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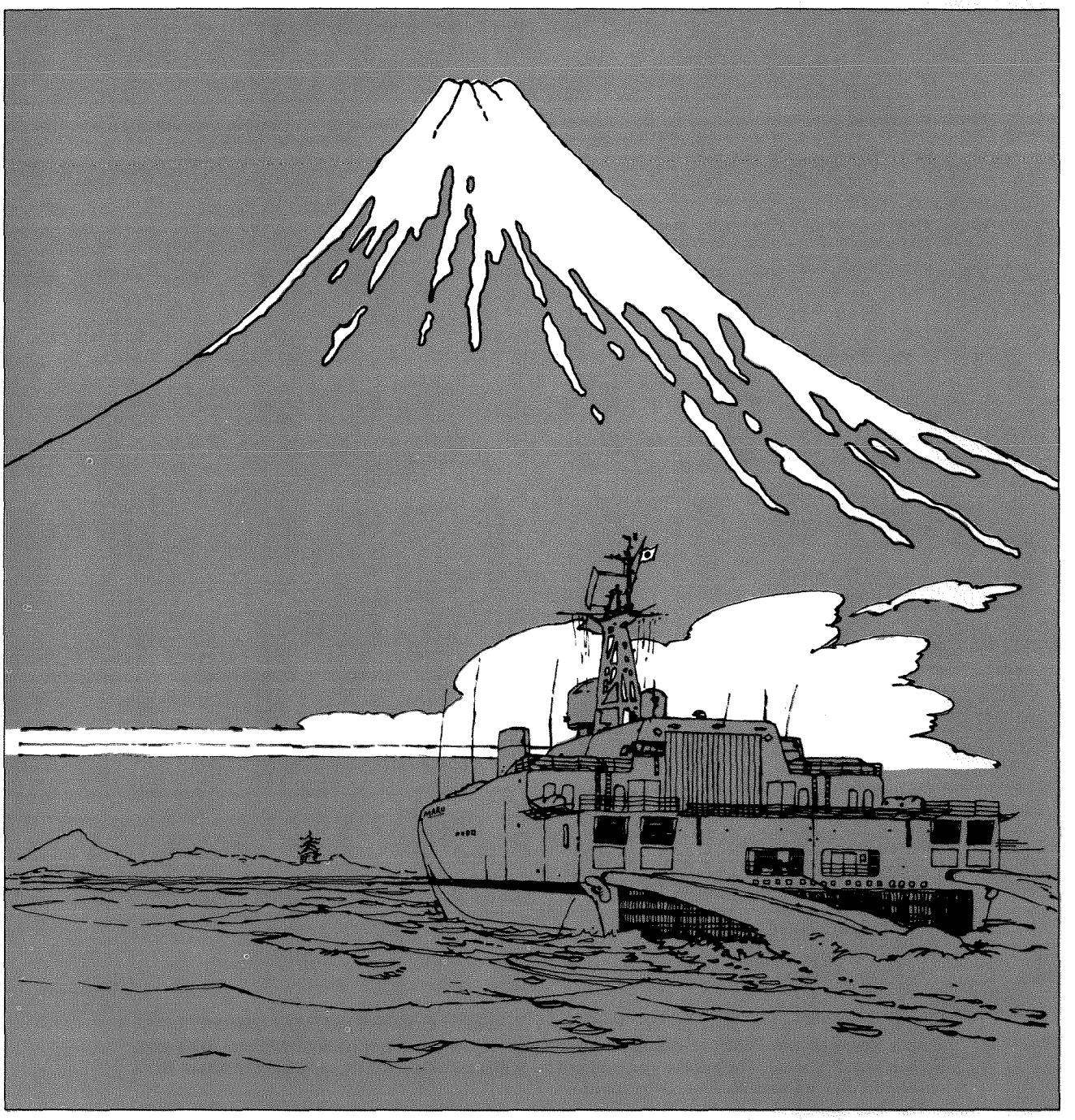

JAPAN: GROWTH AND PROSPECTS

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Japan's Policy of Food Security: An Alternative Strategy

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Japanese food prices are among the highest in the world. The actual cost of food in Japan is even higher than retail prices alone would suggest, since a significant amount of tax revenues is devoted to agricultural subsidies. High food costs primarily reflect the existence of a relatively inefficient agricultural sector protected by a comprehensive system of tariffs and import quotas. While there are several reasons, including strong political reasons, for the current state of Japanese food and agricultural policy, a major policy objective is Japan's desire for some reasonable degree of food security.

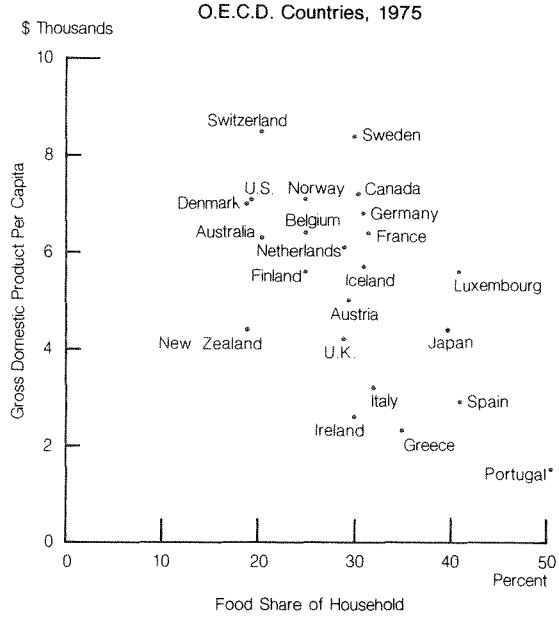
We first discuss this current approach to food security, and then examine an alternative and potentially cheaper strategy—the removal of all barriers to grain and soybean imports, along with the creation of a one-year contingency stockpile of each of those commodities. The purpose here is not to criticize Japan for her trade policies—indeed, she has made a number of steps toward the liberalization of agricultural trade over the past decade. Our purpose, rather, is to discuss an alternative policy which could generate lower food prices *and* food security, and also open up the Japanese market to more foreign agricultural products.

I. High Cost of Eating in Japan

Eating in Japan is an expensive activity. A recent (March 1979) survey of retail prices revealed that shoppers in Tokyo were paying 504 percent more for potatoes, 112 percent more for broilers, 84 percent more for onions, 75 percent more for apples, and 62 percent more even for rice than were their counterparts in Washington, D.C. In this survey of 21 food items in 16 major capitals, Tokyo prices exceeded the median in all cases, and were the highest for just over half of the items surveyed.[1] Since the demand for food tends to be price inelastic, it is not surprising that Japanese consumers spend a relatively large share of their total budgets on food—39 percent in 1975. This share is exceeded by only 3 of the other 22 industrial countries shown in Chart 1.[2] Two of these countries, Spain and Portugal, have per capita incomes considerably below Japan's, and given Engels' Law (the traditionally negative relationship between per capita income and the share of income spent on food), one would expect to find the Spanish and Portuguese devoting a larger portion of their budgets to food than do the Japanese.

Chart 1

Per Capita Income and Food Share of Budget
O.E.C.D. Countries, 1975



Source: O.E.C.D., *Main Economic Indicators,* January 1979

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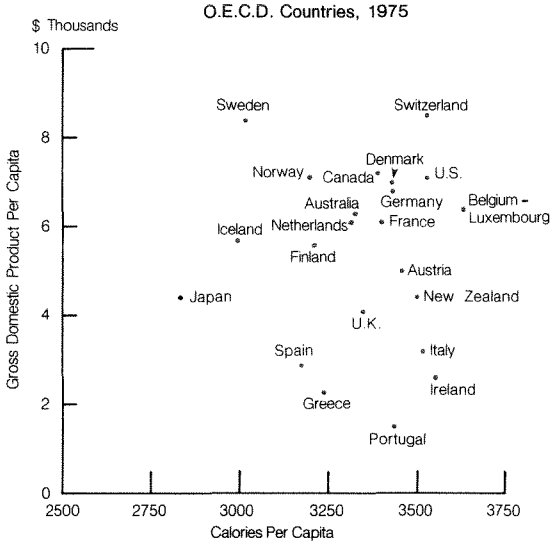
Of countries at or above Japan's income level, only the Netherlands spends a larger share of income on food. New Zealand, which has approximately the same per capita income as Japan (but which is also a land-rich and agriculturally abundant country) spends less than half the proportion of its income on food as does Japan. Moreover, the Japanese seem to get less for their money by most conventional measures. Japan consumes significantly fewer calories per capita than does any other OECD country (Chart 2), and fewer grams of protein per capita than any other OECD country save Sweden, where protein consumption is negligibly lower (Chart 3).[3]

Explaining High Food Costs

Why is food so expensive in Japan? There are several relatively minor reasons. First, Japan simply does not have the arable land to feed its population, so a significant amount of its food supply must be imported. Arable land in Japan is estimated at .05 hectares per person. The United States has 19 times as much, Canada 40 times as much, and even crowded India has 6 times that amount.[4] During the 1972-74 period, just over half of Japan's grain consumption (by weight) was imported. By comparison, the European Community imported 11 percent, China 2 percent, India 3 percent, the Soviet Union 5 percent, and the Philippines 12 percent, of their respective

Chart 2

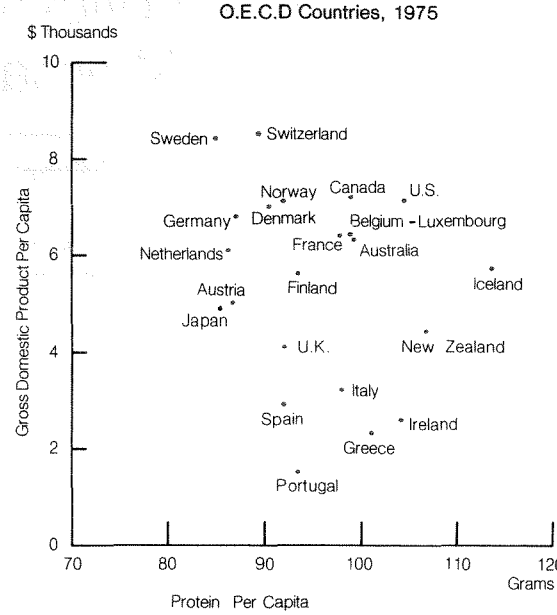
Income and Calorie Consumption Per Capita
O.E.C.D. Countries, 1975



Source: *FAO Production Yearbook 1977,* and *O.E.C.D. Main Economic Indicators,* January 1979

Chart 3

Income and Protein Consumption Per Capita
O.E.C.D Countries, 1975



Source: *FAO Production Yearbook 1977,* table 98; and *O.E.C.D. Main Economic Indicators,* January 1979

consumption of grains[5]. Because such a large share of the food supply must be imported, Japanese food must cost more than that of other countries by the amont of the additional transport and handling costs involved. However, these transport costs are relatively minor—yet Japanese farm prices range from 35 percent to 286 percent higher than the prices of foreign-produced commodities shipped to Japanese ports (Table 1).

Another possible explanation for high food prices is Japan's highly labor-intensive distribution sector. Whether the Japanese system of distribution is rational or not is a moot point. There is no doubt, however, that Japan (for whatever reason) has taken much less advantage of economies of scale than have other countries. For example, Japan has only half as many people as the United States, but it has over twice as many grocery outlets. Add to this multitude of retail outlets a multi-layered and small-scale wholesale sector, and the inevitable result is a larger wedge between farm prices and final retail prices than is the case in the United States.[6] Yet despite the price impact of this type of distribution sector, the problem actually begins back at the basic-commodity level, as Table 1 suggests.

Inefficiencies in Agriculture

Japan's high food prices are largely due to a combination of an inefficient agricultural structure and a protective system of elaborate tariffs and import quotas. Both domestic and foreign observers have commented on this problem. Patrick and Rosovsky of the United States called agriculture "the largest and most conspicuous sector of economic inefficiency in Japan."[7] Bieda of Australia noted that "this problem of Japanese agriculture being unable to evolve farms of sufficient size to make them economic is the most intractable of all Japanese economic problems."[8] Former Prime Minister Tanaka argued that Japanese agriculture would have to undergo full-scale reorganization and large-scale mechanization.[9]

The average Japanese farm covers slightly less than 3 acres—roughly one-hundredth the size of the average American farm—and is often scattered in non-contiguous parcels. Thus, while the Japanese rice farmer uses a combination of small machinery and his own labor for most rice growing tasks, the American rice farmer seeds, fertilizes and sprays for pests by airplane.

The Japanese farmer has performed extremely well within this farm-size constraint: per acre rice yields in Japan are among the highest in the world and are several times the Asian average. However, this tiny farm size presents a formidable barrier to achieving significant economies of scale. A major factor limiting farm size is the Occupation-inspired land reforms, which severely restrict the amount of land which can be owned or leased. Some efforts have been made to liberalize these laws and allow larger-scale agriculture through cooperatives, but as Bieda notes, these reforms have failed to induce any perceptible change in average farm size.[10] While these land-reform laws served their purpose in displacing the rural aristocracy and providing employment and food to the repatriated and industrially displaced Japanese following World War II, they have now created serious fetters on efficiency in agriculture. Before Japanese agriculture can reorganize itself along more efficient lines, further changes may be necessary in the legal framework governing the ownership and the leasing of land.

Table 1
Ratio of Japanese to World Prices
Selected Products, 1976

Rice	3.86
Wheat	3.73*
Barley (1975)	3.15
Soybeans	2.76
Sugar (1975)	1.35*
Milk (1975)	1.69**
Pork (1975)	1.59**

Japanese price is the average price paid to farmers, or if denoted *, it is the government purchase price.

World price is the average export unit price (plus 6-percent estimated ocean-transport cost), or if denoted **, it is the U.S. farm price.

Source: Fred H. Sanderson, *Japan's Food Prospects and Policies,* Washington, D.C.; The Brookings Institution 1978, pgs. 18–19.

Even with reorganization, however, arable land will remain scarce and valuable because of the country's mountainous terrain. Land has always been the scarce factor in Japanese agriculture, so that capital and labor have been substituted for land to a much greater extent than in the United States. Thus Japan in 1970 used more mechanical power (measured in horsepower) per acre than any other country.[11] While Japanese agriculture has always been more labor-intensive than Western agriculture, rapidly rising industrial wages—generated by the 10-percent annual economic growth rate of the past two decades—have tended both to attract farm labor to the cities and to raise the opportunity cost of the labor remaining on family farms.

The Japanese have typically adapted to this situation by sending the most able-bodied members of farm families into the cities each day. As a result, the farms are often left in the hands of older, physically less productive and perhaps entrepreneurially more conservative family members. Farm family income benefits, of course, since the urban worker often remains a part of the farm household. Partly for this reason, farm family income is significantly higher than urban family income, and has risen more rapidly than urban income since 1958, as shown by Chart 4. (The relative improvement in farm income is also attributable to the shift toward higher subsidies for rice growers which began in

1960.)[12] However, the flight of the prime-age, male laborer from farm activity has also contributed to the uncompetitiveness of Japanese agriculture on the world market.

Protective Agricultural Shield

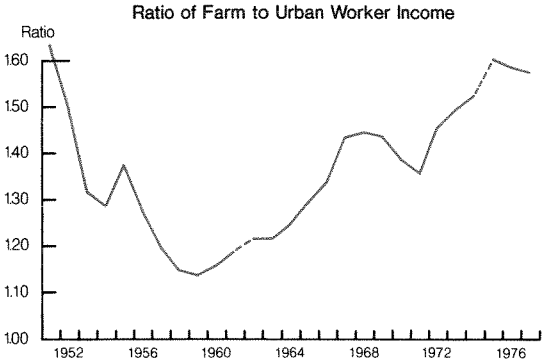
Japan's relatively uncompetitive agricultural sector is able to survive because it is insulated from the rest of the world by a system of tariffs and import quotas. While a number of tariffs have been reduced or removed over the past decade, Japanese agriculture is still quite heavily protected. Grains used for direct human consumption (rice and wheat) generally are protected—while those used for animal feeding (corn, sorghum, and oilseeds) generally are imported free of duty or quota, to help provide low-price feed for the livestock and poultry industries. While Japanese farmers do not grow any corn, they do grow barley (which is the only protected feed grain) and soybeans (for which they receive a subsidy).

Not all of the cost of protection is passed directly to consumers. For example, the government sells rice to wholesalers for less than it pays farmers. It offsets these losses partly by buying foreign wheat and other grains at low world prices and selling them domestically at higher prices. To the extent that the rice subsidy is not covered by "profits" on other government grain transactions, it is paid from general revenues and thus becomes a burden on taxpayers. To the extent that these expenditures contribute to a general budget deficit, financed by money creation, the burden takes the form of a higher rate of inflation.

Of all the types of agricultural protection, the rice subsidy is the most costly. In 1978, the rice subsidy alone (i.e., the difference between the government buying price and the 14-percent-lower government selling price) amounted to about $1.9 billion, and was the largest single item in the budget of the Ministry of Agriculture and Forestry. While this government selling price is lower than the farm price, it is still several times the price at which foreign rice could be delivered to Japan's door. Thus, in 1978, wholesalers paid the Japanese government $6.4 billion more for rice than they would have paid on the world market. The total cost of rice protection in 1978 thus reached $8.3 billion, or about $72 for each of the 115 million men, women and children in the country.[13]

Chart 4

Ratio of Farm to Urban Worker Income



Source: The Bank of Japan, Statistics Department, *Historical Statistics of Japanese Economy* 1962; *Economic Statistics of Japan*, 1956; and *Economic Statistics Annual* 1965, 1968, 1974, 1978

There are, of course, many other agricultural items which involve tariffs and/or import quotas. For 1972, Sanderson calculated that the cost of Japan's food supply, at the producer level, was 53 percent (or $5.5 billion) more than it would have been in the absence of import restrictions.[14] At the retail level, this might translate into a price premium of 20 to 25 percent above the alternative under free trade.[15]

II. Causes of Protective Agricultural Policy

Why has Japanese agricultural policy been so protective? Perhaps the best single answer is that such a policy is in the interest of farmers, who still have the political power to keep this protective apparatus in place. The fact that farmers account for only about 10 percent of the labor force is politically deceptive. When the current electoral districts were drawn in 1946–47, some 57 percent of the labor force was agricultural. Those electoral boundaries remain intact, so that the remaining rural population has retained its early postwar power despite the tremendous shift

of population from the country to the city.[16] Rural areas and small towns thus control about 60 percent of the Diet, and a rural vote can have up to five times the weight of an urban vote. Also, since rice occupies more than half the cultivated acreage and accounts for more than a third of gross farm income, the relatively expensive rice program tends to have strong support in rural areas. So until there is some change either in electoral boundaries or in farmer attitudes toward protection, Japanese agriculture is likely to remain insulated from the world market.

The agricultural-protection policy also is popular because it acts as a welfare program. One could argue that the rapidly growing Japanese industrial machine has attracted the most productive workers off the farms, leaving behind the elderly and those less able to cope with an urban, industrial environment. A free-trade policy would seriously undercut the incomes of those left behind in rural areas. But a protective policy generates some urban support because, as Komiya argues, urban Japanese view such a policy as a way of supporting the incomes of the elderly and poor[17]—many of whom are their own relatives.

A third reason for agricultural protection—one which has become increasingly important since the 1973 food crisis—is Japan's desire to reduce her extreme dependence on the outside world for food. Japan is normally the world's largest importer of grains, having passed Britain in 1964.[18] Moreover, Japan is one of the world's least self-sufficient countries in food supplies. Ogura found that only 13 out of 103 countries during the 1970–72 period depended upon foreign sources for more than 25 percent of their food calories. Only 3 of the 13 countries were industrialized, and one of these was Japan. Of the 18 largest countries, Japan was the only one which imported more than half of its grain—52.1 percent in 1972–74. (Indeed, most of these large countries were more than 90 percent self-sufficient in grain.) Moreover, Japan's self-sufficiency in food has declined rather sharply since 1960. Over the following decade, her self-sufficiency ratio declined 20 percent when measured in value, 30 percent when measured in original calories, and 52 percent when measured by weight (of grains only).[19]

For a while, there was surprisingly little concern over this increasing dependency upon foreign food supplies. According to Donnelly, neither the annual white papers on agriculture nor the annual report to the Diet by the Ministry of Agriculture and Forestry paid noticeable attention to food security. "As late as 1972, government planners and private research organizations were calmly projecting a continuing and rapid decline in the agricultural economy as a consequence of official programs of rationalization and liberalization."[20]

Then came three events which renewed Japan's concern over its degree of food dependence. *First* was the Soviet crop shortfall and consequent heavy purchases on the world market in 1972 and 1973. Grain became hard to find, and so wheat prices more than tripled and corn prices more than doubled during that brief period. *Second* was the temporary but very upsetting interruption in the flow of American soybeans to Japan. Japan imports about 97 percent of its soybean requirements, almost entirely from the U.S. But in 1973, in response to rapidly rising beef prices and "panic" Japanese buying of soybeans, the U.S. temporarily embargoed soybean exports in order to assure domestic supplies of feed. Even though the embargo lasted only a few months and barely affected the annual total of soybean shipments, the point had been made: Japan's food imports could be interrupted with short notice, depending on the internal politics of a major food-exporting country. The *third* event was the 1973–74 oil shock; while it did not involve food, the oil embargo and quadrupling of oil prices contributed to a general feeling of vulnerability on the part of the Japanese.

While none of these three events actually caused significant food shortages in Japan, the potential for such a scenario became clear. And unlike the United States, Japan has several generations of people who experienced real and prolonged hunger during the severe food shortages following World War II.

The policy response to this increased feeling of vulnerability was an attempt to increase domestic food production and thus decrease import dependence.[21] In April 1975, the National Agricultural Council recommended a series of steps to reverse the trend in Japan's food self-sufficiency ratio. These included: the develop-

ment of 0.7 million hectares of new land, the addition of 1.3 million hectares through double cropping of paddy fields, increased price supports to encourage these two developments, diversification of sources of agricultural imports, and a national stockpiling policy. The following month, the Ministry of Agriculture and Forestry published demand and supply projections to 1985 based upon this policy shift. The Ministry proposed to reverse the previous decline in the food self-sufficiency ratio (measured in value terms), with an increase in the ratio from 73 to 75 percent over the 1972–85 period as a result of increased subsidies to farmers. Actually, that improvement may be difficult to achieve because, as Sanderson argues, the Ministry underestimated the growth in meat demand and overestimated the ability of Japanese farmers to double forage production over this period.

III. Food Security Via Greater Production

Assume for a moment that Japan could achieve 75-percent self-sufficiency (in value terms) in food by 1985. Would this actually guarantee Japan a secure supply of food? To answer that question, we must first determine what it is that the Japanese are insuring against. The worst scenario would be one in which all foreign sources of food were cut off. This could occur because the rest of the world was either *unable* or *unwilling* to export. It is not impossible that a combination of weather and pests could seriously cut world harvests for several years running, causing the export market to vanish. In such a case, Japan's traditional suppliers would be simply unable to supply her needs, despite the best of intentions.

Of course, even the 1973–74 world food crisis did not approach this type of situation, but it did cause many analysts to believe that a long period of abundant food supplies had finally given way to a new era of worldwide food shortgages.[22] Japan thus had to take seriously the possibility that world agricultural production had undergone a fundamental change. Once the dust settled, however, the 1973–74 experience was generally attributed to transient (not permanent) factors—basically a Soviet crop shortfall combined with relatively thin world grain stocks. Indeed, grain supplies later returned to normal levels and prices fell by as much as two-thirds from their 1973 peaks. Moreover, some analysts argue that the medium-term outlook for world food supplies is favorable for those who have the currency to purchase supplies on the world market.[23]

Yet even if the rest of the world is able to supply food to Japan, can Japan depend upon its continued willingness to do so? The prospects seem favorable in this regard. The fear that grain producers will form an OPEC-like cartel to restrict production appears unfounded, since grain production involves both a large number of countries and millions of producers within these countries—hardly the environment necessary to make a cartel work. Furthermore, the potential for grain production exists in almost all countries.

Export embargoes have been used in the past for political reasons. The United States stopped trading with Cuba in 1959 because the new Cuban government expropriated U.S. oil refineries. Again, the United Nations declared a trade embargo on Rhodesia in 1966, following the latter's declaration of indendence from Britain and establishment of a white minority government. (Both of these embargoes are still in effect at this writing, though embargoes, like cartels, are difficult to enforce.) However, since both Cuba and Rhodesia are agricultural countries, they have not incurred serious food shortages because of the embargoes. In fact, the international community generally withholds food supplies only in cases of outright military hostilities. So Japan, short of war, should probably not worry about the willingness of the rest of the world to supply grain as long as that grain is readily available.

For that matter, even a high level of domestic agricultural production might not assure a stable supply of food in the case of outright military hostilities. Japanese agriculture is energy dependent, and an interruption of oil supplies would hamper field work and slow the production of fertilizers and pesticides. Sanderson calculates that a sharp decline in fertilizer supplies alone could reduce grain yields by one quarter

(for wheat and barley) to one third (for rice).[24] Furthermore, an interruption in energy supplies would probably also reduce the Japanese fish catch—a serious event since the Japanese eat about twice as much fish as they do meat. Sanderson estimates that such an emergency could reduce Japan's food production to about 1,650 calories (grain equivalent) per person per day—considerably less than minimum biological requirements.[25] In short, Japan simply could not weather a total trade embargo, even if she increased the self-sufficiency ratio to 75 percent.

We may conclude that 1) the medium-term outlook for world food production is relatively good, 2) the rest of the world would be willing to supply food to Japan as long as crop surpluses are available, and 3) in the event of war, without accessible food-producing allies, Japan would not be able to produce enough food to feed its population even at a 75-percent self-sufficiency ratio.

Cost of Protection

What is the cost to Japan of this current approach to food security? Answers differ widely—partly because of differences in statistical methodology—ranging from $0.4 billion to $6.0 billion annually, or in per capita terms, from $4 to $54 annually.

Japanese agricultural policy imposes costs on both consumers and taxpayers, and imparts benefits to producers. Consumers pay more for food, and consume less food, than they would under a free-trade scenario. Taxpayers pay higher taxes, which are then used to subsidize farmers. While Japan's protective policy is primarily designed to redistribute income from consumers and taxpayers to farmers, there is also a net social loss involved. This loss has two components. First, there is the deadweight loss in production due to the transfer of resources from other, more productive, pursuits to the less productive activities of the protected agricultural sector. Second, there is the deadweight loss in consumption due to the impact of artifically high food prices on consumers, with households purchasing less food as well as more non-food items which give them less satisfaction per yen. (See Appendix for a more formal discussion of the costs of protection.)

Of the three studies listed in Table 2, only the Bale and Greenshields study attempts to measure the net social loss due to Japan's agricultural policy. The other two studies, although methodologically simpler, sacrifice a certain amount of theoretical neatness. They simply calculate the difference between domestic agricultural production valued at official producer prices and that same production valued at the world prices which would prevail under free trade. While this simple calculation captures the social deadweight loss in production, it also includes the transfer of income from consumers and taxpayers to farmers. Furthermore, it ignores the deadweight loss in consumption resulting from the fact that at lower world market prices, consumers would purchase more food, increasing their overall satisfaction. Therefore, this hybrid cost measure of Payne/Severs and Sanderson overstates the social cost by the amount of the consumer and taxpayer transfer to farmers, and understates it by the amount of the deadweight loss in consumption. While, in theory, this cost measure could either fall short of or exceed the methodologically current calculation of social cost, the estimates generated by the three studies suggest that the hybrid-cost measure is probably an overstatement.

According to the Bale-Greenshields estimates, the social cost of agricultural protection in the

Table 2
Estimates of the Cost of Agricultural Production in Japan

	Year of Loss	Cost ($Billions)	Commodities	Nature of Cost
Payne/Severs[26]	1969	$2.1	Grains only	• Social loss in production plus transfer from consumers and taxpayers to farmers
Sanderson[27]	1972	5.5	All Agriculture	
Sanderson[27]	1976	7.3	Rice only	
Bale/Greenshields[28]	1975-76	0.4	All Agriculture	• Net social loss in production and consumption
Bale/Greenshields[28]	1985	7.9	All Agriculture	

mid-1970's was not very burdensome. (Still, according to Sanderson, a substantial amount of income was transfered from consumers and taxpayers to farmers—about $7.3 billion, or $65 per capita, for the rice program alone.) But when Bale and Greenshields examine the increased level of protection currently planned for 1985, they see a substantial rise in social cost. The incremental annual cost of moving the self-sufficiency ratio from 73 to 75 percent turns out to be more than $3 billion for each percentage point, or a rather negligible increase in food security at a rather substantial cost. In 1985 this cost would average $63 per capita (in 1975–76 dollars), if the current 1.2-percent rate of population growth continues. The actual burden might be better expressed on a per worker basis, since it is typically the income earner who pays the taxes and buys the groceries. If roughly half of the Japanese population is employed in 1985, then the per-worker social cost of agricultural protection would be about $125. If we include the income transfered from taxpayers and consumers to farmers, the burden would increase significantly.

IV. A Stockpile Approach to Food Security

A high level of domestic agricultural production is not the only way to assure a secure supply of food. An obvious alternative is to stockpile a sufficient amount of food and feed grains to insure against world-market shortages. This approach has not received much serious discussion, at least not in the English-language literature. Komiya notes that "a systematic stockpiling program may cost much less than agricultural protection to prepare for possible emergencies," but he does not provide any calculations to support this argument.[29]

An OECD report notes that the Japanese government "has been envisaging increasing its stocks of wheat and barley and also encouraging private stocks of feed grains and soybeans."[30] However, at this writing, none of these commodity stockpiles appear to exceed one or two month's consumption.[31] Sanderson, more explicitly, suggests providing up to one year's stockpile of imported grains and soybeans. He does not calculate the cost of such a program, but suggests that it might be quite high.[32]

In order to assess the costs and benefits of a stockpile policy, let us assume that the Japanese government decides 1) to gradually remove all barriers to agricultural imports, and 2) to gradually develop a one-year rotating stockpile of essential food and feed grains and soybeans. Such an approach should reduce consumer food costs, since (as will be shown) the cost of this policy would be significantly less than that of the current approach of supporting domestic production. This approach also could partially insulate the domestic market from large swings in world grain prices. This would involve storing more when prices were low and less when prices were high. Since a flexible approach of this type would require a larger capacity per average ton of grain stored, it would also entail certain costs.

Table 3
Changes in World Production of Selected Crops (Percent)

	Rice	Wheat	Corn	Barley	Soybeans	All Five Crops
1970/71	3.1	1.2	1.9	2.0	3.2	1.1
71/72	1.5	10.8	14.5	14.1	4.3	9.0
72/73	-3.7	2.6	-2.0	1.5	9.2	-0.3
73/74	7.3	12.2	9.9	14.1	23.3	11.0
74/75	1.8	-4.1	-9.0	1.2	-7.3	-3.3
75/76	6.8	-2.1	12.3	-9.6	22.6	4.0
76/77	-1.0	18.5	4.2	23.0	-11.8	8.0
77/78	4.1	7.8	4.8	-2.8	24.8	0.6
78/79	4.2	14.7	3.2	9.2	--	--

Source: Commodity Research Bureau, Inc., *Commodity Yearbook 1978*, and *FAO Monthly Bulletin of Statistics, February 1979.*

Would this policy really provide food security? How much would it cost? What effect would such a policy have on Japanese farmers—and on the international grain market? We consider each of these questions in turn.

A one-year stockpile of soybeans and major grains (i.e., wheat, rice, corn and barley) would surely guard against any one-year shortfall in all crops or multi-year shortfalls of a single crop. Over the past decade, the world market has not once experienced a simultaneous downturn in the production of all five crops, and only once experienced two consecutive declines in any single crop (see Table 3). Even this latter case—the wheat decline of 1974–75—was cushioned by more than offsetting increases both before and after the shortfall.

While a one-year stockpile of grains and soybeans would insure against temporary production shortfalls, there are two possible scenarios in which it would not do the job. The first would be a prolonged war without accessible food-producing allies. (Allies across an ocean might not be of much use.) The second would be a period of prolonged crop shortages. We can say nothing about the first scenario, except that policymakers must assess the probability of such an occurrence and include this in their decision-making. On the second point, this century has seen its share of starvation, but this has typically been associated with wars or localized crop failures accompanied by a lack of income to purchase food on the world market. There has not been any prolonged period of insufficient global production. While we cannot simply extrapolate the past, several post-1973-crisis studies suggest that food supplies will be adequate over the medium-term future. Thus, as long as Japan has the income to purchase food on the world market, the food is likely to be there.

The storage approach to food security cannot be judged against some ideal standard, but rather against the current approach of import quotas and subsidized production. As explained above, even the current approach would not fare very well in the case of a prolonged war without food- or energy-producing allies. Furthermore, any worldwide pest, disease, or weather change which reduced yields in the rest of the world, could just as easily affect Japanese production. And if prolonged shortages arose, for whatever reason, Japan could still allocate some resources again to domestic grain production. Skills would be rusty, mistakes would be made, and yields would remain low, but the country could shift back to some level of grain production in case of emergency. Thus, while there is no final answer, the storage approach probably could provide as much security as the current approach.

Cost, then, should be the deciding factor. Let us calculate the annual cost of a hypothetical storage program initiated in 1976–77 (Table 4). There are two major cost components involved—the cost of purchasing and the cost of storing the grain. To convert the initial lump-sum purchase cost of $5.8 billion to an annual cost, we assume that the Japanese floated a perpetual bond for that amount, and calculate the annual interest payments as the annualized cost of purchase. The government-bond rate in 1976–77 was two percentage points higher than the early-1979 rate, but to be conservative we use that high rate. (This is appropriate, since government bond sales involve modest government coercion and the stated rate may be a bit higher than a free market would yield.) On this basis, the annual cost of the initial purchase amounts to $465 million. Total storage costs, which are also estimated on the high side, approximate the same figure. So annual storage and amortized purchase costs would come to about $0.9 billion, or slightly less than $8 per capita, with rice accounting for about half of the total program cost.

One disadvantage of the rotating stockpile approach would be a decline in the quality of rice purchased by the averge consumer. At present, Japanese stores typically sell rice when it is less than a year old, though they sometimes mix one- to two-year old rice with the new rice following years of poor harvests. Americans generally do not notice taste differences in rice stored as long as three or more years, but the Japanese are much more sensitive to taste changes which result from age, and have a definite preference for new over old rice. The quality decline would be slowed if the rice were stored in rough (unhusked) form, but this tends to raise storage costs, as our calculations indicate.

The $0.9-billion annual stockpile cost would be roughly double the Bale/Greenshields esti-

mate of the net social loss attributable to agricultural protection in 1976-77. Consequently, if the stockpile and protectionist approaches to food security provided equivalent outputs, Japan clearly made the correct least-cost choice for the mid-1970's. But this would not necessarily be the correct strategy for 1985. Bale and Greenshields estimate that the extra two percentage points of food self-sufficiency planned by the Japanese government will involve a social cost of $7.9 billion (in 1975–76 dollars). In contrast, the stockpile by 1985 might cost just over $1 billion (in 1976-77 dollars), as grain storage needs rise with population growth and with an expected increase in per capita meat and poultry consumption. A storage approach could thus be some $6–7 billion cheaper than the cost of continuing the current policy.

International Effects

If a free-trade program (with stockpiling) were adopted, what effect would it have on international grain markets? Since Japan already imports 89 percent of her barley, 96 percent of her wheat and soybeans, and virtually 100 percent of her corn and sorghum, the impact on world markets of reduced domestic production of these commodities would be almost imperceptible. If

Table 4
Cost of Maintaining a Stockpile of Essential Grains and Soybeans, 1976-77

Commodity	Consumption[1] (Millions of tons)	Purchase Price[2] (Dollars)	Total Purchase Cost ($ Millions)	Storage Cost per Ton[3] (Dollars)	Total Storage Cost ($ Millions)
Rice	14.6	180.19	$2,630.7	$18.00	$216.0
Wheat	5.6	113.85	637.6	9.19	51.5
Corn/Sorghum	12.0	99.34	1,192.1	9.19	110.3
Barley	2.2	142.53	313.6	9.84	21.6
Soybeans	3.5	294.02	1,029.1	11.47	40.1
			$5,803.1		$439.5
			× .0802[4]		
			$ 465.4	Amortization of grain purchase	
			439.5	Total storage cost	
			$ 904.9	Total program costs	

1 Barley, wheat and soybeans from Bale and Greenshields *op. cit.* p. 60. Corn/sorghum estimated from data in *Study of Trends in World Supply and Demand of Major Agricultural Commodity,* Paris: OCED, 1976, p. 163. Rice from USDA "Foreign Agricultural Circular: Grains," March 1978, p. 52. The 14.6 million tons of rice consumption is in rough form and is equivalent to 10.6 million tons milled, since there is a 27.4-percent wastage in Japanese rice milling.

2 Prices are U.S. wholesale prices plus 6 percent for transportation (and insurance) to Japan. Rice price is U.S. farm price plus 6 percent for domestic handling, plus another 6 percent for transportation to Japan. Prices are from Commodity Research Bureau, Inc., *Commodity Yearbook 1978,* New York, 1978. For 6-percent shipping factor, see Sanderson 1978, *op. cit.,* p. 19. Cheaper sources of these grains may be available elsewhere; for example, Bangkok prices for milled rice tend to be 25 percent below U.S. prices. We also assume here that price elasticity of demand is 1.0, so that the stock purchase would bid prices up by the following percentages: rice, 4.1 percent; wheat, 1.5 percent; corn, 3.5 percent; barley, 1.3 percent; soybeans, 4.7 percent.

3 Storage costs for rice from Shelby Holden and Earl Sternis, "Costs of Commercial Rice Drying and Storage Facilities in Mississippi, 1978," Agricultural and Forestry Experiment Station, Mississippi State University, 1979, Mimeo. Storage costs for other grains based upon USDA payment of $0.25 a bushel to cover farmer storage costs in various agricultural programs. The rice-storage cost is estimated for 1978, at about 11 percent above the January 1977 figure. Also, storage costs of other grains range from 23 to 53 percent higher than those used in a Brookings study of grain reserves. See Philip Trezise, *Rebuilding Grain Reserves: Toward an International System,* Washington, D.C. 1976. This upward bias in our storage estimate should much more than offset any higher land costs in Japan, given that land accounts for a very small portion of creating a storage facility—0.3 percent in the case of the U.S. rice facility.

4 The interest rate used here is the average Japanese government-bond rate for 1976–77. This rate has since fallen to an average 6.09 percent in 1978.

the program had been implemented in 1976, additional Japanese requirements for wheat, soybeans and barley would have been no more than 1.0–1.5 percent of the world export markets for those commodities.[34] The rice market would be dramatically different, however—at least in the extreme case where all Japanese producers drop out of business because of the effects of a free-trade policy. In that case, Japan would probably not have been able to purchase sufficient rice in 1976 to fulfill her domestic requirements; and an attempt to do so would have driven prices sharply upward. After all, Japan's 12-million metric ton consumption was almost twice the size of the world export market in that year. On the other hand, only about 2 to 4 percent of world rice production enters the export market in any given year, reflecting the fact that rice (unlike wheat and corn) is generally consumed where it is produced. Therefore, rice production outside Japan would have had to expand only about 3 percent in 1976–77 to offset the cessation of Japanese rice production.

The problem may be complicated by the fact that the Japanese have a strong preference for short-grained rice—as opposed to the long-or medium-grain rice which is produced in such major growing areas as China, Thailand and the Philippines. It is not difficult to shift production from long-to short-grain rice, but major adjustments would have to be made in production and marketing patterns, commensurate with the vast size of Japan's expected demand. In any event, a recent Trilateral Commission report argues that with certain changes in irrigation, Asian rice production could be doubled in 15 years,[35] so that a sharp rise in Japanese demand could be handled by the world market.

What role would the United States, frequently the world's leading rice exporter, play in this picture? California, which is now the only significant producer of short-grain rice in this country, probably cannot bring additional land into rice production due to water constraints. By shifting its medium-grain land into short grain, it could produce another 700,000 metric tons, but that would be less than 5 percent of Japan's needs. A significant increase in short-grain prices would be needed to bid land in Arkansas and other southeastern states away from long-grain production, but if that were done, a potential 2 million acres could be diverted—enough to produce 4 million metric tons of short-grain rice, or just over one-fourth of total Japanese consumption.[36]

Table 5
Major Rice Exports in 1976

Exporter	Exports (Millions of tons)	Share of Market (by value)	Major Customers[1]
U.S.	2,107.0	31	Indonesia (12%), Iran (11%)
Thailand	1,977.8	21	Indonesia (27%)
Pakistan	NA	12	Sri Lanka, Indonesia, Saudi Arabia
Burma	NA	7	Indonesia, Sri Lanka
Italy	398.5	6	France (30%)
Egypt	211.0	4	--
Australia	310.8	4	Indonesia (26%), Hong Kong (13%)

1 Customers purchasing more than 10 percent of that exporter's sales

Source: United Nations, *Yearbook of International Trade Statistics, 1977*, Vol. 2, p. 518–519.

A listing of the world's leading exporters indicates the sources of potential Japanese supply (Table 5). Actual trade patterns, of course, would depend on such factors as production and transportation costs, alternative land uses, political develoments, and so on. At any rate, all exporters except Italy and Egypt today send significant shipments to Indonesia, one of Japan's neighbors. All five of those exporters (the U.S., Thailand, Pakistan, Burma, and Australia) thus could become major suppliers to Japan, provided that they offered the desired short-grain variety. Moreover, Japan's experience with the 1973 world food crunch and U.S. soybean embargo has increased her desire to diversify sources of food imports. Consequently, if Japan should decide to cease or sharply reduce rice production, she probably would spread her import business among a number of producers, some of which (such as Taiwan and Korea) do not even appear in our listing.

Effect on Farm and Food Sectors

As noted earlier, agricultural protection in Japan is viewed as part of the nation's welfare program—an important consideration, since the Japanese have no well-developed social-security system. The removal of subsidies, tariffs and quotas would thus have a tremendously depressing effect on farm income. Farm land prices would also be depressed, so farmers who had been looking toward land appreciation as a major form of retirement protection would find these capital losses eating into their planned future consumption. On the other had, income losses would be cushioned by the availability of non-farm sources of income. Also, land price declines—at least near urban areas—would be cushioned by the potential utilization of farm land for non-agricultural purposes.

Still, a change to a free-trade policy would involve serious social dislocations. Many of the farmers who would be forced out of business are probably too old and unskilled to enter the non-farm labor force. About a third of the agricultural labor force in 1972 consisted of people over 50, and few of these people would be able to find equally attractive occupations outside of agriculture. So if the policy change were ever made, it would have to be done slowly and with appropriate compensation to those made worse off by the change.

The face of the Japanese agricultural landscape would change considerably with such a move, in view of the fact that almost half of Japan's farm land has been devoted to rice in recent years. If forced to compete on the world market, only the most efficient rice growers on the best land would remain in business. With the drastic cutbacks in rice and other grain production, much land would shift to forestry and non-agricultural uses. Other land would shift into agricultural pursuits for which the Japanese have or could develop a comparative advantage. In Sanderson's view, these would include production of livestock, fruits, vegetables, and nuts.[37]

If Japan were to reduce her primary-production role, she might be wise to expand her role as an important food processor. The processed component of the world's food supply is growing, and will continue to grow as rising world incomes and growing female labor-force participation cause households to substitute away from kitchen labor. Japan may have a comparative advantage here, in view of the inroads she has already made in the soy-sauce and instant-noodle markets. Other non-perishable processed foods which can be conveniently shipped include breakfast cereals and stacked potato chips. Also, a whole range of new soybean derivatives is not out of the question. If Japan developed as an important supplier of processed foods, other countries would be more reluctant to reduce her supply of primary agricultural commodities. The more Japan becomes a supplier as well as a demander of food stuffs, the more secure will be her own domestic food supply.[38]

Conclusion

This paper has called attention to the high cost of food in Japan, and attributed this mostly to the current agricultural policy, which subsidizes and protects inefficient grain production. That policy primarily reflects the rurally-biased distribution of political power in the country, but it also reflects urban consumers' fears about the security of Japan's food supply.

We considered an alternative approach to food security, specifically the maintenance of a one-year stockpile of all major grains. While the cost of stockpiling would have exceeded the net social cost of the current program in the mid-1970's, by the mid-1980's this cost relationship would likely be reversed. By 1985, current policies could cost just under $8 billion, while the stockpile approach could run a little over $1 billion. A switch to the stockpile approach could have a dramatic impact on the domestic farm economy, with falling prices, production, land values and incomes. Thus if such a policy shift took place, it would have to be implemented slowly. However, Japan could evolve into a major food processor, importing raw foods and exporting processed foods for which there is a rapidly growing world demand. By becoming a supplier as well as a demander of foodstuffs, Japan could become an important part of the world food-supply system—one which could not be easily cut off in times of food shortages.

Appendix: Winners and Losers in Japanese Agricultural Policy.

A diagrammatic illustration of Japanese agricultural policy is shown in Figure 1. Under free trade, the world price of food, P_W, would prevail in the Japanese market, domestic producers would supply Q_1 of food (where their marginal cost equaled the world price), consumers would demand Q_4, and the quantity $Q_4 - Q_1$ would be imported. Japanese agricultural policy involves two deviations from this free-trade scenario. First, a tariff of $P_c - P_w$ is applied to imported goods, so the domestic-market price is raised from P_w to P_c. (This is a simplification, since there are also quotas and government purchases of imports at world prices, with resale at higher domestic prices.) Corresponding to this tariff is a loss of consumer surplus represented by the areas $2 + 4 + 6 + 7$.

Second, in order to stimulate domestic production even more than is done by the tariff alone, the government buys farm products at the official producer price P_p and resells them in the market at the lower price P_c, thus incurring the loss $1 + 3$. Note, however, that a portion of this agricultural subsidy, $1 + 3$, can be paid from the tariff revenues 6. The actual cost to taxpayers is thus $1 + 3 - 6$. The total loss to consumers and taxpayers is $1 + 2 + 3 + 4 + 7$.

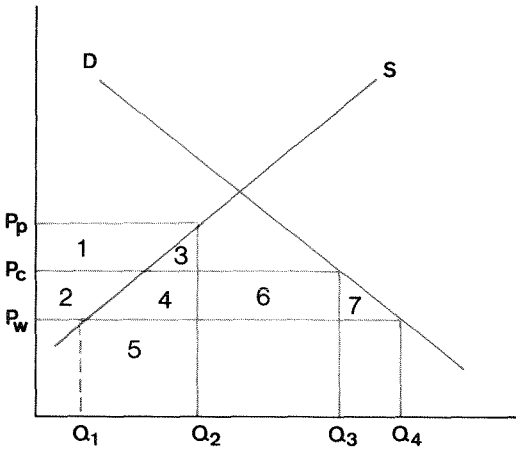
Not everyone loses in this retreat from free trade. Producer incomes have risen by $1 + 2 + 3 + 4 + 5$, though with increased production their costs have also risen by $3 + 4 + 5$. The net gain to producers is thus $1 + 2$—the first area consisting of a transfer from taxpayers and the second a transfer from consumers.

We now come to the bottom line. Since $1 + 2$ is simply shifted from consumers' and taxpayers' pockets to producers' bank accounts, it cannot be considered a loss to society as a whole, unless we judge the gainers somehow less deserving than the losers. There is, however, an unambiguous social loss in the two triangles $3 + 4$ and 7. The former, $3 + 4$, represents the deadweight loss in production due to the transfer of resources from more-productive to less-productive pursuits in the protected sector. The other triangle, 7, is the deadweight loss in consumption; this represents the fact that consumers must now shift to other products which give them less satisfaction.

We turn to the estimates of these losses given in Table 2. Only the Bale and Greenshields' study estimates the two triangles representing the net social loss of protection, $3 + 4 + 7$. Their estimate of the 1975–76 loss is relatively small, amounting to less than $4 per capita. The other two studies use a very simple technique which avoids the use of supply and demand elasticities. They simply calculate the difference between domestic agricultural production valued at official producer prices, and that same production valued at world prices. The simplicity of the calculation, however, sacrifices a certain amount of theoretical neatness. This technique actually estimates the deadweight loss in production plus the consumer and taxpayer transfer to producers, $1 + 2 + 3 + 4$—a sort of hybrid cost measure which overesti-

Figure 1

Welfare Effects of Japanese Agricultural Policy



Effects: Consumer Loss = 2 + 4 + 6 + 7
Farm Subsidy = 1 + 3
Tariff Revenue = 6
Taxpayer Loss = 1 + 3 − 6
Producer Gain = 1 + 2
Net Social Loss = 3 + 4 + 7

Note: Consumers pay $P_C - P_W$ more per unit of food and consume $Q_4 - Q_3$ less food than would be true in free trade.

Definitions: P_W=world price
P_C=consumer price
P_P=price paid to producer by government
Q_1=quantity which would be supplied domestically under free trade
Q_2=quantity supplied by domestic producers at subsidized price P_P
Q_3=quantity demanded by consumers at government determined consumer price P_C
Q_4=quantity which would be demanded by consumers at world price P_W

mates the net social cost by the amount 1 + 2 − 7. It should thus not come as a surprise that this technique yields considerably higher cost estimates than that of the Bale and Greenshields' study.

FOOTNOTES

1. U.S. Department of Agriculture, **Foreign Agriculture,** April 1979, p. 14-15.

2. Note that the three countries (Portugal, Spain and Luxemburg) which devote larger budget shares to food have beverages included in their food category, while Japan does not. If beverages were included in the Japanese case, the point for Japan would shift to the right in Chart 1, and the gap between Japan and the other three would be reduced.

3. Because both protein and calorie requirements are typically expressed as linear functions of body weight (e.g., the Recommended Daily Allowance of protein for adults is 0.8 grams per kilogram of body weight), the smaller average weight of the Japanese suggests that their per capita requirements would be somewhat less than those of Westerners. Furthermore, we do not suggest that the Japanese diet is less healthy than that of other OECD countries; in fact, the opposite could be true. The point here is simply that the Japanese spend a larger share of their income on food and get less for it.

4. Takekazu Ogura, "Implications of Japan's Declining Food Self Sufficiency Ratio," **Developing Economics,** Vol. XIV, No. 4, December 1976, p. 433.

5. Ogura, *op. cit.,* p. 429.

6. Richard E. Caves and Masu Uekusa, **Industrial Organization in Japan,** Washington, D.C.: The Brookings Institution, 1976, p. 115.

7. Hugh Patrick and Henry Rosovsky, **Asia's New Giant: How the Japanese Economy Works,** Washington, D.C.: The Brookings Institution, 1975, p. 46.

8. K. Bieda, **The Structure and Operation of the Japanese Economy,** Sydney: John Wiley and Sons, Australasia Pty. Ltd., 1970, p. 252.

9. Kakuei Tanaka, **Building A New Japan: A Plan for Remodeling the Japanese Archipelago,** Tokyo: Simul Press, Inc., 1972, p. 10.

10. This discussion of land tenancy laws draws heavily from K. Bieda, *op. cit.,* p. 243-254.

11. *Ibid.,* p. 261.

12. See full discussion of the 1960 change in agricultural policy in Yujiro Hayami, "Rice Policy in Japan's Economic Development," **American Journal of Agricultural Economics,** February 1972, p. 19-30.

13. In 1978, the Japanese government paid farmers $1,300 a ton for brown rice and in turn sold it to wholesalers for $1,120 a ton. This subsidy of $180 a ton on the 10.5 million tons consumed in 1978 amounts to a total of $1.9 billion. Since the wholesalers could have had U.S. rice delivered to their door at $507 a ton (or $478 U.S. price plus 6 percent for shippers' handling and insurance), they paid a premium of $613 a ton, or $6.4 billion on the entire 10.5 million tons consumed. Rice prices taken from U.S.D.A., **Agricultural Situation: Asia,** April 1979.

14. Fred H. Sanderson, **Japan's Food Prospects and Policies,** Washington, D.C.: The Brookings Institution, 1978, p. 23. This simple exercise involves valuing Japanese agricultural output for 1972 at Japanese producer prices, then at world prices, and simply dividing the former by the latter. Thus, $16.0 billion/$10.5 billion = 1.52, or 1.53 before converting yen to dollars, and the cost of protection is 53 percent.

15. Producer prices are only a portion of the final consumer price of food. While the share of retail food prices attributable to farm prices is not readily available for Japan, the U.S. figure has been relatively stable at about 40 percent in recent years. If the Japanese figure is roughly the same, a 53-percent premium at the farm level would translate into a (53 × .4) = 21-percent premium at the retail level.

16. See Philip Trezise and Yukio Suzuki, "Politics, Government and Economic Growth in Japan," in Hugh Patrick and Henry Rosovsky, *op. cit.,* pp. 772-773.

17. Ryutaro Komiya, "Japan and the World Economy," in C. Fred Bergsten (ed.), **Toward a New World Trade Policy: The Maidenhead Papers,** Lexington, Mass.: D.C. Heath and Co., 1975, p. 185.

18. This section draws heavily on Ogura, *op. cit.*

19. Self-sufficiency ratio $= \frac{\text{domestic production}}{\text{domestic consumption}}$, with the units measured alternatively in value, weight or original calories. In the latter case, meats are converted to their grain equivalent.

20. Michael W. Donnelly, "Japan's Search for Food Security," **Current History,** November 1978, p. 165.

21. Sanderson, *op. cit.,* ch. 4.

22. See, for example, Lester Brown and E.P. Eckholm, **By Bread Alone,** New York: Praeger, 1974.

23. Fred H. Sanderson, "The Great Food Fumble," in Phillip H. Abelson (ed.), **Food: Politics, Economics, Nutrition and Research,** Washington, D.C.: American Association for the Advancement of Science, 1975, p. 1-7.

24. Sanderson, 1978, *op. cit.,* p. 61.

25. *Ibid.,* p. 61.

26. William F. Payne and Gary L. Seevers, "An Analysis of Japanese Food Grain Policies," Special Report 323, Corvallis: Agricultural Experiment Station, Oregon State University, April 1971.

27. Sanderson, 1978, *op. cit.*, p. 23-25.

28. Malcolm D. Bale and Bruce L. Greenshields, "Japanese Agricultural Distortions and Their Welfare Value," **American Journal of Agricultural Economics,** February, 1978, p. 63.

29. Komiya, *op. cit.*, p. 185.

30. O.E.C.D., **Study of Trends in World Supply and Demand of Major Agricultural Commodities,** Paris, 1976, p. 163.

31. From a telephone conversation with Mr. Uno, Agricultural Attache at the Embassy of Japan in Washington, D.C.

32. Sanderson, 1978, *op. cit.*, p. 84-85.

33. See Sanderson, 1975, *op. cit.*, for a discussion of these studies.

34. This does not mean that Japan would not be an important participant in these markets. She is generally the largest single importer of wheat and corn (13 and 20 percent, respectively, in 1976) and the second largest importer of barley (18 percent in 1976).

35. This discussion is based upon U.S.D.A. "Rice Situation," March 1979, and telephone conversation with USDA rice specialist, Tom Elam.

36. Umberto Colombo, D. Gale Johnson, Toshio Shishido, **Reducing Malnutrition in Developing Countries: Increasing Rice Production in South and Southeast Asia,** New York: The Trilateral Commission, 1978.

37. Sanderson, 1978, *op. cit.*, p. 97.

38. Some Japanese food processers have already begun to move offshore because of a combination of high raw-food costs and the yen appreciation. Because the domestic price of imported wheat is held far above the landed price of that wheat, instant noodle makers have been facing a severe profits squeeze. Three noodle makers have already opened plants in the United States. For a discussion, see Kenichi Tsunoya, "Food," **Industrial Review of Japan 1979,** Tokyo, March 1979, p. 117.