domestic price stability. However, the resulting higher prices, while benefiting farmers, raise retail prices to consumers by limiting consumer access to imported supplies. When major trading countries impose these import policies, they also have a depressing effect on world market prices. Import quotas, variable levies, and state control of trade also prevent world price movements from being transmitted to domestic markets, thereby insulating domestic consumers and producers from price instability and forcing production and consumption adjustments on other countries. Except for Nigeria, tariffs are not typically used by rice-importing countries.

#### State Trading

State trading agencies control or restrict imports to support domestic policy objectives. State control of trade is widespread in the world rice market (table 7). The Japanese Food Agency controls all imports of rice and imports only small quantities of glutinous rice which it cannot grow. Japan, South

Table 7--Comparison of main policy tools and their percentage of producer value

Country	Main policy tools	Percentage of producer value 1/	
		Average 1982-86	1986
<u>Percent</u>			
<b>Developed countries:</b>			
Japan	State control of external and domestic trade	88.3	94.3
EC-12	Import levies, export subsidies	46.6	73.3
United States	Deficiency payments, support prices	45.2	71.7
Australia	Home consumption pricing	13.8	21.8
<b>Developing rice-importing or self-sufficient countries:</b>			
South Korea	Restrict imports, government procurement	72.1	76.6
Brazil	Subsidized credit, export taxes	51.3	64.2
Taiwan	Ban imports, government procurement	28.5	31.5
Malaysia	State control of trade, input subsidies	N/A	N/A
Indonesia	State control of trade, government procurement	11.0	22.0
Bangladesh	State control of trade, government procurement	7.4	17.0
India	State control of trade, government procurement	-28.1	-15.3
Nigeria	Currency overvaluation	-42.6	-22.9
<b>Developing rice-exporting countries:</b>			
Thailand 2/	Export taxes, irrigation subsidy	-5.4	5.4
Pakistan (basmati)	Overvalued currency, state control of trade	-109.8	-128.0
Pakistan (white)	Overvalued currency, infrastructure, inputs	-8.0	-2.0
Burma 3/	State control of trade, government procurement	N/A	N/A
China 3/	State control of trade, government procurement	N/A	N/A

N/A = Not available.

1/ Percentage of producer value is really a "producer subsidy equivalent" (PSE), a concept explained later in this report.

2/ Thailand eliminated all export taxes as of January 1, 1986.

3/ Net effect of government policies is producer tax.

Sources: USDA, ERS (1988b) and unpublished updates.

Korea, and Taiwan ban imports of rice to protect domestic producers. South Korea's restrictive import policy acts as a virtual ban on imports. Taiwan does not permit rice imports.

The government is the sole importer of rice in many other countries. These countries import rice only to meet domestic shortfalls and stabilize domestic prices. State control of trade is also practiced by Bangladesh, Indonesia, India, Malaysia, and Brazil. The Philippines and Nigeria currently have a ban on imports and the governments control imports when necessary.

### Variable Levy

The EC maintains a minimum import price (threshold price) to protect domestic producers from low-cost imports and applies variable import levies to enforce protection. In order to guarantee producers a level of prices generally above world market prices and to provide stable internal market prices, the EC charges a variable levy on imports from outside the Community. These levies, which match the difference between c.i.f. (cost, insurance, and freight) import prices and the threshold prices, bring world supply prices up to the target levels, taking account of internal transport costs.

### Other Policies

Although the United States imports very little rice, it does not ban or restrict imports. U.S. imports of Thai rice have increased threefold in the last 5 years. Australia does not outright ban imports but imposes sanitary

standards that limit imports into rice-producing states, although developing countries are exempt. These requirements offer some protection to domestic producers.

### **Export Policies**

In contrast to the large-scale trade intervention practiced by most rice-importing countries, exporting countries typically do not directly interfere with trade. However, their domestic price and production policies have indirect effects on trade. Because many of the developed rice-exporting countries support producer prices above world levels, these countries are forced to subsidize to increase exports. Export promotion schemes, such as direct export subsidies, low-cost credit, and two-tier price systems, are employed to aid exports. They also add to world trade distortions.

Because export subsidies lower actual traded prices and reduce the role of quoted prices, the effect of these types of programs has been to reduce the world price and add instability to the world rice market. The use of export subsidies often makes quoted prices irrelevant and reduces the role price signals can play in equating supply and demand. In contrast to import restrictions, export promotion programs can require extensive budget outlays. Export subsidies tend to put a gap between export and domestic prices, with taxpayers paying the difference. In addition, consumers are also affected if export subsidies are the result of price support programs. The use of export subsidies has also hindered the ability of lower income exporting countries to acquire a larger share of the world market.

### The United States

The United States assists exports through various programs. Roughly 40 percent of U.S. rice exports are shipped under some form of credit assistance or as bona fide food aid. Many of the U.S. rice export programs were designed to counter EC export subsidies and Japanese import barriers.

The most important program affecting U.S. rice exports is the marketing loan, introduced for rice in the 1985 Food Security Act. It is a marketing subsidy rather than an export subsidy, but can affect price competitiveness. The marketing loan program allows participating producers to repay their nonrecourse commodity loans at the higher of the world price or one-half the loan rate in 1986 and 1987 (the fraction of the loan rate rises after 1987). When the world market price is less than the loan rate, the intent of the marketing loan is to allow farmers to receive the total loan value and help exporters to purchase rice at or near the world market prices. The marketing loan generally made U.S. rice more competitive in international markets from its inception in April 1986 until late 1987. Since early 1988, higher world prices have virtually eliminated any price-distorting effect of the marketing loan program.

The marketing loan is not an export subsidy because the program does not separate the domestic and trade price. Thus, the marketing loan is not a true export program, but a marketing subsidy.

Export Credits. The 1985 Food Security Act also continued export credit programs. The CCC has also operated a variety of credit programs since 1956 which facilitate rice exports. Some programs provide short-term credit to importers at commercial rates (GSM-5), while other programs guarantee



repayment (GSM-101 and GSM-102) of short-term commercial loans. The act also introduced longer term loan guarantees (GSM-103) which cover credit for 3 to 10 years. In fiscal 1986 to 1988, credit guarantees facilitated over 20 percent of U.S. rice exports.

Export Subsidies. The Export Enhancement Program (EEP) was announced in May 1985 to help U.S. exporters compete with subsidizing competitors, particularly the EC. Under EEP, the CCC awards bonuses in the form of generic certificates (redeemable for CCC-owned commodities) to exporters, who in turn sell specified U.S. commodities in targeted countries at world prices. For rice, the use of the EEP has been very limited with peak use in 1987 accounting for less than 5 percent of total exports. No EEP sales for rice were made in 1989. Turkey and Jordan have been the only recipients of rice shipments under EEP. The EEP has not been used extensively for U.S. rice because of the targeted approach.

Food Aid. The PL-480 food aid program allows surplus rice to be shipped overseas for emergency relief, sold for foreign currency, or bartered for strategic materials. Major recipients currently include Bangladesh, Ghana, Guinea, Jamaica, Liberia, Madagascar, Mozambique, the Philippines, and Somalia. Indonesia is a regular recipient of small quantities of food aid. PL-480 shipments peaked in the early 1970's and have declined as a share of total U.S. exports since that time. In 1988, U.S. rice exports under PL-480 accounted for nearly 20 percent of the total exports.

The Targeted Export Assistance (TEA) Program. This program helps U.S. exporters counter unfair trade practices by foreign competitors and importers by helping to promote various commodities overseas. The thrust of the program for rice has been to promote U.S. rice in countries that have the potential to develop into commercial markets.

#### The EC

The EC provides export subsidies (restitutions) to exporters to dispose of domestic surpluses created by high internal price supports and variable levies. Community producers are refunded the difference between the internal market price (including cost of transport to the Community port of export) and the selling price obtainable on the world market. In addition to this price difference, the amount of the refund also depends on the destination and on the market situation at the time of export.

#### Other Exporters

Australia and Taiwan provide very small export assistance programs. Taiwan signed an agreement with the United States in 1984 limiting subsidized exports to 1.38 million metric tons through 1988. Australia's two-tiered price system is an indirect export subsidy. Brazil has recently offered small export incentives, but these have been ineffective in increasing Brazil's share of the market. Egypt and Thailand export rice on a government-to-government basis only at prices below domestic levels.

#### Export Taxes

The traditional rice-exporting countries (Pakistan, Burma, and Thailand) historically taxed exports as a means of generating revenue and providing low and stable consumer prices. Export taxes reduce exports and lower producer

incentives. Because elasticities of international supply and demand were extremely low, these countries were able to pass on most of the tax to foreign buyers. However, with more sources of supply today, exporters are unable to pass on the cost of an export tax to foreign buyers. Overvalued currencies reduce domestic prices of traded goods but hinder international competitiveness of many developing countries. Rice producers in Pakistan, Nigeria, and Brazil have been taxed through currency overvaluation.

Many of the developing exporting countries currently tax exports. Pakistan maintains a specific export tax for private exports which effectively eliminates private exports of rice. Pakistan's currency is currently overvalued, costing producers an estimated 38 percent of total producer value (table 6). Brazil and Argentina also maintain export taxes and both countries have or had overvalued currencies which reduce their competitiveness in world markets. Thailand removed its export premium in 1987.

### Measurement and Significance of Policies

A fundamental problem in agricultural trade negotiations is the wide variety of trade and domestic policies that governments use to intervene in their agricultural markets. In addition, tariffs, the traditional GATT negotiating subject, are relatively unimportant to agricultural trade.

Although increasing budget outlays have given urgency to trade liberalization, they are an inadequate measure of the total support provided by government policy. Some policy instruments, such as tariffs, import quotas, and variable levies, permit producers to receive prices higher than prevailing world market prices. Consumers bear the cost of these policies, yet this tax on consumers does not appear in the government budget. Government budget outlays also do not reveal support to producers in the form of other types of government intervention, such as concessional credit offered at below-market rates of interest. Using a price wedge (the difference between the domestic producer price and border price) as a measure of producer support is inadequate also. Such policies as deficiency payments, PIK entitlement, and producer co-responsibility are not included in price-wedges.

### The PSE and CSE Approach

The producer subsidy equivalent (PSE) and consumer subsidy equivalent (CSE) approach was developed by Timothy Josling (OECD, 1988) and others to measure the support implied by government intervention in agriculture. This approach is based on the proposition that many aspects of government policies can be reduced to: (1) the level of subsidy that would be necessary to compensate producers (in terms of income) for removing government support under current programs, and (2) the level of subsidy that would have to be paid to consumers to compensate them for removing agricultural programs. Taken together, PSE's and CSE's indicate the net income transfer from other sectors, through the government, to the agricultural sector.

A PSE is reported as a ratio between the total value of policy transfers to producers and total producer agricultural income (cash receipts plus net direct payments). For example, a PSE of 25 percent for a commodity indicates that government programs account for roughly 25 percent of farmers' gross returns for that product (gross returns include direct government payments). Positive PSE's refer to producer assistance or support, and negative PSE's to

producer taxation. Similarly, a CSE is expressed as a ratio between total value of policy transfers to consumers and total consumer expenditure for the agricultural commodity.

A PSE is typically the summation of the effects of many types of government policies (table 8). PSE estimates are derived from two specific sources: (1) by looking at budgetary effects of government policies and (2) by looking at the wedge that a policy instrument (or mix of instruments) drives between domestic and external prices. CSE's generally estimate the effects on consumers of policies that separate domestic and external prices.

In order to compare support across countries, policies are categorized by certain characteristics that broadly identify how they affect prices and production decisions and, therefore, trade. Most agricultural policies fall into one of five categories: price support measures including price stabilization schemes, direct income support measures that are tied to

Table 8--Policies included in the producer subsidy equivalent (PSE) estimates

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Market price support and border measures:

- o Domestic price supports linked with border measures (quotas, permits, tariffs, variable levies, and export subsidies and restitution).
- o Tariffs and export taxes.
- o Two-price systems and home consumption schemes.
- o Domestic price supports linked with production quotas.
- o CCC inventory and commodity loan activities.
- o Marketing board price stabilization policies.
- o State trading operations.

Direct income support to producers tied to production:

- o Direct payments (deficiency, disaster, direct storage, and acreage diversion, PIK entitlement, stabilization payments, crop insurance, and other direct government payments).
- o Producer co-responsibility levies (negative support).
- o Income tax concessions.

Input subsidies or taxes:

- o Fertilizer, seed, chemical, and irrigation subsidies.
- o Fuel tax exemptions.
- o Concessional domestic credit for production loans.

Domestic marketing subsidies:

- o Transportation subsidies.
- o Marketing and promotion programs.
- o Inspection services.

Long-term structural measures:

- o Research and extension services.
- o Conservation and environmental programs.
- o Structural programs.
- o Rural development.

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Source: USDA, ERS (1988a).

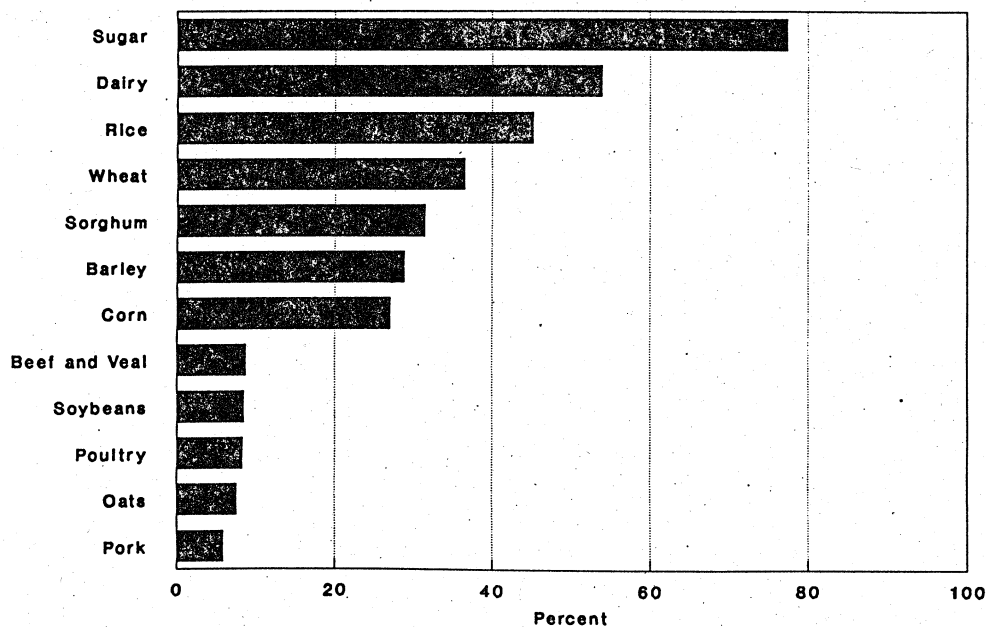
production or price, input subsidies, marketing subsidies, and long-term programs for research and infrastructure. Table 8 categorizes most of the policies used by ERS in the construction of PSE's under these categories.

PSE's and CSE's are based on prices, production, consumption, and trade under current policy conditions. When examined across countries or commodity markets, PSE's and CSE's show the relative importance of government policy in different countries and commodity markets in terms of government policies' contributions to farm revenues and consumer costs (figs. 6 and 7). When examined over time, PSE's and CSE's show changing government involvement in the agricultural sector. Changes in PSE's and CSE's can be due to policy changes, changes in world reference prices, or movements in exchange rates. Because these factors are quite variable, PSE's often show much variability over time.

#### Comparison Across Countries

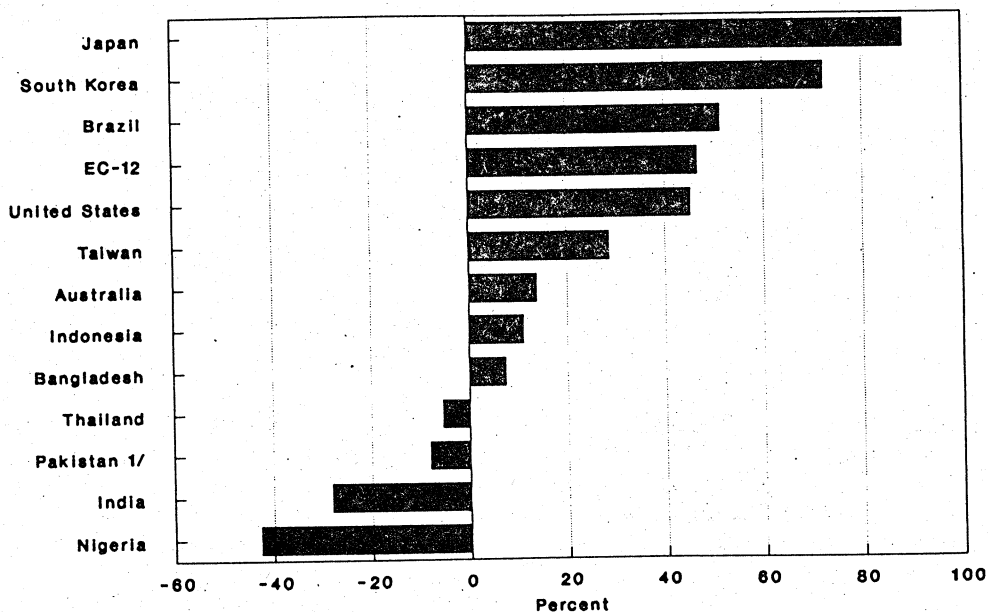
The data on PSE's and CSE's suggest several different patterns. Rice producers in Japan and South Korea are assisted at the highest level and levels of protection have been rising in these two countries (table 7). South Korea reduced its procurement price in the mid-1980's to ease budget pressures but raised the procurement price a record 14 percent in 1987 in response to election pressure. Although Japan's procurement prices were reduced in 1987 and 1988, the strengthening of the country's currency during that period caused the gap between world and domestic rice price to actually widen (table 9). In both countries, rice has been at the center of farm policy.

Figure 6  
 Producer subsidy equivalent for major  
 U.S. agricultural commodities 1/



1/ 1982-86 average.  
 Source: USDA, ERS, 1988b.

Figure 7  
 Comparing producer subsidy equivalent  
 for rice by country, 1982-86 average



1/ White rice only, basmati excluded.  
 Source: USDA, ERS, 1988b and unpublished updates.

The United States, the EC, Brazil, and Taiwan provide producers with moderate levels of assistance (table 7). Declining world rice prices in 1986/87 caused levels of producer support to increase in both the EC and the United States. According to USDA estimates, PSE's exceeded 70 percent in 1986 for both regions. Correcting Brazil's currency overvaluation and increasing the support price have accounted for increases in producer support in Brazil. In contrast, Taiwan has increased its producer support level only slightly since 1982. The Taiwanese Government has shown a reluctance to continue the high level of budgetary expenditure to support rice producers. Producer support in Taiwan has led to overcapacity and to costly land diversion schemes and subsidized exports to correct the imbalance.

Australia, Indonesia, Malaysia, and Bangladesh provide producers with a somewhat smaller, but increasing, level of assistance. Australia is a price taker in the world market. Australia, which exports about 85 percent of its rice crop, increased its producer support in 1986 in the face of declining world prices. Indonesia and Malaysia have raised procurement prices since the mid-1980's to promote self-sufficiency. However, both countries have recently experienced difficulties in meeting domestic demand. Yield growths have stagnated and declining oil revenues hinder government support. Although Indonesia was self-sufficient in rice in 1985, the country imported 415,000 tons of rice in 1989. Malaysia has indicated a willingness to retreat from the goal of 80-percent self-sufficiency. Bangladesh's goal is self-sufficiency; procurement prices were raised in FY 1987 to encourage production. But severe problems with drought and floods and stagnant yields have prevented achievement of this goal.

Table 9--Ratio of producer price to world price, average 1985-87 <sup>1/</sup>

Country	Ratio	Country	Ratio
	<u>1=world price</u>		<u>1=world price</u>
Japan	8.3	Australia	1.4
Nigeria	5.0	Bangladesh	1.2
South Korea	4.2	Indonesia	1.1
Saudi Arabia	4.0	Brazil	1.1
Iran	3.7	India	.95
EC	2.5	Thailand	.90
Taiwan	2.4	Egypt	.85
Malaysia	2.2	Pakistan	.71
United States	1.7		

<sup>1/</sup> Producer prices are on milled basis. World price is Thai white rice 5-percent broken, FOB Bangkok, taken from Thai Board of Trade; average of monthly prices in April-March year.

Sources: USDA, ERS (1987), (1988b); and unpublished updates.

India and Nigeria tax their producers through state control of trade and marketing in India and, in the case of Nigeria, currency overvaluation. Both India's and Nigeria's level of tax on producers has declined since 1982. India temporarily achieved self-sufficiency goals in the 1980's and regularly exported small quantities of rice during that period. However, weather-related problems forced India to import substantial quantities of rice in 1988 and 1989. India may have to eliminate the producer tax to remain self-sufficient in rice.

With the exception of Thailand, the developing rice-exporting countries tax rice producers. High export taxes on basmati rice and currency overvaluation are the major sources of producer tax in Pakistan. Pakistan and India have a virtual monopoly in basmati sales and can pass the tax on to consumers.

Export taxes rose and procurement prices have dropped in Pakistan for basmati rice. Thailand lightly taxed its rice producers through an export premium. This premium was reduced after 1982 and eliminated in January 1, 1987. China purchases rice from producers at levels approximately 90 percent of the border price (Tyers and Anderson, 1986), but considerably lower than the domestic market price.

Rice consumption is subsidized at low levels in Nigeria through currency overvaluation (table 10). Consumers in Japan and South Korea are heavily taxed through high domestic prices and tight import controls. Japanese consumer prices were above world prices but below producer prices, requiring large budgetary outlays in 1982-86 (table 11). An export tax in Pakistan provides a substantial consumer subsidy for basmati consumers. However, export subsidies on coarse rice create a small consumer tax. Taiwan's and Indonesia's consumers are taxed at a moderate level via government procurement and tight import control. India's goal of self-sufficiency has created very small consumer taxes in some years while subsidized distribution created a small consumer subsidy in other years.

Table 10--Comparison of main policy tools and consumer subsidy equivalents

Country	Main policy tools	Percent of consumer value	
		1982-86	1986
<u>Percent</u>			
Developed countries:			
Japan	State control of trade	-63.6	-57.5
EC-12	Trade measures	-10.0	-13.0
Australia	Home consumption pricing	-13.8	-21.8
Developing rice-importing or self-sufficient countries:			
South Korea	Price stabilization	-69.5	-72.6
Taiwan	State control of trade	-28.8	-30.9
Malaysia 1/	State control of trade	N/A	N/A
Indonesia	State control of trade	-21.7	-22.6
Bangladesh 1/	State control of trade	N/A	N/A
India	State control of trade, public distribution	3.2	1.4
Nigeria	Tariff, currency overvaluation	23.3	14.9
Developing rice-exporting countries:			
Pakistan (basmati)	Overvalued currency, state control of trade	71.0	96.0
Pakistan (white)	Overvalued currency, infrastructure, inputs	-5.0	-2.0
China 1/	State control of trade, state procurement	N/A	N/A

N/A = Not available.

1/ Net effect of government policies is producer tax.

Sources: USDA, ERS (1988b) and unpublished updates.

Table 11--Ratio of consumer price to world price, average 1985 to 1987 1/

Country	Ratio	Country	Ratio
	<u>1=world price</u>		<u>1=world price</u>
Japan	8.4	Malaysia	1.9
South Korea	5.0	Indonesia	1.3
EC	4.8	India	1.2
Iraq	3.6	Pakistan	1.1
Taiwan	3.2	Thailand	.9
Australia	3.1		

1/ Consumer prices are on a milled basis, retail level. World price is Thai white rice 5-percent broken, FOB Bangkok, taken from Thai Board of Trade; average of monthly prices in April-March year.  
Sources: USDA, ERS (1987), (1988b); and unpublished updates.

### Cost of Producer Support

It is possible to divide the cost of producer support into two categories: support paid for by the consumer through higher-than-world agricultural commodity prices and support provided by the taxpayer through budgetary outlays. The distribution of the cost of government support to producers between consumers and taxpayers varies among countries and, within countries, among commodities (USDA, ERS, 1987).

Many forms of government support to producers affect prices paid by consumers, with consumers bearing the cost of the programs. Trade policies that drive a wedge between domestic and world prices, such as border measures, are included in this category. Examples of these types of policies are import restrictions, bans, and quotas. Export subsidies also drive a wedge between domestic and world prices, but have a budget component as well. Most of the cost of public assistance to rice producers is borne by consumers through higher food prices in the EC, Australia, and Japan. Consumers in Indonesia,

South Korea, and Taiwan also bear a substantial portion of the cost of producer support.

Other types of policies supporting producers have no direct effects on consumers but do incur budget outlays. The cost of these types of programs is borne by taxpayers. These are typically domestic policies and examples include deficiency payments, input and marketing subsidies, long-term structural support, state trading, and research and extension services. Most producer support in the United States (deficiency payments, CCC storage, nonrecourse loans, export assistance) is paid for by taxpayers. Taxpayers in the EC support grain producers through export subsidies necessary to move high-priced EC commodities into the world markets. The Japanese Food Agency markets rice at prices lower than it purchases rice from farmers, thereby incurring a budgetary expense in addition to shipping and handling costs.

### Effects of Trade Liberalization

How would the removal, over roughly a 5- to 10-year period, of all trade-distorting policies practiced by all GATT members affect the operation of the world rice market? Economic theory provides a number of general insights that allow identification of the direction and approximate magnitude of changes in world rice production, consumption, trade, and prices. But because it is virtually impossible to translate the mix of policies and programs in place into any precise market impact measures, the focus is on broad multicountry groupings and rice aggregates that often ignore type and quality differences.

### Economics of Trade Liberalization

The world rice market is strongly affected by a number of different and sometimes contradictory programs and policies. In addition, there are different types of rice and variations in quality of rice grown throughout the world. This complicates any evaluation of changes in country policies and programs concerning rice and how the world rice market would operate if all supports and trade restrictions were removed. However, it is possible to trace the economics of trade liberalization in a somewhat broad or aggregate sense.

This study does not develop any independent modeling effort. Instead, it summarizes the conclusions of numerous past modeling efforts that empirically estimate the impact of full or partial trade liberalization on the world and domestic rice markets. And the results of each model are dependent on the assumptions underlying the modeling effort. A brief description of each model is given in table 12.

Domestic producer support and border protection measures encourage high-cost production which is inefficient in terms of resource allocation. This places downward pressure on world prices and limits trade opportunities. Price policies in Japan and South Korea are estimated to be the largest factors accounting for world prices being lower than market forces alone would dictate during 1986/87 (Roningen and Dixit, 1988). Export assistance programs practiced by many countries also place downward pressure on world prices and discourage developing exporters from expanding trade. But, these programs are less important.



Table 12--Characteristics of trade liberalization models

Study	Description
<p>IIASA (Parikh and others, 1986)</p>	<p>A dynamic general equilibrium model which captures the interrelationship between agricultural and nonagricultural sectors. Provides detailed commodity coverage and includes a number of centrally planned and developing countries, in addition to developed countries. Price wedges (the difference between border and domestic prices) existing in 1980-82 are used to measure distortion caused by policy. Estimates longrun equilibrium by removing trade-distorting policies in OECD countries over the 5-year period 1986-90 and then looks at the dynamic change from 1991 to 2000. Provides information on the effects of liberalization on national income, terms of trade, and factor use.</p>
<p>OECD (OECD, 1987b)</p>	<p>A static, medium-term partial equilibrium model with extensive commodity coverage, complex treatment of the interrelationship between livestock and feed industries, and substantial policy detail through PSE's and CSE's. Reduces assistance in OECD countries 10 percent from base period (1979-81) and estimates what would have been observed for production, consumption, trade, and prices after 4-5 years of adjustment. Specifies nine countries/regions plus centrally planned economies and rest of world and includes intercommodity linkages.</p>
<p>SWOPSIM (Roningen, 1986, and Roningen and Dixit, 1989)</p>	<p>A static, medium-term partial equilibrium model with 11 regions and 22 commodities. Trade distortions are measured by PSE's and CSE's and elasticities are exogenous. Examines full trade liberalization by industrial market economies and assumes participants have 5 years to adjust to prices and policies in effect in the base period (1986/87). Allows construction of single product as well as multiproduct world models. Includes economic linkages across products and countries. Does not model stock adjustments. Prior version used 1984/85 as reference period.</p>
<p>Tyers and Anderson (1986)</p>	<p>A dynamic partial equilibrium model that estimates phased-in trade liberalization from 1983 to 1993 using prices and policies in effect in 1980-82. Includes seven agricultural commodities and 30 regions. Trade distortions are measured by price wedges. Can be used for both industrial market economies and global trade liberalization, as well as commodity specific or total agricultural liberalization. Is a stochastic simulation model of the world markets, incorporating supply uncertainty and domestic market stabilization of food policy. Incorporates the cross effects in both production and consumption between interdependent grains. Stockholding behavior is assumed endogenous.</p>

Continued--

Table 12--Characteristics of trade liberalization models--Continued

Study	Description
Tyers and Anderson (1988)	Identical to previous model developed by Tyers and Anderson except policy variables are endogenous. Based on 1980-82 data, simulates the world food economy through 1995 by projecting policy parameters which are endogenous to the model, as well as standard parameters such as population, per capita incomes, productivity growth, trends in supply and demand elasticities, and trends in exchange rates.
Horridge, Pearce, and Walker (1988)	Uses two general equilibrium static models: (1) a world food and trade (WFT) model and (2) the ORANI model of the Australian economy to estimate the effects of the removal of price-distorting policies by GATT member countries. The ORANI model is a multisectoral general equilibrium model of the Australian economy that explicitly accounts for links between agriculture and the rest of the economy. The WFT model is much like Tyers and Anderson except it contains a nonfood sector and policy distortion measured by 1986 PSE estimates.

World rice production tends to be slightly greater because of trade and domestic policies. The combination of input subsidies, support prices, and state control of trade provides rice producers on average higher net returns than a free-trade environment would offer. Thus, producer prices tend to average higher with policies in effect. This is especially true in the developed countries and in certain developing countries, most importantly South Korea, Indonesia, Malaysia, and Taiwan.

Although government policies in the two largest rice-producing countries, China and India, force producer prices below border levels, both countries partially compensate producers with input subsidies and infrastructure development. In addition, longrun producer responses to price changes are much greater in countries where producer prices are expected to fall (the United States, Japan, South Korea, the EC, Australia, Indonesia, and Malaysia) than in countries where producer prices are expected to rise (India, China, and Thailand) under complete free trade (Sullivan and others, 1988).

World rice consumption is also slightly higher because of government price policies. Although consumers pay a substantially higher price for rice in Japan, Korea, the EC, and Malaysia because of border measures, price elasticities are small in these countries, so lower consumer prices would have a small impact on demand. More importantly, consumer prices are below market levels because of the operation of state import and pricing policies in several large rice-consuming countries such as China (only observer status in GATT), India, Bangladesh, and Pakistan. The removal of all trade and domestic policies by all GATT contracting parties should encourage increased consumption of rice in most developed countries. But consumption could

decline in some of the larger rice-consuming developing countries due to higher world prices.

The world rice market would look vastly different if all agricultural trade-distorting policies conducted by GATT contracting parties were removed over a 5- to 10-year period. The proposed policies to be eliminated, in keeping with GATT discussions to date, would include export subsidies, quantitative import barriers, producer support prices, most input subsidies, income payments tied to production, and state trading. Infrastructure development and some input subsidies would still be allowed, but disciplined and monitored. Producer supports such as research and extension, income payments not tied to production, disaster assistance, and bona fide food aid would all be permitted under current proposals.

Three specific factors will be particularly important in shaping a liberalized world rice market. The most important factor would be the complete opening of Japanese (and Korean if full trade liberalization) rice markets to foreign suppliers. The second would be the removal of price support policies and elimination of export assistance programs in the United States, the EC, and Australia. And finally, the response of the developing Asian countries to a market-oriented world rice sector and higher world prices will be critical. An additional factor is worth noting. Because about 90 percent of all rice is produced in developing countries, the exact GATT treatment of these countries is crucial in describing a free-trade environment.

A discussion of how these factors are likely to shape trade, prices, production, consumption, and market stability follows. Two trade-liberalization scenarios are examined. The first scenario examines the impact of trade liberalization by industrial market economies. The second examines the impact of trade liberalization by all GATT contracting parties.

The following discussions on the impact of trade liberalization on the world and domestic rice markets draws heavily on the results of several previous modeling efforts. However, no one, or even several of these models combined, is an accurate gauge of the outcome of adopting the U.S. or any other country's GATT proposal. Nor do the models even attempt to describe the expected results of the Uruguay Round of GATT negotiations. Instead, they attempt to examine the impact of specific trade liberalization scenarios on empirical models of the world rice market. And results are dependent on base periods chosen, degree and timing of liberalization, and exact specification and forecasting ability of the trade models employed.

Results of modeling efforts should only be viewed as a broad and general description of the world rice market in a free-trade environment. It is unlikely that the outcome of the current GATT negotiations will lead to a world rice market closely resembling any of the modeling efforts. However, the sum total of prior modeling efforts, even given the limitations inherent in each, do provide a useful benchmark for describing the effects of free trade on the world rice market.

#### **Trade Liberalization by Industrial Market Economies**

This scenario assumes that only industrial market economies are required to eliminate trade-distorting practices within 5-10 years and that developing countries will be afforded special status such as a much longer time frame to adjust or be required to only partially phase out of trade-distorting

programs. Bona fide food aid and research and extension programs would be allowed. This scenario closely matches most previous modeling efforts.

### Trade Volumes and Flows

Rice trade would increase under trade liberalization by the industrial market economies, but the extent is subject to debate. Tyers and Anderson (1986) estimate trade liberalization would have increased world rice trade 32 percent in 1985, the study's base year, assuming 1980-82 policies were removed (table 13). However, Roningen and Dixit (1989), using the much higher levels of protectionism in effect in 1986, estimated world rice trade would have been roughly 81 percent higher with trade liberalization after allowing market participants 5 years to adjust. Both of these studies assumed only industrial market economies liberalized. A weakness of both studies is that they do not distinguish between japonica and indica rice.

Common to almost all trade liberalization studies is the assumption that free trade would encourage production based on comparative advantage and lead to greater specialization and increased trade. Adjustments in Japan will account for much of the increased trade volume. First and most important, the removal of import barriers by the Japanese Government would increase import demand for japonica rice. This would place strong upward pressure on the international price of japonica rice and, because substitution does occur in some markets, indica trading prices would rise also. The ability of the limited number of current high-quality japonica producers to expand production and supply Japan's import needs and the Japanese consumer response to lower prices will largely determine the extent of growth in japonica trade.

A second factor affecting trade volumes will be the response of developed and developing countries to the elimination of producer support in the United States, Australia, and the EC. Following liberalization, the EC is expected to produce less of both types of rice and the United States may produce less indica rice than if current support programs remain in effect. Consumption is expected to increase in the EC due to lower retail prices while consumer prices in the United States will likely be unaffected. Increases in world price will likely mitigate much of the loss in producer support in Australia.

Although neither the EC nor the United States currently produce or consume substantial amounts of rice, their impact on the world market could be much larger because both are major participants in trade. The United States could eventually lose some of its lower quality indica export market, especially without the elimination of protectionist policies in developing Asian countries. Tyers and Anderson (1986), using 1980-82 levels of support, found U.S. exports dropping 5 percent. Roningen and Dixit (1989), using the much higher levels of support in effect in 1986/87, estimated U.S. rice exports dropping roughly 16 percent.

The EC should import additional quantities of rice. In addition, per capita consumption of rice is increasing in both the United States and the EC. However, at least in the short term, the response of the numerous Asian countries to higher world prices and expanded trade opportunities will be far more important.

The resulting higher world prices for japonica and indica rice could encourage some Asian countries with a comparative advantage in rice production to export

Table 13--Estimated effect on net imports for selected countries and regions and world trade volumes following trade liberalization by industrial market economies 1/

Country/ region	Roningen and Dixit (1989) 1986/87	Tyers and Anderson (1986) 1985	Roningen and Dixit (1987) 1986/87	Horridge and others (1988) 1987
<u>1,000 metric tons</u>				
Australia	0	30		
EC-12	600	120		
Japan	8,900	6,260		
United States	400	120		
Industrial market economies		6,460		
Bangladesh		-810		
China		-1,300		
India		-1,710		
Indonesia		-1,050		
The Philippines		-180		
Brazil		-230		
Developing economies		-6,320		
Developing importing economies	-6,800			
Developing exporting economies	-2,000			
Centrally planned economies	-100	-150		
<u>Percent</u>				
World	81	32	257	72

1/ Roningen and Dixit (1987) and Horridge and others (1988) estimated only changes in aggregate net imports, not country specific net import changes.

indica rice to the EC, Sub-Saharan Africa, and possibly other Asian countries, depending on policy changes. Although traded prices are expected to increase with trade liberalization, producer prices in Japan, the EC, and the United States are expected to be lower with the removal of support programs.

Roningen and Dixit (1989) estimate rice exports from the developing exporting countries would be about 2 million metric tons greater while exports from the United States would be about 400,000 metric tons less with current programs removed. This estimate assumes that most Asian countries voluntarily change their current internal policies to be more favorable to imports. Because rice is a highly protected commodity worldwide, the degree that changes in world prices are transmitted to developing Asian countries' domestic markets will be critical in defining the new trading environment under industrial market

economy liberalization. The greater the degree of price transmission in the developed world, the greater the expected increase in price and world trade.

### Crucial Changes in the Japanese Market

The complete removal of import barriers by the Japanese would be expected to lower the domestic price of rice in Japan about 60 percent in the short run and over 80 percent in the long run, according to Bateman (1988). Bateman estimated the Japanese will import about 3.2 million additional tons of japonica rice in the short run and about 4.8 million tons in the long run. Domestic consumption would increase by over one-half million tons in the short run and over three-fourths million tons in the long run. Roningen and Dixit (1988) estimated the Japanese will import almost 9 million tons of rice with industrial market economy trade liberalization. Their model also found Japanese rice consumption increasing substantially more than Bateman (1988). Tyers and Anderson (1986), using 1980-82 levels of support, estimated Japanese rice imports reaching 6.3 million tons in 5 years.

Roningen and Dixit (1989) and Tyers and Anderson (1986) both estimated much larger supply responses by Japanese producers to lower incentive prices than found by Bateman. However, other responses have been suggested and attention to political and cultural rigidities is warranted.

Several factors account for such large differences in estimates of Japanese response. For example, actual Japanese price elasticities may be much higher or lower than estimated because the expected decrease in price exceeds the price changes used in historical elasticity studies. Several factors contribute to this ambiguity. First, supply elasticities used in past modeling efforts are based on producer responses with protectionist policies in place and with risk virtually eliminated. Producer response to price changes in an unprotected environment could be much different, probably larger. Second, the Japanese have a very strong preference for high-quality japonica rice, and the japonica price for consumers will be lower than the current domestic price. So, a significant switch to indica, which is more plentiful in the world market, is highly unlikely. An exception would be increased imports of specialty indicas such as those used in pilafs. Third, the Japanese could consolidate numerous small rice farms and become more competitive in rice production even without import bans. Most Japanese rice farmers are part-time farmers with adequate off-farm incomes. Their response to lower prices may be quite negligible. Finally, Japanese consumers may continue to purchase some quantities of high-quality domestic rice at prices above world levels due to perceived quality differences.

Another area of ambiguity concerns the ability of foreign producers to supply adequate quantities of high-quality japonica rice to Japan. Australia, Italy, and the United States can all ship high-quality japonica rice to Japan. These countries together currently produce around 3 million tons and export over 1 million tons of japonica rice. Japan can easily outbid all other japonica importers and some domestic users in certain countries. Australia has some room for modest expansion, perhaps a maximum increase of 300,000 to 350,000 metric tons. Italian production is heavily subsidized and would not likely be competitive at expected world trading prices.

The United States can increase exports of japonica rice by returning idled acreage in California to production. California has a geographic advantage in terms of ocean freight rates to Japan compared with most other high-quality

japonica exporters. However, expected price increases derived from numerous empirical models (see table 14) are not high enough to bring additional land into production due to the high fixed costs associated with rice production (specifically, irrigation). Thus, expansion in California rice production probably would not exceed an additional 480,000 to 530,000 tons. California has a water constraint problem which would require some other agricultural commodity's production to decline in order for rice area to expand.

The southern rice growing region of the United States is another potential source of high-quality japonica rice. But because there has never been a sizable and sustained world market for japonica, no serious attempts have been

Table 14--Predicted effects on world prices of trade liberalization by industrial market economies

Study	Base	Period	Percentage change from base	Countries liberalizing
			<u>Percent</u>	
IIASA (Parikh and others 1988)	1980	1995	22	OECD countries
		2000	19	OECD countries
Tyers and Anderson (1988)	1980-82	1980-82	11	Industrial market economies
		1988-90	0	
		1995	18	
Tyers and Anderson (1986)	1980-82	1985	5	Industrial market economies
		1985	-8	Global
OECD (1987b)	1979-81	1985-86	.5	OECD countries
Roningen and Dixit (1987)	1984	1985	18	Industrial market economies
Roningen and Dixit (1989)	1986/87	1986/87	26.2	Industrial market economies
Roningen, Dixit, Seeley (1988)	1986	2000	-5	Industrial market economies plus Taiwan and South Korea
Horridge, Pearce, and Walker (1988)	1986	1987	-2	GATT members
Krissoff and others (1988)	1986/87	1986/87	15	Industrial market economies
	1986/87	1986/87	23	Global

made at growing high-quality japonica rice in the South. There has been little price incentive to encourage development and growing of high-quality japonica rice. Louisiana, whose production was 75 percent medium grain in 1970, has the greatest potential to produce it. Arkansas also produces japonica rice. Together, these two Southern States likely could produce 1.5-2 million tons of japonica rice if a suitable high-quality variety is developed. Texas and Mississippi produce only long-grain rice and have little potential as japonica producers since japonica varieties have not been commercially successful in those two States.

Other low-cost japonica producers have not been successful at growing high-quality japonica rice. China is the second largest producer of japonica rice, averaging over 9 million tons each year in the early and mid-1980's, but exports very little and the quality is inferior to that consumed by the Japanese (Bateman, 1988). However, China has the potential to supply some of Japan's rice needs if the quality can be substantially improved.

Thailand has not been successful in producing a high-quality japonica variety, although no price incentive has existed. Thailand has been quite adaptable to changing market conditions in recent years. But, the country will have to move much further away from subsistence rice production to commercial rice operations to export large quantities of japonica rice even if a suitable variety is developed. Brazil's japonica rice is low quality and is produced with much government support. And the country has not been successful at regularly exporting rice. Hence, many unanswered questions remain concerning the ability of foreign producers to supply Japan's import needs.

#### Adjustments Outside Japan

The elimination of export assistance programs and producer support in the United States could make U.S. producers less competitive in certain indica markets. The EC would cease to export indica rice and likely import additional quantities of indica rice. The rise in the price of japonica rice would lead to some substitution to indica rice in certain markets such as Indonesia, South Korea, and Sub-Saharan Africa. These factors would increase the demand for indica rice, putting upward pressure on the price.

Traditional indica exporting countries, such as Thailand, Vietnam, Burma, and Pakistan, would be able to compete in world markets more effectively if producer support were eliminated in industrial market economies. However, lower fixed expenses due to the return of set-aside acres and a decline in land values would offset part of the above effect for the United States.

The responses of the nonrice exporting countries of Asia, such as Indonesia, Malaysia, South Korea, Bangladesh, Taiwan, and the Philippines will be critical in shaping a free-trade environment. If trade liberalization increases the size of rice trade relative to production and reduces price variability associated with the world rice trade, these countries, especially Taiwan and South Korea, may feel more confident about sources of foreign supplies and reduce or eliminate border protection. Because indica rice, which accounts for about one-half of each countries' consumption, can be produced at lower cost in the United States, such reduced protection in Taiwan and South Korea would help preserve the U.S. position in the world market. Increased import demand by some Asian countries likely would be necessary to preserve the U.S. position in the world indica market.



The responses of the developing rice-exporting countries to higher world prices is also critical. Tyers and Anderson (1986) estimate that India, China, and to a lesser extent Brazil, will respond to higher world prices by exporting more rice. Although endowed with substantial unused productive capacity, Brazil has been reluctant to enter the world rice market because of potential losses. India currently taxes rice producers, but has the potential to be a regular exporter if policies were changed. However, with a large population to feed, India will most likely produce for the domestic, rather than the export market.

China (observer status only in the GATT) could respond to higher world rice prices by exporting more rice and importing more wheat. This would help China's balance of payments position because wheat prices are not expected to rise as much as rice prices (Harwood and Bailey, 1990). Although China was the world's largest importer of rice in 1989, importing 1.4 million tons, this should not be taken as a trend. China's import demand was largely due to inadequate transportation facilities which prevented rice from being shipped from surplus regions to deficit regions and an attempt by the central government to reduce domestic turmoil by assuring low urban rice prices.

### Price and Price Stability

The world price for rice would increase in response to the removal of protective agricultural policies in the industrial market economies. This would be due primarily to declining production in Japan and the EC, and increased import demand by Japan, the EC, and possibly some developing Asian countries. Because rice is heavily protected in developing countries, the price increase for rice should be greater than for other grains. However, some policies that will be removed, such as supply restrictions, will dampen the increase in world price, at least in the short run.

Numerous models have been developed that estimate the effect of changes in world price with rice trade liberalization (table 12). These models typically estimate price, supply, and demand for a given period with existing policies in effect, remove producer and consumer support, and re-estimate supply and demand in a free-trade environment. Trade is the difference between supply and demand in each country. Variations in expected responses are due to different base periods chosen, the number of years allowed for market participants to react, and the estimated supply and demand elasticities utilized. In addition, when evaluating trade models, it is critical whether global or industrial market economies' liberalization is modeled.

A major problem with all these modeling efforts is that they assume constant elasticities of supply, possibly inappropriate for looking at large price changes. Another problem with the price elasticities generally used in these modeling efforts is that the producer response to market price changes were estimated with current no-risk protectionist policies in effect. Hence, modeling efforts assume producers respond identically to price change under both protected and free-trade conditions. It is generally accepted that supply elasticities tend to be greater in a free-trade environment. If this is true, most modeling efforts underestimate the impact of trade liberalization on world and domestic rice markets.

Roninggen and Dixit (1989), using 1986/87 as a base period and allowing market participants 5 years to adjust, estimate world prices rising 26 percent in response to trade liberalization by the industrial market economies (table

14). In a similar model using 1984 levels of protection, these authors found prices rising only 18 percent. A general equilibrium model developed by IIASA using the protection levels existing in 1980 found world prices rising 22 percent by 1995 (Parikh and others, 1988). Tyers and Anderson (1988) used dynamic modeling to examine the time series response of market participants to a free-trade environment using protection levels existing in 1980-82. They found prices rising 11 percent in a year or two and 18 percent by 1995, indicating long-term responses are greater than short-term responses.

While these results suggest some unresolved differences, they point to significant price rises with liberalization in industrial market economies. The extent of the rise is likely to vary by type. Given Japan's expected new role as a major importer, the rise in japonica price will be much greater than the rise in indica price in the short run. Bateman (1988) estimated the longrun rise in japonica price would be 40 percent and the longrun rise in indica price 11 percent. Although prices for both types of rice will eventually decline somewhat from initial highs as producers respond to the higher shortrun prices, both types' longrun price will be above current world levels. Japonica prices are expected to remain above indica prices in the long run.

Trade liberalization will have several varied effects on world price stability. Current policies insulate domestic producers and consumers from world price movements, making excess supply and demand less responsive to world price movements. Hence, any shock (such as an abnormal monsoon) currently results in greater world price movement than would occur if current farm programs were eliminated. So, trade liberalization will tend to reduce market instability by making world supply and demand elasticities greater. But this stabilizing effect will be relatively small if liberalization is restricted to industrial market economies because these countries account for a very small portion of world rice production. Global trade liberalization will have a much greater positive impact on market stability than liberalization confined to industrial market economies.

However, the removal of some protective policies in the industrial market economies could increase world price variability. U.S. set-aside programs and stocking activities sometimes can work to maintain world prices within price bands. The United States, with surplus land, is able to respond quickly to higher world prices, thus mitigating price increases.

In addition, because almost all rice in Japan, the United States, and the EC is produced on irrigated land, these countries are rather stable producers of rice. Reduced production by these countries would mean a larger portion of world output will be produced on land subject to the uncertainties of the Asian monsoons.

The net effect on world market price stability is therefore less than certain. Price variability in the world rice market is partly a function of weather-induced variability in production. And, self-sufficiency policies conducted by traditional rice-importing countries are both a response to trade instability and a cause of instability. In addition, the thinness of the world rice market is partially a result of weather-induced production variability and partially a cause of price and trade instability. Hence, the impact of the removal of domestic and trade policies in the industrial market economies on market stability is estimated by some empirical models to be less than for

other commodities (fig. 8). The magnitude of the effect would be less than expected for wheat (Tyers and Anderson, 1986).

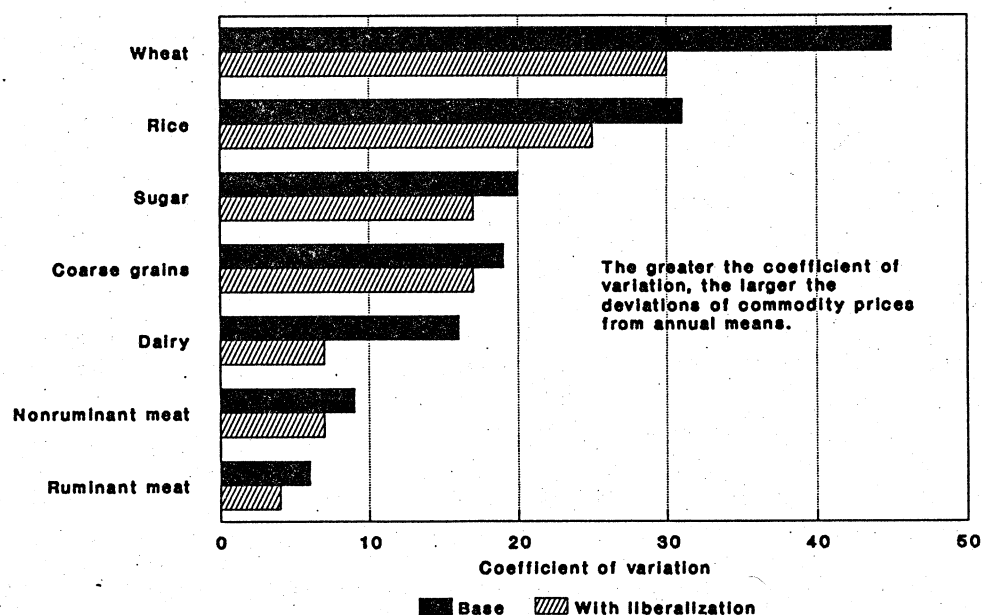
### Producer Price and Production

Removal of producer support in the industrial market economies will cause incentive prices for rice producers to decline in Japan, the EC, Australia, and the United States (table 15). Although world prices are expected to rise, the increase will not be sufficient to compensate producers for the loss of price support. Because world prices are expected to increase more under multilateral liberalization than unilateral liberalization, the decline in production in any one industrial market economy will be less under multilateral liberalization.

Tyers and Anderson (1986) estimate Japanese domestic producer prices would drop 87 percent, EC domestic prices 47 percent, and U.S. prices 27 percent by 1995 with industrial market trade liberalization. Elimination of Australia's home-pricing policy is estimated to cause domestic prices to decrease about 13 percent. Their model assumes market players have 5-6 years to respond to a free-trade environment.

Roningen and Dixit (1989) estimate EC and U.S. producer prices dropping even more and faster in response to liberalization by industrial market economies. Their model found producer prices rising 10 percent for developing exporters, 13 percent for developing importers, and 5 percent for centrally planned economies. Roningen and Dixit (1989) used a price transmission of 1 for developed economies and 0.5 for all other countries. This implies changes in prices were passed along directly to producers and consumers in industrial

**Figure 8**  
Effects of policy reform in industrial countries on world price stability



Source: Tyers and Anderson, 1986, p. 41.

Table 15--Change in producer prices after trade liberalization by industrial market economies, selected countries <sup>1/</sup>

Country/ region	Tyers and Anderson (1988) 1980-82	Tyers and Anderson (1986) 1985	Tyers and Anderson (1988) 1995	Roningen and Dixit (1989) 1986/87
	<u>Percent</u>			
Australia		-13		9
European Community	-21	-25	-47	-62
Japan	-67	-68	-87	-83
United States	-11	-3	-27	-59
Developing exporting <sup>2/</sup> countries				10
Centrally planned economies <sup>3/</sup>				5
Newly industrial Asian countries <sup>4/</sup>				3
Developing importers <sup>5/</sup>				13

<sup>1/</sup> Regions and countries included in each model varied.

<sup>2/</sup> Argentina, Brazil, Thailand, Indonesia, Malaysia, and the Philippines.

<sup>3/</sup> Eastern Europe, Soviet Union, and China.

<sup>4/</sup> Taiwan, South Korea, Singapore, and Hong Kong.

<sup>5/</sup> Developing countries minus developing exporting countries.

market economies, but only half reached producers and consumers in other countries. Actual responses of developing countries will critically depend on the degree governments allow world prices to be transmitted to producers.

All models surveyed estimated future rice production in the industrial market economies to be lower under trade liberalization than with current policies in effect, primarily due to lower incentive prices. Tyers and Anderson (1986) estimate production in Japan falling 44 percent, the EC 11 percent, the United States 3 percent, and Australia 2 percent from the 1980-82 base period by 1985 (table 16). Roningen and Dixit (1989), using a base period with much higher levels of support, estimate production declining 48 percent in Japan, 32 percent in the EC, 11 percent in the United States, but increasing 3 percent in Australia.

Australia provides a lower level of producer support than other industrial market economies. Higher world prices could encourage Australia to produce and export larger quantities of japonica. However, total production in Australia would not increase significantly due to competition from other agricultural enterprises such as livestock, dairy, and wool, and the heavy additional fixed expenses required to acquire/develop additional irrigated land for rice production.

Two important factors will influence the response of U.S. rice producers to lower incentive prices: (1) how quickly and to what degree idled acreage returns to production and (2) the effect of lower fixed costs on the production decisions of U.S. farmers. In the short run, most idled acreage is expected to return to production quickly since the opportunity cost of irrigated farmland is low. Yields should decline somewhat because land will be used less intensively. Because virtually all U.S. rice is irrigated, the return of idled acreage should have a smaller effect on yields (yield slippage) than is expected for other commodities. Some production and consumption shifts would be expected to follow liberalization.

Much of the idled acreage should return to production in California. Because of the high price, California producers would likely shift almost all of their production to japonica rice to satisfy the Japanese market. Long-grain rice

Table 16--Change in production from trade liberalization by industrial market economies, selected countries and regions 1/

Country/ region	IIASA (Pakikh and others, 1986)		Tyers and Anderson (1986)	Roningen Dixit (1989)
	1995	2000	1985	1986/87
	<u>Percent</u>			
Australia			-2	3
EC			-11	-32
Japan			-44	-48
United States			-3	-11
Developing exporters <u>2/</u>				3
Centrally planned <u>3/</u>				0
Developing importers <u>4/</u>				4
World	0.88	1.11		

1/ Regions and countries included in each model varied.

2/ Argentina, Brazil, Indonesia, Thailand, Malaysia, the Philippines.

3/ Eastern Europe, Soviet Union, and China.

4/ Developing countries minus developing exporting countries.

and brokens would be used more in processed foods because of higher prices for quality japonica rice. Use of japonica rice in beer could decline. There has been no major concentration of breeding programs for japonica varieties adapted to the South, possibly because no price incentive existed. But, certain southern regions could grow and export japonica rice satisfactory to Japanese consumers in as little as 2 years.<sup>2</sup> Other rice specialists disagree.

In the long run, U.S. rice production of indica rice could decline if developing countries are still allowed to restrict or ban imports. The United States will face stiff competition in the international market, particularly for low-quality indica rice, if lower cost producers are able to respond to higher world prices. Thailand, Vietnam, Burma, and Pakistan could become more competitive exporters with the elimination of developed country producer support programs. While U.S. rice consumption will continue to increase with population, per capita increases would be insufficient to compensate for lost demand should exports decline.

Because of the limited number of countries that can produce high-quality japonica rice and Japan's strong preference for it, production should not decline in the long run in California. Texas grows only indica rice and currently has the lowest net returns per acre due to higher water costs

<sup>2</sup> Conversation with C.O. Little, Experiment Station, Louisiana State University, Baton Rouge.

(Childs, 1988). Texas would, therefore, likely experience a decline in rice production under free trade by industrial market economies. Both rice production and acreage have declined in Texas throughout the 1980's. Grazing is a likely alternative use for riceland in Texas. Arkansas producers typically earn the highest net returns per harvested rice acre in the United States and would, therefore, not likely reduce production, or only slightly.

Louisiana and Mississippi would produce less indica rice in the long run with industrial market economy liberalization than if current policies had remained in effect, although not as markedly as Texas. Although Louisiana and Mississippi are lower cost rice producers than Texas, both States report average yields lower than in Arkansas. Soybeans will likely replace some rice production in Mississippi, depending on the change in price expected for soybeans under trade liberalization.

Because most rice is produced in developing countries, the increase in world price expected with only industrial market economy liberalization may have very little effect on world production. Producers and consumers in the major rice-producing and consuming countries are insulated from market prices. Unless these countries (especially China and India) change their domestic policies in response to liberalization by the industrial market economies, little effect on production is expected.

China's response to trade liberalization by the industrial market economies is a major unknown. China currently maintains observer status in GATT. Depending on movements in the relative prices of competing crops, yield growth, and income elasticities of demand, China may substantially increase its exports of rice. Its domestic developments and policy decisions could have a major effect on the outcomes discussed here.

The response of producers and policymakers in several important developing Asian countries--primarily Indonesia, India, Pakistan, and Bangladesh--to rising world rice prices is critical in analyzing the world production response to partial trade liberalization. If these policymakers allow changes in world prices to be transmitted to domestic markets, incomes for rice farmers should increase. Because the income elasticity of demand is positive for most developing Asian countries (specifically India, China, Indonesia, Burma, the Philippines, Sri Lanka, and South Korea), higher incomes for rice farmers should translate into increased rice consumption as well as increased exports.

Thus, in contrast to most model results, world production and consumption could increase if policymakers in key Asian rice-producing countries allow higher world prices to be transmitted to domestic producers. However, because the income elasticity is negative for some Asian countries (Japan, Malaysia, Taiwan, and Nepal) and declining for most others, this income-induced increase in consumption would not likely be very large and would decline over time.

#### Changes in Consumption

Previous modeling efforts estimate total rice consumption in the industrial market economies to increase in response to the price changes associated with trade liberalization. Lower domestic prices in Japan, the EC, and, to a smaller degree, Australia will account for increased domestic demand in the industrial market economies. Tyers and Anderson (1986) estimate rice consumption would rise 20 percent in Japan, 5 percent in the EC, and 21

percent in Australia (table 17). Because border and consumer prices do not differ much in the United States, trade liberalization will have little effect on U.S. rice consumption.

Other studies, using lower price elasticities, estimate Japanese rice consumption increasing much less (Bateman, 1988). This small increase in consumption seems more likely because per capita consumption of rice in Japan peaked in the late 1960's. In addition, estimated income elasticities for rice consumption in Japan are negative (Barker and others, 1985). So, the response of Japanese consumers to lower rice prices is therefore ambiguous, but likely not very large.

Another important factor to consider in analyzing the effect of partial trade liberalization on consumption is the response of Asian indica consumers to higher world indica prices. Most Asian governments insulate consumers from world price movements and many practice low food price policies (India, China, Bangladesh, and Nigeria). If these countries' governments pass on higher world indica prices to consumers, higher prices in the short run should dampen consumption in the countries that conduct low food price policies. But higher world prices for indica rice would eventually mean higher incomes for South and Southeast Asian rice farmers. Also, consumers in Japan, South Korea, Malaysia, and Taiwan currently pay prices higher than those estimated under free trade, thus indicating consumption could expand in these countries. By increasing traded volumes (and perhaps reducing risk in the world rice market), trade liberalization by the industrial market economies may encourage these countries to import more of their rice needs, thus lowering the price to consumers and increasing consumption.

#### Shortrun and Longrun Adjustments

The United States could initially acquire a larger share of the world rice market in response to trade liberalization by the industrial market economies. But just as the United States saw its early advantage in world agricultural trade diminished in the 1980's as other producers responded to higher prices and increased import demand, the U.S. early advantage could erode as other producers respond in the long run.

Table 17--Change in consumer prices and consumption after liberalization by the industrial market economies

Country/region	Change in consumption	Change in consumer prices
	<u>Percent</u>	
Australia	21	-40
Canada	-2	5
European Community	5	-25
Japan	20	-64
United States	-1	5

Source: Tyers and Anderson (1986).

Critical to the shortrun effect on U.S. rice market participation would be the elimination of its set-aside programs. In the short run, most of the idled rice acreage would return to production for two reasons. First, there are few alternative uses of irrigated riceland other than rice growing. And second, because land values will decline and incentive prices will be lower with free trade, farmers would logically minimize production cost by using less variable inputs and more fixed inputs (land).

Producers in Texas may not return much or any of this idled acreage to production because of the scarcity of water. But, the other rice-producing States would be expected to return most of their idled acreage to production in the short run. Thus, U.S. rice production and trade could increase in the short run in response to partial trade liberalization.

The longrun situation under industrial market economy trade liberalization may be less favorable to U.S. participation in the world indica market. The supply responses of the developing Asian rice-exporting countries are critical to the longrun view. Tyers and Anderson (1986) estimate the U.S. longrun supply elasticity at almost three times the average Asian longrun supply response. If the developing Asian rice-exporting countries can increase production, in the long run they would be able to capture a larger share of world production and trade. The United States, while increasing production and trade in the short run due to the return of idled acreage to production, could experience a decline in indica rice production in the long run as some U.S. producers are not able to receive a producer price high enough to cover economic costs.

#### Trade Liberalization by All GATT Members

This scenario assumes all GATT contracting parties are required to remove trade-distorting policies (but not export taxes) within 5-10 years. Bona fide food aid and research and extension would still be allowed. This scenario more closely matches the October 1989 U.S. comprehensive proposal.

#### Trade Flows and Volumes

Full trade liberalization by all GATT members should cause trade volumes and traded prices to increase more than estimated under the theoretical assumption of exempting developing countries. Horridge and others (1988) modeled global trade liberalization using 1986 as a base and found rice trade to increase by 72 percent. With the assumption of trade liberalization by all GATT members, the opening of many important Asian rice markets to foreign suppliers will account for the greater expected trade opportunities and higher world prices. South Korea, Malaysia, Indonesia, the Philippines, and Taiwan should all be important import markets when producer supports and import barriers are removed. Changes in the japonica market would not vary as much as the indica market depending on the extent of trade liberalization.

With full trade liberalization by all GATT members, the United States would be more likely to retain most or even all of its exports of indica rice in the long run. Both South Korea and Indonesia were large markets for U.S. rice in the 1970's and early 1980's and currently restrict or ban imports. Even if the lower cost indica exporters (Thailand, Vietnam, Burma, and China) account for most of the increase in indica trade in Asia, the United States would still gain because it would face less competition in other markets, primarily



the Middle East and Europe. The resulting higher world prices expected with full trade liberalization will benefit U.S. indica producers.

#### Price and Price Stability

Tyers and Anderson (1986) found that global trade liberalization would cause international prices to decline 8 percent. This decline in price was due primarily to the elimination of producer taxes (not proposed in GATT negotiations) and consumer subsidies in developing countries. Horridge and others (1988) modeled trade liberalization by all GATT members and estimated that world prices would decline 2 percent immediately after trade liberalization. Roningen and others (1988) modeled trade liberalization by the developed countries plus South Korea and Taiwan and estimated prices rising 10 percent for developing exporters, 13 percent for developing importers, and 5 percent for centrally planned economies.

Although not specifically modeled, trade liberalization (excluding export taxes) by all GATT members would likely cause the world price to increase more than industrial market economy liberalization. This greater increase in world price would be due to the opening of several important Asian markets. Imports by South Korea, Taiwan, Indonesia, Malaysia, and the Philippines would account for most of the added price increase. These countries currently heavily support and protect their domestic rice sectors. Krissoff and others (1988), found aggregate world rice prices rising 23 percent with global trade liberalization compared with only 15 percent when liberalization was confined to only developed countries. But results from other modeling comparisons varied. Increase in the price of indica rice would explain most of the additional aggregate price rise.

#### Producer Prices and Production

Although still expected lower than current incentive prices, producer prices in developed countries would be higher with full GATT member participation than with just industrial market economy trade liberalization. This is explained by higher expected world prices caused by both greater imports and by less production in many developing Asian countries. Producer prices after full trade liberalization are expected to be lower than current incentive prices in South Korea, Taiwan, Malaysia, Indonesia, and possibly the Philippines.

South Korea, Malaysia, Indonesia, Taiwan, and possibly the Philippines would all rely more on imported rice and reduce domestic production once borders were opened and support reduced or eliminated. Among the developed countries, the United States would benefit the most from global trade liberalization as opposed to only industrial market economy participation. It is unlikely that the EC would export any or produce much indica rice with full GATT member trade liberalization.

#### Consumption Response to Trade Liberalization

The aggregate consumption response to global versus industrial market economy trade liberalization would vary only a little. The slightly higher consumer prices in the EC, United States, and Australia would have only minute effects on domestic demand. And, while higher prices may discourage rice consumption in certain developing countries (India, Pakistan, Thailand), increased incomes from higher producer prices and lower retail prices in other developing

countries (South Korea, Taiwan, Indonesia, Malaysia) should cancel out much of any net impact.

#### Shortrun and Longrun Adjustments

Because the United States has substantial idled acreage and a much greater supply elasticity than virtually all developing rice producers, global trade liberalization should benefit the United States in the short run. Exports could increase in the short run because world prices are expected to rise quickly, especially for japonica rice, under global liberalization once import barriers are removed. The United States exports both types of rice and can quickly increase production.

But in the long run, much as was the case with only developed country liberalization, the United States could face substantial and formidable competition from several low-cost Asian producers. However, increased import demand by many Asian countries and faster income growth rates in Asia would help the United States retain some, or even most, of its indica market.

#### **Welfare Effects of Agricultural Trade Liberalization**

The worldwide welfare implications of agricultural trade liberalization are dependent on the number of countries included. World income is expected to increase under either scenario, but should increase more if all countries liberalize their agricultural sectors.

#### **Trade Liberalization by Industrial Market Economies**

Several studies of the effects of trade liberalization of agricultural commodities by the industrial market economies have focused on the gains, losses, and transfers of income and wealth between producers, consumers, and countries. Results of two previous partial equilibrium models are considered: Tyers and Anderson (1988) and Roningen and Dixit (1989). Both studies model trade liberalization by industrial market economies. Each of these models estimates the transfers between producers, consumers, and taxpayers in terms of economic surplus measured in 1985 dollars. The sum of these transfers is considered the net benefit or loss for each country. Gainers and losers vary by country and model. The final effects depend on the levels of producer and consumer protection. Variability in gains across countries is expected to be quite large. The higher the level of protection in the base year, the greater the economic gains to trade liberalization.

The models generally agree that free trade in all agricultural commodities by the industrial market economies would likely lead to a net increase in global economic welfare (tables 18 and 19). Roningen and Dixit (1989) estimate global economic welfare increasing by \$28 billion in 1986/87, while Tyers and Anderson (1988) estimate global welfare increasing by \$39 billion by 1995.

Tyers and Anderson (1988) estimated protection levels existing in 1995 would cost consumers and taxpayers twice what the 1986/87 levels did, thus explaining the greater estimated global welfare gain. In a prior study, Tyers and Anderson (1986) estimated global welfare increasing \$16 billion using the lower levels of protection existing in 1980-82.

Table 18--Welfare implications of multilateral trade liberalization by industrial market economies, selected countries, 1986/87 1/

Country/region	Producer welfare	Consumer welfare	Taxpayer costs	Net benefits	
				Total	Per capita
- - - - - <u>Billion dollars</u> - - - - -				<u>Dollars</u>	
United States	-16.2	-4.6	30.3	8.6	36
EC-12	-22.7	21.2	13.6	12.0	37
Japan	-21.8	24.7	5.7	6.3	52
Australia	1.6	-1.5	1.1	1.1	71
Developing exporters	5.1	-4.8	-.3	.7	2
Centrally planned economies	9.8	-10.3	.1	-.8	-1
Newly industrial Asia	.5	-.9	.1	-.9	-13
Developing importers	11.8	-14.5	-.1	-4.4	-2
Developing countries	17.4	-20.2	-.3	-4.5	-2
Industrial market economies	-65.6	40.9	61.1	33.3	44
Global	-38.4	10.4	60.8	27.9	6

1/ Estimated change in producer surplus, consumer surplus, net government expenditures, and the sum of all three. Source of estimates was a multilateral liberalization scenario with the SWOPSIM ST86 world agricultural trade model.

Source: Roningen and Dixit (1989).

Both models show gains to consumers and taxpayers in industrial market economies exceeding losses to producers. Roningen and Dixit (1989) found industrial market economies gaining \$33 billion in 1986/87 while Tyers and Anderson (1988) found industrial market economies gaining \$51 billion in 1995. The EC, the United States, and Japan--countries with the highest level of protection--are expected to gain the most. However, the models also show losses to consumers in developing countries from higher food prices exceeding gains to producers. Estimates of developing country losses ranged from \$2.3 billion in 1980-82 as a base to \$13.5 billion in 1995 (Tyers and Anderson, 1988).

In addition, the poorest countries, specifically Bangladesh and most of Sub-Saharan Africa, could lose the most under trade liberalization by industrial market economies. Krissoff and others (1988) found the net welfare effects of trade liberalization on developing Asian countries to vary. They estimated that India, Thailand, the Philippines, Bangladesh, Pakistan, and Malaysia would experience net welfare gains from higher agricultural export earnings. However, Indonesia, North and South Korea, Taiwan, Vietnam, Laos, and Cambodia are expected to experience small net welfare losses due to higher food prices under the assumptions used by Krissoff and others (1988). (Vietnam was not considered a substantial rice exporter in their analysis.)

Table 19--Welfare effects of liberalizing agricultural policies in the industrial market economies, selected countries and regions, 1980-82 and 1985

Country/region	Producer welfare	Net economic welfare
<u>Billion dollars</u>		
1980-82 effect on:		
EC-12	-35.3	7.5
Japan	-19.3	5.5
United States	.2	2.7
Canada	-.6	.7
Australia	2.3	1.2
New Zealand	1.7	1.0
All industrial market economies	-58.0	20.3
Developing economies	26.3	-2.3
Centrally planned economies	7.0	-1.8
Global	-24.7	16.2
1995 effects on:		
EC-12	-73.7	17.6
Japan	-38.7	19.5
United States	3.1	3.1
Canada	-.6	1.0
Australia	3.2	1.7
New Zealand	1.6	1.1
All industrial market economies	-122.9	50.9
Developing economies	50.4	-13.5
Centrally planned economies	13.5	1.8
Global	-59.0	39.2

Source: Tyers and Anderson (1988).

Both studies suggest that if domestic and consumer prices fall with free trade, producers lose and consumers gain in industrial market economies. Taxpayers in industrial market economies also gain under free trade, with U.S. taxpayers gaining the most. The gains to consumers in terms of lower food prices alone are estimated to outweigh the losses to producers in Japan and virtually equal losses to producers in the EC. For the United States, Roningen and Dixit (1989) estimate U.S. consumers lose due to slightly higher food prices but that the gains to taxpayers are more than adequate to compensate for losses of both producers and consumers. Tyers and Anderson (1988) estimate U.S. agricultural producers would experience a small (\$3.1

billion) welfare gain under trade liberalization in 1995 due to lower costs of production associated with declining land values.

Asian rice producers should experience substantial gains in producer surplus with agricultural trade liberalization because of higher world prices. Krissoff and others (1988) found producers of rice experiencing the largest gain among Asian countries and India becoming a major exporter. For all Asian countries, the contribution of rice producer income gains under liberalization by industrial market economies accounted for over 45 percent of the total estimated Asian producer gain.

Although trade models show country and global welfare gains to be small, they are too narrowly focused to capture the full benefits of trade liberalization. Transfers of incomes within countries are much greater than benefits to individual countries. Shifts in incomes from producers to taxpayers and consumers are nearly three times the net income gain in the United States. More important, the models typically miss potential sources of gains in the industrial market economies such as economies of scale (if export markets expand), reduced cost of tax evasion, political lobbying for favorable legislation, efficiency associated with more competitive world trade (domestic industries facing world competition are forced to lower costs), and the elimination of uncertainty associated with future protectionist policies. The expected decline in agricultural income in several developing countries misses possible increases in incomes in the nonagricultural sector. Future analysis must consider impacts on other sectors of the economy, especially efficiency gains caused by shifts in resources from industry to agriculture as a result of higher incentive prices.

#### Trade Liberalization by All GATT Members

Krissoff and others (1988) examined the effect of different trade liberalization scenarios on the developing countries' economic welfare. They found that while trade liberalization by industrial market economies would reduce economic welfare in developing countries due to higher consumer prices, global liberalization would increase economic welfare due to the elimination of consumer taxes in Taiwan and South Korea and producer taxes in India and Pakistan.

In addition, Krissoff and others (1988) found producers in Asian countries that tax agricultural output, such as India and Pakistan, would gain more from global than industrial market economy liberalization. However, producers in Asian countries that subsidize agricultural output, such as Indonesia, Malaysia, Bangladesh, and the Philippines, were found to gain more from liberalization by industrial market economies than from all GATT members. Overall, Krissoff and others (1988) estimated Asian countries experiencing about a \$1 billion loss in net welfare with liberalization by industrial market economies, but gaining nearly \$4 billion with global liberalization. Changes in rice producer and consumer surpluses account for most of the difference.

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