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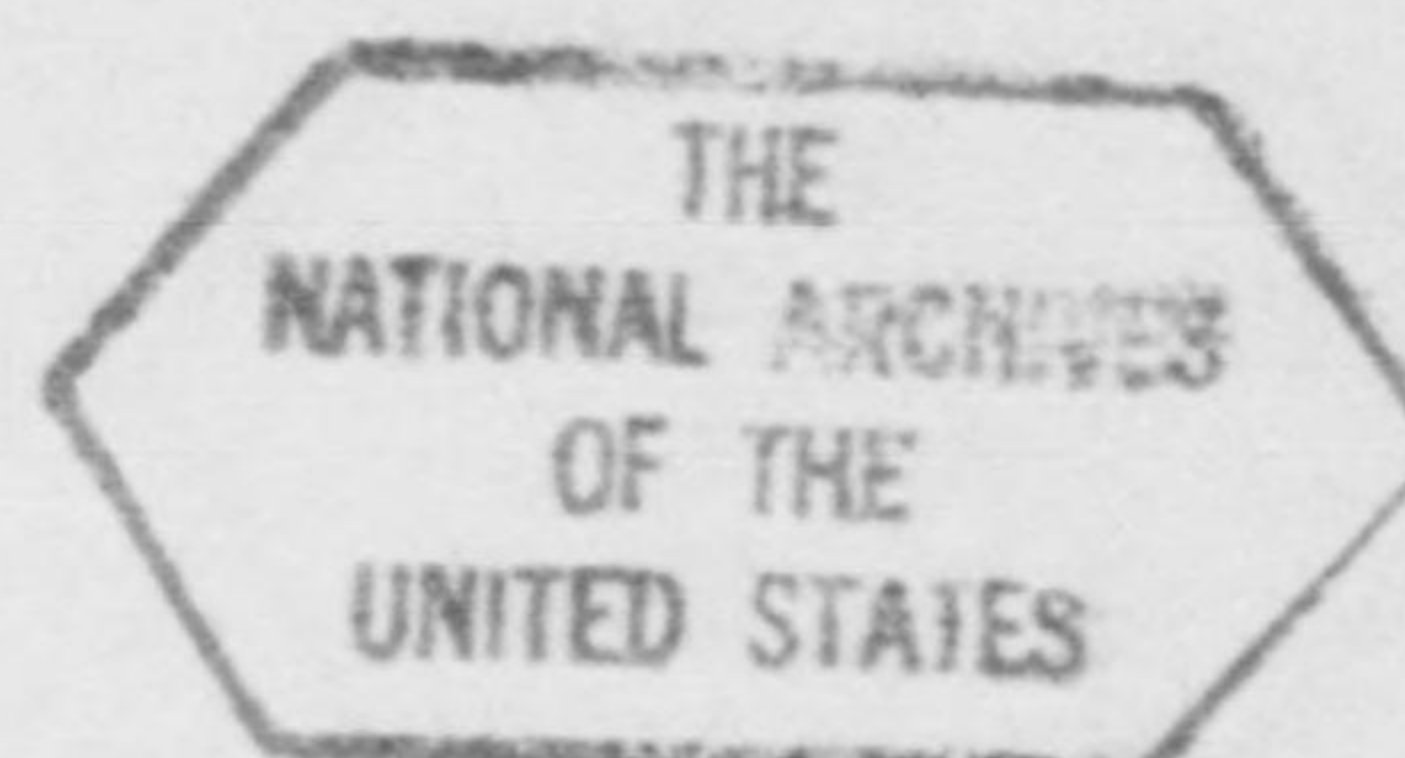
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OUTLOOK FOR JAPANESE AGRICULTURE

GENERAL HEADQUARTERS
SUPREME COMMANDER FOR THE ALLIED POWERS
Tokyo, Japan, 6 May 1948

GENERAL HEADQUARTERS
SUPREME COMMANDER FOR THE ALLIED POWERS
Natural Resources Section

Preliminary Study No 25

OUTLOOK FOR JAPANESE AGRICULTURE

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List of Natural Resources Section Preliminary Studies
Distribution

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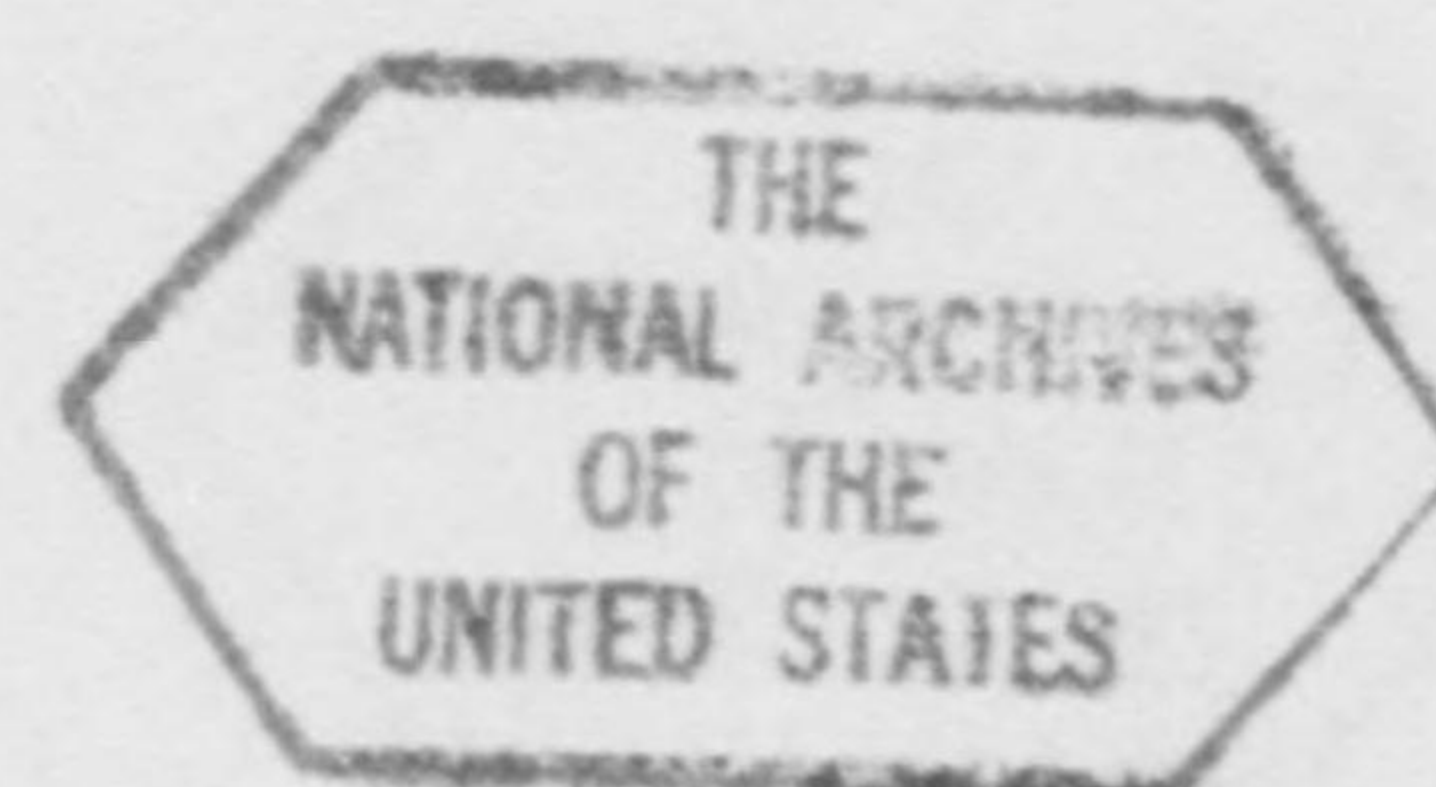
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OUTLOOK FOR JAPANESE AGRICULTURE

INTRODUCTION

This study was prepared for the consideration of those concerned with Japan's agricultural problems. It is a discussion of the prospects for increasing crop yields and the part agriculture can be expected to play in Japan's economic recovery.

IMPORTANCE OF AGRICULTURE

Agriculture is the backbone of the economic life of Japan. The unprecedented program of industrialization in Japan before World War II did not obscure this fact. Agriculture provided employment for more than 40 percent of the population and supplied about 85 percent of the nation's food. In terms of capital invested and net value of output, agriculture in the early 1930's was the leading industry of Japan. Its position is even more dominant now.

Agriculture is the only segment of the Japanese economy that survived the defeat of the country in good condition. Except for the shortage of fertilizer, Japanese agriculture is in a better position now than during World War II, particularly with respect to labor supply. However, agriculture can play only a limited role in the rehabilitation of Japan. Agriculture will not provide all of the food the nation will need in the years ahead, nor will it furnish the prewar volume of exportable industrial crops. Reference is made particularly to raw silk which at one time was the most important item in Japan's export trade. Finally, agriculture in postwar Japan will not be in a position to provide greater employment even though agricultural production should be considerably expanded. Japan already uses practically all the available land, most of which is intensively cultivated. Under these circumstances, the return from the application of additional labor would be very small.

This preliminary study was prepared by Mr Wolf I. Iadejinsky, Major W. H. Leonard and Mr Mark B. Williamson.

It appears probable that Japan's only solution will be to retrace part of the course pursued in the 1920's and 1930's. This course consisted of concentrating the nation's resources to an increasing extent on the consumer-goods industries and of attempting to build up an export trade in those goods sufficient to enable buying raw materials and the food required. Japanese agriculture, even when purged of its worst prewar features, provides only a weak foundation for the rehabilitation of the Japanese economy. When the economy of Japan was purely agricultural it supported a generally stable population of about 30,000,000 people; the support of an additional 48,000,000 people in less than a century has been made possible primarily through the growth of industry and foreign trade. Only by an increase in industry and trade can Japan support its population, even on a modest basis, in the years immediately ahead.

THE FOOD PROBLEM

1. General Food Requirements

Approximately 80,000,000 people will have to maintain themselves in 1950 on a comparatively small land area (about equal to the state of Montana) that is basically poor in natural resources. The average caloric intake of the Japanese people during 1935-40 was about 2,160 per capita per day. With about the same intake assumed for 1950, the total Japanese food requirement for human consumption will be about 64,491 billion calories or approximately 19,000,000 metric tons in brown rice equivalents.

The question arises as to Japan's ability to meet its food requirements from indigenous production. Self-sufficiency in foodstuffs in Japan, even though desirable, should not be achieved at the expense of the acreage under industrial crops for which there is a prime need in the domestic economy and a ready demand abroad. Economically it is to Japan's advantage to pay for imported food by exporting such products as raw silk and tea. Without a deliberate reduction in the acreage under industrial crops for the sake of greater food self-sufficiency, Japanese agriculture can probably furnish, on the basis of average prewar yields (1936-40) a volume of food estimated at 48,597 billion calories or approximately 15,000,000 metric tons in brown rice equivalents. In terms of 1950 requirements, Japan would have a food deficit of approximately 15,894 billion calories (4,000,000 metric tons in brown rice equivalents) or 24.65 percent of the required food intake.

In the past rice has been the principal deficit food item; the deficit averaged about 1.8 million metric tons, nearly one-fifth of the annual consumption. Imports from Korea and Formosa met most of the deficit. Other important food imports were sugar from Formosa and soybeans from Manchuria. All these were imports from colonies. Obviously, Japan will not be able to draw on these countries for food as in the past, certainly not in the same manner, and must attempt a greater measure of self-sufficiency in order to reduce the need for food imports.

2. Factors in Future Food Self-Sufficiency

Under the impact of trade restrictions which are likely to be imposed, and the urgent need of utilizing foreign exchange for import of raw materials other than food, Japan might make an effort to become totally self-sufficient in food. Any success in such an attempt would depend upon one or more of the following factors: (a) expansion of arable acreage, (b) higher yields, (c) additional labor for the cultivated acreage, and (d) effect of agrarian reform upon the food supply. An examination of these factors indicates that Japanese agriculture will not be in a position to satisfy the food requirements of the growing population.

a. Expansion of Arable Acreage

In order to ascertain whether the arable land area of Japan can be expanded, it is necessary to examine the crucial elements which determine the cultivated acreage of the country. The preponderance of hill and mountainous terrain sets definite limits to the cultivated area. It explains why no more than 6,000,000 hectares, or 16 percent of the total area of Japan, is cultivated.

Persistent efforts to augment the cultivated acreage have been made, during the past 20 years, without marked results. From 1918-39 the amount of land reclaimed annually averaged only 20,000 hectares; the amount of land lost to purposes other than agriculture equaled or exceeded that average. The fact that the upward trend in farm acreage has been arrested does not prove that acreage expansion possibilities have been exhausted. Some reclaimable land remains which could be put into crops.

The Japanese Government has prepared a 15-year plan for the reclamation of 1,650,000 hectares (4,090,000 acres), starting in 1945. An evaluation of this 15-year reclamation program shows that the reclamation possibilities and anticipated returns are not so great as estimated by the Government. Nearly 43 percent of this land is in Hokkaido, and the remainder is divided among the three other islands. Only 10 percent of the total is considered reclaimable as irrigated rice land; the other 90 percent will be permanent nonirrigated fields, generally of lower quality than those already in cultivation. The scheme calls, among other things, for the creation of new farms from present nonproducing forest land and marsh.

In summary, (a) most of the desirable land is already in use, (b) most of the reclaimable land left is inferior to the land now in cultivation, (c) the cost of reclamation on some land is prohibitive, and (d) land which is not suitable for reclamation has been included in the program.

A large part of the potentially cultivable land of Japan is situated where both soil and climate are particularly unfavorable. An increase of acreage by double-cropping often is not possible, and conversion of uncultivated land into fields in the mountainous areas is difficult and expensive. This explains in great part why the two decades before World War II witnessed no net increase in the cultivated area despite the desire

of land-hungry Japanese farmers to add to their small holdings. It helps to explain another recent development in Japanese agriculture. From 1932-39 the wheat area increased by 243,000 hectares, but the country's total cultivated area remained virtually unchanged. The increase in wheat acreage by 46 percent was due almost entirely to the displacement of other crops, such as barley and mulberry bush.

Work on the reclamation program has been accelerated since the surrender. Between 1 July 1945 and 31 December 1947 approximately 284,000 hectares were reclaimed, a rate of more than 9,000 hectares per month. A close examination of this average shows a gradual decline of the monthly rate from 14,000 hectares (1 Jul 45-30 Jun 46) to 6,000 hectares (1 Jul-31 Dec 1947). In the latter period the rate of reclamation ranged from 11,000 hectares in July to 3,000 hectares in December. This work was accomplished under considerable handicaps, particularly shortage of material and administrative confusion. On the other hand, one-half of the reclaimed acreage had been out of crop production only a few years as it was formerly in military use. Considering the fact that the greater and vastly more difficult part of the work remains to be done, the rate of reclamation in the years to come will probably be lower than that of the period July-December 1947. The completion of the project by 1960 is, therefore, highly questionable.

Assuming, however, that this ambitious and unrealistic reclamation program will be completed by 1960, what might be Japan's food situation in that year? The Japanese Government, as already indicated, estimates that only 10 percent of the reclaimable land is suitable for irrigated rice fields. Conceivably, therefore, if the entire program were accomplished the Japanese could expand the cultivated area by 165,000 hectares under paddy and 1,485,000 hectares under upland. On the basis of a yield of 2.8 metric tons rice per hectare, additional paddy production would be 470,000 metric tons; a yield of 1.2 metric tons (brown rice equivalents) per hectare of upland would give an output of 1,795,000 metric tons of brown rice equivalents. A total of 2,080,000 metric tons would be available for human consumption ^{1/} from the reclaimed land. The total volume of food (other than fish) available for consumption in 1960 can be estimated at about 16,000,000 metric tons of brown rice equivalents ^{2/} or 53,360 billion calories. Fish production available for consumption might add another 1,944 billion calories ^{3/}, or an estimated grand total of 55,304 billion calories. The requirements of 92 million people consuming an average of 2,160 calories are 72,532 billion. Hence an estimated deficit of 17,228 billion or 25 percent of the food intake of Japan in 1960 can be expected.

- ^{1/} Waste and seed account for the difference between the original total of 2,265,000 metric tons and the figure of 2,080,000 metric tons.
- ^{2/} This figure is made up of an estimated 2,080,000 metric tons from the reclaimed land and 13,932,000 metric tons, which is the average volume of food available for consumption (waste and seed deducted) for the period 1931-46.
- ^{3/} The assumption is that a per capita consumption of fish in 1960 will approximate that of 1935-40, or an estimated 75 calories daily.

Japan's ability to reclaim 1,650,000 hectares is very problematical. The evidence clearly points in that direction. A more realistic approach would be an estimate of food production in Japan in 1960 in terms of a net acreage increase amounting to not more than two-thirds of the planned reclamation program. The estimated food availability from indigenous sources would have to be reduced and the over-all deficit raised accordingly. But whatever the variant used, the continued rapid increase in population on the one hand, and the limitations of expanding the acreage under cultivation on the other, will prevent Japan from achieving food self-sufficiency in the next 15 years.

b. High Yields

A review of the subject of crop yields in Japan leads also to the same conclusion that Japan must continue to import large amounts of food. In the 60 years preceding 1940, agricultural production in Japan showed a remarkable increase, resulting primarily from increased yields per unit area of land rather than from an extension of the cultivated area. This is best illustrated in the case of rice, the mainstay of Japanese agriculture. Japanese rice yields are much higher than those in other major rice-producing countries. During 1931-34, rice yields in southern and eastern Asia were:

TABLE A. - COMPARATIVE RICE YIELDS

<u>Location</u>	<u>Cleaned Rice</u> (metric tons per hectare)
Japan	2.8
China	1.7
Formosa	1.7
Korea	1.2
British Malaya	1.1
Java and Madeira	1.0
India	1.0
Burma	1.0
Siam	1.0
Philippine Islands	0.8
French Indo-China	0.7
Ceylon	0.6

SOURCE: Wickizer, V. D. and Bennett, M. K., Rice Economy of Monsoon Asia, Stanford University, California, 1941.

The high yields in Japan have resulted from the ample use of manpower, improved rice varieties, abundant use of fertilizers, and improved agricultural practices. Such intensive farming has accentuated the ill effects of multiple cropping, as well as those associated with continuous cropping.

It is unlikely that the Japanese will be able in the next five or ten years to obtain increases in crop yields above those of the prewar years. Yield trends before 1940 were upward, but the annual rate of increase averaged only 0.3 percent between 1922-40 as compared with 1.3 percent up to 1922. This is even more significant in view of the evidence on fertilizer consumption. While the volume of farm-supplied fertilizers hardly changed between the early 1920's and 1930's, the aggregate amount of commercial fertilizers utilized increased from 2,854,000 metric tons in 1922 to 4,755,000 metric tons in 1936. Since cultivated acreage during this period remained practically unchanged, the increase indicates a much greater application of fertilizer per unit of land to obtain a small increase in yield. Yield trends show that an even more intensive utilization of fertilizers in the next few years probably would not result in yields high enough to insure self-sufficiency for Japan in foodstuffs, or to effect much of a reduction in food import requirements.

c. Additional Labor for the Cultivated Acreage

When the amount of labor already used is considered, it is questionable that a still greater application of manpower will increase appreciably the productivity of the soil. Sometimes a paddy field of one tan (0.245 acre) with a labor outlay of 15 man-days has been known to produce as much under equal conditions as a field of the same size where 30 man-days have been used. A limit exists, above which more labor would not mean more production. In some instances, it is possible that increased labor may result in higher unit area yields, but in general, higher yields in Japan can hardly be expected from more intensive utilization of labor.

d. Effect of Agrarian Reform upon the Food Supply

Economically, as well as socially, the agrarian reform instituted by the Japanese Government will have far-reaching effects upon rural Japan. The majority of the tenants will become owners, and the benefits accruing to these farmers will be significant. As owners they will improve their land more carefully, and spare no effort to increase its productive power. But it would be fallacious to view agrarian reform as a means of raising agricultural production to a point that would furnish Japan with all of its food requirements. The effect of the agrarian reform on the food supply of Japan would be vastly different were reform to mean additional acreage under cultivation. This is not possible, and a significantly greater agricultural output cannot be expected as a result of agrarian reform.

INDUSTRIAL CROPS

1. General Situation

The area devoted to industrial (nonfood) crops in Japan during 1930-34 averaged slightly more than 750,000 hectares, or about 12 percent

of the total area cultivated during that period. The principal industrial crops were mulberry trees, tea, pyrethrum, and tobacco. These crops now occupy approximately 75 percent of the total area devoted to industrial crops. The area in industrial crops in 1947 has been estimated at 335,000 hectares, or five percent of the total cultivated area. This decline from the 1930-34 area was caused by the replacement of industrial crops with food crops necessitated by food requirements during World War II and by the greatly reduced demand for raw silk.

Some restoration of the industrial crops area is essential to Japanese economy and should be effected as soon as the world food situation permits. At that time the amount of food imports into Japan will depend on the amount of foreign exchange credits available for the purchase of food. Industrial crop products such as pyrethrum, tea, and tobacco will probably be saleable in foreign markets at prices which will enable Japan to purchase much more food than could be grown on the area occupied by these industrial crops.

2. Sericulture

Raw silk was Japan's principal source of foreign exchange before World War II. During the period 1920-30 the annual export value of raw silk from Japan averaged \$294,100,000. In 1930, the maximum production year, an area of 708,000 hectares was planted to mulberries, and 399,000,000 kilograms of cocoons and 42,722,165 kilograms of raw silk were produced. In the late 1930's raw silk production and mulberry acreage declined because of competition from synthetic fibers, particularly rayon and nylon. The war greatly accelerated this decline in raw silk production in Japan by eliminating her silk export market. Furthermore, in order to meet the food shortage, the Government wartime land utilization policy called for a shift of much of the mulberry acreage to food crops. As a result of these adverse factors the estimated mulberry acreage in 1947 was only approximately 175,000 hectares, while cocoon production has declined to an estimated 53,478,000 kilograms and raw silk to 6,623,000 kilograms.

The future world silk demand is unpredictable in view of the unknown role to be played by synthetic fibers. It is doubtful that the export demand for Japanese raw silk in the future will exceed one-fourth of its 1930-34 level. Until the prospects for future silk demand are more stabilized mulberry acreage probably should be limited to approximately 200,000 hectares.

3. Other Industrial Crops

Tea production has declined since the 1930-34 period when an average of 41,000,000 kilograms of tea was produced annually on a land area of 38,000 hectares. The estimated production in 1947 was 24,937,500 kilograms, grown on 26,000 hectares. Decreases in yield per hectare were due to shortages of fertilizer and improper care of the tea bushes since 1941. Export demand for Japanese tea will probably warrant moderate increases in tea acreage and production during the next few years.

Present pyrethrum production is inadequate to furnish even domestic requirements. The substantial export market for pyrethrum products and tobacco is not being supplied. Acreage and production of these crops should be increased immediately. Long-term export prospects for pyrethrum indicate some outlet but they are not too promising. The tobacco export market is likely to be good for many years. Acreage and production of pyrethrum and tobacco products are shown below:

TABLE B. - PYRETHRUM AND TOBACCO PRODUCTS

	<u>1930-34 Average</u>		<u>1947 Estimate</u>	
	<u>Acreage</u> (hectares)	<u>Production</u> (metric tons)	<u>Acreage</u> (hectares)	<u>Production</u> (metric tons)
Pyrethrum	15,107	6,019	6,450	1,252
Tobacco	35,162	63,504	41,413	59,789

SOURCE: Ministry of Agriculture and Forestry.

Low yields per hectare for 1947 as compared with 1930-34 average are caused, as for silk and tea, by fertilizer shortages and general war dislocation.

OTHER AGRICULTURAL PROBLEMS

1. Fertilizers

Large applications of fertilizer have always been necessary on Japanese farm lands because of the natural infertility of the soils and the necessity for maximum crop production on a very limited land area. Drastic reduction in fertilizer applications since 1941 has depleted the plant food reserves in the soil. In order for Japanese agriculture to produce the same amount of agricultural crops as before 1941, as much or more fertilizer must be applied to the soil as was applied from 1936-40, the five-year period of maximum consumption.

During this period the average annual consumption of fertilizers was 2,082,000 metric tons of commercial nitrogenous fertilizer expressed as ammonium sulfate (20 percent N); 1,834,000 metric tons of phosphatic fertilizer expressed as superphosphate (16 percent P₂O₅); and 220,000 metric tons of potassic fertilizers expressed as potassium sulfate (50 percent K₂O).

The Japanese program to reclaim 1,650,000 hectares of land, a large proportion of which is inferior to that now under cultivation, will increase the need for additional fertilizer above that consumed from 1936-40. It is estimated that during the next few years Japan will require

2,000,000 metric tons of nitrogenous fertilizer expressed as ammonium sulfate (20 percent N); 1,500,000 metric tons of phosphatic fertilizers as superphosphate (16 percent P_2O_5); and 200,000 metric tons of potassic fertilizers as potassium sulfate (50 percent K_2O). This is the absolute minimum needed to maintain yields approximating those of the prewar years.

Commercial nitrogenous fertilizer production for the 1948 fiscal year is estimated at 945,000 metric tons expressed as ammonium sulfate (20 percent N). Self-sufficiency in nitrogenous fertilizers may be attained by 1950, but this accomplishment will depend upon increased coal production, adequate supply of other critical materials, and maximum rehabilitation of fertilizer plants. It is doubtful that organic fertilizer, such as fish meal or soybean meal, will be available in sufficient quantities to contribute significantly to nitrogenous fertilizer supply in the near future.

Japan has depended almost entirely upon imported phosphate rock and potassic salts to meet her needs for phosphatic and potassic fertilizers. Domestic production of commercial phosphatic and potassic fertilizers has met only a small fraction of the annual requirements of Japanese soils. Furthermore, these fertilizers have been of low quality. Estimates are that 1,822,000 metric tons of phosphatic fertilizers (16 percent P_2O_5) and 304,700 metric tons of potassic fertilizers (50 percent K_2O) will be required by the end of 1950.

2. Livestock Industry

Major changes are not likely to occur in the livestock industry during the next five years. It will be difficult for the Japanese even to maintain their present livestock population because of the increased slaughter to fill the demand for meat, and the shortage of foodstuffs, particularly concentrate feeds. The best possibility for the immediate expansion of the livestock industry appears to be an increase in ruminants, particularly sheep and goats. These animals are able to live with comparatively little concentrate feed, and their utilization of roughage offers an opportunity for an improvement of the Japanese diet. However, to effect a substantial increase in ruminants, particularly the larger breeds, improvement and increased utilization of grazing lands is essential. Substantial increases in animals requiring large amounts of concentrate feeds, such as hogs and poultry, are improbable in the near future. Concentrate feeds for livestock have always been imported, and at present practically all concentrates are being used for human consumption.

CONCLUSIONS ON THE AGRICULTURAL ECONOMY

The factors examined show that Japan cannot provide all its food requirements from domestic sources or reduce its prewar dependence upon imported food. Not even an expanded acreage as envisaged by the Japanese land reclamation program, nor a reasonable increase in yields, or both, could make Japan self-sufficient in food. The only other source of

augmenting the food-crop acreage is a drastic reduction of the area in industrial crops. But such action is not in accord with the best interests of Japan's over-all economic reconstruction. It is well to remember that the proceeds from an acre of mulberries can buy several times the volume of food that could be grown on the same area, even at present low silk prices.

Both Japan and the countries trading with Japan should find it more advantageous for Japan to meet its food shortage by importing food. The countries of the Far East that produce rice, sugar, and soybeans can find in Japan a natural outlet for their products, taking in return consumer goods manufactured in Japan. Through such an exchange Japan should obtain its deficit food requirements. Attempts at food self-sufficiency under conditions existing in Japan are doomed to failure.

Consideration should be given also to the problem of rural unemployment with which Japan is faced in the years immediately ahead. Even at the height of Japanese industrial development, the shift from farms into industry was hardly sufficient to offset the annual increase of farm population. The population remaining on the farms was too large in relation to the cultivated acreage to find full employment there.

The number of surplus farmers would have been greater except that agricultural techniques in Japan have undergone only a few changes. From 1931-41 the use of machines for processing products increased considerably but there was no significant increase, however, in the amount of machinery used on farms.

Shortage of farm equipment during the war put an end to the expanding use of labor-saving devices. The trend now is in the opposite direction, and the surplus labor already existing in the Japanese village will be augmented still further. The consolidation of small agricultural holdings would open more possibilities for labor-saving devices, and one of the principal results of a more efficient use of labor would be the greater need to transfer labor from agricultural to other occupations. More emphasis should be placed on the development of rural industries. For example, the establishment of small canneries in rural districts might be examined as a means toward creating new fields for employment.

Because of the downward trend in silk production, Japanese agriculture is faced with further unemployment, as well as a considerable decline in income. Two hundred working days are required for cultivating an acre of mulberries and raising the cocoons from the harvested leaves. Less than 100 days are required for cultivation of upland crops on the same acreage. In consequence of the mulberry acreage reduction, the principal cocoon raising prefectures (Nagano, Gifu, Gumma, Yamagata, Saitama, Aichi, and Ibaraki) will be faced with the problem of finding employment for a large reserve of surplus labor.

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Thus, improvement in the economic utilization of agricultural resources in terms of land, labor, and equipment would only add to the surplus labor reserve. In that event, the need for alternative occupation, which the farm cannot provide, would be even greater than before the war. The effective remedy lies in the transfer of surplus workers in agriculture to other occupations, primarily to those of an industrial and commercial nature.

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