IMPLICATIONS OF JAPAN'S DECLINING FOOD SELF-SUFFICIENCY RATIO

TAKEKAZU OGURA

BEFORE AND after World War II, one of the principal objectives of Japanese agricultural policy was to increase production and self-sufficiency in grain and other starchy foods such as sweet and regular potatoes. However, as the Japanese economy recovered and moved into a high-growth phase, self-sufficiency lost priority, and the food self-sufficiency ratio (food SSR) gradually declined. In 1973 the declining ratio began to concern the general public.

What is the current state of affairs and declining degrees in self-sufficiency and what are the implications for the Japanese economy? Japan's food SSR shows the tendency to a steady decline. The ratio is seriously low as seen from the viewpoint of "food security," and Japan will increasingly depend on a foreign food supply. The conclusion can also be drawn that Japan's food policy will have to be more "international" than that of any other country.

I. THE ANGLE OF OBSERVATION

In order to explain the present state of declining food SSR and its implications, the first need is to firmly determine how the problem is to be observed, methods which cannot be the same from one country to another or from one period to another. Most of the time, balance of payments and national security should have overriding importance. There may well be other angles of observation and a great number of other factors to be considered. But with contemporary Japan and its future prospects, food security as part of national security seems to be the single most important item for several reasons.

First, food SSR is considered to be not an agricultural but primarily a food problem. True, since food SSR is a function of the relation between domestic agricultural production capacity of a country and its domestic demand for food, it is inseparably related to agriculture. Food SSR is an important index in assessing the agricultural situation, but this index is more closely related to food policy and serves as a means to assess food security. Second, it neither is nor will be probable that declining degrees of self-sufficiency in food are hazardous to the balance of payments. The price and volume of crude oil imports may well be an issue in dealing with the payments balance, but prices and volumes of food imports do not seem to significantly contribute to an imbalance. Rather, the immediate problem for today and tomorrow is the possibility that a favorable payments balance may be a factor in higher food security. Third, the term "food crisis" has become a popular one with certain people in this country. Without

establishing whether or not Japan really is in a crisis situation, it should be noted that the prevalent use of the term itself is a reflection of some apprehension over food security. Fourth, some people argue that for a country like Japan heavily dependent on foreign sources not merely for food but for other important primary goods, the maintenance, or even improvement, of the present degree of self-sufficiency in food will not guarantee better national security. This line of argument, however, allows an undesirable state of affairs to be left unattended. Rather, as self-sufficiency declines, policy makers are forced to give greater attention to food security as an element of national security.

II. DOWNWARD TREND IN SSR

There are a number of ways to calculate food SSR, the differences between them rising in part from differing points of view.

SSR can be calculated for either individual commodities or for the aggregate food situation. Calculation of the SSRs for items like rice and wheat poses no problem, and no great controversy. Many observers believe that item-by-item SSRs are adequate indices of production capacity or production policy targets. If necessary, one can easily calculate SSRs for more all-encompassing food categories, such as grain, vegetables, or fruit. In fact both SSRs are used at present.

However, these SSRs do not necessarily give an indication of the entire agricultural supply capacity of the country. Such a measurement requires a self-sufficiency ratio of total value aggregate for all food commodities (or SSR of TVA). The first line in Table I gives ratios derived from the latter measurement for only agricultural products, while Table II uses it for marine products as well. For methods of calculating SSR of TVA and SSRs for individual commodities and categories, see notes 1 and 2 to Table II.

TABLE I

MOVEMENTS OF SSRs OF AGRICULTURAL FOODS

(%)

	1960	1965	1970	1971	1972	1973	1974	1985
I. Value	90	81	76	72	73	71	72	75
II. Original calories	78	65	56	53	53	—	(55)	(56)
III. Grains (in weight)	83	61	48	42	43	41	40	37
IV. Grains and pulses (in weight)	79	58	43	37	37	36	37	34

Sources: Value: for 1960, 1965, 1970–74, [6]. Original calories: for 1960, 1965, 1970–74, Agriculture and Forestry Minister's Secretariat, Research Section, *Shokuryō nōsanbutsu no jikyūritsu ni kansuru tōkei shiryō* [Statistical data on self-sufficiency ratios of agricultural foods] (1973). Grains (in weight): for 1960, 1965, 1970–74, [6]. Grains and pulses (in weight): for 1960, 1965, 1970–74, [2]. For 1985, [3].

Notes: 1. Okinawa Prefecture is not included until 1972.
2. No official data on original calories for 1973 and after are published.
3. Rice is measured threshed but not polished except for imported and crushed rice (measured polished).

TABLE II

CHANGES IN FOOD COMMODITIES SSRs

(%)

	1960	1965	1970	1971	1972	1973	1974	1985
SSR of TVA of agricultural foods	90	81	76	72	73	71	72	75
Staples								
Rice	102	95	106	92	100	101	102	100
Wheat	39	28	9	8	5	4	4	9
Barley and naked barley	107	73	34	29	18	10	11	36
Beans	44	25	12	11	12	11	11	13
Soybeans	28	11	4	4	4	3	4	9
Vegetables	100	100	99	99	99	98	98	100
Fruits	100	90	84	81	81	83	83	84
Eggs	101	100	97	98	98	98	98	100
Milk and dairy products	89	86	89	88	86	83	83	94
Meat (except whale meat)	91	89	88	83	81	78	84	86
Beef	96	95	98	82	79	60	85	81
Pork	96	100	89	96	90	87	93	99
Sugar	18	30	23	20	20	20	15	28
Marine products	108	106	103	101	102	97	99	95
SSR of TVA	93	85	81	77	78	76	77	78

Sources: For 1960, 1965, 1970–74, [6]; for 1985, [3]; and materials from the Research Section, Agriculture and Forestry Ministry's Secretariat.

Notes: 1. SSR of TVA=domestic production value/domestic consumption value ×100.
Both domestic production value and domestic consumption value are in 1965 wholesale prices, and double-counting is avoided by exempting feed.
2. SSR for specific commodities or group commodities=domestic production volume/domestic consumption volume×100.
Domestic consumption volume refers to domestic production volume plus net import minus inventory increases.
3. Sugar is a total beet, cane and non-centrifugal sugar, and Okinawan sugar has always been counted in domestic production.
4. Okinawa Prefecture is included after 1973.
5. SSRs of marine products are based on materials from the Research Section, Agriculture and Forestry Minister's Secretariat.

SSR of TVA serves to calculate balance of payments as well, and is referred to as domestic SSR against national SSR, but in national SSR the imported inputs of agricultural origin such as imported feedstuff grains and imported oil cake fertilizer are not subtracted from production. In Japan national SSR is not usually used. National SSR may prove to be a valid index if one examines it with the idea of securing the greatest extent of domestic market for domestic agriculture.

SSR can be calculated in three ways. SSR of TVA, as shown, is calculated in monetary terms. SSRs for specific commodities and commodity groups are usually calculated in quantum terms (weight or bulk). The calorie is also used as a measurement (this too is in quantum terms). Fortunately, all food items can be aggregated in caloric terms, as shown in the second row of Table I.

There are two methods of calculation when calories are used as the criterion. One is to aggregate vegetable calories and animal calories without discriminating between them, and the other is to make the distinction and calculate the needed calories of vegetable origin for livestock and poultry production. The latter of the two is called SSR in original calories and the following formula is used.

$$\text{Agricultural food SSR in original calories} = \frac{\text{calories of vegetable origin} + \text{calories of animal origin} \times 7^{*} \times \text{SSR in feedstuff}}{\text{calories of vegetable origin} + \text{calories of animal origin} \times 7^{*}} \times 100 .$$

* The seven is the coefficient for converting calories of animal origin to calories of vegetable origin. It is roughly estimated that the production of one calorie of animal origin needs seven calories of vegetable origin.

If food SSR is calculated in caloric terms only from the viewpoint of nutrition, a distinction between calories of vegetable and animal origin may be called for but tracing back to original calories is not necessary. However, if the considerations are ones of food security, calculations of original calories in dealing even with nutrient supply would be necessary.

Tables III and IV show simple SSRs in caloric terms that do not revert back to original calories. Note that in Table III a distinction is made between calories

TABLE III

SSRs IN CALORIES

(Calorie)

	Total Supply of Calories per Person per Day	Domestic Supply of Calories per Person per Day	SSR (%)
1974:			
Total	2,501.5	1,437.5*	57.5
		1,575.4†	63.0
Vegetable origin	2,137.2	1,222.9	57.2
Animal origin	364.3	214.6*	58.9
		352.5†	96.8
1985:			
Total	2,593.0	1,476.6*	56.9
		1,628.1†	62.8
Vegetable origin	2,187.0	1,255.3	57.4
Animal origin	406.0	220.0*	54.2
		368.8†	90.8

Sources: For 1974, [2]; for 1985, [3] and materials from the Research Section, Agriculture and Forestry Minister's Secretariat.

* Figures where livestock and poultry raised on imported feed are not considered self-supplying.

† Figures where livestock and poultry raised on imported feed are considered self-supplying.

TABLE IV

TOTAL SUPPLY, DOMESTIC SUPPLY (PER PERSON PER DAY), AND SSRs BY NUTRIENTS

	1974					1985				
	Grand Total	Vegetable Origin	Animal Origin			Grand Total	Vegetable Origin	Animal Origin		
			Total	Livestock & Poultry	Marine Products			Total	Livestock & Poultry	Narine Products
Calories (per person per day):										
Total supply	2,501.5	2,137.2	364.9	242.3	121.6	2,593.0	2,187.0	406.0	288.0	118.0
Domestic supply	1,437.5	1,222.9	214.6	50.3	141.1	1,475.3	1,255.3	220.0	117.0	103.0
SSR (%)	57.5	57.2	58.9	20.8	116.0	56.9	57.4	54.2	40.6	87.3
Carbohydrate (in calories per person per day):										
Total supply	1,655.9	1,619.4	36.5	29.8	6.7	1,636.7	1,592.7	44.0	36.9	7.1
Domestic supply	1,055.1	1,039.0	16.1	8.7	7.4	1,035.7	1,035.0	20.7	14,5	6.2
SSR (%)	63.7	64.2	44.1	29.2	110.4	64.5	65.0	47.0	39.3	87.3
Protein (in grams per person per day):										
Total supply	79.1	43.4	35.7	17.0	18.7	83.3	42.9	40.4	19.8	20.6
Domestic supply	52.5	25.8	26.7	5.2	21.5	53.7	27.3	26.4	7.8	18.6
SSR (%)	66.4	54.4	74.8	21.1	115.0	64.5	63.6	65.3	39.4	90.3
Fat (in grams per person per day):										
Total supply	59.6	38.7	20.9	16.1	4.8	70.0	67.7	22.3	19.1	3.2
Domestic supply	19.7	9.1	10.6	5.0	5.6	23.1	12.4	10.7	7.9	2.8
SSR (%)	33.1	23.5	50.7	30.1	116.7	33.0	18.3	48.0	41.3	87.5

Sources: [2] [3].

Notes: 1. SSRs are calculated by the following formula; $\frac{\sum \text{domestic supply of item-by-item nutrition supply per person per day}}{\sum \text{item-by-item nutrition supply per person per day}} \times 100.$

2. SSRs of livestock and poultry are calculated by multiplying the domestic production by SSRs of feed (TDN).
3. Carbohydrate is calculated as follows: Carbohydrate = calories − (protein × 4 + fat × 9).
4. Figures for 1985 not mentioned in [3] are estimates.

of animal origin calculated simply as they are and calories of animal origin calculated by considering the self-supply as only that part which is fed by domestic feed. The former is the national SSR, the latter is the domestic SSR in calories. Table IV has the domestic SSRs in calories.

Another important SSR measurement is grain (or the total of grain and pulses), calculated by weight. SSRs are shown in this manner in Table I, as III. grains, and IV. grains and pulses.

SSRs in quantum terms present no problem for making time-series comparisons, but comparison in monetary terms must be made in constant prices. Both Table I, I. value, and Table II, SSRs of TVA, are in 1965 prices. A long-term comparison in monetary terms may not be adequate for certain purposes.

SSR can be also expressed in hopingly adjusted or normative terms in addition to objective terms. The latter depicts the "objective" facts or relations between various aspects of these facts based on actual records of present or past production and consumption. Figures in Tables I, II, IV, and V for 1955, or 1960 to 1974 belong to this category of SSR. Future perspectives which are simple extrapolations of previous trends may be described as "objectively projected," but the figures forecast for 1985 are hopingly adjusted in various degrees depending on the item. Generally speaking, figures of 1985 especially for domestic supply of many of the individual items are in hopingly adjusted terms, providing the basis for the calculation of aggregate SSRs.

The normative concept of food SSR sets a clear standard or norm, to which necessary production and actual domestic production or consumption is compared. For instance, the needed energy and protein are calculated for the entire nation in accordance with a standard of nutrition set by those charged with making such decisions, and in line with this domestically produced energy and protein are charted.

In Japan, the nutritional requirements, or desirable amount of nutrients to be consumed, were renewed and published by the Ministry of Welfare in March 1975 and are applicable up until 1980. According to this specification, the typical Japanese would require 2,100 calories of energy, with 70 grams of protein per day among other items. No calculation of domestic SSR in objective terms has been made against these nutritional requirements. However, it is possible to estimate the supply and domestic production of energy and protein from *Shokuryō jukyū-hyō* [Table of demand and supply for food] [3] (see Tables III and IV), and the results indicate that the food supply for calories and protein fully satisfies specified requirements. Only one must subtract from the figures on food in the *Shokuryō jukyū-hyō* losses accruing in the kitchen or on the dining table to arrive at a more accurate food intake.

Calculation of SSRs applying to nutrition is merely an estimate. Generally, sources of nutrition are divided into those of vegetable and animal origins, and there is also the division of nutrients into carbohydrates, protein, and oil and fat. In Japan, animal derived food is further subdivided into livestock and poultry, and marine products. This division is of particular importance. There are two methods of calculating SSRs in energy and protein deriving from livestock and poultry,

TABLE V

PRODUCTION, CONSUMPTION, AND SSR OF GRAINS AND PULSES

(1,000 tons)

	1955	1960	1965	1970	1971	1972	1973	1974	1985
Production:									
Grain	16,160	17,101	15,208	13,858	11,945	12,605	12,658	12,838	13,661
Rice	11,855	12,858	12,409	12,689	10,887	11,889	12,149	12,292	12,110
Wheat, barley, naked barley	3,876	3,832	2,521	1,047	943	608	418	465	1,443
Miscellaneous cereals	429	411	278	122	115	108	91	81	108
Pulses	911	919	646	505	417	510	451	436	727
Grains and pulses	17,071	18,020	15,854	14,363	12,362	13,115	13,109	13,274	14,388
Consumption:									
Grain	18,546	20,680	24,682	28,989	28,189	29,600	31,247	32,133	36,733
Rice	10,745	12,618	12,993	11,948	11,859	11,847	12,078	12,033	12,110
Wheat, barley, naked barley	6,925	6,106	6,319	6,892	6,952	7,157	7,624	7,649	8,401
Miscellaneous cereals	876	1,956	5,370	10,149	9,378	10,596	11,545	12,451	16,222
Pulses	1,766	2,075	2,634	3,894	3,934	4,076	4,196	4,151	5,543
Grains and pulses	20,312	22,755	27,316	32,883	32,123	33,676	35,443	36,284	42,276
SSRs (%):									
Grain	87	83	61	48	42	43	41	40	37
Rice	110	102	95	106	92	100	101	102	100
Wheat, barley, nekad barley	56	63	40	15	14	9	7	6	17
Miscellaneous cereals	49	21	5	1	0	1	1	1	0
Pulses	52	44	25	12	11	13	11	11	13
Grains and pulses	84	79	58	44	38	39	37	17	34

Sources: [2] [6] for 1955–74 and [3] for 1985. In absence of figures on future outlook for miscellaneous cereals, performance for the base year 1972 was tentatively used.
Note: Okinawa Prefecture is included after 1973.

one is to consider that part of livestock and poultry raised on imported feed as part of domestic production and the other is to reject the same portion from domestic production. Table III shows the slight differences in final results arising from this difference in calculation method, and Table IV shows the great variance in SSRs among nutrients. Protein, carbohydrates, and oil and fat decline in SSR in that order, and oil and fat is particularly low. The low figure for protein SSR in Table IV is due to imported feed as well as imported livestock. What raises the protein SSR somewhat is marine products. Japanese animal protein consumption is almost equally divided between livestock and poultry on one hand and marine products on the other. Since livestock and poultry depends heavily on imported feed, lower SSRs would result from removal of livestock and poultry fed on imported feed. The total domestic supply of protein of 52.5 grams (per person, in 1974) consists of 25.8 grams of vegetable protein and 21.5 grams from marine products, leaving only a residual of 5.2 grams supplied by animal protein. This calculation is the domestic SSR of protein food. This basic feature will not change very much in 1985 and these calculations are vital to food security.

We would obtain quite different agricultural foods SSRs for Japan depending on whether we consider TVA, original calorie, or grain and pulse SSRs in quantum terms (Table I). Around 1974, a controversy over SSR calculation arose in the Ministry of Agriculture and Forestry and in other areas as well, partly because of the global food situation, but also because of gross discrepancies from different calculation methods. One argument pointed that it was extremely difficult to calculate livestock and poultry in terms of calories of vegetable origin and that the coefficient 7 in the formula previously shown (p. 422) was rather arbitrary. It was also pointed out that grains and pulses could not entirely represent the food situation and some doubts were raised as to the adequacy of the method of adding grains and pulses in quantum terms. These points were quite justified and are well taken, but it does not lead to the view that only the SSRs of individual items or groups of commodities and the SSRs of TVA are valid.

It is the discrepancies in SSR among TVA, original calories, and grains (and pulses) that show the characteristic features of Japanese agriculture. Agriculture in Japan is characterized by, first, a policy emphasis on paddy rice farming bringing on an extremely low SSRs in grains and pulses other than rice and, in addition to the low SSRs of grains, there is a very small amount of grassland (both permanent and temporary) in comparison to the number of people and livestock, resulting in development, during the postwar era, of livestock raising as a processing industry requiring heavy feed import.

Despite controversies over the methods of SSR calculation and putting aside the possible future of this debate, there were rapidly falling SSRs in all categories from 1955 or 1960 to 1971. There is no room for doubting the validity of this trend. The magnitude of the decline commands attention: 20 per cent in SSR of TVA from 1960 to 1971, 32 per cent in original calories, 49 per cent in quantum term grains, and 53 per cent in quantum term grains and pulses. These sharp drops in SSRs in a little more than a decade probably have no precedent anywhere.

Of the various indices, SSRs of TVA have the mildest declines and those of quantum term for grains and pulses have the most conspicuous drop, with original calories in the middle. The reason for this order of decline is that in calculating SSR of TVA livestock and poultry fed by imported feeds are counted as domestically produced except for subtracting import price terms, while in the calculation of original calory SSR all livestock and poultry fed by imported feeds are excluded. The SSRs of grains and pulses show a direct rise in feed imports and a fall in grain production other than rice, without counting in vegetables and fruits, which are highly self-sufficient. Despite these discrepancies, however, the importance of original calories and grain and pulse SSRs over SSR of TVA is quite evident for food security.

III. INTERNATIONAL COMPARISONS OF SSRs

Before turning to an elucidation of the reasons for precipitous SSR falls and to

an examination of the more recent trend since 1972 of less rapid decline, international comparison of food SSRs should be made. Relative standing in the international setting cannot be ignored if food security is our most important consideration.

Great Britain is well known for a solid calculation of SSR of TVA. It is generally claimed that the SSR of TVA in Great Britain is approximately 50 per cent. It seems that the SSR has been a little bit improved in recent years and for 1971–72 it attains to 52 per cent, yet far lower than for Japan. However, international comparisons of SSRs of TVA present various difficulties. Besides differences in production and consumption structures, there are big differences in relative price structure. For instance, rice and beef in Japan are much higher priced relative to other agricultural products than in other countries, giving Japan a higher SSR of TVA even when the SSR in rice and beef of Japan are approximately the same as of other countries. In comparing Japan and Great Britain, the latter's lower SSR of TVA may not be an indication of the same trend in original calory SSR for certain reasons. One is the grain SSR. In the first half of the 1960s, Japan's grain SSR was higher than Great Britain's, but in the latter half, Great Britain's grain SSR was higher than Japan's. Tables VI and VIII show the

TABLE VI

AGRICULTURAL FOOD SSRS FOR MAJOR INDUSTRIAL COUNTRIES (1973)

(%)

	U.S.A.	France	Nether-lands	Italy	West Germany	U.K.	Japan
Food grains	226	184	52	87	87	74	70
Coarse grains	119	165	15	47	74	71	2
Pulses	97	34	7	87	18	17	11
Vegetables	100	96	189	110	39	81	98
Fruits	97	79	46	120	41	33	83
Milk and dairy products	97	113	254	83	100	61	83
Meat (including whale meat)	97	94	183	69	83	72	78
Eggs	100	102	151	96	83	99	98
Sugar	40	144	103	59	106	37	20

Sources: [2]; OECD, *Food Consumption Statistics, 1975;* for sugar, see *International Sugar Report,* No. 36 (Ratzeburg: F. O. Light Co., 1974).
Note: Pulses for Japan include those used for extracting oil but this is not the case for other countries.

situation in more recent times. Secondly, Great Britain has much more permanent grassland and pasture land than Japan (see Table XI). Thus, it is difficult to believe that Great Britain is worse off than Japan in original calory SSRs.

In comparing various categories of agricultural food SSRs for the principal industrial countries, Japan is in the second lowest position (next to the Netherlands) in food grains and in the lowest position in coarse grains and sugar. Table VI does not mention oil and fat in which Japan does poorly. In other items Japan does not compare very unfavorably with the other industrialized countries.

Delving further into the international comparison of the grain situation, it is readily understandable that the above comparison of major industrial countries will be a target of criticism for its arbitrary choice of countries compared. In Table VII, 103 countries are classified according to the degree of self-sufficiency in food or in food of vegetable origin. In certain countries, the SSR for food of vegetable origin is used as a proxy for total food in terms of energy in calories units.

TABLE VII

CODIFICATION OF COUNTRIES BY DEGREE OF SELF-SUFFICIENCY IN FOOD OR FOOD OF VEGETABLE ORIGIN, 1970–72, WITH COMPARISON

	Surplus		Essential Self-Sufficiency	Moderate Deficit	Significant Deficit	
	SSR>110	SSR>105 and ≤110	SSR> 95 and ≤105	SSR>85 and ≤95	SSR>85 and ≤85	SSR≤75
Developed countries:						
Number of countries	11	—	7	3	2	3
Percentage of countries	43	—	27	11	8	11
Percentage of population	33		38		29	
Developing countries:						
Number of countries	17	5	25	15	5	10
Percentage of countries	22	6	33	20	6	13
Percentage of population	14		72		14	
World (103 countries):						
Number of countries	28	5	32	18	7	13
Percentage of countries	27	5	31	17	7	13
Percentage of population	19		62		19	

Source: FAO, *A Provisional Study of the Measurement and Use of the Concept of Self-Sufficiency* (1975), p. 20.

According to Table VII, 65 countries of the 103 accounted are the essentially self-sufficient or have surpluses while 38 countries have moderate deficits or significant deficits. Among the 38 countries there are 13 countries which depend on foreign imports for over 25 per cent of their food supply. Among these 13, there are only 3 which are industrialized, one of which is Japan.

The 103 countries in Table VII must include ones consuming large amount of food as well as other ones consuming small amounts of food. In respect of food security, it might be better to compare the food SSRs of the former countries.

We now take all nations with a population greater than 1 per cent of the total world population (3,838 million in 1973) in examining grain SSR. Choosing countries by this criterion was made in order to include all those with a grains consumption that would be subject to meaningful measure. Grain consumption does not necessarily correspond to population size but it is an important factor in determining the amount consumed. There are eighteen countries with a population of more than 1 per cent of the world total (Table VIII), representing 73.0

TABLE VIII

GRAIN SSRs FOR MAJOR COUNTRIES

	Population in 1973 (Million)	Percentage of Total World Population	1972–74 Average Grain Consumption (1,000 MT)	Percentage of Grain Consumption	1972–74 Average Grain SSR (%)	1972–74 Average Grain Import (1,000 MT)
World	3,838.0	100.0	1,329,542	100.0		146,348
Group I:						
China	814.9	21.2	227,804	17.1	97.5	8,580
India	574.2	15.0	114,800	8.6	97.3	3,299
Total of nine EC countries	256.4	6.7	119,795	9.0	89.0	36,308
USSR	249.8	6.5	196,933	14.8	95.1	16,091
U.S.A.	210.4	5.5	157,089	11.8	142.2	395
Group II:						
Indonesia	132.5	3.5	25,234	1.9	93.3	1,833
Japan	107.3	2.8	34,009	2.6	47.9	18,111
Brazil	101.3	2.6	26,193	2.0	92.5	2,478
West Germany	62.0	1.6	27,274	2.0	78.3	8,045
U.K.	55.9	1.5	23,423	1.7	67.0	7,697
Italy	54.9	1.4	23,526	1.8	69.1	8,141
France	51.1	1.3	26,152	2.0	158.6	756
Group III:						
Bangladesh	83.3	2.2	19,517	1.5	89.2	2,103
Pakistan	68.4	1.8	12,813	1.0	95.7	1,126
Nigeria	59.6	1.6	7,755	0.6	94.9	398
Mexico	56.2	1.5	15,799	1.2	88.6	1,984
Philippines	42.2	1.1	8,566	0.6	87.7	1,052
Thailand	39.9	1.0	12,462	0.9	125.8	94
Turkey	38.6	1.0	17,195	1.3	99.7	271

Sources: FAO, *Production Yearbook, 1974,* and [1, 1975].

Notes: 1. Grain consumption=grain production+import−export.
2. SSR=grain production/grain consumption×100.
3. Grain import refers to gross imports not net import.
4. The total of the nine EC countries is the aggregate of all these countries, and, thus, total imports include imports from countries within the community.
5. Rice here is unhulled, accounting for the considerable discrepancy in Japan's SSR from that of Table I.

per cent of world population and 73.5 per cent of estimated total grain consumption.

These countries can be classified into three groups by estimated grain consumption: Group I, countries with a very large grain consumption at over 100 million tons; Group II, countries consuming less than 100 million but more than 20 million tons; and Group III countries consuming less than 20 million but over 5 million tons. Although all countries consuming more than 20 million tons must be included in the eighteen here, there may be others with grain consumption greater than 5 million tons.

Making slight modifications in the codification of Table VII and examining the eighteen countries in terms of categories of self-sufficiency the following comparative rates are derived:

abundant surplus (SSR>110 per cent);
moderate surplus (SSR>105 and $\leqslant$ 110);
essential self-sufficiency (SSR>95 and $\leqslant$ 105);
moderate deficit (SSR>85 and $\leqslant$ 95);
significant deficit (SSR>75 and $\leqslant$ 85);
serious deficit (SSR<75).

The countries in Group I (except for EC nations) all have either abundant surplus or are essentially self-sufficient. The countries in Group II are more divergent. However, if we group West Germany, Great Britain, Italy, and France together in the EC, we find that besides the EC in Group I, Brazil and Indonesia have moderate deficits, with only Japan having a serious deficit. All Group III countries have either abundant surpluses, are essentially self-sufficient, or have moderate deficits, and none have significant or serious deficits.

In addition to Japan, as individual countries, Great Britain and Italy have serious deficits, and West Germany has a significant deficit. But these countries all belong to the EC, and Japan's SSR is far lower than any of them.

IV. FACTORS IN THE DECLINE OF AGRICULTURAL FOOD SSR

For what reasons and under what conditions did Japan's agricultural food SSR decline? An answer to this question is essential in order to devise policies for improved SSRs.

First, mention should be made of the dietary improvements in Japan which began around 1955, leading to what was called a "Westernization of the diet" during the 1960s. This improvement meant not only increased intake but changes in calorie and protein sources, as clearly shown by Table IX. Changes were greater from 1955 to 1973 than they were between 1934/36 and 1955. Such a violent transformation in diet called for expanded production and structural changes in Japanese agriculture. However, production expansion and structural change were not sufficient to meet requirements. Declining food SSRs are a result of agriculture's failure to respond to improved dietary patterns.

According to Table IX, calorie supply as a whole increased, with the share of starch going down slightly while the share of energy of animal origin, from sugars, oil and fat went up. There is also a rise in the total supply of protein as well as a rapid increase in animal protein and, in particular, that from livestock and poultry. But, agricultural production failed to adequately respond to the new dietary pattern. In terms of energy supply, per capita consumption of rice turned slightly downward beginning in 1973 despite growing total production, and wheat had a slight per capita increase in consumption but the trend in production continued downward until 1972. The rate of consumption of livestock and poultry as a source of animal protein is rapidly growing, per capita egg consumption rose until 1970, and consumption of milk and dairy products climbed until

TABLE IX

CHANGES IN PER CAPITA CALORIE AND PROTEIN SUPPLY IN JAPAN

	Calorie Supply	Percentage Components				Protein Supply (grams)	Percentage Components		
		Starchy Origin	Animal Origin	Sugar	Oil and Fat		Animal Origin	Out of Which Livestock and Poultry	Out of Which Marine Products
1955	2,217	77.2	6.1	5.8	3.0	65.7	25.7	5.2	19.8
1965	2,408	74.1	10.4	8.2	6.7	73.7	36.4	14.1	20.5
1973	2,522	63.4	13.7	11.8	10.7	79.2	43.7	21.3	21.4
1974	2,502	52.0	13.9	11.4	11.2	79.1	44.2	21.4	22.8
1934/36	2,026	77.2	4.6	6.6	1.1	52.2	13.4	3.8	9.2

Source: [2].

TABLE X

DEGREES OF CONTRIBUTION TO LOWER SSRs OF TVA BY ITEM
(Estimates for the Period 1960–73)

	Production Factor (1)	Demand Factor (2)	Fluctuations of SSR of TVA (1) + (2) = (3)	Degree of Contribution as Component of (3)
Grain total	Δ3.8	Δ4.1	Δ7.9	41.8
Rice	Δ1,4	0.9	Δ0.5	2.7
Wheat, barley, and naked barley	Δ2.2	Δ1.0	Δ3.2	16.9
Miscellaneous cereals	Δ0.2	Δ4.0	Δ4.2	22.2
Pulse	Δ0.7	Δ2.4	Δ3.1	16.4
Livestock and poultry	13.2	Δ15.4	Δ2.2	11.6
Fruits	5.3	Δ8.0	Δ2.7	14.3
Sugar	0.6	Δ2.2	Δ1.6	8.5
Others	2.0	Δ3.4	Δ1.4	7.4
Total	16.6	Δ35.5	Δ18.9	100.0

Sources: Estimate by Research Section, Agriculture and Forestry Minister's Secretariat, based on [2], cited in Nōrin-tōkei-kyōkai [Association of agricultural and Forestry statistics], ed. *Shōwa 49-nendo nōgyō hakusho fuzoku tōkei shiryō* [The agricultural white paper for 1974, attached statistics] (Tokyo: Nōrin-tōkei-kyōkai, 1975).
Note: Δ=minus.

1973. Production of these items kept pace with rising demand but only at the cost of increasing feed imports. Sharply rising demand for oil and fat, provided a stark contrast to the rapid, continual fall in the production of rapeseeds and soybeans. These phenomena had a direct impact on the degree of self-sufficiency.

Table X is a summary of these production and demand factors in terms of their contribution in lowering SSRs for individual items or groups of items. For wheat, barley, and naked barley, which had a considerable influence in lowering SSRs, the fall in production was conspicuous. But for other items the growing demand exerted a stronger impact than drops in production. Demand increased

most rapidly for miscellaneous grains, wheat, barley, and naked barley, pulses, fruit, livestock and poultry in that order.

Grains and pulses alone contributed as much as 58.2 per cent to lowering SSRs. In this connection attention must be given to falling production in these items and to the trade liberalization of feed grains (1951) and soybeans (1961). Feed grains were all regarded as inputs for domestic agriculture and were exempted early on from customs duties. Liberalization of soybean trade (1961) and abolition of tariff on it (1972) as well were put into effect due to requests from the United States within the context of the Japan-U.S. trade relations (the United States in 1973, however, placed an embargo on soybean exports to Japan and other parts of the world). The Agricultural Basic Law (*Nōgyō kihon hō*) of 1961 envisioned expanding demand for miscellaneous grains and soybeans but failed to give any measures for increased production in feed grains. Nor could this law give much expectation for a greater soybean production. There was a price support scheme for soybeans, but nothing to successfully maintain the level of production. The situation for wheat, barley, and naked barley was somewhat different. These items were considered the second most important staples source of starch (after rice) and enjoyed a price support scheme under government control. There was an excess supply of barley and naked barley around 1960, because the demand for them as food declined while they were not even considered as a feed source due to the import of far cheaper maize. At the same time, a growing amount of funds was needed to support not only barley and naked barley but wheat prices as well. Thus, the government did not exert much effort to increase production growth in wheat, barley, and naked barley as it did with rice. Nor did it give price support to as favorably as it did for rice. Except in certain limited areas farmers gradually lost interest in growing these starchy source items.

Rice received very favorable treatment. The producers' price was supported at levels which took into account the cost of the family hands as equivalent to wages in manufacturing. Considerable public investment was given to improve paddies. While production went up, total demand stagnated, resulting in overproduction. The price of rice to the producers is about four times that of Thailand (16,572 yen for 60 kg in Japan in 1976), and the price that consumers pay is approximately three times that of Thailand. Rice produced under these conditions holds Japan's SSR for grains and pulses up to 37 per cent (1974).

SSR for livestock and poultry is on a slight downward path, but the deficit is not great. On the contrary, feed grains are almost wholly dependent on foreign import. Feed is of two kinds: concentration feed made up principally of feed grains, and roughage mainly comprising green feed and forage crops. The latter, important for grass-eating livestock, such as dairy and beef cattle, usually is supplied by domestic sources but not so in Japan, which is poor in grassland.

As long as agriculture uses the biological productivity of soil and as long as the main basis of food production is grain and livestock, a certain amount of agricultural land is an essential element in a nation's agriculture. This problem is one of the relative balance between total population and size of agricultural

TABLE XI

TOTAL POPULATION AND AGRICULTURAL AREA IN MAJOR COUNTRIES

	Total Population (1,000)	Agricultural Area				Year
		Arable Land and Land under Permanent Crop		Permanent Grassland and Pasture		
		Acreage (1,000 ha)	Per Capita Acreage (ha)	Acreage (1,000 ha)	Per Capita Acreage (ha)	
World	3,834,135	1,474,863	0.38	3,005,002	0.78	1970
France	50,775	19,101	0.38	13,934	0.27	1972
West Germany	61,290	8,093	0.13	5,386	0.09	1972
Italy	54,489	12,311	0.23	5,203	0.09	1972
Sweden	8,120	3,031	0.37	703	0.09	1972
U.K.	56,122	7,222	0.13	11,523	0.21	1972
USSR	247,460	232,431	0.94	375,300[a]	1.52	1972
Canada	21,600	43,767	2.03	24,896[b]	1.15	1971
U.S.A.	202,680	191,053	0.94	244,277	1.21	1969
Mexico	50,710	27,469	0.54	69,789[c]	1.38	1970
India	550,822	165,680	0.30	13,000	0.02	1971
Japan	108,430[d]	5,615	0.05[e]	242	0.00	1974
Korea	31,343	2,311	0.07	18	0.00	1969
Australia	12,768	44,771[f]	3.51	454,768	35.62	1971

Source: Ministry of Agriculture and Forestry, Statistics and Information Department. *Nōrin suisan tōkei* [Statistics of agriculture, forestry, and fisheries], 1976 ed. (Tokyo: Nōrin-tōkei-kyōkai, 1976).

[a] Reindeer grassland is excluded.

[b] Area of natural grassland are waste land at the time of the 1971 agricultural census.

[c] Refers to agricultural holdings.

[d] 1973.

[e] 1970.

[f] Out of this acreage, 27,707,000 ha is cultivated pasture.

land. No adequate data exist to make international comparisons of this balance, but Table XI may serve some purpose, showing how poor Japan is in agricultural land. Japanese agriculture had fed its population in these unfavorable land conditions by technology, labor intensive cultivation, and increased use of fertilizers. However, even before World War II, Japan's landmass was insufficient to provide enough food for its population. During the past twenty years, a slowly but still growing population and rapid change in food demand pattern have come to the point that this demand has exceeded Japanese agricultural capacity. Naturally, various policies might have been tried, such as those dealing with private ownership of agricultural land, farming scale, and fiscal spending for agriculture, which may have totally upset the already serious imbalance in land and population. Such policies, however, are not fully considered, nor are their directions ever clear.

Exhausting an examination of all conceivable factors working for a trend of lower SSRs, the question then arises of just what causes the seeming halt in SSRs

decline from 1972 to 1974 (Tables I and II). To find the answer, a multiplicity of interacting factors would have to be examined.

First, the decline in rice consumption started to slow down in 1972. Second, wheat and barley production continually declined until 1973, but seems to have slightly increased since then. Third, soybeans were produced in continually declining volume until 1973 but this trend seems to have stopped by 1974. Pulses other than soybeans, and miscellaneous grains, continue to decline in production. Fourth, per capita sugar consumption started to grow at a slower rate in 1971, while production has stagnated. Fifth, the rate of fruit consumption has levelled off since 1972. Sixth, per capita milk consumption has been at the same level since 1970. Milk demand changed from a rapid to a mild increase around 1970, while production has been at the same level since 1972. And lastly, the number of beef cattle hit its lowest level in 1967 but increased until 1974 when it levelled off.

The result of such divergent phenomena is an apparent change in demand and supply for food in the 1970–74 period. There was a halt of sharp fall in the production of certain items and lower rates of increase for items for which the demand had been rising very rapidly. Behind these changes was most certainly a slower rate of growth in the aggregate Japanese economy as it changed gears from high to stable growth, coupled with high inflation rates in 1973–74. The tightened world food market in 1973–74 must also be mentioned in this connection. The question now is whether the halt of declining food SSR in Japan will develop into a reverse trend of rising SSR or will it be followed by a resumption of the earlier trend, albeit more slowly.

V. POSSIBILITIES OF RISING AGRICULTURAL FOOD SSR

As Japan's food SSR continued to decline and the world market became tighter in 1973, the government made its Long Term Prospect of Agricultural Demand and Supply [3], a demand and supply forecast for agricultural food for the years up to 1985 with 1972 as the base year. Generally speaking, its approach to demand is almost wholly in objective terms while that for production is more or less in hopingly or politically adjusted terms, although it does not always try to overcome various factors acting to make SSR decline that were pointed out in the previous section and other difficulties facing Japanese agriculture. In this sense, it is a realistic document which posits the following, though. First, since rice still may be superfluous, production must be held down in order to maintain 100 per cent self-sufficiency. Second, production of wheat, barley, and soybeans must be increased as much as possible to improve SSR. Third, there is no forecast for miscellaneous grains and feed (see note to Table V). Fourth, the 1970–73 performance in vegetable, fruit, milk and dairy products, and meat in SSRs (Table II) must be maintained. Fifth, the sugar SSR must be raised by greater production of beet and cane, particularly sugar beets. Sixth, the plan has almost no intention to improve the SSR of oil and fat (see Table XII).

As a result of these forecasts and plans, there will be a slight improvement in

TABLE XII

DEMAND AND PRODUCTION OF AGRICULTURAL FOODS OTHER THAN GRAINS AND PULSES

(1,000 tons)

	1972			1985		
	Domestic Consumption	Domestic Production	SSR (%)	Domestic Consumption	Domestic Production	SSR (%)
Tea	104	95	91	129	125	97
Vegetables	16,041	15,837	99	20,136	20,136	100
Fruits	7,894	6,420	81	10,416	8,789	84
Sugar	3,052	621	20	3,821	1,064	28
Oil and fat	1,533	352	23	2,240	370	17
Milk and dairy products	5,719	4,944	86	8,142	7,680	94
Meat	2,147	1,730	81	3,193	2,747	86
Beef	367	290	79	625	508	81
Eggs	1,848	1,811	98	2,206	2,205	100

Source: [3].

Note: See Table II for grains and pulses.

SSR of TVA from 73 per cent in 1972 to 75 per cent in 1985. No SSR of aggregate original calories is published, but it will also improve from 53 per cent in the base year to 56 per cent in the target year: One factor may be a greater production of roughage of good quality such as pasture grass. On the other hand, the SSR of grains will decrease from 43 to 37 per cent (Table I).

There is criticism of this official prospect which says that "it fails to make enough efforts to materialize the latent possibilities in Japanese agriculture, which is most important for improved SSRs. Rather the official projection undermines such possibilities" [5, p. 23]. According to this line of criticism, the per hectare yield of rice will not be 4,850 kg (brown rice) as envisaged in official forecasts but enhanced to 5,500 kg, giving a surplus of 300,000 ha. which can be used for maize. The criticism also wants to call off projected diversion of 700,000 ha. of agricultural land, but maize should be grown there so that 5 million tons of maize can be harvested. Second, the criticism contends that surplus rice paddy of 300,000 hectares can be used during the winter season for barley to be used as feed, which will give a harvest of 1,200,000 tons. Third, the per unit yield of wheat, barley, and naked barley can be increased to raise total production by 1,700,000 tons. The criticism concludes that the SSR of grains can be improved from what is officially forecasted to 58.6 per cent by the added 8,900,000 tons of production.

It might not be impossible, but it will be extremely difficult, to achieve a grain SSR of 58.6, almost 60 per cent, in 1985. Many measures proposed to reach the target will not be easy to implement. From the viewpoint of food security at least it is not acceptable to depend on such prospects in excessively hopingly adjusted terms. Even the official prospect in which the production is in only moderately adjusted terms, will not be easily implemented. For instance, the demand for rice may very well be smaller than the official forecast by as much as 500,000 tons. Also, however desirable it may be to produce more wheat and barley, the

amount of increase may well be short of the official forecast by around 200,000 tons for wheat and 400,000 tons for barley. Third, production of soybean pulses may slightly increase, although not as much as the official forecast says they will. However, production of other pulses may continue to decline. As a result, the total pulse production may be around 400,000 tons, which is lower than the government forecast by 300,000 tons. Fourth, it is doubtful if fruit other than tangerine oranges and apples can be produced in greater amounts. Total production may be 1,000,000 tons lower at 7,800,000 tons. Fifth, in order to attain the government's target of 7,680,000 tons of milk and dairy products, it will be necessary to increase the number of cattle from the 1,780,000 of 1972 to 2,567,-000 by 1985. Is this possible? The number of cattle may be about 2,000,000 and total milk and dairy products production at around 6,000,000 tons in the target year. Sixth, beef production is forecast to increase from the 290,000 tons of 1972 to 508,000 tons and cattle from 1,749,000 to 3,305,000 head. However, it may be more difficult to increase the number of cattle for beef than for milk. With an expected increase in raising dairy-steers, the number of cattle in the target year may be around 2,500,000 and meat production less than 400,000 tons. Seventh, if these estimates of mine on the number of cattle for milk and beef are more or less correct, feed import will be less than the official estimate. If the demand for concentrated feed decreases in correspondence with the smaller number of beef and milk cattle in the target year, and if feed imports also go down, the margin of import drop would be 1,350,000 tons.

Taking all these points of my estimates into account in calculations, the new agricultural food commodity SSRs would be around 70 per cent, lower than what is given in the official projection. Only the SSR for grain would remain at 37 per cent. SSR for the grain and soybean total would be 32 per cent, slightly below the official figure.

The SSRs for agricultural foods in Japan went down rapidly during the 1960s, but, by 1971 they seem to have stopped their decline. But, according to my analysis, the downward trend will continue until 1985 although at a slower rate, even with certain efforts made to avoid such downward trends.

VI. NUTRITION AND LOWER SSRs

Having examined the present and future downward trend of SSRs from the viewpoint of food security, various latent problems of serious nature are evident in demand and supply for food in Japan. How severe are the problems in the context of nutrition.

The domestically produced per capita calorie supply is on the order of 1,400 (refer to figures with asterisk in Table III). A supply of approximately 1,400 calories a day is only adequate for the energy needs of a four-year old child, and is what the basal metabolism of a twelve or thirteen year old requires.

The domestic supply of protein per person is 52 to 53 grams (Table IV), only adequate for children aged five. The highest protein levels which are required

by males and females twelve to fifteen in age is as high as 85 grams and 80.9 grams.

The average Japanese nutritional requirement is 2,100 calories of energy and 70 grams of protein. These figures, however, should be the amount actually taken in, while the figures shown above are only the amounts supplied. A certain percentage of the supply must be discounted to arrive at actual intake in order to account for losses in the kitchen or on the table. Of the three basic elements of nutrition, carbohydrate, protein, and fat, the SSR of fat is lowest, carbohydrates are next, and protein is highest. However, for food security the protein SSR commands highest priority.

Along with the amount of supplied calories, the amount of supplied protein is adequate to meet demand in terms of nutrition. However, protein supply is not firm.

The 79.1 gram total of protein (1974) is supplied from three sources: vegetable, such as rice, wheat, and soybeans (43.4 grams); animal, such as milk, meat, and eggs (17.0 grams); and seafood (18.7 grams) (see Table IV). No major change is forecasted in the official prospect, except for an increase in per capita supply and greater emphasis on animal protein, following the past trend. Each of the three sources of protein has its own salient features. In terms of SSRs, seafood commands 115.0 per cent of its rate for 1974, vegetable protein 54.4 per cent, and meat protein 21.1 per cent, and this order of SSRs will remain unchanged in 1985.

Problems with vegetable protein are quite similar to those associated with grains and pulses and a discussion of these problems can be omitted. Supply of protein from livestock and poultry and from marine products, on the other hand, presents more or less variant problems: the problem of feed for livestock and poultry; and the law of the sea for marine products.

The official prospect envisages a rise in SSR of feed from 45.9 per cent in 1972 to 50.6 per cent in 1985 (see Table XIII). Before examining the feasibility of improved SSRs, the method of calculating SSRs must be examined, because of the great variance in results depending on calculation method.

TABLE XIII

SSRs OF FEED

(%)

	Supply Rate of Roughage $\left(=\frac{\text{roughage supply}}{\text{total feed supply}}\right)$	SSR of Concentrated Feed			Feed SSR	
		(1)	(2)	Out of Which SSR of Grains	(1)	(2)
1972	23.4	36.3 (29.7)	20.3 (13.8)	13.7 (3.0)	51.2 (45.9)	39.0 (37.2)
1985	31.0	28.3	12.2	3.8	50.6	39.4

Source: [4].

Note: Figures in parentheses represent the case that surplus rice is excluded from calculation. Column (1) shows produce by imported materials considered as domestically produced; column (2) produce by imported materials not considered as domestically produced.

The 45.9 per cent 1972 feed SSR, as shown in Table XIII, results only when feedstuffs derived from processing imported agricultural products are considered to be domestically produced and when the portion of surplus rice going for feed production is excluded. If the portion of feedstuffs derived from processing imported agricultural products is excluded from the domestic product category and the surplus rice used for feed is included in the same category, the SSR for feed in the base year 1972 is 39.0 per cent (see column [2]). The corresponding figures for the target year 1985 is 39.4 per cent, or roughly the same, although at a low level. However, the same method of calculation applied to concentration feed results in extreme aggravation of the situation from 20.3 per cent in 1972 to 12.2 per cent in 1985 (Table XIII). This undesirable picture is due to a complete lack of effort to increase domestic production of concentration feed or feed grains in the government's prospect and also to the nonuse of surplus rice as feed. The prospect then "expects," in order to avoid a drop in the SSR of aggregate feedstuff as well as a large increase in the imports of feed grains, a stepped-up production of good-quality roughage (green feed and forage crops) (see Table XIV).

TABLE XIV
FEED DEMAND AND SUPPLY BALANCE (ON TDN BASE)

(1,000 tons)

	Feed Demand	Supply							
		Roughage			Concentrated Feed				
		Total	Good Quality	Poor Quality	Total	with Materials Domestically Produced	Imports		
							Total	Materials Imported	Imports
1972	20,253	4,739	2,907	1,830	15,516	3,153	12,363	2,475	9,888
1985	29,878	9,269	7,648	1,621	20,609	2,511	18,098	3,326	14,772
1985/1972 (%)	147.5	195.7	263.1	88.5	132.8	79.6	146.4	134.4	149.4

Source: [4].

In order to attain production increases in feed and forage crops, according to the prospect, planted area is supposed to increase from 768,000 hectares in 1972 to 1,469,000 hectares in 1985, along with improvements in the per unit yield. It will not be easy to achieve these targets, and to the extent that these targets fail to be met either more milk and beef must be imported or larger inputs of feed grains will have to substitute for roughage.

The traditional source of protein in Japan, seafood is shown in SSR terms in Table XV. The figures for demand in 1985 are simple extrapolations of previous consumption trends (but consumption of whale meat is fixed at the 1972 figure). Production in 1985 takes into account development of new fishing zones and improved littoral facilities (production of whale meat is again left at the 1973 level). The table can be summarized by saying that demand is projected in objective terms by extrapolating past trends but production is envisaged in hopingly adjusted terms by categories of fish and fishing methods.

TABLE XV
FISHERY PRODUCTS SSRs

	1972 (1,000 tons)	1985 (1,000 tons)	1985/1972 (%)	Annual Fluctuation (%)
Demand	11,252	14,754	131.1	2.1
Portion of demand intended for feed and fertilizer	2,429	4,001	164.7	(3.9)
Production	10,376	11,953	115.2	1.1
SSR	101%	95%		
Per capita net food per year	35.7 kg	42.4 kg	118.8	1.3

Source: [3].
Note: SSRs are given on aggregate basis in price terms.

In the demand structure of marine products, the volume used as fish paste, feed, and fertilizer has been increasing. This is wasteful utilization of important food resources. The rates of protein production to fish volume used for food alone is as low as 9.6 per cent (in 1973). Not much thought is being given to more effective use of these resources. On the other hand, the production forecast seemingly fails to take into account the vocal claims for sovereignty over the ocean by coastal states particularly that of the 200-mile economic zone issue. Despite a great degree of uncertainty over the issue and apparent difficulties in taking such factors into account, it must not be forgotten that Japan total catch in areas covered by 200-mile economic zones is 4,500,000 tons.

If the previous trends of consumption are to be maintained and production suffers from difficulties in trying to coordinate activities with coastal nations, then generally shrinking demand and supply relations and lower SSRs for Japan will be unavoidable. This would place greater stress on livestock and poultry as protein sources but this would come not from domestic goods but from imports.

In the future, we will need to not only more effectively use existing agricultural and fishery resources but also to develop new sources of protein utilizing micro-organisms, and at the same time, move ahead with domestic institutional improvements to attain more grassland.

VII. DECLINING SSRs AND FOREIGN DEPENDENCE

Declining SSRs are synonymous with greater dependency on foreign countries, and foreign dependence has a greater degree of uncertainty than of domestic supply, because of disturbing incidents arising from acts of belligerency and diplomacy, although domestic supply is beset with uncertainties such as drought.

So far in the discussion of SSRs no major disruptions of order have been assumed. If a total embargo of grains or pulses for instance is hypothesized, it would be quite impossible to even maintain the aforementioned SSRs by domestic supply, because imports of other input materials needed to maintain SSRs and

distribute produce would also stop. Although such possibilities cannot totally be ruled out, they are not very likely and at least some of factors then would be under Japan's control.

There is, however, a good probability of partial embargo or export control by countries exporting food to Japan.

The world food situation, distinctly different from that prior to 1972, is such that exporting nations have declining stockpiles, the giant consumer such as the USSR now keenly feel the difficulty of adjusting demand to crop failures by killing livestock and the threat of inflation is ever present in the world. Also, there is a good possibility of workers striking to prevent food exports or the government setting export restrictions to avoid domestic inflation, particularly eventual shortage of food in exporting countries. The degree of probability seems to be such that it would call for a continual guard with adequate emergency measures for food security in importing countries. Even in normal times, countries like Japan would have to bear certain burdens to maintain, let alone improve, SSRs. But when SSRs are dangerously low for basic foods as they are now, maintenance of food security calls for special burdens on the national economy under separate items: domestic stockpiling, participation in international stockpiling, international cooperation in overseas agricultural development projects, and others.

In this connection, the relation between free trade and export restriction should be examined. Free trade is usually the opposite of import restriction rather than export restriction.

As is well known, the principle of GATT is to make it very difficult for countries to restrict imports of commodities which are liberalized but easy for countries to temporarily restrict exports of the same commodities in order to avoid or ameliorate critical domestic shortages of those commodities. There is no international, multilateral frame of reference to control the right of export control, so to speak, at a time when exporting countries are able to get the upper hand over importing countries. This is not an age of global food surplus.

Japan is the world's largest importer of grains. Japan surpassed Great Britain in 1964, and has been in that position ever since except for temporary replacement by the USSR in 1973. Table XVI shows the conspicuous rise in Japan's position as a grain importer. Both import volume and import value have come to occupy a dominant portion of the world grain and pulse trade (Table XVII). This implies that Japan should share in the international burden for fostering the trade and increasing the production of grains and pulses, but, at the same time, it tells us how easily Japan's food situation may be affected by changes in world grain production and trade.

Japan's income elasticity of grain demand was 0.238 for the 1955–72 period (with a correlation coefficient of 0.982). The per capita growth rate in demand for grain was 1.6 per cent. Taking the rate of population increase during the same period into account, the aggregate growth rate of grain consumption was 2.8 per cent a year. The growth rate of grain consumption from 1972 to 1985 will be only 1.7 per cent a year according to the official prospect, due to an estimated lower income growth and lower income elasticity of grain consumption

TABLE XVI

CHANGES IN GRAIN IMPORTS IN MAJOR COUNTRIES (1,000 tons)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
World total	67,273	77,372	82,799	87,666	98,826	102,390	112,489	102,855	102,275	97,168	112,102	118,230	131,321	158,845	148,879
France	753	864	1,228	1,292	1,319	1,568	1,481	1,315	1,117	1,194	1,043	798	709	905	654
West Germany	5,077	5,474	7,706	4,906	5,702	6,453	6,729	6,790	6,267	6,295	7,890	8,186	8,597	8,385	7,154
Italy	3,012	5,044	3,763	4,901	4,795	7,143	7,875	7,143	7,633	7,087	6,556	7,603	7,603	8,721	8,100
U.K.	9,231	9,046	10,376	8,781	8,469	8,965	8,461	8,391	8,300	8,965	9,660	9,071	8,539	7,782	7,580
India	5,145	3,826	4,043	4,756	6,465	7,820	10,375	9,379	5,989	4,266	4,212	2,462	6,855	3,793	5,418
USSR	774	730	413	3,631	8,995	7,015	8,470	2,876	2,230	1,243	2,832	3,971	16,161	24,379	7,733
Japan	4,362	4,974	5,575	7,111	8,818	10,262	11,139	11,952	12,574	13,581	15,578	14,994	16,168	18,608	19,557

Source: FAO: *Trade Yearbook*, 1965, 1971, and 1974 ed.

TABLE XVII

JAPAN'S SHARES IN WORLD TRADE OF MAJOR GRAINS (1,000 tons, $ million)

		1960		1965		1970		1971		1972		1973		1974	
		Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Grains (Total)	World a	67,273	4,750	102,390	7,654	112,102	8,514	118,230	9,328	131,321	10,072	158,845	17,463	148,879	26,410
	Japan b	4,362	287	10,262	761	15,578	1,023	14,994	1,063	16,168	1,051	18,608	1,936	19,557	3,327
	b/a (%)	6.5	6.0	10.0	9.9	13.9	12.0	12.7	11.4	12.3	10.4	11.7	11.1	13.1	12.6
Wheat*	World a	31,634	2,225	55,554	3,970	54,943	3,937	57,602	4,303	61,078	4,615	77,826	8,066	65,037	12,181
	Japan b	2,678	177	3,652	251	4,685	318	4,872	347	5,150	362	5,386	659	5,377	1,207
	b/a (%)	8.5	8.0	6.6	6.3	8.5	8.1	8.5	8.1	8.4	7.8	6.9	8.2	8.3	9.9
Maize	World a	12,110	711	23,824	1,590	29,042	2,009	30,938	2,286	38,020	2,605	47,049	4,606	48,797	6,904
	Japan b	1,354	81	3,434	231	6,018	407	5,007	369	6,052	379	7,771	738	7,940	1,194
	b/a (%)	11.2	11.4	14.4	14.5	20.7	20.3	16.2	16.1	15.9	14.5	16.5	16.0	16.3	17.3
Soybean	World a	5,151	474	6,629	711	12,234	1,353	12,613	1,600	13,737	1,836	14,718	3,182	17,499	4,556
	Japan b	1,128	107	1,847	226	3,244	366	3,212	426	3,396	475	3,635	769	3,244	881
	b/a (%)	21.9	22.6	27.9	29.3	26.5	27.1	25.5	26.6	24.7	25.9	24.7	24.2	18.5	19.3

Source: See Table XVI. * Wheat and flour in wheat.

despite the same population growth rate of 1.1 per cent a year. World grain consumption will naturally grow more rapidly, at 2.4 per cent a year according to an estimate by FAO and 2.2 to 2.8 per cent according to four estimates by the U.S. Department of Agriculture for the period from 1969–71 to 1985 [7, p. 36].

Despite the lower than world average growth rate of grain consumption for Japan, this country will import grain at the growing rate of 2.3 per cent a year from 1972 to 1985, according to the official prospect. If world grain trade grows at a faster pace, Japan's share will decrease. However, there are no prospects for such rapidly expanding world grain trade. Many countries intend to raise their food SSRs, and the policy objective of higher SSRs for basic foods for developing countries is accepted as a valid goal at various international conferences. This almost precludes the possibility of Japan's having a drastically smaller share of world grain trade.

Under these conditions, certain things must be studied and carried out for both Japan's food security and international responsibility: (1) to attain higher degrees of self-sufficiency through domestic agriculture and fisheries; (2) for the animal protein supply, to make more effective uses of marine products, improve fishery operations and compare feed input with livestock imports; (3) to achieve greater stability in food imports; (4) to cooperate with overseas agricultural and fishery development; and (5) to acquire a better information system on world food demand and supply and international food stockpiling.

Some of these items have already been discussed, the first in the section dealing with the possibility of higher agricultural food SSRs. It remains to be added that a giant importing nation such as Japan must raise its SSRs not only for national interest but for a contribution to greater balance in the world food market, particularly in the long run. The second item is also taken up in the section dealing with declining SSRs and nutrition.

Dealing with the remaining items; first, with respect to greater stability in food imports, we must say that Japan's acting as a stable importer is a factor contributing to improving stability in securing imports and enabling supplier countries to depend on Japan as an export market. Japan cannot be a reliable buyer by making sudden purchases of great volumes and suddenly suspending import. This criticism was once or twice leveled at Japan's beef imports. Grain items which come under the food control system may be more susceptible to stable import, but feed grains cannot be bought in a stable amount under the present system. Feed grains need to be considered like as food grains and placed partially under state control. The same applies to soybeans. Furthermore, import agreements may be needed between selling and buying countries, and half of the grain and soybean imports may be regulated by bilateral agreement. Approximately 40 per cent of the grains and pulses consumed in Japan are domestically produced, and foreign resources make up the remaining 60 per cent of demand (30 per cent and 70 per cent respectively for the target year). The idea is to place a half of the foreign imports, i.e., 30 to 35 per cent of total Japanese consumption under the jurisdiction of such agreements. Beef can be thought as being in the same category.

Japan's cooperation with overseas agricultural and fishery development must be dramatically strengthened and should emphasize development projects. Developing nations first come to mind as partners, but we must always be ready to search for appropriate projects in and cooperate with more industrialized countries. We must never separate technology from capital nor the private from the public sector in these endeavors.

Last, the need for an information system on world food demand and supply is well recognized and the first steps have been taken to establish just such a system. However, the international food stockpiling scheme, which is not stockpiling of food by and under the control of an international agency but only international coordination of individual countries' stockpiles, is not clearly envisaged as such yet. There are various problems, including relations between exporter and importer countries, relations with international commodity agreements, relations between aid to developing countries and stockpiling, and the actual content of international coordination. At any rate Japan should play a leading and positive role in the discussion and execution of an international stockpiling scheme.

VIII. DEPENDENCE ON THE UNITED STATES FOR GRAINS

With food security as the perspective, a conspicuous feature of Japan's food situation is that of all supplier countries there is a particularly dependence on the United States for grains. Japan is dependent on the United States for the most grain (except barley) and pulse imports. Table XVIII shows that Japan's dependence on the United States for grains and pulses in 1972–74 was 67 per cent. Since domestic supply in the same period was 37 per cent of consumption, 63 per cent of grains needs were imported (Table V), and (67 per cent × 63 per cent ≒) 42 per cent of Japan's total grain and pulse consumption came from one country, the United States. Thus, Japanese depend more heavily on the United States than on their own country for both direct and indirect grain and pulse consumption. In 1972–74 average domestic production of grains and pulses in Japan was 13,165,000 tons, with average imports of 14,055,000 tons of grains and pulses from the United States. This indeed is a surprising feature.

There is an expression "food power" corresponding to food security. It describes the supply capacity of the United States in grain and other food items. There is only a limited number of food exporting countries in the world (see Table XIX), and the United States has an overwhelming position (except in rice) among them.

The term "food power" has become popular in relation to OPEC oil strategy. In addition to Japan's vulnerability vis-à-vis the OPEC countries, it is probably most vulnerable to U.S. food power. Naturally this does not necessarily mean that the United States is going to use its food power but that Japan is bound to acutely feel the pressure of U.S. food power.

It is true that the United States is dependent on Japan for agricultural exports, and Japan is dependent on the United States for agricultural imports. However, the degree of dependency is far higher for Japan than the United States. Tables

TABLE XVIII

SOURCES AND VOLUMES OF JAPAN'S AGRICULTURAL IMPORTS

(1,000 tons)

		1972	1973	1974	1975
Wheat:	Total	5,148	5,386	5,377	5.654
	U.S.A.	2,545	3,616	3,025	3,004
	Canada	1,236	1,450	1,488	1,476
	Australia	1,367	183	830	1,174
	Others	0	137	34	0
	U.S.A./total (%)	49.4	67.1	56.3	53.1
Barley:	Total	1,004	1,322	1,418	1,598
	Canada	666	859	716	978
	Australia	333	267	619	619
	Others	5	196	83	1
Maize:	Total	6,052	7,771	7,940	7,470
	U.S.A.	3,398	6,539	6,169	5,354
	South Africa	1,175	591	361	918
	Thailand	862	387	909	778
	Others	617	254	501	420
	U.S.A./total (%)	56.2	84.1	77.7	71.7
Grain sorghum:	Total	3,505	3,742	4,474	3,794
	U.S.A.	2,049	2,733	2,831	2,012
	Australia	717	463	721	777
	Argentina	522	504	795	833
	Others	217	42	127	172
	U.S.A./total (%)	58.5	73.0	63.3	53.0
Soybean:	Total	3,396	3,635	3,244	3,334
	U.S.A.	3,126	3,210	2,924	3,041
	China	254	226	232	240
	Brazil	15	185	82	44
	Others	1	14	6	9
	U.S.A./total (%)	92.1	88.3	90.1	91.2
Grand total:	Total	19,105	21,856	22,453	21,850
	U.S.A.	11,118	16,098	14,949	13,411
	U.S.A./total (%)	58.2	73.7	66.6	61.4
			1972–74 average		1972–75 average
	Total		21,138		21,316
	U.S.A.		14,055		13,894
	U.S.A./total (%)		66.5		65.2

Source: Nihon-kanzei-kyōkai [Japan tariff association], *The Summary Report, Trade of Japan,* 1972, 1973, 1974, and 1975 ed.

XVIII and XX give evidence for this point. If the United States were to wield its food power, it would hurt Japan much more than itself.

How are export restrictions on food dealt with in the United States? According to the Export Administration Act of 1969, in certain circumstances, export control may be deemed necessary, although for agricultural commodities the secretary

TABLE XIX

SHARE OF THE U.S.A. IN THE WORLD EXPORT OF MAJOR GRAINS

(1,000 tons)

			1970	1971	1972	1973	1974
Grains	Total:	World a	114,697	118,968	134,813	164,463	150,012
		U.S.A. b	40,392	36,046	52,474	82,407	65,166
		Canada	14,897	18,201	19,639	16,409	13,170
		Argentina	10,218	9,823	5,754	10,002	11,292
		Australia	8,365	11,827	12,112	7,474	7,265
		b/a (%)	35.2	30.3	38.9	50.1	43.4
	Wheat:	World a	50,163	52,053	59,404	75,279	59,228
		U.S.A. b	17,438	16,215	21,308	37,397	25,133
		Canada	10,746	12,886	13,965	12,317	10,122
		France	3,446	3,357	5,153	7,023	7,344
		Australia	6,886	9,089	8,459	5,391	5,128
		USSR	4,852	7,605	3,911	4,198	5,262
		Argentina	2,302	811	1,640	2,971	1,900
		b/a (%)	34.8	31.2	35.9	49.7	42.4
	Maize:	World a	29,422	30,854	37,286	48,061	50,549
		U.S.A. b	14,402	12,884	22,385	33,196	29,868
		Argentina	5,233	6,128	3,005	4,033	5,600
		France	2,455	4,121	3,481	3,420	3,835
		South Africa	1,201	1,468	3,155	1,317	3,000
		Thailand	1,371	1,806	1,158	1,306	2,328
		b/a (%)	48.9	41.8	60.0	69.1	59.1
Soybean:		World a	12,621	12,282	13,815	15,613	17,186
		U.S.A. b	11,839	11,521	11,992	13,222	13,940
		Brazil	290	213	1,037	1,786	2,724
		China	410	460	370	310	340
		b/a (%)	93.8	93.8	86.8	84.7	81.1
Grains and Soybean		World a	127,318	131,250	148,628	180,076	167,198
		U.S.A.	52,231	47,567	64,466	95,629	79,106
		b/a (%)	41.0	36.2	43.4	53.1	49.3

Source: [1, 1974].

of agriculture must recognize the imposition of controls in particular instances before export control goes into effect. The secretary may not give his approval to controls on the export of agricultural commodities during any period in which he considers the supply of the commodity to be in excess of domestic requirements. The secretary thus gives approval of export control for commodities which may not meet domestic needs. This may be natural enough from the U.S. viewpoint, but at any rate this is the principle. However, when the president determines that control of an agricultural commodity is required to advance foreign policy objectives and fulfill international responsibilities, or where control over export is important for national security, exceptions can be made. Foreign policy or national security considerations thus may have some bearing on decisions of agricultural commodity export control. This is the institutional setup under which

TABLE XX

SHARE OF U.S. GRAIN EXPORT TO JAPAN

(%)

	1972		1973		1974		1975	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Wheat and wheat flour	12.9	12.8	11.9	11.9	9.8	10.5	11.0	11.6
Maize (excluding seeds)	15.1	15.5	19.3	20.1	20.0	21.9	17.9	17.7
Grain sorghum (excluding seeds)	48.1	46.9	55.1	54.0	51.7	52.1	41.5	43.0
Soybean	25.5	25.7	24.9	22.0	19.6	20.7	21.5	22.1
Total	—	20.1	—	20.2	—	18.8	—	17.6

Source: U.S., Department of Agriculture. *Foreign Agricultural Trade Statistical Report* (1976).

American food power operates. In the presidential campaign, the Democratic presidential candidate Mr. Carter stated to the press that he did not intend to use food power.

Other than using food power, agricultural commodities which may not meet domestic requirements can be placed under export control. Under the Agriculture and Consumer Protection Act of 1973, exporters are obligated to report on their grain export dealings. Since domestic demand and export demand compete for agricultural commodities, production greater than domestic demand may not meet total domestic needs if export volume is greater. There is neither a surplus inventory nor a stockpiling scheme. Export control may very well be effectuated when the international food supply is tight. And this is no pure fancy. In 1973 the United States applied the export controls on soybeans. We must not ignore the power of organized labor and consumers, which is stronger than the power of farmers who oppose export control. Changing the name from Agricultural Act to Agriculture and Consumer Protection Act is symbolic of this altering power balance.

Japan's food security depends on the supply of U.S. food to Japan, next to the supply capacity of her own agriculture. For grains and pulses, the major consideration in Japan's food security, the domestic supply is smaller than that obtained from the United States. This relation will only intensify in coming years. Japan's food security thus is heavily dependent on guaranteed imports from the United States. The United States persistently advocates the principle of free trade and free enterprises even with respect to agriculture and particularly so since 1973, refusing to conclude a grain trade agreement with Japan. The United States has such treaties with the USSR, an erratic purchaser, and with Poland in view of the U.S. policy toward the Communist bloc countries. But Japan, a mature and stable market and the biggest for U.S. grains, is a most desirable trade partner. This seems to be enough for the United States with no need of a promise to Japan, which may bind the United States in certain ways. The so-called agreement reached in August 1975 between Agriculture and

Forestry Minister Abe and Secretary of Agriculture Butz was in this context not an agreement between two governments and has no binding power. Formally, it was an expression of the thoughts on both sides rather than a promise, only there were no conflicting points raised by either. The Japanese minister proposed to set up a trade target effective for two of the three coming years, and showed annual figures of 3 million tons of wheat, 8 million tons of feed grain, and 3 million tons of soybeans. Secretary Butz expressed gratitude on behalf of U.S. farmers (not of the U.S. people) for the necessary volumes of Japanese imports of grains and pulses and stated that the United States intended to respond fully to the demands of long-standing markets such as Japan. This is the content of the so-called agreement which may have significance for Japan's food security. But at the very least any meaningful agreement would have to secure a promise that the U.S. government would not place controls over export to Japan until and unless Japan's imports have reached the annual targets. Japan on the other hand should guarantee to purchase up to the target figures. This does not necessarily mean a guarantee by the U.S. government to set amounts for export, while Japan would be giving an import guarantee. In this sense it is imbalanced. However, the U.S. government uses the principle of free trade. Unless it makes a change to some degree, export guarantees are impossible. Japanese government presently is not in a position to guarantee imports of a set amount of soybeans and feed grains. In this respect Japan would have to change the institutional setting so that the government or an agency on behalf of the government may guarantee imports.

Not unrelated to a possible Japan-U.S. grain trade agreement is the issue of grain stockpiles held by U.S. government agencies. Under the Agriculture and Consumer Protection Act, the U.S. government is not contemplating stockpiling by the government itself or a government agency (Commodity Credit Corporation), leaving the task of stockpiling in private hands. The U.S. government has officially proposed an energetic international stockpiling scheme, but it is not clear whether or not the United States intends to establish a new scheme of governmental stockpiling in relation to the proposed international setup. At any rate, it is desirable that the United States to be a dependable supplier to Japan do a certain amount of stockpiling not only to meet domestic needs but also to be able to respond to international needs. There are organizations in the United States which promote public stockpiling, and their work is advantageous to the Japanese. (September 1976)

REFERENCES

1. Food and Agricultural Organization. *Trade Year Book.*
2. Ministry of Agriculture and Forestry. *Shokuryō jukyū-hyō* [Table of demand and supply for food] (1975).
3. ————. *Nōsanbutsu no juyō to seisan no chōki mitōshi* [A long-term prospect of agricultural demand and supply] (1975).
4. ————. *"Shōwa 60-nen chōki mitōshi kanren shiryō"* [Related materials to the long-term prospect up to 1985] (1975).

5. Nōrin-gyōsei-o-kangaeru-kai [Association of thinking about the administration of agriculture and forestry], ed. *Shokuryō jikyūritsu no gijutsuteki tembō* [Technological prospect of self-sufficiency ratio in food] (Tokyo: Nōrin-tōkei-kyōkai, 1976).
6. Nōrin-tōkei-kyōkai [Association of agricultural and forestry statistics], ed. *Shōwa 50-nendo nōgyō hakusho huzoku tōkei shiryō* [The agricultural white paper for 1975, attached statistics] (Tokyo: Nōrin-tōkei-kyōkai, 1976).
7. United States, Department of Agriculture, Economic Research Service. *The World Situation and Prospects to 1985* (1975).