JAPAN AS A PRODUCER AND IMPORTER OF WHEAT

Since the war, there has been a gradual increase of the international trade in wheat and flour in eastern Asia. Though the absolute volume is not great, the trend has been steadily upward.[1] The question naturally presents itself to students of food commodities whether this phenomenon is merely the result of increasing density of population or presages any appreciable change in dietary habits among Orientals. If it indicates change of customs, the matter is of the utmost importance to the world at large. Unfortunately, few Asiatic countries possess a body of statistics adequate to test the question. Japan is the outstanding exception. In the present paper, her position as producer, importer, and consumer of wheat and its products is examined for the purpose of finding, if possible, an answer to the question put above.

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For such a study, Japan is suitable not merely because she presents good statistics, but also because she has gone further than other oriental nations in adopting occidental civilization, and because she is not a heavy producer of wheat, and has no considerable classes of population for which wheat is the staff of life.

This cannot be said of the Chinese, for example. China is both a great producer and a great consumer of wheat. In Central China, from the Yangtse Valley to the Yellow River, much winter wheat is grown, in large part in rotation with rice upon irrigated rice land (paddy), but also in rotation with soy beans, maize, and other crops upon upland, either irrigated or not irrigated. In many parts of North China and Manchuria, spring wheat is an important crop. For many of the North Chinese, wheat, millet, and kaoliang (a grain sorghum) are the staff of life and rice the luxury, whereas, for the South Chinese, rice is the necessity, though wheat is gradually becoming more widely used as a luxury. One of the principal obstacles to the wider use of wheat in South China is psychological: the South Chinese do not like its flavor.

Wheat consumption is nevertheless gaining ground in Central and South China, due to two phenomena, the result largely of the disturbed condition of the country. One is a curious internal migration of North Chinese into Central and South China. This migration is the result largely of better transportation facilities which enable the northerners to move south from their home regions of very low standards of living to regions of relatively higher standards of living. They merely follow the rule that population flows whenever and wherever possible from regions of lower living standards to regions of higher ones, that is, from places where it is relatively hard to make a living to places where it is easier. The movement has probably been accentuated by the revolutionary disturbances of the past decade, which apparently have been harder on the common people in the north than in the south. The North Chinese, who thus are infiltrating Central and even South China, not merely bring with them their food habits, but by their example they also lead other Chinese to consume more wheat, though as yet only as a diet accessory and to but a slight extent. The other phenomenon is a military one, the frequent inter-provincial movement of soldiers. The armies, on the whole, are composed of North Chinese in greater proportion than South Chinese, partly because the men of North China, by and large, are physically the more powerful and historically more inclined to war. During the past decade, North Chinese soldiers have come to many parts of Central and South China, and dis-

[1] See WHEAT STUDIES, June 1930, Vol. VI, No. 7.

banding of defeated forces and desertions have added to the internal migration above mentioned. The presence of these northerners, whether as soldiers, as deserters, or as bandits, has stimulated the consumption of wheat. Moreover, wheat is a more convenient army ration than rice, for wheat flour can be cooked in a greater variety of ways. Rice has to be cooked for each meal; it is not convenient to carry about. Bread, and especially the oriental types of steamed bread, can be slipped into a pocket or the haversack and is directly available for consumption for several days—a great advantage for an army in motion. In the rations of Chinese armies, wheat plays, therefore, an important rôle. When one considers that there are said to be two million men under arms in China, the effect upon China's dietary habits is bound to be considerable and probably lasting.

No such complex situation seems to obtain in Japan. Whatever may be the standards of living in the different regions of Japan proper, practically all Japanese are primarily rice eaters to the extent that their income permits. If there is in the Orient a general tendency for rice eaters to become wheat eaters, Japan should furnish an uncomplicated example.

During the last fifty years, the wheat area of Japan has increased by more than 30 per cent, and the crop by more than 170 per cent. The prospects of a further large increase of wheat culture, except possibly upon Hokkaido, are not good. At present, wheat does not compete at all with rice for land, since most of the wheat is grown in winter in rotation with rice.

Japan has been a steadily increasing importer of wheat. Before the war, she was a net importer of flour; during the war, she became a net exporter, and has strengthened her position in this regard since, ranking in 1928–29 as the world's fifth largest flour exporter. This is an "improvement trade" in wheat, the expression of growing industrialization and protective duties; she is likely to go further in this direction in future.

Between 30 and 40 per cent of Japan's domestic wheat crop is not commercially milled. Nevertheless, there is not very much room for the expansion of the milling of domestic wheat, because a large portion of the crop is consumed without conversion into flour. The per capita consumption of rice has steadily risen in Japan. It is now about 32 per cent greater than it was fifty years ago. The per capita food consumption of wheat has also risen; it is now between two and three times greater than it was fifty years ago. However, the absolute consumption is still small, not much more per capita than one tenth of that of rice. There is little evidence that the deep-rooted Japanese preference for rice is undergoing appreciable change. The preference remains despite the lower price of wheat per thousand calories.

I. AREA IN RICE AND WHEAT IN JAPAN PROPER

Let us first examine the area under rice and under wheat in Japan. Only 16 per cent of the total area of Japan is arable land, and a very large fraction of the total, some 59 per cent, is classified as forest land.[1] Of the arable land, 15 million acres, somewhat over 50 per cent is irrigated or "paddy" land; somewhat less than 50 per cent is unirrigated land or "upland." The rice crop occupies a little more than 50 per cent of the total arable area.[2] Table 1 shows the relative growth of the areas devoted to the principal grain crops in Japan proper by five-year periods from 1878–82. The area in rice has increased steadily. Wheat acreage reached a peak in 1918–22, but fell off in 1923–27; annual data since 1923 do not suggest that the post-war tendency is distinctly downward.[3] The area sown to barley increased from 1878–82 to 1903–07, but subsequently has tended downward. The acreage of naked barley reached a peak in 1913–17, and since then has declined; and the acreage in the millets has been declining since 1883–87.

Far the greater part of the wheat grown in Japan is sown very late in the autumn, though some spring-sown wheat is found in Hokkaido. The wheat is grown in small patches sometimes distributed among vege-

[1] S. Nasu, *Land Utilization in Japan* (Tokyo, 1929), pp. 68, 205.

[2] See Appendix Table I.

[3] See Appendix Table III.

table and barley crops. It is sown in rows, not broadcast. In some cases it succeeds and is succeeded by rice, in some cases by vegetables. Oxen or horses are in some places used in preparing the ground, but most of the work, including all the harvesting, is done with hand implements. As with other agricultural crops in Japan, cultivation is extraordinarily intensive: there is an entire absence of weeds; if any appear they are immediately eliminated by hand weeding. Night soil and chemical fertilizers are used. As the "nyubai" season, characterized by high humidity, heat, general cloudiness and intermittent rains, usually commences by the middle of June and continues into the second week of July, wheat must be harvested late in May or early in June, partly in order that the land may be ready for rice at the proper time. Japanese wheat is almost entirely a type of soft red winter wheat, characteristically starchy rather than glutinous.

TABLE 1.—TRENDS IN ACREAGES OF THE PRINCIPAL CROPS IN JAPAN PROPER, 1878–1927*

(Per cent: 1878–82 = 100)

Year	Rice	Barley	Naked barley	Wheat	Millets
1878–82.....	100	100	100	100	100
1883–87.....	102	103	115	109	100
1888–92.....	107	107	133	119	99
1893–97.....	109	108	145	123	97
1898–1902.....	111	108	149	131	96
1903–07.....	113	110	151	125	85
1908–12.....	116	103	149	131	78
1913–17.....	120	98	153	141	71
1918–22.....	122	88	142	147	61
1923–27.....	124	75	119	131	47

* Computed from data in Appendix Table III.

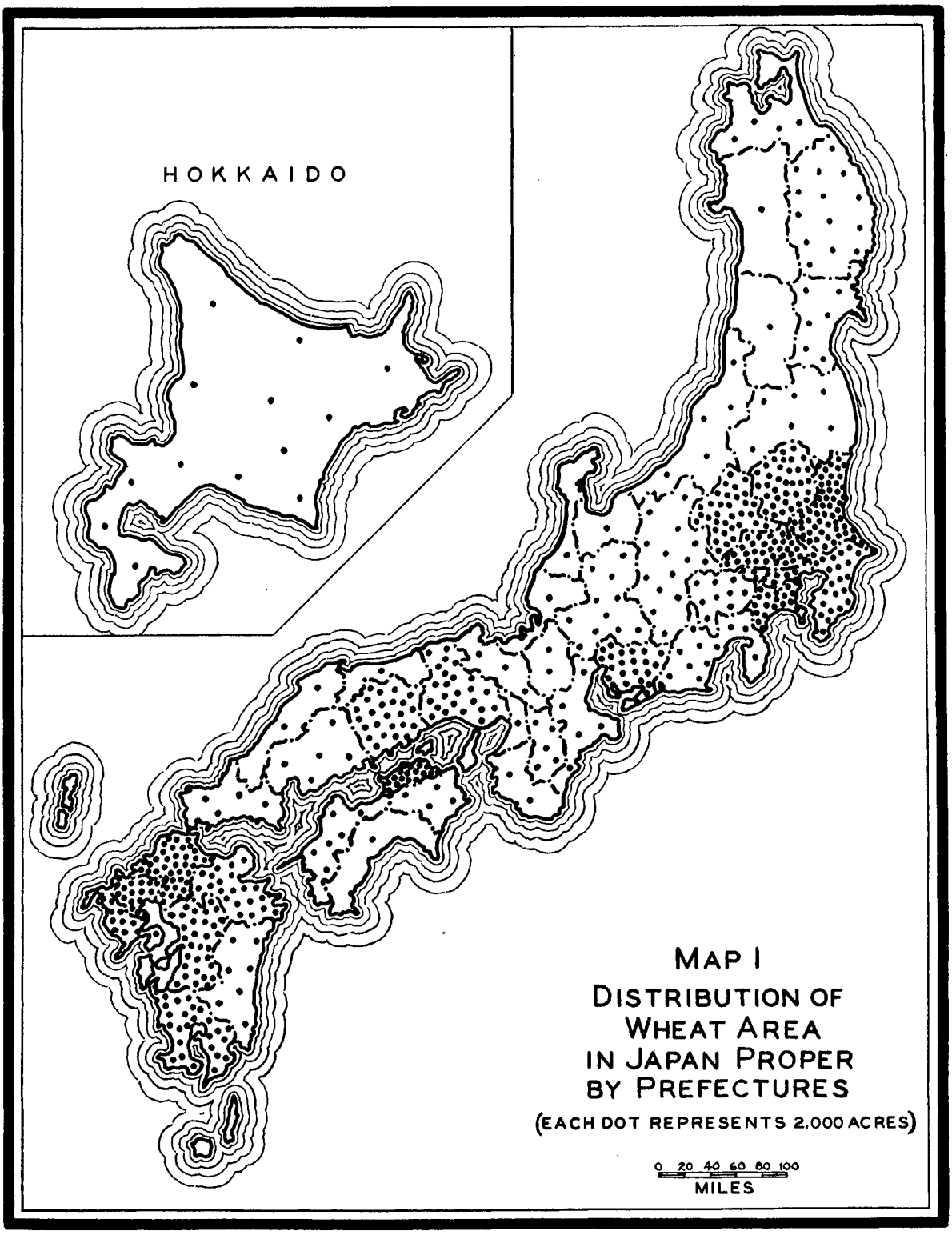
Wheat, barley, and naked barley are grown both on paddy land and on upland.[1] The area in barley is nearly three times as great upon upland as upon paddy; for naked barley, the upland area is less than the paddy area; and for wheat, the upland area is considerably greater than, but not double, the paddy area. Wheat, barley, and naked barley are crops subsidiary to rice, being grown during the winter where the climate permits the growing of more than one crop a year. Wheat, therefore, does not compete with rice for land, and hence is likely to continue to be grown regardless of the trend of rice culture. It is even likely to increase somewhat at the expense of the two kinds of barley. It is not likely to displace them entirely, partly because it is less suitable for certain soils, partly because it matures later. The late maturing causes the land to be ready for rice later in the spring when sown to wheat than when sown to barley—in some regions a disadvantage in delaying the sowing of rice. Later maturing of wheat than of barley is also disadvantageous because the wheat harvest tends to coincide with the beginning of the rainy season, and this makes for wheat poor in condition. Moreover, because the growing period of wheat is longer than that of barley, it is often advantageous for a farmer to grow both in the same season, since he thus achieves a better seasonal distribution of his labor. The competition for the land between wheat and barley is, therefore, rather less than one would be inclined to think.

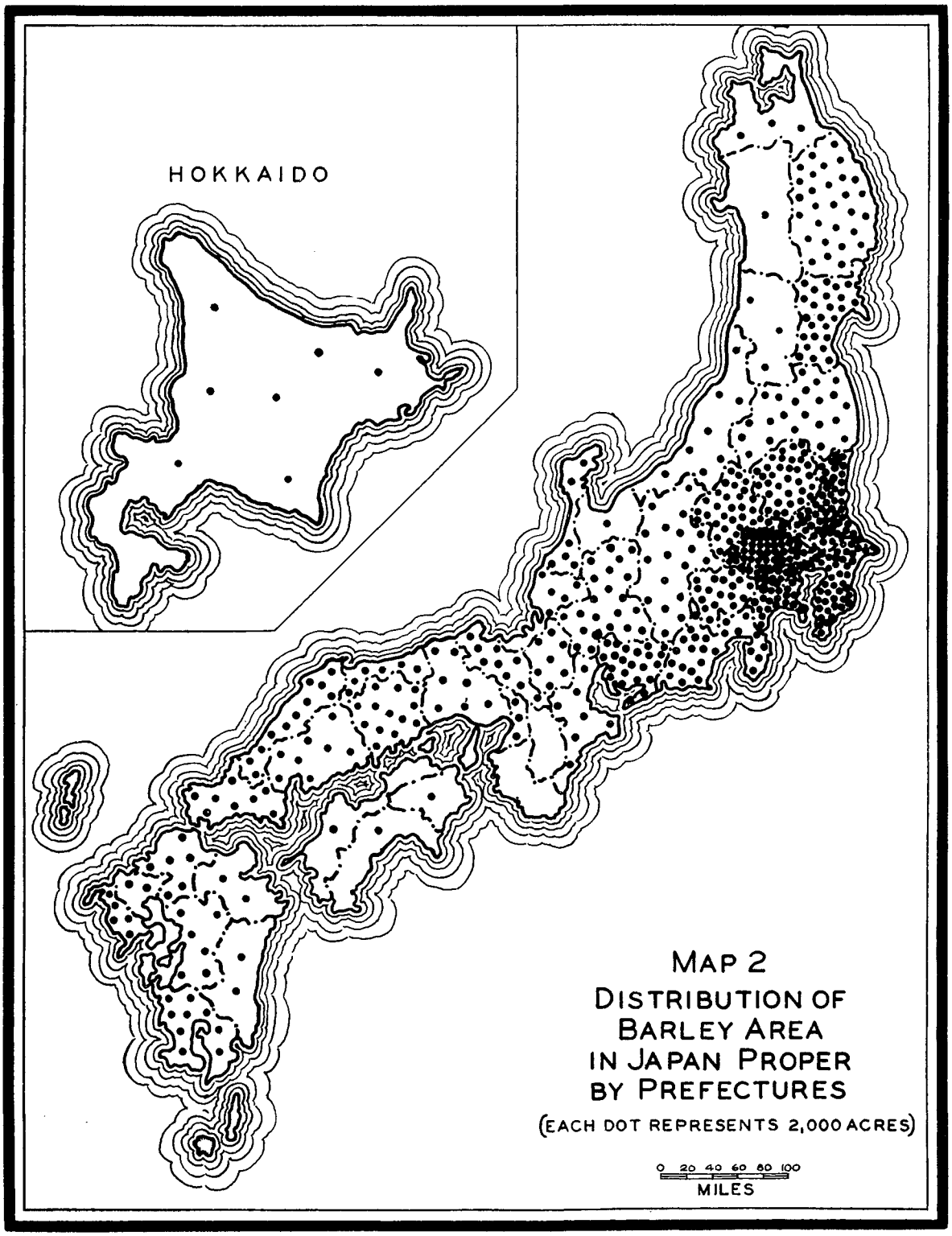
Maps 1, 2, and 3 (pp. 354–56) show the areas sown to wheat, barley, and naked barley by prefectures. There are no areas where wheat is extensively grown in the absence of the barleys. On the other hand, barley of one kind or the other is produced rather heavily in a few prefectures where there is little wheat. There is some overlapping of the three crop areas. Wheat competes principally with naked barley in the southern prefectures and with ordinary barley in the central regions. There is apparently room for some expansion of wheat at the expense of the barleys, especially in the central regions of the east coast where both wheat and barley culture are densest.

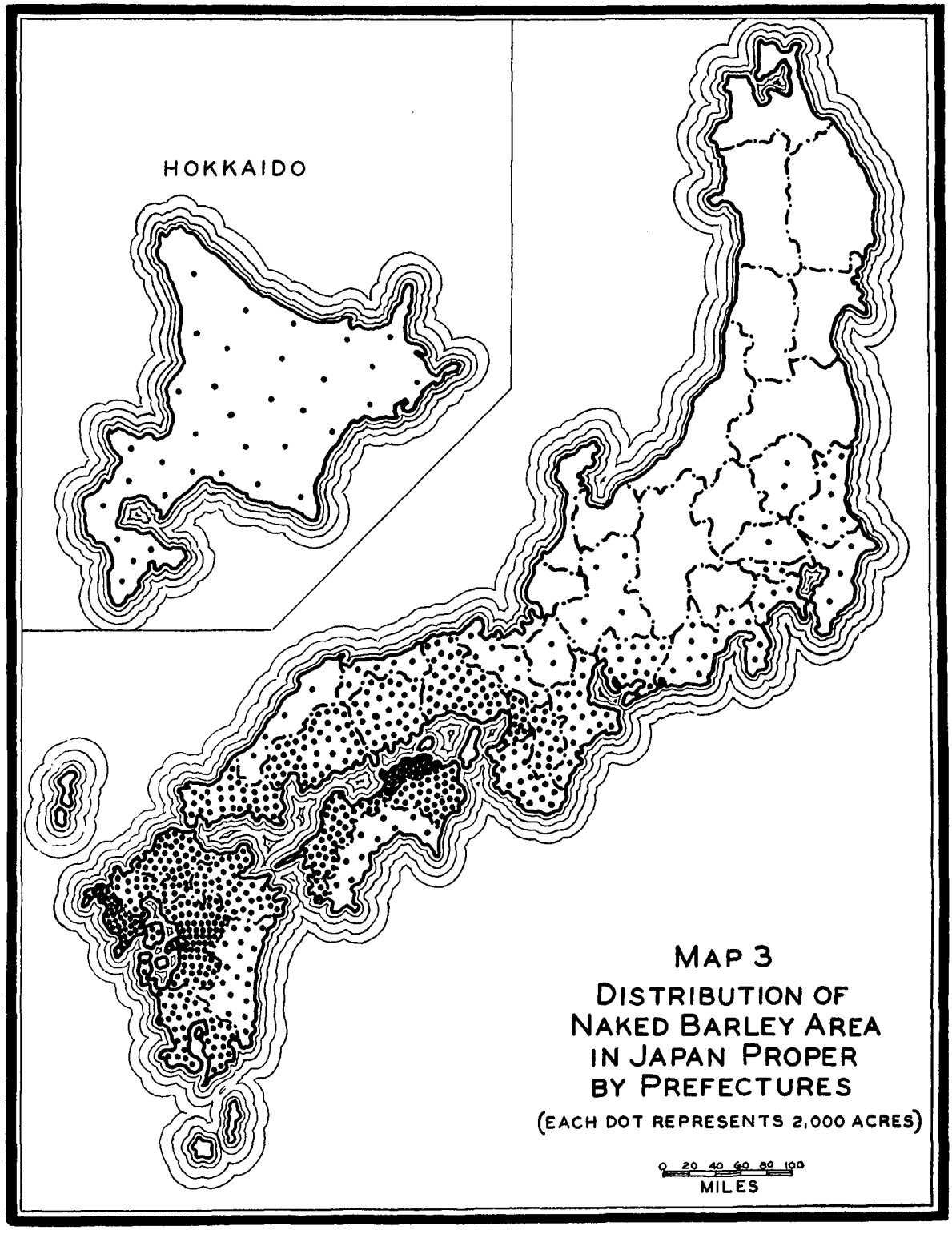
While wheat production might be increased to some extent by displacing the barleys upon both paddy and upland, there is little likelihood that the wheat area can be extended materially by bringing new land under cultivation. Between 1923 and 1927, the total arable area of Japan proper increased only 100,000 acres, or only 20,000 acres per year on the average, though in most earlier periods of equivalent length the average annual increase was a good deal larger.[2] Increases in the area of paddy land go largely into rice, at least in the southern regions. On upland, wheat competes not merely with food crops, but also

[1] See Appendix Table IV.

[2] See Appendix Table I.


HOKKAIDO
MAP I
DISTRIBUTION OF
WHEAT AREA
IN JAPAN PROPER
BY PREFECTURES
(EACH DOT REPRESENTS 2,000 ACRES)
0 20 40 60 80 100
MILES


HOKKAIDO
MAP 2
DISTRIBUTION OF
BARLEY AREA
IN JAPAN PROPER
BY PREFECTURES
(EACH DOT REPRESENTS 2,000 ACRES)
0 20 40 60 80 100
MILES


HOKKAIDO
MAP 3
DISTRIBUTION OF
NAKED BARLEY AREA
IN JAPAN PROPER
BY PREFECTURES
(EACH DOT REPRESENTS 2,000 ACRES)
0 20 40 60 80 100
MILES

with crops that furnish the raw material for some of Japan's most important industries, notably silk. The area devoted to these crops has in the past increased and shows no signs of decreasing in the immediate future.[1]

The opinion is sometimes expressed that on the northern-most island, Hokkaido, there is opportunity to bring appreciable areas of new land into cultivation. This is not the place for the discussion of this question. But even if extension of cultivation on Hokkaido were possible, it is problematical if such land would be devoted in any material degree to wheat, for the island seems better suited to oats and sugar beets.

There is, however, a possibility of increase in wheat production through extension of the area that is double cropped. At present, 30 per cent of the paddy area and 27 per cent of the upland area is so utilized, an average of 28 per cent, in round numbers, of all arable land.[2] Of the 70 per cent, in round numbers, that is single cropped, some, no doubt, is not suitable for double cropping because of climate; a good deal is in tree crops, fruits and mulberries principally. Nevertheless, when one considers that over 50 per cent of all arable land is in rice alone, it seems probable that there is room for expansion of double cropping, if the pressure to do so becomes great enough. If such expansion occurs, winter wheat would be one of the crops grown, and the domestic wheat crop would be enlarged. But wheat would not be the only crop, for much of the land now single cropped is moist and heavy and would involve vegetables rather than wheat if double cropped.

The inference seems warranted, therefore, that the only considerable expansion of wheat growing possible is through increase in double cropping and through displacement of the barleys, both in all likelihood very slow and gradual processes. No other possibilities seem important except in the event of an agricultural revolution. This is a conceivable result of increasing industrialization. At present, Japan proper is a rice-deficient country. It needs to import from Chosen (Korea), Taiwan (Formosa), and elsewhere about a seventh (14 per cent) of its rice requirements.[3] Even with this deficit, the situation is in part an artificial one, because of the government's protective tariff policy. A considerable tariff (about 22 cents per bushel) is levied in some years and not in others, according to the size of the domestic crop. In some years, an import embargo is imposed. For example, in 1927 there was a bumper crop, 1.12 times that of 1926. In March 1928, because the stocks on hand were adequate, the government placed a modified embargo on imports.[4] From 1910 to 1913 Korean rice had to pay the same rate as rice from foreign countries. Moreover, since the war, the Ministry of Agriculture and Forestry has practiced stabilization of rice prices by purchasing and selling in the open market. Through tariff policy, embargo, and stabilization schemes, the price of rice has been maintained at an artificial level, with the result that some land upon which production costs are high has been devoted to rice.

Should the Japanese government, under pressure of increasing industrialization, change its policy, as England did under analogous conditions in 1846 when it repealed the Corn Laws, much land now in rice would inevitably have to be devoted to other crops. Whether the wheat area would be increased materially is problematical. Since wheat is a winter crop, reduction of the rice area would not necessarily lead to an increase in the wheat area; indeed, it might lead to a decrease, if the crops that took the place of rice were of such a character as to occupy the land too long to make double cropping feasible. Certainly, fruits and vegetables would be grown largely upon the fertile irrigated paddy land, and some of these would not permit double cropping. Whether or not, at the distant time here under discussion, mulberries would take the place of upland rice—the mulberry is at present hardly grown at all on fertile irrigated land—it is not now possible to say, since the future world position of silk cannot be known. At present, there is reason to believe that silk culture in Japan has perhaps reached its climax, if it is not overexpanded. Silk is so large a proportion of Japan's foreign trade and the United States takes so large a proportion of all silk, that Japan's economic welfare depends too much for safety upon

[1] See Appendix Table III.

[2] S. Nasu, *op. cit.*, p. 139.

[3] See below, p. 366.

[4] British Department of Overseas Trade, *Report on Economic Conditions in Japan* (London, 1928), p. 85.

American purchases of silk. Hence, even in the event of agricultural revolution due to change in national policy, it is not clear that mulberry culture would expand and compete more than at present with wheat. The changes in wheat area that might follow an agricultural revolution are not clearly predictable, but such changes as one can reasonably imagine seem not to include a startling increase of wheat acreage.

II. THE VOLUME OF PRODUCTION OF FOOD GRAINS

Let us next turn to the volume of production of the principal food grains, as given in Appendix Table V and Table 2. These tables show the increasing efficiency of Japanese farmers in modern times. While the rice area has increased only 24 per cent since 1878, the total crop has nearly doubled.

TABLE 2.—TRENDS IN PRODUCTION OF THE PRINCIPAL CROPS IN JAPAN PROPER, 1878–1927*

(Per cent: 1878–82 = 100)

Year	Rice	Barley	Naked barley	Wheat	Millets
1878–82.....	100	100	100	100	100
1883–87.....	112	121	129	123	113
1888–92.....	130	131	142	146	157
1893–97.....	126	152	183	178	124
1898–1902.....	142	163	196	200	126
1903–07.....	155	168	180	170	119
1908–12.....	169	178	210	227	115
1913–17.....	184	186	229	264	113
1918–22.....	197	168	212	287	106
1923–27.....	194	154	191	273	77

* Computed from data in Appendix Table V.

The area in wheat during the same period increased a little more than 30 per cent but the wheat crop has nearly trebled. And this has been accomplished despite the fact that the newer land brought under cultivation must have been of poorer average quality than the land already cultivated. A further large increase in the rice area is not to be expected in the future, since there is little land left in Japan that can be brought under cultivation of any sort, except perhaps in Hokkaido, not very well suited to rice culture because it lies far north. On Hokkaido for the period 1923–27, there were nearly 320 thousand acres in rice, with a production of somewhat over 9 million bushels, equivalent to a yield of 28.6 bushels per acre. This comparatively low yield is evidence partly of the relatively unfavorable conditions for rice on the island, partly, perhaps, of a situation involving less intensive cultivation than in the southern islands. The scarcity of new land suitable for rice finds expression in the small expansion of the rice area in recent years and in the still more significant fact that in a number of years since the war the inroads upon arable land made by roads, railroads, building sites, etc., have been greater than the area of new land brought under cultivation.[1]

It is doubtful if yields per unit of area can continue to be increased as greatly in the future as they have been in the past, even though the yields do not now approach those of Spain and Italy. The following figures[2] give indexes of the yield per acre of rice in some rice-growing countries, in terms of averages for four years ending with 1927–28:

	Index
Japan proper	100
Spain	188
Italy	135
Taiwan	61
Chosen	51
World, excluding China.....	46

It is unfair, however, to compare Japan with either Spain or Italy, because only a small fraction of the arable land of Spain or Italy is in rice, whereas in Japan over 52 per cent is devoted to this crop. Hence it is reasonable to assume that in both Spain and Italy only land especially suitable for rice is devoted to it, whereas in Japan not merely such land, but nearly all other land on which rice culture is possible is in this crop. Moreover, in Europe different varieties are grown which tend to yield more heavily than the Japanese varieties. Furthermore, in Japan 4.4 per cent of the total rice area is upland (1923–27), on which the yield was about 20.9 bushels per acre, as compared with 39.2 bushels per acre on paddy land. In Spain and Italy, there is no upland rice; and this fact also contributes,

[1] See Appendix Table II.

[2] Computed from data in *International Yearbook of Agricultural Statistics, 1927–28,* pp. 138–41.

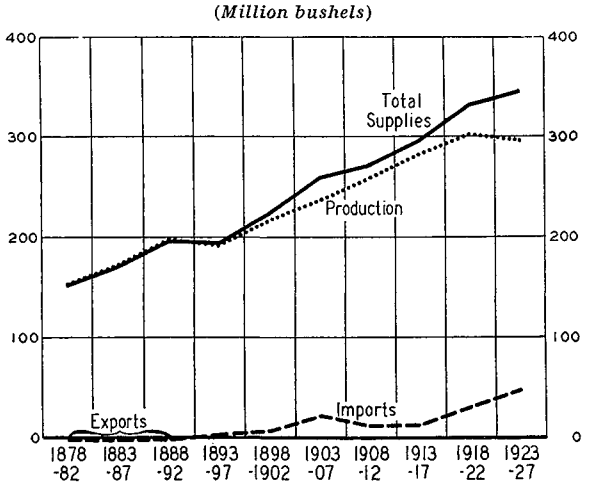
though only to a small extent, to make Japan's showing seem unfavorable. When all this is taken into consideration, it is questionable whether the showing made by Japan is much, if at all, inferior to that made by Spain or Italy. In any event, the conclusion is inescapable that Japan proper inevitably must become a steadily heavier rice importer if and as its population grows. Will her people in consequence turn more to wheat? Such a modification of dietary habits would probably render Japan's food situation easier, for wheat has long been cheaper per calorie than rice in the coastal Orient, and there is little reason to suppose that the relationship will be reversed.

III. FOREIGN TRADE IN RICE AND WHEAT, AND WHEAT MILLING

In order to determine the trend of consumption of rice and wheat in Japan, it is not sufficient to know domestic production; it is necessary also to know what quantities are both imported and exported, so that the total annual disappearance in the country may be calculated. Such data are given in Charts 1 and 2.

CHART 1.—NET IMPORTS (OR NET EXPORTS), PRODUCTION, AND TOTAL SUPPLIES OF RICE IN JAPAN PROPER, BY FIVE-YEAR PERIODS FROM 1878–82*

(Million bushels)



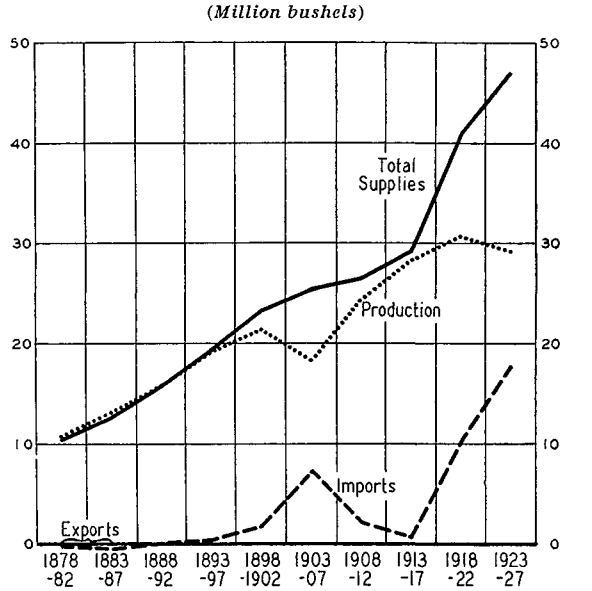
* Data from Appendix Tables V, VIII, and X.

Prior to about 1890, Japan was a small net exporter of rice. In recent decades there has been a large increase in net imports. For the period 1913–17, the net imports were 5.1 per cent of the domestic production; they rose in 1918–22 to 10.3 per cent; and in 1923–27 reached 16.7 per cent of the domestic crop. During the past fifteen years, 55 to 68 per cent of her imports have come from Chosen and Taiwan;[1] she depends more upon these two regions of the Empire for imported rice than upon all the rest of the world combined. Most of the rice imported is consumed in Japan; the portion exported represents for the most part a type of rice not desired by Japanese and goes to Chosen and Taiwan in exchange for rice of the type preferred in Japan. The exports in the past decade were less than 7 per cent of the imports.

[1] See Appendix Table VIII.

CHART 2.—NET IMPORTS (OR NET EXPORTS), PRODUCTION, AND TOTAL SUPPLIES OF WHEAT IN JAPAN PROPER, BY FIVE-YEAR PERIODS FROM 1878–82*

(Million bushels)



* Data from Appendix Tables V, VI, and X.

Like rice imports, the net imports of wheat (including flour as wheat) into Japan proper have grown rapidly, as appears from Chart 2. Prior to 1890, Japan was a small net exporter of wheat as of rice. The net imports of wheat increased strikingly between 1913–17 and 1923–26, rising from less than a million to nearly 18 million bushels per year on the average.

Table 3 gives data on Japan's trade in wheat flour and in wheat separately. From 1888 to 1907 imports of wheat flour increased steadily; imports thereafter dropped sharply to a lower level with no tendency to increase again. Before the war, Japan was a net importer of flour; during the war, she became a net exporter, and has remained increasingly so ever since. For the crop year 1928–29, Japan ranked as the fifth largest net exporter of flour in the world, following the United States, Canada, Australia, and Hungary, and leading Argentina and India. Southern Manchuria and northern China are the leading markets for Japanese flour. Japanese millers have been able to compete successfully with millers of the United States, Canada, and Australia, also with the Chinese millers of Shanghai, in these markets. This growth of the flour export trade is an expression of Japan's growing industrialization. According to the *Japan Year Book,* there were 33 machine mills on January 1, 1928, with a capacity of about 44,600 barrels in 24 hours. The milling capacity is now reported to be 46,000 barrels a day, of which 43,000 barrels is represented in the Japan Flour Milling Association, set up by the seven larger milling concerns under a benevolent governmental attitude.

Through the system of tariff duties, Japan reserves for herself the domestic market within the Empire. The policy involves expansion of the milling industry only in Japan, not in Chosen or Taiwan. The market for flour in Taiwan is retained by Japanese millers through high duty on foreign flour. Chosen sends wheat to Japan, but imports flour thence. Similarly, Japan imports wheat from northern Manchuria, when the crop permits, and exports flour to southern Manchuria and various points in China proper.

Table 3 also gives Japan's trade in wheat and flour with Chosen and Taiwan. The importation of wheat into Japan from Chosen is appreciable, though it constitutes but an insignificant fraction of the total imports, which come mostly from the United States, Canada, and Australia, the quantities imported from each country depending partly upon the relative prices.[1] The exports to Chosen are small. The imports of flour from Chosen are inconsiderable, but the exports from Japan into Chosen are large, 20 per cent of Japan's total flour exports in 1926.

From Taiwan, there are now no imports of wheat or flour into Japan, but the exports into Taiwan are considerable. There are no figures for the exports of wheat alone to Taiwan; it is grouped with barley and naked barley; but the sum of these grains is appreciable. The flour exports, however, are large. In 1926, they amounted to 11.47 per cent of the total exports of Japan proper.

Chosen and Taiwan together took nearly 31.5 per cent of all the flour exports in 1926,

TABLE 3.—TRADE IN WHEAT AND FLOUR AS WHEAT OF JAPAN PROPER, 1878–1926*

(Million bushels)

Year	Wheat net imports from				Flour net imports from				Total net imports from			
	Chosen	Taiwan	Other	Total	Chosen	Taiwan	Other	Total	Chosen	Taiwan	Other	Total
1878–82.....	...	...	(.25)[a]	(.25)[a]	...	...	...	...	...	...	(.25)[a]	(.25)[a]
1883–87.....	...	...	(.43)[a]	(.43)[a]	...	...	...	...	...	...	(.43)[a]	(.43)[a]
1888–92.....	...	...	(.12)[a]	(.12)[a]	...	...	.12	.12	...	...	.00	.00
1893–97.....	...	...	.00	.00	...	...	.37	.37	...	...	.37	.37
1898–1902...	...	...	.21	.21	...	...	1.65	1.65	...	...	1.86	1.86
1903–07.....	...	.03	1.72	1.75	...	(.13)[a]	5.71	5.58	...	(.10)[a]	7.43	7.33
1908–12.....	.05[b]	.01	1.66	1.68	.00	(.42)[a]	.99	.57	.05[b]	(.41)[a]	2.65	2.25
1913–17.....	.30	.03	2.51	2.84	(.14)[a]	(.70)[a]	(1.17)[a]	(2.01)[a]	.16	(.67)[a]	1.34	.83
1918–22.....	.48	(.06)[a]	10.03	10.45	(.27)[a]	(.49)[a]	.61	(.15)[a]	.21	(.55)[a]	10.64	10.30
1923–26.....	.05	(.14)[a]	21.69	21.60	(1.20)[a]	(.73)[a]	(1.93)[a]	(3.86)[a]	(1.15)[a]	(.87)[a]	19.76	17.74

* Data from Appendix Table VI.

[a] Net exports.

[b] Data for 1912 only. The five-year average counted into the total is 10 thousand bushels.

[1] See Appendix Tables VII and XIV.

a striking example of the importance of these parts of the Empire to Japan proper. In partial exchange, Japan took large quantities of rice. Japan has also exported appreciable quantities of barley and other coarse grain to Chosen.

The chief staple food of Formosans is rice, and as food habits are hard to change, the per capita rice consumption on Taiwan has remained about constant. Koreans, on the other hand, have always been accustomed to consume wheat and coarse grains, such as kaoliang and millet; the per capita consumption of rice is only about half as large in Chosen as in Taiwan. It was, therefore, less difficult to induce Koreans to export a large proportion of their rice to Japan and substitute for it wheat and coarse grains imported in part from Japan as barley and flour, in part from China as coarse grains.

Table 4, showing the details of Japan's flour-milling industry, is significant not merely because it shows the enormous expansion of flour milling—it has multiplied nearly 5 times in 25 years—but also because it indicates that an increasing percentage of domestic wheat is being ground in commercial mills. More wheat is being sold by farmers and less used directly on the farm. This is a manifestation of the transition from subsistence to cash-crop farming that is going on in many parts of the world today. The same phenomenon may also be observed in China, though there it cannot be proved statistically for lack of the necessary data. Mills at interior points have become more numerous and Chinese farmers, wherever favorably located, are increasingly selling wheat and buying flour or other cereals. Probably something similar is going on in Japan. Wheat is becoming more and more a cash crop. The phenomenon is usually accompanied by a shift in the classes that consume wheat. Farmers consume less and urban residents more of the domestic crop. Aside from the commercial advantage to the farmer to sell wheat and to purchase less flour than corresponds to the wheat sold, there are very special factors, as we shall see below (p. 364), that favor the consumption of wheat flour in cities as compared with the rural districts.

Table 4 also shows that, despite the increase in the proportion of the domestic crop that is ground in commercial mills, the domestic wheat so ground represents a decreasing proportion of the total volume of wheat milled in this way. This is the expression of increasing importation of wheat. During the period 1918–22, a little more than 41 per cent of the domestic crop failed to find its way to commercial mills. Nevertheless, the possibilities of expansion of milling of domestic wheat are not as great as this figure would indicate, since large volumes are consumed in the manufacture of sauce and for other purposes not requiring milling. This is shown in Table 5 (p. 362), which gives the distribution of the disappearance of wheat and also of barley and naked barley. The table shows that in the year 1922–23, 67.2 per cent of all wheat available disappeared in the form of flour and offal. Since, as we have seen, 59 per cent of the domestic crop was commercially milled in the period 1918–22, a period in which commercial milling increased faster

TABLE 4.—WHEAT-FLOUR PRODUCTION IN JAPAN PROPER, 1905–27*

Year	Total production of flour		Amount of wheat used					Domestic production of wheat		
			Total (*Million bushels*)	Domestic product		Foreign product				
	Quantity (*Million barrels*)	Index		Quantity (*Million bushels*)	Per-centage	Quantity (*Million bushels*)	Per-centage	Quantity (*Million bushels*)	Index	Per-centage milled
1905–07	1.40	100	6.23	4.86	78	1.37	22	18.18[a]	100	26.7
1908–12	2.62	187	11.83	10.30	87	1.53	13	24.26	133	42.5
1913–17	3.68	262	16.57	13.69	83	2.88	17	28.28	156	48.4
1918–22	5.25	374	23.42	18.10	77	5.32	23	30.71	169	58.9
1923–27	6.73	480	.....	.....	..	....	..	29.22	161	....

* Data from *Statistical Report on Wheat*, January 1928, and *Statistical Annual of the Empire of Japan*.

[a] Five-year average, 1903–07.

than the domestic crop, the wheat milled otherwise than in commercial mills cannot amount to more than 8 per cent of the total disappearance; for the last year of the period, it was probably less.

TABLE 5.—APPROXIMATE UTILIZATION OF WHEAT, BARLEY, AND NAKED BARLEY IN JAPAN PROPER, JULY–JUNE, 1922–23*

(Percentage of total)

Item	Wheat	Barley	Naked barley
Whole grain, cracked grain, coarse meal	1.0	64.8	74.0
Feed	1.5	22.1	11.7
Seed	2.2	2.9	3.6
Flour and offals	67.2	0.2	0.3
Sauce	21.5	1.2	3.4
Beer	.0	3.8	.0
Cakes and sweetened foods	3.2	1.0	0.2
Pea-cheese	1.6	3.3	5.6
Others	1.8	0.7	1.2
Total	100.0	100.0	100.0

* Data from *Statistical Report on Wheat*, January 1928, p. 56.

No large volume of domestic wheat is, therefore, available for the expansion of commercial milling.

It is possible, from the figures contained in Table 4 and Appendix Table VI, to estimate the domestic consumption of commercially milled flour. The data, by five-year periods from 1905–07, appear in Table 6. Calculations such as these must always be interpreted with caution. Even so, Table 6 indicates that, while the consumption of commercially ground wheat flour is small (18.6 pounds per capita per annum in 1923–27), it has been steadily rising for two decades. This is not to be taken to mean, however, that the per capita consumption of wheat in all forms, whether milled on the farm or in a machine mill, or consumed unmilled in other ways, is necessarily also increasing. It may merely mean that more domestic wheat is now consumed as commercially milled flour. In this connection it is desirable to recall that the proportion of the Japanese wheat crop that goes to flour mills has increased greatly, as we have seen.

TABLE 6.—PER CAPITA CONSUMPTION OF COMMERCIALLY MILLED FLOUR IN JAPAN PROPER, 1905–27*

Year	Total flour consumption (*Million barrels*)	Population (*Millions*)	Per capita flour consumption (*Pounds*)
1905–07	2.60[a]	48.1	10.6
1908–12	2.74	51.0	10.5
1913–17	3.25	54.9	11.6
1918–22	5.22	58.0	17.6
1923–27	5.90	62.1	18.6

* Flour production and trade data from Table 4 and Appendix Table VI; population from *Statistical Annual of the Empire of Japan* and *Japan Year Book*.

[a] Includes imports for 1903–07.

IV. FORMS OF WHEAT CONSUMPTION IN THE ORIENT

The interpretation of consumption statistics is simplified by knowledge of the various ways in which wheat is consumed as food in Japan, for wheat utilization takes certain forms largely unknown in the Occident.

Wheat may be consumed with or without conversion into flour. In Japan, unlike in the Occident, much is used for human food whole or cracked or ground into coarse meal. Whole or cracked wheat boiled like rice presents no special advantages over the coarse grains. A people accustomed only to this utilization would hardly turn from coarse grains like sorghums to the more expensive wheat. As this is the principal method of cooking rice, rice eaters would not be expected to substitute wheat for rice cooked in this way, unless induced to do so because of price. One would not expect a people with a rising standard of living, like the Japanese, to increase their wheat consumption in this form; and it is probable that this use has been on the decrease. There are no available statistics to support this surmise, but it is rational because the food use of coarse grains, especially the barleys, which are largely consumed in this way, has certainly been decreasing. However, appreciable quantities of the barleys (65–75 per cent) and a little wheat (1 per cent, see Table 5) are still used thus. A small proportion of wheat is mixed with rice and the mixture boiled or steamed, as

rice is cooked by itself. There is a special reason for the continuance or even the increase of this practice, since the admixture helps to prevent the development of the disease, beriberi, which is liable to attack those whose diet consists too largely of polished rice.

Another use taking appreciable quantities of wheat in Japan is in various types of confections and in a large variety of sweet goods. The wheat is boiled, parched, or steamed, and made into cakes or confections with some form of syrup or sugar. The syrup is often the product known as *ame,* really a malt-sugar syrup made by malting glutinous rice, barley, wheat, or other cereal or starch derived from potatoes, sweet potatoes, imported cassava, etc. About 3.2 per cent of the disappearance is accounted for in this way (Table 5).

Another, though minor, use is as a beverage. The wheat is parched and used much like some of the imitation coffee preparations on the European and American markets.

Another use is in the manufacture of a sort of fish sausage and with fried fish. It is also used in the manufacture of a sort of cheese, *miso,* made from a mixture of wheat and soy beans or peas. This use takes 1.6 per cent of the total disappearance.

The largest use of all of unmilled wheat is in the manufacture of soy-bean sauce and related products. In this process, roasted wheat and soy beans, suitably moistened, are inoculated with the spores of a special kind of fungus, and incubated until the fungus has grown all through the mass. Brine is then added and the mixture is allowed to ferment until the mass has been converted to a brown liquid. This liquid after ageing is the sauce. The quantity of wheat used in this way is large, 21.5 per cent.

Another product peculiar to the Orient is *ajinomoto.* Chemically this is monosodium glutamate, $NaH_8C_5NO_4$. It is a micro-crystalline, white or cream-colored powder, widely used as a flavoring matter in soups and sauces. While it has long been known that glutamic acid and its salts, discovered by Ritthausen in 1866, have a characteristic flavor, its commercial introduction is due to the Japanese biochemist, Suzuki. In its manufacture, gluten is prepared from flour. The starch obtained incidentally is used for other purposes. The gluten is hydrolyzed, and from the products of hydrolysis *ajinomoto* is prepared. The product is now manufactured in China as well as in Japan. The process has recently been described in some detail by Han.[1] How large a volume of flour is devoted to the manufacture of *ajinomoto* in Japan is not recorded.

Oriental uses of flour resemble those of the Occident more closely than do the uses of wheat grain. Data on the several uses of flour in Japan appear in Table 7. Throughout the Orient, flour is much used to produce cakes, crackers, biscuits, and sweet goods of various sorts. The consumption of many kinds of cakes and biscuits seems to be on the increase in various oriental countries, notably in the cities of Hongkong and Shanghai, and in the Netherlands East Indies. In Hongkong, for example, there are several Chinese factories making many kinds of sweet goods which are extensively exported. There are no statistics on the subject, but the inference based on multiplication of such factories seems reasonable. It is through crackers, sweet goods, and biscuits that increasing quantities of wheat will probably be consumed, since very sweet and highly seasoned goods make a strong appeal, and since these goods may be sold conveniently in very small units for very small sums. There are no separate data for this use in Japan; it is lumped in with dumplings and steamed bread (Table 7).

TABLE 7.—APPROXIMATE UTILIZATION OF WHEAT FLOUR IN JAPAN PROPER, JULY–JUNE, 1922–23*

(Percentage of total)

Item	Percentage
Macaroni or vermicelli	50.3
Bread	17.2
Bran	5.3
Cakes and dumplings	20.7
Adhesives	2.3
Others (industrial manufacture)	4.2
Total	100.0

* Data from *Statistical Report on Wheat,* January 1928, p. 56.

[1] John E. S. Han, "Monosodium Glutamate as a Chemical Condiment," *Journal of Industrial and Engineering Chemistry,* October 1929, XXI, 984–87.

The largest use of flour, however, over 50 per cent of the total, is for noodles, boiled or fried for consumption. The next largest use is for cakes and dumplings or steamed bread, together 20.7 per cent of all flour used. In China, to make dumplings, pieces of unleavened dough are boiled or the dough is wrapped around the end of a stick, which is immersed in boiling water or steamed. Dumplings often contain a filler of vegetables and meat, or peas, or beans, or sweetened material. Some of them are not unlike very large Italian ravioli. The Chinese method of making steamed bread is to make a dough with some sort of leaven and let it rise. Except in the cities, most of the leavening is by the sour-dough method, the excessive acidity being neutralized carefully with commercial soda. When available, yeast is sometimes used. Pieces of the risen dough are placed on a circular, perforated tray which fits into a large, conical pot, the tray put into place, and the pot covered. The pot is then placed on a fire. The conical shape of the pot permits a small volume of water to suffice, and thus fuel is economized, a most important matter in many parts of China, where fuel is very expensive. The steamed bread thus made is about the size and shape of an apple. It has a golden-brown crust with good bloom; but the crust is not crisp as in oven-baked bread. It is rather tough and leathery, and might perhaps more properly be described as a skin than as a crust. It can be pulled off rather readily. The interior of the bread is rather tight in grain and soggy. In Japan, in steamed bread made by these or similar methods, some flour is consumed; but the amount is not made clear by the official statistics.

Bread baked in an oven in the occidental fashion is found in Japan principally in the cities that have been touched by occidental influences. It is consumed largely by the upper classes and by students, clerks, etc., who take their midday meals in shops or restaurants. It is all bakers' bread, and absorbs 17.2 per cent of the flour disappearance. There seems to be little, if any, home baking in the Orient. For this there are very good reasons. Few houses in Japan are equipped with stoves with ovens. Indeed, cooking on a stove or in an oven is the exception in the Orient, apparently largely because it is wasteful of fuel. There is very little coal available for domestic use; cooking is done in Japan largely with charcoal and wood, and to a limited extent in some cities with gas. In much of China, every bit of grass, straw, stalk, and root, so far as it finds no other use, is carefully preserved for fuel. Indeed, in China, while kaoliang is grown primarily for grain, the stalks have also value for weaving the walls of houses, for making fences, for fuel, and for many other uses. In Japan, wood and charcoal are the principal cooking fuels of the common people. No doubt, the high price of firewood and charcoal is an important factor in keeping some of the rough land in forests.[1] This apparently pays better than to devote it to animal husbandry, even though a large increase in the numbers of domesticated animals seems greatly in the national interest, for it is generally believed that the Japanese diet is on the average deficient in protein of good quality, such as is furnished by animal products.[2] The high cost of fuel is unquestionably a great obstacle in many regions of the Orient to the introduction of any new food that requires to be prepared by baking, a procedure that is relatively wasteful of fuel.

There is another serious obstacle to the general use of leavened bread, the difficulty of securing good yeast. In tropical countries and in southern Japan, during a portion of the year, the climate is rather warm for the proper growth of yeast as well as for the yeast-leavening of bread. Saving a piece of dough from one baking to use as a leaven for the next does not always work well. The sour dough is likely to putrify. Moreover, knowledge concerning the leavening of bread is not current among the common people. Where there are breweries, as in Japan, the difficulties are not so great, for yeast may be obtained from a brewery; at a pinch, a bottle of beer, if it has not been pasteurized, will serve, and is so used in some tropical regions. At any rate, lack of general knowledge concerning the leavening process, difficulty of securing

[1] Fifty-nine per cent of the total area of Japan is classed as forest land. Fifty per cent is in standing trees for the production of timber; 9 per cent is treeless, used for animal husbandry. S. Nasu, *Land Utilization in Japan* (Tokyo, 1929), pp. 68, 205.

[2] Shozo Toda, "The Actual Consumption of Food in Japan," *Japan Medical World*, February 15, 1927, VII, 41–45; also Edgerton Charles Grey, "Has Japan Enough to Eat?" *Asia*, April 1928, XXVIII, 274–79, 339–42.

or preparing yeast except in a few large cities, absence of baking equipment, and high fuel costs of baking all render it extremely unlikely that there will soon, or perhaps ever, be any general home baking of yeast-leavened bread in a country like Japan. What bread is consumed is bakers' bread, limited to the larger towns and the areas immediately tributary to them. If the consumption of wheat flour is to increase outside these regions, it will be in the form of steamed bread and dumplings, noodles, cakes, crackers, biscuits, sweet goods, and other non-perishable products, or products that are more easily prepared than leavened bread.

V. THE CONSUMPTION OF FOOD GRAINS IN JAPAN

To understand the course of consumption of wheat in Japan for the past half-century, it is important to know the character of the diet in general at different periods. The Bureau of Agriculture published data[1] in diagrammatic form for the diet of 1880 (excluding fish, animal products, and sugar) as follows:

Rice	53.1 per cent
Wheat (including barley and naked barley)	26.9 per cent
Other grains	13.8 per cent
Vegetables, fruit, and seaweeds	6.2 per cent

For the urban population the diet[2] was given as follows:

Rice	91 per cent
Wheat (including barley and naked barley)	4 per cent
Other grains	4 per cent
Sweet potatoes	1 per cent

While these figures may perhaps be open to question in certain respects, they may nevertheless be regarded as presenting a generally truthful picture of the situation. They indicate, indirectly, that the consumption of animal foodstuffs must have been quite inconsiderable.

For recent years, a study by Grey is illuminating. Table 8 summarizes his findings. This is not the place for a detailed analysis of dietary trends in Japan. For present purposes, it is sufficient to note that, according to Grey's study, the percentage of rice in the diet would seem to have decreased. However, the 1880 study of the Bureau of Agriculture did not include fish, animal foods, and sugar. If these are eliminated from Grey's list, then the percentage of the diet consisting of rice was actually greater in 1925 (55.4 per cent) than in 1880 (53.1 per cent). In general, one may then say that the proportions of all elements of the diet have increased, save of the non-rice cereals, wheat excepted.

TABLE 8.—DISTRIBUTION OF FOOD CONSUMPTION IN JAPAN IN 1925*

Item	Percentage
All plant foods	91.75
All cereals	70.85
Rice	50.83
Barley (including naked barley)	10.15
Wheat	6.63
Other cereals	3.24
All legumes	8.47
Soy beans	4.76
Other beans and peas	3.71
Roots and tubers	9.65
Potatoes (sweet and Irish)	8.63
Other roots	1.02
Vegetables, fruits, and seaweeds	2.78
All animal foods	2.95
All fish	2.43
Meat and poultry	0.27
Eggs and milk	0.25
Sugar	5.30

* Data from E. C. Grey, *Food of Japan* (Geneva, 1928).

While it is not possible from the data at hand to estimate with any degree of certainty whether the diet of the Japanese today is more diversified than it was a generation ago, everything indicates that such is the case, and also that the per capita food intake is somewhat greater. How is this fact, if it is a fact, to be interpreted? Does it mean that the Japanese were formerly undernourished, under-weight, or merely that they waste more nowadays? Or does it mean that their food requirements are greater per capita today than they were fifty years ago?

[1] Data from Japanese Bureau of Agriculture, *Second Statistics on Agriculture* (in Japanese), September 1881.

[2] *Ibid.*

Probably all of these elements play a part in the situation. Certainly, there is evidence that present-day food requirements must be greater than fifty years ago, because the rapid rate of increase of population growth must have changed the age distribution of the people, so that the proportion of those in the prime of life and of children must be greater. The food requirements of both these classes are high and would tend to raise the average per capita consumption. Furthermore, one very frequently encounters the statement that the average Japanese of today is of larger stature than formerly. If that is indeed true, his food requirements would be greater. That his greater food intake may be the cause of his better physique does not alter the fact. Against these factors, however, must be offset the fact that the Japanese, as a whole, today are probably better clothed and better housed than they were in 1880, for the general standard of living has unquestionably been rising. Warmer clothes and better houses tend to lower food requirements. Moreover, with increasing industrialization, there is some tendency to replace manual labor with machines; the use of the machine makes less hard manual labor necessary. This is readily observable in Japan. Before long, automobiles will make the jinrikisha in such a city as Tokyo as much a curiosity as a hansom cab in New York or London. This reduction of the necessity for arduous manual labor tends to reduce food requirements. Nevertheless increasing industrialization has brought with it great increases in the volume and weight of freight transported, and manual labor is widely used in handling it; and this may have tended to increase the calorie requirements. Again, it is possible that farm work, being more diversified in its nature than it was fifty years ago and yet not much more mechanized, may make for a greater calorie requirement among the rural population.

The total disappearance of all the cereals, including buckwheat, from 1878 by five-year periods, is given in Appendix Table X. Prior to the war, the disappearance of all the grains except the millets and in a lesser degree naked barley steadily increased. Since the war, however, the disappearance of all of them except rice, wheat, and oats has diminished. This phenomenon is even more striking if the per capita disappearance is considered, as given in Appendix Table XI. In making these computations, it has been assumed that each year's crop was consumed in the same year, which is, of course, not the case. No other method of analysis is possible, since there are no statistics of carryovers. However, the use of five-year averages tends to minimize errors from this source. Furthermore, the calculations are based on the figures for legal population; in 1920 this was probably 3.5 per cent too high, and in 1928, probably 3.9 per cent.

We have already noted that imports of rice have been rising rapidly. This is due, in the main, to population increase, as the following figures suggest:

Year	Population growth (*Millions*)		Net rice imports (*Millions of bushels*)	
	Total	Increase	Total	Increase
1913–17	54.9	...	14.5	....
1918–22	58.0	3.1	30.9	16.4
1923–27	62.1	4.1	49.3	18.4

It is obvious that there is a very close relationship between rice imports and population increase. This relationship is even closer than the figures above indicate, as the figure 4.1 millions for the population increase between the periods 1918–22 and 1923–27 is undoubtedly too high, since it is derived from the figures for the "legal" population, not from the figures of the population actually resident. This form of enumeration is a peculiarity of the Japanese census, which it is not necessary to discuss here.

Let us put the matter in another way. Assuming the per capita rice consumption in Japan proper to be 5.58 bushels per annum, around 8.9 million people depended during 1923–27 upon importations for their rice supply. Or in other words, in 1923–27, 14 per cent of Japan's inhabitants were dependent upon other countries for rice. Japan has sought for years to achieve self-sufficiency in food supply, and has truly achieved wonders. Yet, though in half a century she has increased her rice fields by 24 per cent, her production by 94 per cent, and her yields per unit area by 56 per cent, all this has been inadequate to meet the demands of a 73 per cent increase in population, and a 32 per cent increase in per capita consumption (see below).

Since rice has other than dietary uses, it is necessary, in order to arrive at a sound estimate concerning the trend of the rôle of rice in the Japanese dietary, to eliminate these uses from the calculations. According to an official survey made for the year November 1, 1920, to October 30, 1921, the disappearance of rice[1] took the following forms:

Direct	85.1 per cent
Other foods: cakes, dumplings, sweetened foods	5.5 per cent
Manufactured foods: brewing, soy sauce, flavoring	7.4 per cent
Seed	1.2 per cent
Others: yeast, adhesives, etc.	0.8 per cent
Total	100.0 per cent

It will be noted that 85.1 per cent was used as such without having undergone any manufacturing process, except milling to remove the hull and polishing. Together with that used in cakes and sweet goods, this brings the proportion of the total rice supply used directly as human food to 90.6 per cent. Only 7.4 per cent was used in the manufacture of food products by processes in which a part of the food value is sacrificed. Ninety-eight per cent is, therefore, used directly or indirectly for food purposes.

Leaving out of consideration in the calculation the indirect food uses amounting to 7.4 per cent, and assuming the direct use as food to be 90 per cent in the years for which direct data are not available, i.e., for all years except 1920–21, we obtain from the total disappearance the following figures for direct per capita consumption as food:

Year	Bushels	Year	Bushels
1878–82	3.82	1903–07	4.90
1883–87	4.05	1908–12	4.77
1888–92	4.40	1913–17	4.88
1893–97	4.16	1918–22	5.16
1898–1902	5.01	1923–27	5.02

If we adjust for resident population, the approximate annual disappearance per capita due to use as food in Japan proper in 1923–27 was 5.28 bushels.

Most of the official statistics are on the basis of rough, or brown, rice, i.e., rice from which the hull has been removed, but which has not been polished to whiteness. The per capita consumption figures, above given, assume that all the official statistics refer to rough or brown, i.e., hulled, but not polished, rice. They cannot, therefore, be regarded as representing the contribution made by rice to the food value of the diet, for something like 10 per cent by weight is lost in polishing. We have no data concerning the uses to which the material lost, known in America as rice polish, is put. Probably it is used in Japan as animal feed,[2] as it is in America. Then, in estimating the rôle in the dietary of rice, as such, we must reduce the above-given per capita consumption figures by 10 per cent. The per capita consumption (ingestion) figure for the period 1923–27 then becomes 4.75 bushels.[3] Assuming 6 per cent to be unavoidable waste and the energy content of rice as eaten to be 99,609 calories per bushel, then the average energy per day per person, derived from rice, was 1,218 calories. This does not include the energy in alcoholic beverages, sauce, cheese, etc., derived from rice. For lack of data, it is not possible to estimate the quota supplied in this way. At any rate, it is safe to say that over half the energy of the Japanese diet is derived from rice alone.

The picture for wheat is somewhat different, since it is put to more non-food uses than rice. It is not possible to analyze wheat consumption as clearly as rice consumption both because of the multifarious uses of wheat and because certain items of utilization shown in Tables 5 and 7 (pp. 362, 363) are not clear to us. Thus Table 7 includes bran as if it were flour. Moreover, this table accounts for only a portion of the bran produced in milling, to say nothing of other offal. Official records indicate that the flour yield, i.e., the extraction, obtained in Japanese mills is about the same as in commercial mills elsewhere. It is about 72 per cent, with a yield of about 28 per cent of bran and other offal. The inclusion of a figure for bran (which we are unable to interpret unless "bran" means something like "red dog flour") introduces an ele-

[1] Data from *Statistical Annual on Rice*, November 1928, p. 43 (in Japanese).

[2] However, rice polish so used is only in part lost to man for food purposes, since it is converted, with losses to be sure, into meat, poultry, eggs, milk, etc.

[3] This does not include rice consumed in the form of *sake* (rice wine), *sake* whiskey, beer, sauce, etc.

ment of uncertainty in all the other figures of the table; unless this bran is really a low-grade flour, these other figures must be a little too low. Similarly, in Table 5 there is uncertainty concerning the meaning of "other uses" of wheat grain. All told, however, it seems probable that something like 9 or 10 per cent of the Japanese total wheat supplies goes for the manufacture of adhesives, for other industrial uses, for feed, and for seed. This is a rather low figure as compared with many occidental countries, where the uses of wheat for feed and seed especially are larger.

Appendix Table XI gives the total per capita disappearance of wheat in Japan proper. At least 9 or 10 per cent of the quantities there shown must have gone for industrial uses, feed, and seed at least in 1922–23, though one cannot be sure of the distribution in other years.

The available evidence suggests that the industrial uses of wheat have increased in the last fifty years, keeping pace with growing industrialization. Table 7 (p. 363) shows that 2.3 per cent of the flour was used for adhesives (paste, etc.), and 4.2 per cent for industrial uses—6.5 per cent in all. It is probable that these uses are proportionately greater than they were fifty years ago. The principal industrial use of wheat flour is probably for the manufacture of starch as sizing material in Japan's rapidly growing textile industry. However, wheat flour is not the only source of adhesive and sizing materials. Japan produces for these purposes potato starch, and imports a large volume of cassava (tapioca) starch from the Netherlands East Indies. The proportion of the wheat available used for seed has probably been about the same over the whole period of years, though, of course, the absolute quantity has increased with the increase in wheat area. In 1922–23, 2.2 per cent of the disappearance was for seed, or 1,024,000 bushels. This is a seeding of only .85 bushels per acre, a small quantity as compared with what is used in most other countries, but not surprisingly small when one recalls the wheat-growing methods of the Japanese.[1]

[1] See above, p. 353.

[2] See Appendix Table XII.

[3] S. Nasu, *Land Utilization in Japan* (Tokyo, 1929), p. 20.

The use for feed is small, only 1.5 per cent (Table 5, p. 362), so that even a large change in this use would not much affect the calculations of food consumption. However, it is probable that feed use is greater today than it was fifty years ago, because the animal industry of Japan has been expanding greatly.[2] During the last 20 years, cattle have increased 20 per cent; horses, 6 per cent (although over the period from 1878–82 no distinct trend appears); hogs, 174 per cent; goats, 139 per cent; and ducks, 320 per cent. Though the percentage increases have been large, the absolute number of farm animals, even today, is not large. The Japanese are not primarily eaters of slaughterhouse meats; they prefer fish. Nevertheless, the greatest increases have been in the numbers of meat animals, hogs, goats, and poultry. Cattle are kept primarily for purposes of farm labor. Though of recent years there has been a large percentage increase in milch cows, the total number is still insignificant. In addition, there is a small but increasing number of dairy cows on farms devoted primarily to other enterprises than dairying. The number in 1927 was 12,196. There has also been a large increase in the number of poultry, with corresponding increase in the volume of production of eggs. It is not unreasonable to believe that this increase in stock farming, so great in percentages, so small in absolute volume, has been accompanied by a small but increasing use of wheat as feed. Practically all the bran of Japanese mills seems to be used for feed, and, besides, Japan proper imports about half of the bran produced by Chinese seaboard mills, to a value of about 5 million dollars per annum. Bran is now duty-free, because of the government's policy to foster animal industry at home, but some millers have advocated the imposition of an import duty.[3]

Furthermore, it should be recognized that the use of wheat in yeast-leavened bread is new, while the use in sauce, cheese, etc., is ancient. It is reasonable, therefore, to assume that there has been less per capita change in the ancient than in the modern uses, and that the use of wheat in the occidental fashion has probably increased more rapidly than the other uses, industrial ones perhaps excepted.

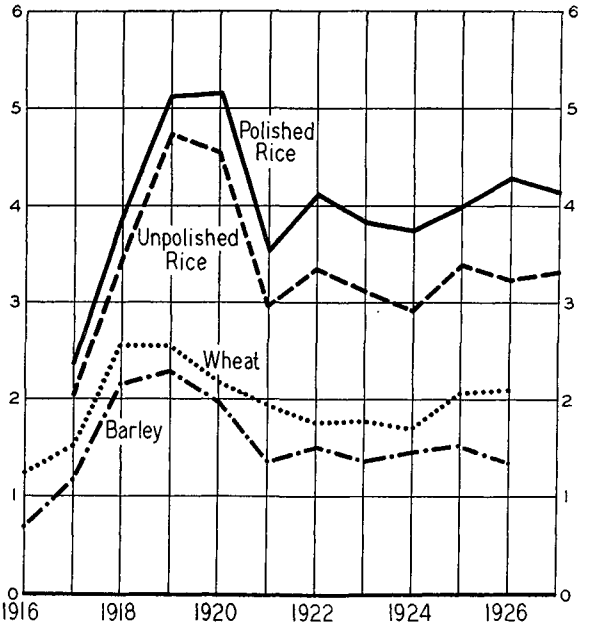
All in all, it is reasonable to say that in

the last fifty years the per capita food consumption of wheat has increased between two and three times, and for the present still shows an upward trend. Half of this increase came before the war; half in the post-war period. This is a much greater rate of increase than for rice over the same period. However, consumption of wheat as food is still small, not much more than one tenth of that of rice.

In this connection, it is interesting to compare wheat, barley, and rice prices. Chart 3 shows such prices for a recent decade, expressed as the prices per 1,000 calories. Barley has consistently brought a little lower price than wheat; and wheat has been a good deal cheaper than rice. It is of interest to observe that (assuming these price relationships to have prevailed over the past fifty years) the annual per capita disappearance of the dearer cereal, rice, increased more between 1878–82 and 1923–27 in absolute terms (about 1.34 bushels) than the per capita disappearance of the cheaper cereal, wheat (about half a bushel). The Japanese preference for rice—whether grounded in taste, historical background, or prejudice—is thus apparently a deep-seated one, for the economies involved in more utilization of wheat and less of rice have seemingly been great over a long period of time, unless the expenses of preparing rice for food are so much smaller than the expenses of preparing wheat as to go far in equalizing the discrepancies in wholesale prices per 1,000 calories. Rice yields so much more per acre than wheat that this is naturally determinative for the domestic grains. But when both rice and wheat are imported, it would seem that the lower price of wheat per calorie would give it more preference than is in fact accorded to wheat.

CHART 3.—PRICES PER THOUSAND CALORIES OF POLISHED RICE, UNPOLISHED RICE, WHEAT, AND BARLEY IN JAPAN, 1916–27*

(U.S. cents per 1,000 calories)



* Calculated from data in Appendix Table XIII, and from the following figures for calories per pound: polished rice, 1,640; unpolished rice, 1,620; wheat, 1,563; barley, 1,525. See M. McKellup, *Food Values: What They Are; How to Calculate Them*, 1925.

This study is the work of Wen Yuh Swen, with the assistance of Carl L. Alsberg

APPENDIX

In the following tables figures have been converted from the original Japanese into American units by means of the following factors:

Japanese units	United States units
1 koku (dry measure)	5.120 bushels
1 cho (land measure)	2.4506 acres
1 tan (land measure)	0.24506 acres
1 kwan (weight)	8.26733 pounds
1 picul (weight)	132.2773 pounds
1 kin (weight)	1.3228 pounds

It should be noted that quantities of grain were with few exceptions originally given in terms of kokus, a volume measure, converted at the rate of 5.12 bushels per koku. The weight per bushel is therefore not definitely stated, but it may be presumed that the following weights per bushel used by the United States Department of Agriculture are approximately correct here.

	Pounds per bushel
Wheat	60
Barley	48
Corn (shelled)	56
Rice, rough	45
Rice, cleaned	61

Rice as given in the tables (except where noted) is apparently cleaned, unpolished rice.

TABLE I.—ARABLE LAND AND AREA OF LAND DEVOTED TO RICE IN JAPAN PROPER, 1878–1927*

(Thousand acres)

Year	Arable land				Area in rice	
	Paddy land	Upland	Total	Percentage of paddy land to total	Area	Percentage of total arable land
1878–82	6,430	4,533	10,963	58.6	6,244	57.0
1883–87	6,508	4,672	11,180	58.2	6,414	57.4
1888–92	6,574	5,468	12,042	54.6	6,708	55.7
1893–97	6,713	5,594	12,307	54.5	6,801	55.3
1898–1902	6,745	5,603	12,348	54.6	6,950	56.3
1903–07	6,927	5,973	12,900	53.7	7,073	54.8
1908–12	7,115	6,721	13,836	51.4	7,247	52.4
1913–17	7,272	7,098	14,370	50.6	7,487	52.1
1918–22	7,427	7,459	14,886	49.9	7,646	51.4
1923–27	7,598	7,269	14,867	51.1	7,732	52.0
1923	7,515	7,285	14,800	50.8	7,714	52.1
1924	7,555	7,309	14,864	50.8	7,701	51.8
1925	7,602	7,266	14,868	51.1	7,729	52.0
1926	7,642	7,258	14,900	51.3	7,740	51.9
1927	7,674	7,226	14,900	51.5	7,778	52.2

* Data for arable land from *Statistical Annual of the Empire of Japan* (Japanese), Bureau of Statistics, Imperial Cabinet, Japan, and *Statistical Abstracts of the Ministry of Agriculture and Forestry*, Japan; data for rice acreage from *Statistical Report on Rice* (Japanese), Department of Agriculture and Commerce, Japan, 1922, 1928.

TABLE II.—CHANGES IN ARABLE LAND IN JAPAN PROPER, 1918–27*

(*Thousand acres*)

Year	Paddy land			Upland			Total		
	Annual increase	Annual loss on uses other than agricultural	Net gain or loss	Annual increase	Annual loss on uses other than agricultural	Net gain or loss	Annual increase	Annual loss on uses other than agricultural	Net gain or loss
1918	28.6	34.2	—5.6	165.7	35.9	129.8	194.3	70.1	124.2
1919	44.2	15.2	29.0	128.7	34.9	93.8	172.9	50.1	122.8
1920	33.2	18.5	14.7	98.8	43.3	55.5	132.0	61.8	70.2
1921	30.1	21.1	9.0	92.0	64.7	27.3	122.1	85.8	36.3
1922	37.2	19.0	18.2	70.3	80.6	—10.3	107.5	99.6	7.9
1923	31.7	26.8	4.9	50.0	96.4	—46.4	81.7	123.2	—41.5
1924	31.7	19.8	11.9	49.0	105.1	—56.1	80.7	124.9	—44.2
1925	28.6	16.6	12.0	52.1	91.9	—39.8	80.7	108.5	—27.8
1926	29.3	26.6	2.7	49.9	64.7	—14.8	79.2	91.3	—12.1
1927	28.2	22.3	5.9	53.8	57.3	— 3.5	82.0	79.6	2.4

* Data from *Statistical Abstract of the Ministry of Agriculture and Forestry*. The following items were originally given under the headings "extension" (increase) and "destruction" (loss):

Extension—Reclamation; embankment or drainage of moors, lakes, etc.; restoration of wasted; change in rice-field and upland farms from salt-field, spring nurse.

Destruction—Residential quarters, factories, and building sites; wasted; roads, railways, tracks, rivers, and water-courses; change into forest, salt-field, spring nurse, etc., from rice-field and upland farms.

N.B. Omitting the change between rice-field and upland farm, and increase or decrease of their surveyed results. (Original footnote.)

TABLE III.—ACREAGES OF THE PRINCIPAL CROPS IN JAPAN PROPER, 1878–1928*

(*Million acres*)

Year	Rice	Barley	Naked barley	Wheat	Soy beans	Small beans	Millets (all kinds)	Buck-wheat	Sweet potatoes	Industrial crops		
										Mulberry	Other[a]	Total
1878–82	6.24	1.47	1.12	.89	1.02	...	.88	.36	.35	.27	...	.27
1883–87	6.41	1.51	1.29	.97	1.08	...	.88	.38	.44	...	.36[b]	.36
1888–92	6.71	1.58	1.50	1.06	1.09	...	.88	.40	.60	.59	.18[b]	.77
1893–97	6.80	1.59	1.62	1.09	1.07	.26	.86	.42	.62	.66	.20[b]	.86
1898–1902 ...	6.95	1.60	1.67	1.16	1.14	.30	.84	.42	.66	.75	.18[b]	.93
1903–07	7.07	1.62	1.69	1.11	1.13	.32	.75	.41	.68	.85	.27	1.12
1908–12	7.25	1.52	1.67	1.16	1.19	.34	.69	.38	.73	1.07	.23	1.30
1913–17	7.49	1.44	1.71	1.26	1.13	.32	.63	.37	.75	1.13	.21	1.34
1918–22	7.65	1.29	1.59	1.31	1.11	.33	.53	.33	.76	1.28	.20	1.48
1923–27	7.73	1.11	1.34	1.16	.98	.31	.41	.28	.70	1.36	.18	1.54
1923	7.71	1.17	1.38	1.20	1.04	.33	.45	.29	.72	1.30	.19	1.49
1924	7.70	1.13	1.33	1.15	.99	.32	.43	.29	.71	1.32	.18	1.50
1925	7.73	1.12	1.35	1.15	.97	.32	.41	.28	.70	1.35	.17	1.52
1926	7.74	1.10	1.33	1.15	.96	.30	.39	.27	.68	1.40	.17	1.57
1927	7.78	1.04	1.30	1.16	.94	.28	.37	.26	.67	1.46	.17	1.63
1928	...	.99	1.25	1.20	...	...	...	...	...	...	...	...

* Data from *Statistical Report on Rice*, 1922, 1928; *Statistical Report on Wheat*, Department of Agriculture and Forestry, Japan, 1928; *Statistical Abstracts of the Ministry of Agriculture and Forestry*, and *Statistical Annual of the Empire of Japan*. Dots (...) indicate that data are not available.

[a] Includes tobacco, indigo, paper mulberry (*Broussonetia kashinoki*), and mitsumata (*Edgeworthia papyrifera*).

[b] Data incomplete.

TABLE IV.—COMPARISON OF WHEAT, BARLEY, AND NAKED BARLEY CROPS ON PADDY LAND AND UPLAND IN JAPAN PROPER, 1889–1928*

Year	Wheat				Barley				Naked barley			
	Area (*Thousand acres*)		Yield (*Bushels per acre*)		Area (*Thousand acres*)		Yield (*Bushels per acre*)		Area (*Thousand acres*)		Yield (*Bushels per acre*)	
	Paddy	Upland	Paddy	Upland	Paddy	Upland	Paddy	Upland	Paddy	Upland	Paddy	Upland
1889–92..	272	802	16.9	15.4	346	1,243	20.3	22.8	777	735	16.8	15.4
1893–97..	297	789	19.8	17.5	382	1,207	23.5	26.6	810	769	20.9	20.1
1898–1902	340	821	20.6	17.5	392	1,203	26.2	28.2	893	782	21.9	21.0
1903–07..	347	765	17.7	15.8	397	1,224	25.7	28.9	914	773	19.7	19.1
1908–12..	400	763	23.1	19.9	383	1,132	29.8	31.2	908	759	23.7	22.1
1913–17..	455	802	24.8	20.8	380	1,062	31.4	36.2	968	743	25.5	23.1
1918–22..	489	818	25.1	22.2	339	955	31.7	35.3	919	670	25.4	23.4
1923–27..	452	708	27.4	23.8	283	828	34.1	38.6	786.	553	27.5	24.3
1923.....	450	746	23.5	21.4	294	877	29.6	34.4	792	586	22.4	20.9
1924.....	434	716	24.4	22.9	281	844	32.4	38.1	769	565	23.2	20.5
1925.....	445	704	29.9	25.7	284	835	37.1	41.5	790	557	31.4	26.9
1926.....	456	690	28.8	24.8	286	814	36.7	41.2	802	533	30.1	26.2
1927.....	473	688	30.5	24.2	268	774	34.8	38.0	776	525	30.1	26.8
1928.....	513	688	30.5	24.8	258	731	36.1	40.5	757	495	30.8	26.6

* Data from *Statistical Abstract of the Ministry of Agriculture and Forestry.*

TABLE V.—PRODUCTION OF IMPORTANT GRAIN CROPS IN JAPAN PROPER, 1878–1928*

(*Million bushels*)

Year	Rice	Barley	Naked barley	Wheat	Millets
1878–82	153.32	27.07	18.25	10.70	14.45
1883–87	172.41	32.75	23.55	13.12	16.33
1888–92	198.85	35.46	25.96	15.68	22.66
1893–97	192.74	41.11	33.36	19.06	18.00
1898–1902 ..	217.50	44.27	35.85	21.41	18.14
1903–07	236.99	45.58	32.93	18.18	17.18
1908–12	259.00	48.32	38.36	24.26	16.67
1913–17	282.82	50.33	41.78	28.28	16.25
1918–22	301.64	45.36	38.79	30.71	15.27
1923–27	296.98	41.61	34.95	29.22	11.05
1923	283.87	38.89	29.98	26.58	12.45
1924	292.71	41.35	29.38	26.97	10.82
1925	305.68	45.20	39.83	31.34	11.86
1926	284.64	43.87	38.10	30.19	10.22
1927	317.98	38.75	37.45	31.02	9.90
1928	.....	38.94	36.49	32.71	.....

* Data from *Statistical Report on Rice; Statistical Report on Wheat*, January 1928; *Statistical Annual of the Empire of Japan; Statistical Abstracts of the Ministry of Agriculture and Forestry.* Dots (...) indicate that data are not available.

TABLE VI.—TRADE OF JAPAN PROPER IN WHEAT AND FLOUR AS WHEAT, 1878–1926*

(Million bushels)

Year	Trade with Chosen							Trade with Taiwan						
	Wheat		Flour		Wheat net imports	Flour net imports	Total net imports	Wheat		Flour		Wheat net imports	Flour net imports	Total net imports
	Exports from Japan	Imports into Japan	Exports from Japan	Imports into Japan				Exports from Japan	Imports into Japan	Exports from Japan	Imports into Japan			
1878–82	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1883–87	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1888–92	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1893–97	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1898–02	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1903–07	...	...	...	...	...	...	...	.00	.03	.13	...	.03	(.13)[a]	(.10)[a]
1908–12	.00	.05[b]	.00	...	.05[b]	.00	.05[b]	.00	.01	.42	...	.01	(.42)[a]	(.41)[a]
1913–17	...	.30	.14	...	.30	(.14)[a]	.16	.01	.04	.70	...	.03	(.70)[a]	(.67)[a]
1918–22	.00	.48	.28	.01	.48	(.27)[a]	.21	.08	.02	.49	...	(.06)[a]	(.49)[a]	(.55)[a]
1923–26	.22	.27	1.20	.00	.05	(1.20)[a]	(1.15)[a]	.14	...	.73	...	(.14)[a]	(.73)[a]	(.87)[a]
1923	.07	.14	.61	.00	.07	(.61)[a]	(.54)[a]	.08	...	.46	...	(.08)[a]	(.46)[a]	(.54)[a]
1924	.82	.35	1.23	.00	(.47)[a]	(1.23)[a]	(1.70)[a]	.11	...	.68	...	(.11)[a]	(.68)[a]	(.79)[a]
1925	.00	.51	1.42	.00	.51	(1.42)[a]	(.91)[a]	.12	...	.92	...	(.12)[a]	(.92)[a]	(1.04)[a]
1926	.00	.09	1.54	.00	.09	(1.54)[a]	(1.45)[a]	.25	...	.87	...	(.25)[a]	(.87)[a]	(1.12)[a]

Year	Trade with Other Countries							Total						
	Wheat		Flour		Wheat net imports	Flour net imports	Total net imports	Wheat		Flour		Wheat net imports	Flour net imports	Total net imports
	Exports from Japan	Imports into Japan	Exports from Japan	Imports into Japan				Exports from Japan	Imports into Japan	Exports from Japan	Imports into Japan			
1878–82	.25	.00	...	...	(.25)[a]	...	(.25)[a]	.25	.00	...	...	(.25)[a]	...	(.25)[a]
1883–87	.43	.00	...	...	(.43)[a]	...	(.43)[a]	.43	.00	...	...	(.43)[a]	...	(.43)[a]
1888–92	.17	.05	.07	.19	(.12)[a]	.12	.00	.17	.05	.07	.19	(.12)[a]	.12	.00
1893–97	.10	.10	.14	.51	.00	.37	.37	.10	.10	.14	.51	.00	.37	.37
1898–02	.00	.21	.06	1.71	.21	1.65	1.86	.00	.21	.06	1.71	.21	1.65	1.86
1903–07	.06	1.78	.01	5.72	1.72	5.71	7.43	.06	1.81	.14	5.72	1.75	5.58	7.33
1908–12	.00	1.66	.03	1.02	1.66	.99	2.65	.00	1.68	.45	1.02	1.68	.57	2.25
1913–17	...	2.51	1.50	.33	2.51	(1.17)[a]	1.34	.01	2.85	2.34	.33	2.84	(2.01)[a]	.83
1918–22	...	10.03	.73	1.34	10.03	.61	10.64	.08	10.53	1.50	1.35	10.45	(.15)[a]	10.30
1923–26	...	21.69	2.44	.51	21.69	(1.93)[a]	19.76	.36	21.97	4.37	.51	21.60	(3.86)[a]	17.74
1923	...	16.63	.53	1.02	16.63	.49	17.12	.15	16.77	1.60	1.02	16.62	(.58)[a]	16.04
1924	...	26.33	.58	.43	26.33	(.15)[a]	26.18	.93	26.68	2.49	.44	25.75	(2.05)[a]	23.70
1925	...	17.41	3.50	.23	17.41	(3.27)[a]	14.14	.12	17.92	5.84	.23	17.80	(5.61)[a]	12.19
1926	...	26.40	5.15	.36	26.40	(4.79)[a]	21.61	.25	26.49	7.56	.36	26.24	(7.20)[a]	19.04

* Data from *Statistical Report on Wheat*. Dots (...) indicate that data are not available.

[a] Net export.

[b] Data for 1912 only. The five-year average counted into the total is 10 thousand bushels.

TABLE VII.—IMPORTS OF WHEAT INTO JAPAN PROPER BY COUNTRIES OF ORIGIN, 1922–26*

(Thousand bushels)

Country	1922	1923	1924	1925	1926
China	320	171	49	19	.....
Kwantung (leased)	90	31	14	19	.....
United States	4,521	8,169	10,288	6,397	7,339
Canada	739	2,220	4,943	3,411	9,411
Australia	2,774	5,811	11,040	7,556	9,618
Asiatic Russia	0	0	0	.....[a]	0
Others	11,848[b]	229	0	5	27
Total	20,292	16,631	26,334	17,407	26,395

* Data from *Statistical Report on Wheat*, January 1928, p. 33. Dots (...) indicate that data are not available.

[a] Imports of 120 bushels.

[b] Includes imports of 11,841 thousand bushels of uncertain origin.

TABLE VIII.—TRADE OF JAPAN PROPER IN RICE, 1878–1927*

(Million bushels)

Year	Trade with Chosen			Trade with Taiwan			Other			Total		
	Imports into Japan	Exports from Japan	Net imports	Imports into Japan	Exports from Japan	Net imports	Imports	Exports	Net imports	Imports	Exports	Net imports
1878–82	....	....	....	....	....	....	.16	1.27	(1.11)[a]	.16	1.27	(1.11)[a]
1883–87	....	....	....	....	....	....	.16	1.80	(1.64)[a]	.16	1.80	(1.64)[a]
1888–92	....	....	....	....	....	....	2.94	4.39	(1.45)[a]	2.94	4.39	(1.45)[a]
1893–97	....	....	....	....	....	....	5.96	3.46	2.50	5.96	3.46	2.50
1898–1902	....	....	....	.47[b]	.17[b]	.30	9.53	2.88	6.65	9.81	2.98	6.83
1903–07	....	....	....	3.08	.16	2.92	21.04	1.41	19.63	24.12	1.57	22.55
1908–12	1.28[c]	.03[c]	1.25	4.42	.20	4.22	8.33	1.67	6.66	13.52	1.89	11.63
1913–17	6.08	.04	6.04	4.29	.32	3.97	7.16	2.65	4.51	17.53	3.01	14.52
1918–22	13.05	.25	12.80	4.98	.45	4.53	14.75	1.14	13.61	32.78	1.84	30.94
1923–27	25.39	2.15	23.24	10.93	.87	10.06	16.80	.81	15.99	53.12	3.83	49.29
1923	19.84	.50	19.34	6.56	.38	6.18	9.07	.38	8.69	35.47	1.26	34.21
1924	23.92	2.12	21.80	9.53	.44	9.09	16.74	.23	16.51	50.19	2.79	47.40
1925	23.29	3.72	19.57	12.25	3.34	8.91	26.32	1.43	24.89	61.86	8.49	53.37
1926	28.38	.54	27.84	12.48	.13	12.35	11.79	.23	11.56	52.65	.90	51.75
1927	31.50	3.85	27.65	13.84	.08	13.76	20.06	1.76	18.30	65.40	5.69	59.71

* Data from *Statistical Report on Rice*, October 1922 and November 1928. Dots (...) indicate that data are not available.

[a] Net exports.

[b] Three-year average, 1900–02. The five-year average, 1898–1902, as counted in the total is .28 million bushels for imports, and .10 million bushels for exports.

[c] Three-year average, 1910–12. Five-year average, 1908–12, as counted in the total is .77 million bushels for imports and .02 million bushels for exports.

TABLE IX.—TRADE OF JAPAN PROPER IN BARLEY, NAKED BARLEY, OATS, AND MILLETS, 1878–1926*

(*Thousand bushels*)

Year	Barley			Naked barley	Oats			Millets
	Exports	Imports	Net exports	Exports	Exports	Imports	Net exports	Imports
1878–82	...	...	...	...	...	1	(1)[a]	.....
1883–87	7	0	7	...	...	1	(1)[a]	.....
1888–92	9	80	(71)[a]	22	...	0	...	.....
1893–97	27	12	15	23	...	1	(1)[a]	.....
1898–1902	38	6	32	4	...	...	...	1,968
1903–07	13	334	(321)[a]	...	173	...	173	492
1908–12	6	72	(66)[a]	...	55	1	54	.....
1913–17	156	14	142	...	272	1	271	1,465
1918–22	5	311	(306)[a]	...	5	...	5	940
1923–26	150	68	82	...	...	...	...	1,276
1923	24	95	(71)[a]	...	...	...	...	817
1924	109	54	55	...	...	...	...	1,500
1925	52	68	(16)[a]	...	...	...	...	1,522
1926	415	57	358	...	...	...	...	1,267

* Data from *Annual Returns of the Foreign Trade of the Empire of Japan.* Dots (...) indicate that data are not available.

[a] Net import.

TABLE X.—TOTAL DISAPPEARANCE OF PRINCIPAL GRAINS IN JAPAN PROPER, 1878–1927*

(*Million bushels*)

Year	Rice	Barley	Naked barley	Wheat (including flour)	Millets[a]	Buckwheat[b]	Corn	Oats[c]
1878–82	152.21	27.07	18.25	10.45	14.45	3.41	....	....
1883–87	170.78	32.75	23.55	12.69	16.33	4.12	....	....
1888–92	197.40	35.53	25.94	15.69	22.66	5.92	....	....
1893–97	195.24	41.10	33.34	19.43	18.00	5.73	....	....
1898–1902	224.33	44.23	35.85	23.27	20.10	5.75	....	....
1903–07	259.54	45.90	32.93	25.50	17.67	6.05	3.15	2.09
1908–12	270.63	48.39	38.36	26.50	16.67	6.18	3.48	4.30
1913–17	297.34	50.18	41.78	29.11	17.72	5.91	3.70	5.77
1918–22	332.59	45.67	38.79	41.01	16.21	5.57	3.79	9.17
1923–27	346.26	41.53	34.95	46.96	12.33	4.82	3.33	9.91[d]

* Computed from production and trade data given in Tables V, VI, VIII, IX. Dots (...) indicate that data are not available.

[a] Only imports were recorded. Exports might be too small in quantity for recording.

[b] No foreign trade recorded.

[c] Domestic production from Hokkaido only. Production data for the whole country not available except for the years 1925–28, when the average total production was 10,711 thousand bushels, of which about 92 per cent was from Hokkaido.

[d] Average, 1923–26.

TABLE XI.—PER CAPITA DISAPPEARANCE OF PRINCIPAL GRAINS IN JAPAN PROPER, 1878–1927*

(Bushels)

Year	Rice	Barley	Naked barley	Wheat (including flour)	Millets	Buckwheat	Corn	Oats
1878–82	4.24	.75	.51	.29	.40	.09	...	...
1883–87	4.50	.86	.62	.34	.43	.11	...	...
1888–92	4.89	.88	.64	.39	.56	.15	...	...
1893–97	4.62	.97	.79	.46	.42	.13	...	...
1898–1902	5.00	.99	.80	.52	.45	.13	...	...
1903–07	5.44	.96	.69	.53	.37	.13	.07	.05
1908–12	5.30	.95	.75	.52	.33	.12	.07	.08
1913–17	5.42	.92	.76	.53	.32	.11	.07	.11
1918–22	5.73	.79	.67	.71	.28	.10	.07	.16
1923–27	5.58	.67	.56	.76	.20	.08	.05	.16

* Computed from data in Table X. Dots (...) indicate that data are not available.

TABLE XII.—LIVESTOCK IN JAPAN PROPER, 1878–1927*

(Thousands)

Year	Cattle			Horses	Hogs	Goats	Sheep	Chickens	Ducks
	Total	Dairy cows	Cattle other than dairy cows						
1878–82	1,113	..	.....	1,578	...	...	..	.....	...
1883–87	1,065	4	1,061	1,762	...	...	..	.....	...
1888–92	1,046	10	1,036	1,544	...	...	..	.....	...
1893–97	1,139	15	1,124	1,548	...	...	..	.....	...
1898–1902	1,260	24	1,236	1,545	201[a]	59[a]	2[a]	.....	...
1903–07	1,216	38	1,178	1,448	247	72	3	17,448[b]	125[b]
1908–12	1,367	46	1,321	1,554	292	97	4	19,983	361
1913–17	1,362	44	1,318	1,575	333	100	3	21,567	353
1918–22	1,385	51	1,334	1,511	482	129	8	27,211	452
1923–27	1,465	65	1,400	1,531	676	172	17	38,208	525
1923	1,469	57	1,412	1,592	668	159	15	35,738	549
1924	1,456	61	1,395	1,569	743	158	16	37,090	545
1925	1,460	65	1,395	1,553	673	168	17	37,170	491
1926	1,465	69	1,396	1,444	621	179	18	38,510	518
1927	1,474	71	1,403	1,495	677	195	19	42,533	522

* Data for 1878–1925 from *Statistical Annual of the Empire of Japan;* data for 1926 and 1927 from *Statistical Abstracts of the Ministry of Agriculture and Forestry.* Dots (...) indicate that data are not available.

[a] Four-year average, 1899–1902.

[b] Two-year average, 1906–07.

TABLE XIII.—MARKET PRICE OF THE PRINCIPAL GRAINS IN JAPAN PROPER, 1897–1927*

(Dollars per bushel)

Year	Wheat[a]	Barley[a]	Naked barley[a]	Rice			
				Unpolished		Polished	
				Domestic[ab]	Korean[c]	Domestic[d]	Korean[e]
1897	.77	.48	.66	....	....	....	....
1898–1902	.74	.45	.64	....	....	....	....
1903–07	.91	.56	.83	....	....	....	....
1908–12	1.03	.62	.91	....	....	....	....
1913–17	1.16	.61	.92	....	....	....	....
1918–22	1.99	1.31	1.99	3.64	....	4.45	3.84
1923–26	1.77	1.04	1.59	3.04	....	4.03	3.33
1916	1.12	.49	.74	....	....	....	....
1917	1.38	.83	1.19	1.94	1.75	2.40	2.07
1918	2.32	1.53	2.21	3.31	3.17	3.95	3.63
1919	2.32	1.62	2.72	4.55	4.28	5.20	4.75
1920	1.99	1.41	2.34	4.28	3.89	5.27	4.50
1921	1.77	.98	1.44	2.86	2.58	3.61	2.93
1922	1.61	1.07	1.32	3.22	....	4.20	3.38
1923	1.62	.98	1.43	3.00	....	3.91	3.16
1924	1.55	1.04	1.64	2.80	2.93	3.81	3.18
1925	1.88	1.09	1.73	3.26	3.17	4.06	3.44
1926	1.90	.96	1.41	3.12	3.30	4.35	3.53
1927	....	...	....	3.19	3.09	4.22	3.23

* Data from *Statistical Report on Wheat*, 1928, and *Statistical Report on Rice*, 1928. Conversions for pre-war years made at par, from 1914 at annual average exchange rate.

[a] Represents the principal markets in Japan proper.
[b] Medium grade.
[c] Medium grade at Tokyo.
[d] Retail price of medium grade at Kobe.
[e] First grade from Fusan at Osaka.

TABLE XIV.—MARKET PRICE OF FOREIGN WHEAT IN JAPAN PROPER, 1921–25*

(Dollars per bushel)

Year	Korean	Manchurian	United States	Canadian	Australian
1921	1.34	1.43	....	....	....
1922	1.39	1.64	1.51	1.58	1.56
1923	1.34	1.57	1.53	1.53	1.54
1924	1.28	1.60	1.53	1.57	1.50
1925	....	1.91	1.95	1.92	1.94
Average 1922–24	1.34	1.60	1.52	1.56	1.53

* Data from *Statistical Report on Wheat*, 1928; prices at Kobe market. Conversions at annual average exchange rates. Dots (...) indicate that data are not available.

TABLE XV.—MARKET PRICE OF WHEAT FLOUR IN JAPAN PROPER, 1905–26*

(Dollars per sack)

Year	Tokyo		Nagoya	Osaka
	Domestic	Foreign		
1905–07	1.25[a]	1.33	....	3.07[b]
1908–12	1.29	1.47	1.37[c]	3.24[b]
1913–17	1.39	1.99	1.39	1.46
1918–22	2.25	3.18[d]	2.23	2.50
1923–26	1.86	....	1.83	1.98
1923	1.73	....	1.69	1.87
1924	1.61	....	1.56	1.76
1925	1.93	....	1.94	2.15
1926	2.04	....	1.98	2.18

* Data from *Statistical Report on Wheat*, 1928, pp. 70–71. Dots (...) indicate that data are not available.

[a] Average of 1906 and 1907.
[b] Not comparable with other years because of a different unit.
[c] Data for 1912 only.
[d] Average of 1918–21; data for following years not recorded.