DEVELOPMENT OF ASIAN AGRICULTURE AND INTERNATIONAL COOPERATION IN THE COMING DECADE

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I. UPS AND DOWNS OF AGRICULTURAL INNOVATION IN ASIA

A. *A Period of Hunger and Hardship before the Green Revolution (the First Half of 1960s)*

THE PRODUCTION OF rice in Asia[1] rose by 57 per cent and wheat by 50 per cent from 1948–52 period to 1964. There was also a significant improvement in consumption levels.

Rice and wheat production in China (Mainland) made similar increases in production, 60 per cent in rice and 46 per cent in wheat during the same period.

In the mid-1960s, however, the food situation deteriorated sharply; demand for major cereals continued to grow rapidly and production levelled off so that prices rose steeply both in domestic and world markets. This development was due to a combination of several factors: exceptionally bad weather in Asia in 1965 and 1966, particularly in India, inadequate production incentives, and disturbing political conditions in major food producing countries.

Rice production fell sharply in 1965 and 1966, wheat production also dropped in 1966 to a considerable extent and there was a fall in per capita supplies in food-deficient countries.[2]

These years were characterized by increasing food scarcities, rising prices and record imports of rice and wheat in the food deficit countries, and therefore, the strong demand stimulated cereals production for export in some developing countries, notably Thailand. But Burma and South Vietnam, which otherwise would be very promising, lost their traditional position as the world's leading rice exporters, and Vietnam, due to the war, has been even importing rice in large quantities since then. Therefore, international prices of rice rose sharply owing to the persistent pressure of demand on limited surplus.

B. *The Dawn of the Green Revolution (1968 to 1971)*

After the food crisis in the first half of 1960s, however, the food situation in Asia generally improved mainly due to continued good weather and successful introduc-

1 This article is partly based on T. Haseyama, "Demand-Supply Analysis of Foodgrains in Asia and Regional Cooperation," Report on Symposium of Foodgrain Marketing in Asia (Tokyo: APO, 1970). The countries covered by the word "Asia" are "Asia and the Far East" as used by FAO, China and other Asian centrally planned economies. Japan belongs to the advanced country group and is not included in "Asia," unless otherwise stated.

2 According to FAO statistics, per capita calories per day in India dropped from 2,020 in 1960–62 to 1,810 in 1966 (FAO, *Production Year Book*).

tion of new high yielding cereals mainly among diligent and well-to-do farmers particularly in those countries deficient in foodgrains.

In 1968, the paddy production in Asian developing countries, excluding Republic of Korea and Republic of Vietnam, reached 146 million tons, 5 per cent more than in 1967, a year of good crops. Wheat, produced mostly in India and Pakistan, increased by 46 per cent, or 23 million tons total.

The production of wheat in both countries has increased at a remarkable pace reaching 27.4 million tons in 1970, 74 per cent more than that in 1967. On the other hand, rice culture in India and Pakistan was not as rapidly developed as wheat. Because, just as in other developing Asian countries, it is greatly influenced by the whims of the tropical monsoon and a more complicated land tenure system. Moreover, the development of new high yield rice suitable to the agricultural conditions of India and Pakistan has been delayed. Even at that, however, paddy production in both India and Pakistan increased by more than 12 per cent from 7.54 million tons in 1967 to 8.45 million tons in 1970, and a notable increase in production was made with the further improvements in high yield varieties and field infrastructure.

Pakistan (formerly West Pakistan) already achieved self-sufficiency in rice at the end of the 1960s, and was providing East Pakistan with a surplus of rice before East Pakistan's independence as Bangladesh, even with exports of Basmati rice to the Middle East.

India was also expected to achieve a long-desired self-sufficiency in foodgrain before 1975, if favored with continued normal weather conditions.

In the India and Pakistan example, the yields of traditional varieties of staple cereals per hectare will be on the average of 1.5 to 2 tons in paddy rice and 0.8 to 0.9 tons in wheat. However, the yield of high yield rice and wheat per hectare would easily reach 3 to 5 tons (in paddy) and 2.5 to 4 tons respectively at present even in average farms, if the necessities of field infrastructure and inputs such as irrigation, fertilizer, pesticides, etc. are properly provided.

The green revolution will need much more input and better infrastructure than traditional agriculture and it would therefore depend heavily upon the availability of these input requirements[3] on the part of the average farmer as to how much this agricultural innovation would develop in the future. From the well-to-do farmers with better field infrastructure to the average farmers with less favorable infrastructure and financial resources.

C. *The Patterns of Development of the Green Revolution*

The pattern of development of high yield varieties observed in the Asian developing countries can be classified as follows:

(1) *Countries that provide limited input materials with priority to those upper*

[3] For a comparative study on agricultural input requirement and production possibility for high yield and traditional varieties, see T. Haseyama, "A Case Study on the Scope for Production of Foodgrains and Requirements of Agricultural Inputs in South Asia, 1970–1980," AGR/FA1/CS. 1 (ECAFE, 1971). Taking one example of the estimates of this study, the requirements of chemical fertilizer and production potential of foodgrains in South Asia are estimated as follows, under a set of projections of area, irrigation, crop response to fertilizer, etc.

and middle farmers who have the financial capacity and better conditioned farms to enable them to adapt new agricultural techniques. Such food-deficient countries as India, Pakistan, and the Philippines are in this category. Although this strategy was efficient and productive enough to make best use of limited input resources of low-income developing countries to achieve a very high yield-level in selected areas of the infrastructure, the problem of increased income disparity between select well-to-do farmers and poor farmers not favored with agricultural innovation remains to be solved.

(2) *Countries aiming at improving the average level of the entire nation.* The food-deficient countries of Sri Lanka, West Malaysia, and Indonesia are in this category. These countries preferred improved local varieties to foreign high yield varieties. Though improved local varieties are lower in yield than new foreign high yield varieties, they can be cultivated even with traditional agricultural technique and inputs, which are more disease-resistant and have better consumers' preference than foreign varieties. This strategy will enable even the small farmers to introduce new high yield varieties, making an interesting contrast with the first strategy category adopted by India, Pakistan, and the Philippines.

(3) *The food-surplus countries that prefer high quality to high yield.* Such traditional food (rice) exporting countries as Thailand, Burma, and Khmer belong to this group. In these food surplus countries, "higher quality even with lower yield" is that important. The governments did not recommend farmers adopt foreign high yield rice so that they could maintain the world famous quality of their local rice (particularly Thai). In recent years, however, they have successfully developed their local improved varieties of high yield and good quality by cross-breeding with IRRI varieties. However, the prices of these cross-bred varieties are usually lower than the traditional, because of stronger consumer preference.

D. *First Ordeal of the Green Revolution (1972–73): Review of Factors to Determine the Development of Agricultural Innovation*

Had it been favored with normal weather for several more years, the demand-supply situation of foodgrains in the world, particularly in the developing Asian countries, would have been significantly influenced by this agricultural innovation. However, the green revolution in Asia was hit by abnormal weather being accompanied by a severe drought in 1972 and the food situation has seen a sudden change, again—a food shortage. In fact, some slow-down phenomena in the development of the green revolution had already been observed in the form of decreased growth-rate of HYV yield per hectare in some areas of Pakistan and India around the end of the 1960s or the beginning of the 1970s. Although this might have been a common phenomenon in new technique development, to develop better-conditioned farms and average farms, institutional improvement based upon land reform should be made so that poor farmers may also adopt the new agricultural innovations and benefit from them.

The severe drought in 1972 that paralyzed the green revolution in Asia has given a chance to reconfirm the following factors needed to successfully develop that revolution:

(1) Advance agricultural infrastructure on the production side, particularly irrigation both in area and quality.

(2) Make available required agricultural input materials and development of credit facilities to provide farmers with funds to obtain input materials.

(3) Make institutional reforms to improve the current disparity of land and income distribution.

(4) Improve quality of HYV grain, which is often inferior to traditional varieties.

(5) Improve capacity of proper post-harvest treatment, and such post-harvest infrastructure as storage, transportation, stable marketing system, etc.

Frankly, agricultural infrastructure in most developing Asian countries is not as well developed as it should be to meet the fundamental requirement for the green revolution. The improvement of field infrastructure generally will require a lot of investment and time, and, unfortunately most developing Asian countries are not yet able to perform this task only with their own finance and technical know-how.

II. BEGINNING AGRICULTURAL DIVERSIFICATION IN ASIA: FROM TRADITIONAL FOODGRAIN AGRICULTURE TO MORE DIVERSIFIED FORMS

The long-term impact of the green revolution in agriculture on developing Asian countries will be seen in the transformation of traditional foodgrain agriculture into

TABLE

POPULATION, AVAILABLE SUPPLIES IN ENERGY, PROTEIN, FATS, AND

Region	Energy (Calorie)				
	Available Supplies		(B)/(A) (%)	Requirements	Supplies as Per Cent of Requirements (%)
	Total (A)	Animal (B)			
World	2,422	410	16.9	2,385	102
Advanced countries	3,039	1,081	33.6	2,555	119
North America	3,261	1,350	41.4	2,642	123
Western Europe	3,051	1,006	33.0	2,565	119
Oceania	3,283	1,549	47.2	2,656	124
Others	2,587	423	16.4	2,363	110
Developing countries	2,193	191	8.7	2,284	96
Africa	2,179	125	5.7	2,335	94
Latin America	2,524	445	17.6	2,383	106
Near East	2,376	227	9.6	2,456	97
Asia & Far East	2,076	133	6.4	2,223	93
South Asia	2,037	132	6.5	2,228	91
East & Southeast Asia	2,161	137	6.3	2,212	98
Centrally planned economies	2,384	361	15.1	2,418	94
USSR & Eastern Europe	3,181	806	25.3	2,570	124
Asian centrally planned economies	2,069	185	8.9	2,355	88

Source: FAO, "Agricultural Commodity Projections, 1970-1980," Vol. 2 (1971),

more diversified types.

Thanks to the remarkable improvement of the situation in traditionally food-deficient Asian countries, import requirements of rice and its international market price were in a downward trend from 1968 to 1971. The traditional rice-exporting countries, Thailand, Burma, and Khmer, found it difficult to sustain their economies by exporting only rice. They then had its work on diversifying agricultural production and export.

The fact that Thailand succeeded in diversifying a traditionally monocultural rice economy into a rice with upland crops (maize and fiber) economy in 1960s shows an excellent example of agricultural diversification in Asia. In recent years, Thailand has been promoting agricultural diversification with improved varieties of oilseeds or pulses as the second crops in the rice field, fish, fruit, marine and livestock products, sericulture, and then developing and agribusiness food processing industry using the above local products.

With the gradual improvement of field infrastructure and marketing, Thailand could possibly transform her agriculture into as diversified an agriculture as that in Taiwan in the coming decade.

On the other hand, the traditionally food-deficient countries of India, Pakistan, Sri Lanka, Indonesia, Philippines, etc. also improved their food situation remarkably from 1968 to 1971. They were increasingly interested in cash crops other than staple cereals, particularly more protective food crops, as the improvement of the

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REQUIREMENTS BY REGION IN 1970 (Per capita per day)

Protein				Fats (g)		Population (1970)	
Available Supplies (g)		Requirements (g)	Supplies as Per Cent of Requirements (%)	Total	Animal	(Million)	(%)
Total	Animal						
66.8	21.7	38.7	173	56.7	31.5	3,719.0	100.0
89.5	52.7	39.2	228	121.5	80.1	727.0	19.5
96.6	69.4	39.7	24	153.1	105.4	226.6	6.1
88.6	48.7	40.0	222	123.8	81.0	355.7	9.5
100.2	69.4	38.9	258	144.8	127.1	15.3	0.4
78.2	32.6	36.3	215	57.1	28.1	129.4	3.5
56.4	11.4	38.4	147	36.5	13.4	1,760.1	47.3
58.6	9.5	41.5	141	37.8	8.2	282.2	7.6
64.9	24.7	37.7	172	60.1	33.0	283.5	7.6
66.8	13.4	45.5	147	43.8	16.6	167.5	4.5
51.7	7.9	36.6	141	28.3	8.8	1,022.9	27.5
52.4	6.7	37.1	141	28.4	8.7	706.7	19.0
50.0	10.4	35.6	140	28.2	9.1	316.2	8.5
68.3	18.2	38.8	176	47.5	28.8	1,231.9	33.2
92.9	40.9	40.0	232	88.0	61.0	348.3	9.4
58.7	9.2	38.3	153	31.5	16.1	883.5	23.8

pp, 129–277.

food situation took place.

As already mentioned, this improved food situation in Asia again took a turn for the worse with the severe drought and resultant bad harvest in 1972. The developing Asian countries are again putting the utmost emphasis upon growing staple cereals.

Effort to achieve or maintain stable self-sufficiency in staple cereals will continue under any circumstances on the part of the developing Asian countries.

From the long-term viewpoint, however, it will be quite probable for developing Asian countries to transform their traditional foodgrain agriculture into more diversified agriculture, by increasing the relative ratio of protective food production.

Because, in most of the developing Asian countries, the daily nutrition depends mostly upon cereals, and the per capita consumption level of protein food, oil and fats, and vegetables and fruits are much lower than the recommended nutritional level as well as that of advanced high-income countries, even considering the difference of habitual diet, and the income elasticity of demand for these protective food commodities is still very high, thus indicating the big potential demand for them.

As mentioned in Section IV, Agricultural Commodity Projections by FAO forecast increasing Asian and global shortages of meat, dairy products, and fishery products in the coming decade. These FAO's agricultural projections are substantially based upon the projected production and effective demand. If all of the above probable potential demand for these nutritive food should be coming out in the market as effective demand, in accordance with the improvement of per capita income level, the shortages of these commodities would be more serious than those projected by FAO's study.

Therefore, the green revolution that has been developing since the latter half of 1960s, with high yield cereals as the forerunner, would possibly develop into new pattern of agriculture in 1970s, "agricultural diversification," putting more emphasis upon protective food commodities and feedgrains to produce animal protein food, and thus accompanying the development of food processing industry and agribusiness.

III. PATTERN OF AGRICULTURAL DIVERSIFICATION IN ASIA AND THE FAR EAST

A. *Agricultural diversification aimed at improved nutritional levels and export of new products after self-sufficiency of staple foodgrains has been achieved:* Traditionally food-deficient countries such as Sri Lanka, India, Indonesia, Pakistan, and the Philippines belong to this category. If there are no adverse weather conditions such as in 1965, 1966, and 1972, wars, natural disasters, etc., many of them can possibly achieve self-sufficiency in foodgrains for human consumption in the 1970s. However, this will only mean an improvement in the average per capita consumption level for foodgrains, the most basic food energy resource in the developing Asian countries. After that, therefore, demand for more protective food commodities such as livestock and fishery products, oil and fats, vegetables, fruits, etc., of which income elasticities of demand are generally as high as 1.0 to 1.5, will be increased

and the ratio of foodgrain calories in total consumption will decline.

B. *Agricultural diversification to achieve a switch-over from monocultural foodgrain to more diversified exporter:* Burma, Khmer, and Thailand are in this category. The green revolution that developed in the traditional foodgrain importing countries and the subsequent drop in international demand for rice from 1968 to 1970 had an unfavorable impact on these traditional rice exporting countries. Since then, these countries have been making an effort to diversify export products both in agricultural and nonagricultural sectors, whenever possible.

Thailand succeeded in diversifying her traditional rice economy into rice cum upland crop and fisheries in the 1960s, as shown by the remarkable production of maize. Thailand is now further expanding the production of cotton, soybeans, and tobacco in the North; kenaf, jute, livestock, and sericulture in the Northeast; superior quality rice, maize, pulses, oilseeds in the Central region; and rubber, coffee, livestock, and fishery products in the South, while maintaining the rice production needed for domestic consumption and possible export.

C. *Agricultural diversification aimed at improving income disparity between agricultural and nonagricultural sectors related to rapid industrialization:* The Republic of Korea and Taiwan belong in this category. Taiwan was also a traditional exporter of rice, and was unfavorably affected by the huge rice surplus in Japan, which used to be a good customer for Taiwanese Japonica rice. So far as these conditions are concerned, Taiwan also belongs to category B mentioned earlier.

However, Taiwan and the Republic of Korea are quite different from other developing Asian countries on the following points:

First, Taiwan is now making rapid progress in industrialization on the basis of a well-developed agriculture, and the income disparity between agricultural and nonagricultural sectors is widening due to much faster development in the nonagricultural sector. The agricultural sector also has a labor shortage problem from the steady outflow of its labor force into the industry sector, thus causing a need to change her traditionally labor-intensive agriculture into a capital-intensive or labor-saving agriculture.

This development process is very similar to that of Japanese agriculture fifteen years ago, though the scale is far smaller than it was with Japan.

Agricultural diversification in Taiwan is, therefore, aimed at (1) earning foreign currency needed for industrialization, (2) transforming the traditional labor-intensive agriculture into labor-saving agriculture to supply the industrial sector with labor, and (3) improving income disparity between agricultural and nonagricultural sectors in the process of rapid industrialization.

Though industrialization in the Republic of Korea is also making steady progress, this country is still deficient in staple foodgrains and is now putting emphasis on increased production of such grains. At the same time, however, the country is diversifying agriculture. The purpose of agricultural diversification in the Republic of Korea is, however, almost the same as that with Taiwan.

Secondly, the average nutritional level and per capita GDP of Taiwan and the

Republic of Korea are much higher than in most developing Asian countries, and the distribution pattern of income and food between income brackets is also much more equal. The per capita calorie intake per day in Taiwan in 1970 was 2,564 (protein 64 g) and in the Republic of Korea 2,652 (protein 74 g). The per capita GDP in 1970 market prices was U.S.$359 in Taiwan and U.S.$244 in Republic of Korea. These figures are higher than the average 2,037 calories (protein 52.4 g) and U.S.$130 in Asia and the Far East as a whole.

Therefore, effective domestic demand for protein and processed food rather expensive compared with cereals, is fairly great. What is better, both countries are able to produce many types of agricultural commodities, both primary and processed, on the basis of well-developed agriculture and industrial techniques which are now very competitive both in quality and prices in the international market. They are just on the verge of taking off from an agricultural to an industrialized economy.

D. *Agricultural diversification to reduce production and surplus of rice:* Only Japan belongs in this category. After the end of World War II and until recently, Japan had consistently used strong incentives to increase rice production through the famous dual rice-price system. That is, a higher producer's price and lower consumer's price, financed by the national budget, was used to achieve stable self-sufficiency of rice and improve farm income levels.

It is true that these incentives, in combination with a highly developed infrastructure and techniques and the drastic and successful postwar land reform in Japan, had been conducive in achieving policy-objectives.

Because of the ever-increasing producers' rice price occasioned by political pressure from farmers' organizations, however, the cost-benefit ratio of rice culture in Japan became very favorable, but the increasing burden on the government finance became unbearable and, Japan also suffered from an ever-increasing surplus of rice which became structure over-production, when the supply of many other crops were still less in demand. After Japan began to export its rice surplus on concessional terms, the rice policy of advanced countries such as Japan and the United States were criticized as a serious international problem by U.N. organizations. The traditional rice-exporting countries, at the end of the 1960s, were then losing their overseas rice market due to the green revolution in the food-deficient countries.

This criticism grew worse, domestically and internationally, and the Japanese government determined in 1970, to curtail rice production by 10 per cent with subsidies so that the rice surplus might be disposed of before 1975 and Japanese agricultural policy made its first drastic post-World War II change; that is, promoting non-incentive measures to grow more rice and encouraging incentive measures to diversify agriculture from rice to products that would meet a rapidly increasing domestic demand and decreasing ratio of self-sufficiency, such as vegetables, oilseeds, fruits, livestock, fish culture, etc.

E. *Impact of Japanese Market for Agricultural Commodities on Agricultural Diversification in Asia*

Along with the FAO's Agricultural Commodity Projections, the outlook of

import demand for such commodities in Japan, the sole high-income advanced country in Asia and one of the world's biggest importers of major primary products, would certainly have serious impact upon the pattern of agricultural diversification in the developing Asian countries.

In October 1972, the Ministry of Agriculture and Forestry (MAF) worked out the "Projection of Demand for and Production of Agricultural Products by 1982"[4] as a guide to pursue the agricultural policy of the coming decade.

The specific feature of this study is that it is not a simple projection but an intentional plan as far as the production side is concerned. Demand projections have been performed basically by correlation analysis of per capita personal consumption expenditures and the quantity of per capita consumption of each commodity in the past and applying selected demand functions for the target year. For this purpose, the compound annual rate of growth of personal consumption expenditure

TABLE II

DEMAND PROJECTIONS FOR MAJOR AGRICULTURAL COMMODITIES TOTAL AND PER CAPITA OF JAPAN

Commodity	Demand for 1970*		Demand for 1982*†	
	Total (1,000 M/T)	Per Capita (Kg)	Total (1,000 M/T)	Per Capita (Kg)
Riec	11,948	95.1	11,090–10,830–10,566	77.3–75.3–73.3
Wheat	5,207	30.8	5,760	29.4
Barley	1,685	1.5	2,310–2,340–2,360	0.9
Sweet potatoes	2,564	4.1	1,473	4.5
White potatoes	3,611	12.1	3,607	11.9
Soybeans	3,281	5.6	4,427	5.8
Miscellaneous beans	397	3.3	381	2.9
Peanuts	115	1.0	118	1.5
Tea	100	0.95	127–130–132	1.06–1.08–1.10
Vegetables	15,210	115.5	20,840–21,170–21,474	138.6–140.7–142.6
Fruits	6,636	38.2	10,273–10,736–11,195	51.9–54.3–56.7
Milk & milk products	5,355	50.1	8,751–9,230–9,705	72.2–76.2–80.2
Meat (excluding whale)	1,678	11.6	3,555–3,878–4,220	21.4–23.3–25.5
Eggs	1,817	14.8	2,271	16.3
Sugar	2,829	26.8	3,820–3,974–4,117	31.8–33.1–34.3
Raw silk (1,000 bags)	408		611–648–686	
Feedstuff (in 1,000 TDN)	20,450		35,735	

Source: Compiled from Ministry of Agriculture and Forestry. "Nōsanbutsujukyū no tembō to seisanmokuhyō no shian" [Productions of demand for and production of agricultural products for 1982] (Tokyo, 1972).

* Fiscal year.

† Based on assumed annual average growth rate of personal consumption, expenditure in real terms of 7 per cent, 8 per cent, and 9 per cent respectively.

[4] The details of the methodology adopted for the projections are not official. However, MAF has deliberately set up production targets with indicators of possible improvement of productivity and self-sufficiency ratios for major agricultural products, because they felt a pressing need to reveal their intention regarding the future orientation of agricultural production, in view of rapidly expanding agricultural imports.

TABLE III
PRODUCTION PROJECTIONS FOR AGRICULTURAL COMMODITIES OF JAPAN

Commodity	Production (1,000 M/T) 1970	1982	Index Numbers of Agricultural Production (1970=100) 1982
Rice	12,689	10,830	85.3
Wheat	474	480	101.3
Barley	572	578	101.0
Sweet potatoes	2,564	1,473	57.4
White potatoes	3,611	3,607	99.9
Soybeans	126	536	425.4
Miscellaneous beans	255	222	87.1
Peanuts	70	94	134.3
Tea	91	130	142.9
Vegetables	15,126	21,170	140.0
Fruits	5,454	8,827	161.8
Milk & milk products	4,789	8,482	177.1
Meat (excluding whale)	1,473	3,455	234.6
Eggs	1,766	2,271	128.6
Sugar	642	1,058	164.8*
Raw silk	342 (1,000 bales)	529	154.7
Feedstuff (in 1,000 TDN)	11,183	15,470	138.3*
Herbage	6,711	10,235	152.5
Concentrates	4,472	5,235	117.1

Source: See Table II.
* Calculated in this study.

in real terms during 1970 to 1982 is assumed at 7, 8, or 9 per cent on the hypothesis of low, medium, or high rate.

It has been assumed that the change in relative prices will be the same as with past trends. It is also assumed that there will be either no further import liberalization of agricultural products by 1982, or even if that should happen, there will be no serious impact upon domestic production.

On the outlook of the international commodity market, it is assumed that a general picture given in FAO's "Agricultural Commodity Projections 1970–1980" (Rome: FAO, 1971) will be materialized. The projected self-sufficiency ratio of major agricultural commodities can be classified into four categories as shown in Table IV.

First, rice is the only commodity aiming at complete self-sufficiency though rice production will be reduced by 15 per cent from 1970 to 1982. This is so because it will still be not only the most important staple food for the people but also the principal type of farming in Japan.

The second category aiming at a higher degree of self-sufficiency includes vegetables, fruits, dairy products, meat, eggs, and raw silk. Vegetables and eggs are planned to be almost completely self-sufficient, because most vegetables are difficult to transport a long distance from overseas, because of perishability. Fruit will keep much the same self-sufficiency ratio as in the base year, 80 to 90 per cent,

TABLE IV
SELF-SUFFICIENCY RATIO AND IMPORT REQUIREMENTS OF AGRICULTURAL COMMODITIES OF JAPAN

Commodity	Ratio of Self-sufficiency (%)		Import Requirements (1,000 M/T)	
	1970	1982	1970	1982
1) Completely self-sufficient				
Rice	106	100	15	0
2) Mostly self-sufficient				
Vegetables	99	Approx. 100	98	304–330
Eggs	97	Approx. 100	51	0
Meat	88	82 – 97	220	100–765
Fruits	84	81 – 88	1,182	1,446–2,368
Milk & milk products	89	87 – 97	561	269–1,223
Raw silk	87	80 – 90	66 (1,000 bales)	82–157
3) Approx. 50% self-sufficient				
Beans (except soybeans)	63	Approx. 55	235	253
4) Mainly dependent on imports but partially self-sufficient				
Wheat and barleys	15	Approx. 15	5,693	7,042
Feedstuff (concentrates)	55	43	9,266 (1,000 in TDN)	20,265
Soybeans	4	Approx. 10	3,244	3,891
Sugar	23	26 – 28	2,187	2,762–3,059

Source: See Table II.

since the supply of many indigenous fruits cannot depend upon foreign sources due to the difference in variety and for plant protection reasons. Also Japanese mandarin oranges have strategic importance in promoting selective agricultural diversification. With eggs, a sufficient supply based on productivity-improvement can be reasonably expected by enlarging the scale of egg production. For meat, the productivity of pork and broilers (including chicken) can be raised relatively easily, as with eggs, by enlarging the size of the herd or flock, and, in view of possible beef shortages in the future international market, every effort will be made to increase indigenous beef production. Thus, the target for total meat production of 3.5 million tons, would be about 90 per cent self-sufficiency.

The third category of half self-sufficiency applies to pulses other than soybeans. Though beans are important crops for rotation purposes in upland farming areas, their self-sufficiency ratio will decline.

The fourth category includes wheat, barley, feedstuff, soybeans, and sugar which are and will continue to be dependent on import. Except for soybeans, sugar, and feed, the intended self-sufficiency ratio for them will remain much the same as in the base year. The intended ratio is much higher for soybeans and higher for sugar, because indigenous soybeans are not only suitable for edible use but also officially recommended as a substitute for rice in the course of rice production adjustment, also sugar beet and cane are of special importance in some remote producing areas.

Following the remarkable expansion of livestock and poultry production, the

requirements for feed in TDN in 1982 will be 35.7 million tons, against the 20.45 million tons for 1970. The requirements for concentrated feed in 1982 will be 25.5 million tons as against the 13.7 million tons in 1970. About 80 per cent of this amount of concentrates feedstuff or 20.3 million tons in TDN (30 million tons in actual feedgrain weight) will have to be imported from abroad, as against 9.3 million tons in TDN in 1970.

After all, Japan will possibly be the largest importer of major agricultural products, except for staple food, even if government targets are implemented, and her import demand-market for agricultural products would have significant influence upon the agricultural policy of developing Asian countries.[5]

IV. AGRICULTURAL COMMODITIES OUTLOOK AND AGRICULTURAL DIVERSIFICATION IN ASIA

As has been already pointed out, most low-income developing countries cannot afford to create a large-scale effective demand for new products by themselves alone. Then, the pattern of agricultural diversification will have to be oriented not so much by preference and production feasibility of the developing countries but by the long-range demand and supply relations for agricultural commodities in the international market.

"The Agricultural Commodity Projections 1970–1980" published by FAO in August 1971 is one of the most comprehensive studies on this problem. Assuming (i) 1970 prices in demand and production as constant for 1980, (ii) national economic policy affecting production remains as it is in late 1970 and early 1971, and (iii) weather conditions are generally normal, the study projects that:

(1) Cereals—surplus in the North and shortage in the South—Demand-supply balances of cereals (rice is milled equivalent) in the world that were 7.7 million tons surplus in 1970 will be 61.7 million tons surplus in 1980, with the projected production and demand, 1,427.4 million tons and 1,365.7 million tons respectively. Of this surplus, 67 per cent (41 million tons) is coarse grain and 29 per cent (18 million tons) is wheat, that are both mostly from advanced countries, only 4 per cent (2.6 million tons) being rice, mainly from the rice exporting countries in Asia. Though Asia as a whole will be deficient in all cereals, with some countries that will be unable to achieve the self-sufficiency of rice, the staple cereal, this cereal shortage will decrease from 9.2 million tons in 1970 to 3.6 million tons in 1980. The shortage in Asia will be mostly wheat.

With *wheat*, the world surplus, mostly in advanced countries, will increase from 3.9 million tons in 1970 to 18 million tons in 1980. In Asia, dominant wheat producers are China (50 per cent), India, and Pakistan. Asia, which has mostly a rice-growing climate imported 13.2 million tons of wheat in 1970, of which China

[5] This section is based on my two papers: (1) "The Scope for Agricultural Development and Fertilizer Requirements in Developing Asian Countries," Report on Seminar on Economics of Fertilizer Use, Food and Fertilizer Technology Center, ASPAC, Taipei, 1972 and (2) "Ajia nōgyō no shintenkai" [New development of Asian agriculture] (Tokyo: Institute of Developing Economies, 1972).

produced 5.2 million tons (39 per cent). The continent would still have to import 11.7 million tons wheat in 1980 (China, 6 million tons or 51 per cent). In the 1964–66 average, India imported 6.7 million tons of wheat and Pakistan 1.4 million tons. However, both India and Pakistan will be self-sufficient in wheat by 1980, if the green revolution can develop further. On the other hand, the import requirements of China would increase a little from 5.2 million tons in 1970 to 6 million tons in 1980.

In 1970, Asia had a *rice* (milled equivalent) shortage of 0.93 million tons, but, will have a surplus of 2 million tons in 1980, if favored with the successful development of the green revolution. The rice surplus of China, which was about 0.8 to 0.85 million tons in 1964–66 and in 1970, will be about the same 0.87 million tons in 1980. In the world as a whole, the demand-supply situation of rice was almost balanced in 1970, but it will be 2.6 million tons surplus in 1980.

Regarding *coarse grains*, the production and export surplus of coarse grains in Asia increased remarkably in the 1960s and will further increase in the 1970s. According to FAO projections, the coarse grain surplus in the world, mostly from advanced countries, would increase from 3.8 million tons in 1970 to as much as 41 million tons in 1980. The export surplus of Thailand will increase from 1.5 million tons in 1970 to 2.9 million tons in 1980, but the total balanced surplus of Asia, 570,000 tons in 1970, will be 1 million tons in 1980. China's share in Asian production of coarse grains is and will be about 63 per cent, and its export surplus will be negligible as in the 1960s. Japanese import requirement of coarse grains for feed use was over 10 million tons in 1970 and will be about 16 million tons in 1980 (or concentrated feeds at about 24 million tons in terms of feedgrains in 1982, according to projections of the Ministry of Agriculture and Forestry, Japan). This means that only a small per cent of Japanese import requirements for coarse grains could be met by developing Asian countries, even if they used their whole export surplus. However, if we make a more detailed analysis of the implications of these cereals surpluses projected by FAO, we would see that the situation might be quite different. This shall be pointed out in Section V.

(2) Increased shortage of animal protein—In 1970s there was an increasing world-wide shortage of animal protein food products. The demand-supply balances of *milk and milk products* (whole milk equivalents) in Asia and in the world in 1970 was short by 1.6 million tons and 3.1 million tons respectively, and this shortage will be as much as 11.9 million tons in Asia and 2,000 tons in the world in 1980. Japan's shortage was 0.25 million tons in 1970 and will be 1.1 million tons in 1980.

For *total meat*, there was a 0.2 million tons shortage in Asia excluding China and 0.22 million tons surplus in the world in 1970. But, both Asia excluding China and the world will have a shortage of 0.45 million tons and 2.14 million tons respectively. China had a total meat surplus of 0.24 million tons in 1970 but will have a shortage of 0.25 million tons in 1980. Japan's meat shortage will increase from 0.24 million tons in 1970 to 0.49 million tons in 1980. It should be noted that the surplus of beef and veal, about 0.25 million tons on the average in the 1960s, would change into a shortage of 1.65 million tons in 1980. Also *fishery*

products, at 0.42 million tons surplus (liveweight) in 1964–66, have had an increasing shortage trend and will have a 7.9 million tons shortage in the world in 1980, partly due to the increasing pollution of the fishery environment.

(3) Other major products—In the world as a whole, oil, fats, sugar, tea, citrus fruits, and tobacco will be in surplus, wine and bananas in short supply. Demand-supply for coffee and cocoa will be almost balanced. Forest products will have more shortages.

V. THE BIG POTENTIAL SHORTAGE OF CEREALS IN THE SOUTH

A. *Difficult Problems of Green Revolution of Asian Rice*

The projected rice surpluses in Asia (2 million tons) and in the world (2.6 million tons) are only about 1 per cent of the projected production in these regions. Rice production was projected assuming that the green revolution would be successful in Asia. However, the field infrastructure for most rice areas is still underdeveloped and production will be heavily influenced by weather conditions. Substantial improvement of the field infrastructure in developing Asia will require huge amounts of long-term investment and will not be completed before 1980 or so. Therefore, these surpluses would easily be offset by a bad harvest, if there should be a severe drought as in 1965–66 and again in 1972. The fear of bad harvest due to the whims of tropical weather may be greater than the possibility of good harvest, under the current field infrastructure.

B. *Problems of Agricultural Policy in Advanced Wheat Surplus Countries*

As projected by FAO, the green revolution in wheat will be more successful in Pakistan and northern India, major wheat producing areas in Asia, due to better-conditioned field infrastructure and better farmers. However, most of the wheat surplus would be from the United States, Canada, Australia, Argentina, the EEC, and the USSR. There would be due potential for these countries to create the surplus of wheat projected by FAO (18 million tons for 1980). However, the United States, the biggest exporter of wheat, would continue to adjust wheat production in order not to have such a big surplus stock of wheat as in the 1960s. Therefore, the wheat surplus would not be made a reality, unless the cost for keeping the surplus stock is guaranteed by government or by some international scheme.

C. *Problem of Large Potential Demand for Feedgrains*

The demand-supply balances of agricultural commodities were projected on the basis of possible production of and effective demand for those commodities concerned and will not show the size of potential demand coming out in the market because of the low income level. The projected surplus of coarse grains, 41 million tons, has a serious invisible implication. In brief, this huge surplus would change itself into a deficit, if potential demand for them should be taken into consideration.

According to the FAO estimates for 1970, advanced countries had a daily per capita consumption level of 3,039 calories.

The ratio of calories derived from cereals was about 33 per cent and that from

animal calories was about 34 per cent.

In developing countries, the daily per capita calorie rate was 2,193 and the per cent of cereal and animal calories were 65 per cent and 9 per cent respectively. In developing Asian countries, the daily per capita calorie was 2,080 and the ratio of cereal calories was as much as 72 per cent, while that of animal calorie was so low as 6.4 per cent.

In advanced countries, only 4 per cent of coarse grains is consumed as human food while most part for animal feed. However, in developing countries, more than 60 per cent of coarse grains is consumed as staple food (this percentage is as much as 80 per cent in developing Asia).

The above means that the advanced countries put most coarse grains into producing animal protein food, or, eat coarse grains in the form of meat or dairy products. In terms of original calories about ten calories will be consumed in order to produce one calorie animal food. Even if animal calories from fishery products are excluded, the daily per capita consumption in terms of original calories will be about ten thousand calories in advanced countries and three thousand calories in developing countries.

Even considering the difference in climate, physique, dietary custom preference, and waste (probably much bigger in advanced countries), the food distribution gap and the nutritional gap between the advanced countries and developing countries are quite large.

As a matter of fact, the income elasticities of demand not only for protective food products but also for staple cereals in developing countries are much higher than those in advanced countries, showing their high potential demand for these products (Table V).

The income elasticities of demand for animal protein food, livestock and fishery products, and other protective food commodities, are as high as 0.8 to 1.3 for all meat, 1.0 to 1.6 for dairy products, 1.0 to 1.5 for eggs, 1.0 to 1.5 for fish, 0.9 to 1.5 for edible oil and fat, 0.8 to 1.2 for sugar, etc.

In advanced countries, the values of demand income elasticity are mostly negative for staple foodgrains, and, for other commodities, except for some special quality food, they are only one-tenth to one-half of those in developing Asian countries, showing that the potential demand for food in advanced countries is not so much in quantity as in quality.

If the developing countries excluding Latin America, and Asian centrally planned economies, should want to improve their nutritional composition at 1970 by increasing the ratio of animal calorie from 6.6 per cent (their weighted average at 1970) to 15 per cent, about 50 per cent level of advanced countries, or, Taiwan's 1970 level, until 1980, the requirements of feedstuff in terms of cereals for the developing countries will be roughly 160 million tons for 1980, according to original calorie estimate,[6] about 200 million tons more than the FAO's projected cereals demand of 1,370 million tons.

[6] Seven kilogram cereals is supposed to be input in order to produce one kilogram animal food. The ratio of calories from fish is assumed at 10 per cent of total animal calories.

TABLE V

INCOME ELASTICITY OF DEMAND FOR FOOD COMMODITIES OF SELECTED REGIONS

Commodity	South Asia[a]	East-South East Asia[b]	Asian Centrally Planned Economy[c]	Japan	North America[d]	Western Europe	Oceania[e]	USSR-Eastern Europe
Cereals	.25	.26	.34	−.07	−.25	−.29	−.10	−.29
Wheat	.47	.66	.46	.10	−.31	−.31	−.10	−.27
Rice	.34	.24	.39	−.10	.19	.16	.01	.26
Coarse grains	−.16	.10	.17	−.50	−.06	−.24	−.01	−.32
Maize	−.11	.11	.17	—	−.08	−.21	.00	−.24
Millet-sorghum	−.18	−.08	.17	−.50	−.03	.09	—	−.40
Others	−.05	.07	.16	−.50	.00	−.26	−.03	−.32
Starchy-roots	.02	−.08	.20	.09	−.19	−.23	.00	−.39
Sugar, products	.91	.72	1.12	.40	.10	.25	−.09	.21
Sugar	.91	.63	1.12	.39	.10	.24	−.09	.21
Sugar products	.91	1.09	—	.70	.12	.41	.01	.33
Pulses-nuts seed	.32	.22	.29	.00	.01	.09	.18	.16
Pulses, nuts	.33	.22	.29	.00	−.07	.09	.17	.14
Oilseeds	.26	.23	.29	.00	.15	.06	.23	.22
Vegetables	.61	.43	.48	.60	.11	.36	.18	.40
Fruits	.74	.56	.85	.57	.25	.61	.68	.72
Citrus fruit	1.02	.87	.72	.60	.32	.67	.63	.92
Oranges-tang.	1.14	.88	.72	.60	.39	.69	.64	.93
Lemons-limes	.76	.85	—	.80	.19	.55	.42	.89
Others	.69	.94	—	.80	.12	.61	.72	.82
Bananas	.63	.62	.79	.40	.20	.44	.48	.73
Other fruit	.73	.50	.87	.58	.20	.61	.75	.71
Meat	1.20	.90	1.14	.79	.26	.44	.05	.49
Beef and veal	1.17	.78	1.22	.70	.52	.51	.17	.61
Mutton and lamb	1.24	.61	1.00	.60	.01	.30	−.30	.60
Pork	.53	.89	1.20	.90	−.19	.32	.26	.36
Poultry meat	1.71	1.21	1.12	.90	.32	.72	.72	.76
Others	.68	.81	.59	.60	−.02	.39	.19	.33
Eggs	1.15	1.00	1.10	.50	−.10	.29	.00	.53
Fish	1.31	.73	1.00	.30	.28	.54	.27	.61
Whole milk	1.18	.86	.98	.50	−.47	.07	−.01	.29
Skim milk	.15	1.05	.92	—	−.01	.13	.21	.43
Cheese	.54	.16	.91	1.00	.43	.42	.39	.56
Fats and Oils	.83	.53	1.26	.40	−.01	.14	.04	.45
Butter	.69	.78	.96	1.20	−.45	.09	−.09	.49
Vegetable oils	.86	.45	1.38	.40	.09	.20	.32	.57
Animal fats	1.20	1.16	.92	.30	−.03	.02	.09	.14
Spices	.45	.32	—	—	—	.45	—	.18
Cocoa	1.09	.76	.91	.80	.30	.34	.28	.78
Other food	.32	.70	—	—	—	—	—	—
Beverages								
Coffee	.28	.29	.72	1.00	.01	.61	.75	.81
Tea	.87	.33	.07	.50	.05	−.01	.00	.46
Wine	—	.97	—	.40	1.41	.25	1.99	.90

Source: Compiled from *Agricultural Commodities Projection, 1970-1980* (Rome: FAO, 1971).

[a] Ceylon, India, Nepal, Pakistan.

[b] Burma, Khmer, China (Taiwan), Hong Kong, Indonesia, Korea (Rep. of), Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam (Rep. of).

[c] China (Mainland), Korea (North), Mongolia, Vietnam (North).

[d] U.S. and Canada.

[e] Australia and New Zealand.

This large additional requirement of cereals would not be met at all, even with the 61.7 million tons cereals surplus projected by FAO for 1980.

The problem is, however, how much the economy of the low income countries can change potential demand into effective demand in the market.

As a matter of fact, FAO projected that the ratio of animal calories in developing countries and Asian centrally planned economies would be improved to only 9 or 10 per cent in 1980, and, this limited effective demand would cause a big cereal surplus as menitoned earlier, with the problem of large potential demand unsolved. Even then, FAO projected that the production capacity of animal protein food would not suffice even for effective demand, and this would be serious for the long-range strategy of agricultural diversification in Asia.

VI. SOME BASIC PROBLEMS TO BE SOLVED FOR DEVELOPMENT AND DIVERSIFICATION OF ASIAN AGRICULTURE

A. *Underdeveloped Infrastructure*

In case of the green revolution, agricultural inputs and field infrastructure were more essential and necessary than traditional agriculture. For promoting agricultural diversification including multiple cropping, a much more developed field infrastructure is necessary. If water should not be available in the dry season, any second crop planted after rice could not be cultivated. Even if water should be available, however, there should be irrigation-drainage facilities that can control water-levels for the second crop. Otherwise, only rice could be cultivated in the dry season.

With traditional foodgrain agriculture, particularly of rice, irrigation has supplied the field with water. In multiple cropping, however, drainage after rice planting will be required in order to adjust the water-level for the crops. That is, more developed or higher quality irrigation facilities will be necessary for agricultural diversification including multiple cropping.

For storage and transportation, too, modern facilities will be needed, since animal protein products, vegetable, fruits, etc., for instance, are much more perishable than foodgrains. Unfortunately, most of the developing Asian countries are not yet equipped with the infrastructure that will meet the above requirement.

Agricultural diversification will also need more varied fertilizer inputs[7] than traditional single rice cropping in monsoon season, and limited financial resources to procure these input materials will be a bottleneck. In addition, fertilizer-input and variety of fertilizer have been recommended mainly for rice culture in Asia, and, this should be improved in order to diversify traditional foodgrain agriculture.

Unless the above conditions needed to transform the traditional monocultural rice agriculture into a diversified agriculture based on multiple cropping cannot be

[7] In Thailand, for instance, Ministry of Agriculture has been importing amorphous complex fertilizer (16-20-0), suitable for rice but prohibiting import of single nutrient fertilizer that could be input on crops other than rice. The consumption pattern of fertilizer in 1969 is 74 per cent for rice, 10 per cent for vegetables, 11 per cent for other farm crops, and 5 per cent for fruits and horticulture.

met, the farmer will have to grow only rice after the first crop. Because rice can be grown under traditional field infrastructure conditions, even if water is available in the dry season, too.

B. *Fear of Widening Gap of Income Disparity among Farmers*

Just as in the green revolution, agricultural diversification will also benefit those farmers with better farm land and better financial power for new recommended crops, with required input materials, poor farmers with inferior farms will not be able to diversify traditional agriculture. This will result in a further widening in the present disparity of farm income distribution.[8] For instance, in Central Thailand, income disparity has been widening between monocultural rice cultivators and farmers diversifying agriculture by double cropping, and better irrigation facilities. In North Thailand, Chinese Thai merchants with large landholding are introducing government-recommended agricultural techniques and required input materials at subsidized cost for fruit growing and with their financial capacity, they are developing large-scale land into efficiently managed fruit-plantation. Poor farmers with small farm started growing fruit in response to the government recommendation but cannot compete with efficient plantationers in marketing products.

C. *Limited Effective Demand in Domestic Market and Less Competitive Power in International Market*

It will be impossible for low-income developing countries to create new large-scale effective demand for new products, even though their potential demand may be large enough. The successful case of Thai maize has been supported by stable large-scale demand for feedgrains in Japan. Japanese demand for maize and other grains as concentrated feed, especially for poultry, has been on the increase recently. Though the share of Thai maize in Japan's total maize imports is still less than 10 per cent, Japan has been Thailand's largest market.[9]

[8] In Thailand, 75 per cent of the total population is agricultural but agricultural GDP is only 30 per cent of the total. Per capita GDP at 1970 market prices is about U.S.$60 in the agricultural sector, one of the lowest in Asia. The average annual rate of growth of GDP in Thailand is so favorable as 3.8 per cent in 1970s and per capita GDP in 1970 is U.S.$176, that belongs to the upper class in Asia. This implies that the benefits of economic development to this agricultural country has concentrated the nonagricultural population in banking, commerce and industry, service, government administration, etc.

[9] In my paper, "The Medium-Term Food Outlook of Thailand" (ECAFE/FAO Agriculture Division, ECAFE, 1969), I have mentioned that the regression analysis of Thai maize production, as an explained variable, with Japan's per capita consumption of animal products produced with concentrates feedstuff in terms of calorie as an explanatory variable reveals a highly significant coefficient of correlation as follows:

$$Y = -226.4 + 8.54X. \qquad R^2 = 0.914.$$

X = Per capita per day calories from animal products (excluding whale and fishery products) in Japan.

Y = Production of Thai maize (1,000 m.t.).

The per capita consumption of livestock products in terms of calories in 1971 was projected in 1968 as 2.1 times that of 1961–63 average. Assuming the ratio of import of maize by Japan from Thailand to her total import of maize to be the same as then, the production of Thai maize, be induced by the increased consumption level of livestock products in Japan,

It would require some time for this potential domestic demand to become effective demand in most developing countries, depending upon improvements in the populations income level.

It might be possible for developing Asian countries to put strong pressure on advanced importing countries, particularly Japan, the sole large-scale market for agricultural commodities in the region, to import more from developing exporters.

However, Japanese trade in agricultural commodities has been liberalized and imports are in the hands of private firms. Their selection of exporters will naturally depend upon quality and prices. So far exporters of major agricultural products to Japan have mainly been advanced countries. Even at that, Japan is making an effort to diversify exporters and to import as much as possible from developing Asian countries, in view of increased importance of political and economic relations with those countries.

D. *Capacity to Maintain a Stable Supply of Products*

If advanced importing countries should rely more upon developing countries for their supply of required products, at the cost of equivalent imports from advanced countries, the problem of demand for products might be solved. But, even then, there may be another serious problem of "stable supply of products" on the part of developing exporters. At many international meetings, the developing countries have been demanding renewed efforts from the advanced countries so that they can have a wider demand market for and imports from the South. However, even if the North should completely accept the demands of the South, the importing countries would be obliged to rely upon advanced exporting countries with a capacity for more stable supply, if the developing exporters could not supply the importing countries with the stable amount of required products.

The stable supply is very important particularly for a country such as Japan, whose self-sufficiency ratio of major agricultural commodities is declining and import requirements are great (e.g., about 3.5 million tons soybeans and 13 million tons of feedgrains annually in recent years), any sudden inability to supply required amounts of products by exporters would have serious impact upon the Japanese economy.[10]

Because of the underdeveloped infrastructure, agricultural production and exportable surplus of most developing Asian countries frequently fluctuates with the whimsical tropical monsoon. Infrastructure-improvement will require large long-term investment and hardly any developing Asian countries can afford this investment by themselves.

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was projected at 1.73 million tons in 1971. The actually achieved production of Thai maize in 1971 was 1.7 million tons.

10 Japan's daily per capita nutrition level at 1970 was 2,475.4 calories (protein 77.1 g, oil and fat 52 g). But according to the estimate by Y. Yuize at Ministry of Agriculture and Forestry, Japan, it would have been only 1,584 calories (protein 54.2 g, oil and fat 17.6 g), if the net agricultural import should be zero for 1970.

VII. STRATEGY FOR AGRICULTURAL DEVELOPMENT IN ASIA THROUGH INTERNATIONAL COOPERATION

Currently, the outlook for the demand-supply situation of foodgrains as well as other major food resources and the improvement of nutritional disparity between the North and the South is rather unfavorable again.

It is expected that the South will persistently demand to increase its cooperation from the North to improve disparity of distribution of food resources through international forums.

This will also be a serious problem to a country such as Japan, whose self-sufficiency ratio of major food products belongs to the lowest class in the world.

The basic ways to solve this problem are that:

(1) To improve the self-sufficiency ability of major food products of the developing countries by the help of the international cooperation with advanced countries in the financial and technical aspects.

(2) The advanced countries should make effort not to depend so excessively upon overseas supply of vital agricultural products as will endanger their national economies in case of a world-wide bad crop.

(3) To perform agricultural commodity projections periodically with international research cooperation and be ready to make a prompt international agricultural adjustment in response to it.

(4) To establish the international scheme for price-support and buffer stock of major agricultural products in order to maintain a stable demand-supply situation of the products.

(5) The advanced countries should promote an international technical and capital cooperation in order to develop artificial production of such important products as protein food, either for human food or feedstuff, of which world shortages seem to become serious.

(6) To decrease loss and waste of agricultural products[11]—In the developing

11 WASTE AND LOSSES OF RICE DURING THE PERIOD OF STORAGE AND TRANSPORTATION (%)

	Storage				Transportation				Grand Total
	Farm	Local	Central	Total	Farm	Local	Central	Total	
China †	—	—	—	2.4‡	—	—	—	—	2.4
Hong Kong *	1–2	0.5–1.0	0.5–1.0	2.0–4.0	0.3	0.3	0.3	0.9	2.9–4.9
India *	—	—	—	6.0	—	—	—	0.5	6.5
Japan †	—	—	—	2.0‡	—	—	—	—	2.0
Pakistan †	—	—	—	3.0	—	—	—	—	3.0
Philippines *	2.2	1.7	1.1	5.0	0.5	0.2	0.2	0.9	5.9
Thailand *	12.0	5.0	—	17.0	—	—	—	3.0	20.0
Vietnam *	2.0	2.0	—	4.0	—	—	—	1.0	4.0

Source: APO, "Symposium on Food Grain Marketing," Chap. 2 (1970).
* Answer to the APO questionnaire.
† Food balance sheet, 1961–62 average, FAO, Rome.
‡ Including those for the period of transportation.

countries, the ratio of loss and waste of products during the term of storage and transportation is as much as production-down at bad crop years. The decrease of these loss and waste through improvement of the above infrastructure will be needed. For this, some international cooperation of the advanced countries will be necessary.

In advanced countries, saving of food at the stage of consumption should be taken care of.

(7) One strategy to solve the problem of establishing stable-supply capacity for agricultural products competitive enough in the international market as well as stable-demand market for them will be "development and then import (or export)" concept where advanced countries provide developing countries with capital and technical know-how and set up a minimum necessary infrastructure, which enables developing countries to make stable production and export of new products as competitive as possible in the international market. Import of newly developed products of advanced importing countries should be made on long-term contract. Another important matter for this development strategy is to take account of local agricultural situation. If the local foodgrain situation is aggravated for instance, it would not be proper for advanced countries to develop some cereals and only import them, while the local population suffers from shortage. In such a case, it would be desirable for advanced countries to offer newly produced cereals to improve the local food situation, whatever the term of aid and the percentage of products to be offered may be, and, to import only the export surplus. It means that "the development and then import" strategy should be a form of international cooperation cum aid for developing production potential of promising products needed by both importing countries and producing countries.

As already mentioned, infrastructure-improvement will require large long-term investment. Therefore, it would be necessary in some cases for this development strategy to be undertaken on a government-basis, or, with government assistance.

If the infrastructure and technical transference should be once established that the developing countries could not afford otherwise by themselves alone, they could be utilized not only for the direct project but also for any other subsequent projects

PERCENTAGE DISTRIBUTION OF STORAGE LOSSES BY CAUSE

	India	Korea	Philippines	Thailand	Vietnam
Rodents	42	51	48	53	40
Birds	17	5	1	35	25
Insects	33	—	12	6	10
Moisture	8	—	17	—	—
Heat	—	—	18	—	—
Spillage	—	18	2	6	25
Mites	—	2	—	—	—
Mold	—	—	3	—	—
Gleaning	—	14	—	—	—
Others	—	10	—	—	—
Total	100	100	100	100	100

Source: See left table.

conducive to development of the national economy as a whole.

(8) Development of primary products should spur the agricultural processing industry cum agribusiness, by utilizing the locally produced primary products as much as possible, stimulating the agricultural-input materials industry. This growth will gradually contribute to a higher-stage industrialization of the developing countries.