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**AGRICULTURAL**

**ECONOMY**

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# THE JAPANESE AGRICULTURAL ECONOMY

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## SUMMARY

Japan's 1960 population of 93.6 million -- just over one-half that of the United States -- is compressed into an area smaller than California. The principal problem of too many people and too little land is further aggravated by the thin, inherently infertile soils and rugged topography. In spite of these adversities, the skillful Japanese farmers produce 80 percent of the domestic food requirements. This has been made possible by the liberal use of labor and capital, the concentration of production in high-calorie-yielding crops, and dependence upon the sea for much of the animal protein.

The agricultural sector accounts for one-seventh of the gross national product and employs nearly one-third of the labor force. Japanese farmers, who enjoy a higher level of living than their counterparts elsewhere in Asia, depend upon nonfarm sources for nearly 40 percent of their income.

Well over 90 percent of Japan's agricultural land is used to produce food crops. Feed grains and forage crops for livestock and agricultural raw materials for industry occupy a minor position. Rice occupies nearly one-half of the planted area and, on a value basis, accounts for nearly one-half of total agricultural income.

In contrast to Western agriculture where the technology adopted has been designed to conserve labor, the primary aim of the land-scarce Japanese agricultural technology has been to increase yields.

At present about three-fifths of the farmland is double cropped. Numerous recent developments, such as earlier maturing varieties, the use of plant beds, and the widespread use of polyethylene for early-spring frost protection, are aiding in the expansion of the multiple-cropped area. More than half of the cultivated area is irrigated. The heavy pressure of population upon the land and widespread underemployment result in the liberal use of labor. In order to obtain high yields, large capital inputs, especially in the form of fertilizer, are required. Overall agricultural production has increased an average of 6 percent annually during the past several years. Yields per acre are among the highest in the world.

Farmer cooperatives, research stations, and an agricultural extension service are the dominant agricultural institutions. The specialized and multipurpose cooperatives found in virtually every village have enabled Japanese farmers, with characteristically small holdings, to effectively pool their efforts and resources. The network of research stations, employing some 6,500 scientists and technicians, is one of the most extensive in existence particularly when related to the limited cultivated area. The successful efforts of the Agricultural Extension Service in diffusing the benefit of research among farmers has greatly accelerated the rate of technological innovation in the agricultural sector.

Japan's overall trade policy is predicated upon the necessity of exporting skilled labor and technology in the form of manufactured goods in exchange for raw materials. Agricultural imports may be broadly classified in two general categories: Agricultural raw materials -- mostly cotton, wool, and rubber; and food staples -- principally wheat, soybeans, rice and sugar. Raw silk and mandarin oranges account for the greater part of Japan's traditionally small agricultural export volume.

Trade totals for the past decade show Japan as the principal U. S. agricultural market, with shipments from the United States averaging \$390 million annually. Of the seven commodities comprising the great bulk of these shipments -- wheat, barley, corn, cotton, hides and skins, tallow, and soybeans -- cotton has been the most important. Japan's agricultural exports to the United States, largely silk and mandarin oranges, have been only a fraction, usually less than one-tenth, of U. S. agricultural shipments to Japan.

# PHYSICAL ENVIRONMENT

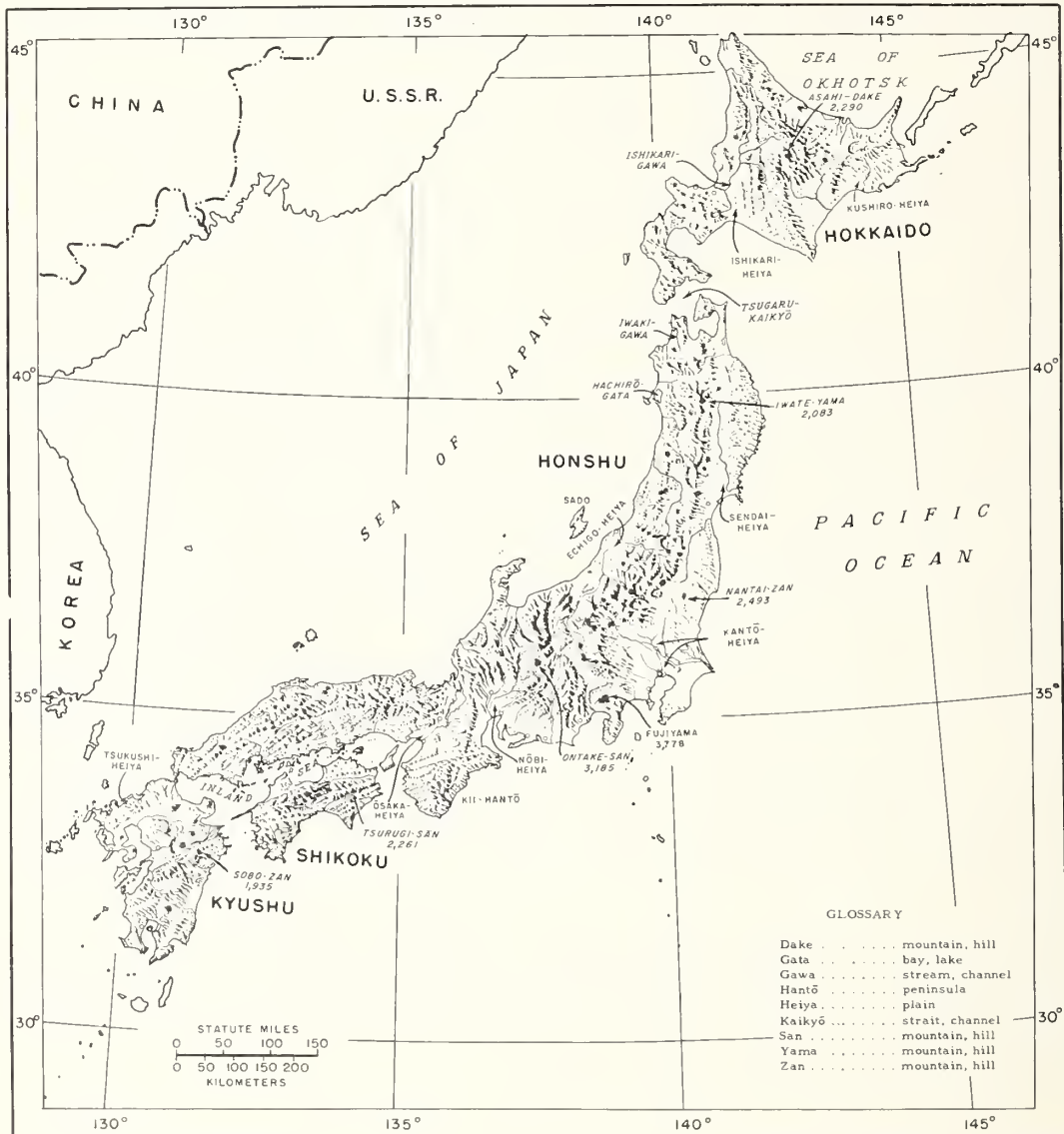
## Location and Area

Japan, with an area of 142,700 square miles, is slightly smaller than California. It is located in the North Temperate Zone, has a north-south range of over a thousand miles, and is latitudinally comparable to the Maine-Florida area of the United States. Although the country is composed of many islands, all are very small except four -- Honshu, Hokkaido, Kyushu, and Shikoku.

## Topography

The Japanese island chain, which parallels the Asian mainland, is a giant, partly submerged mountain range with exceedingly rough topography. Essentially, the islands consist of mountainous centers, fringed by coastal plains. These mountainous centers encompass numerous interior

JAPAN: TOPOGRAPHY



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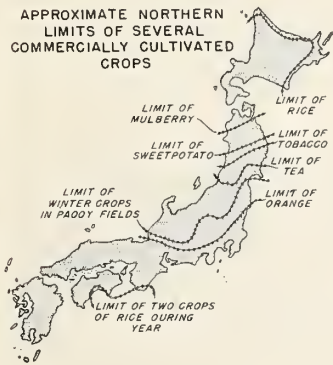
basins and narrow valleys. The mountainous terrain strongly influences Japanese agriculture, in that tillable land is scarce and consists largely of small mountain valleys and narrow coastal alluvial plains. Fully 75 percent of the land has a slope greater than 15 degrees. Rivers are unnavigable and short with steep profiles and limited reservoir capacities. Numerous promontories and indentations result in a lengthy 16,000-mile coastline with many excellent harbors.

## Climate

The climate of Japan is much more favorably disposed toward agricultural pursuits than is the topography. In spite of the broad latitudinal variance and resulting local climatic variations, there is, in most of Japan, a certain unity of climate. This is evidenced by the prevalence of such climatic features as an abundance of precipitation throughout the year with maximum rainfall in summer. Another broad characteristic of the islands is the hot, humid summer generally favorable to agriculture.

The principal climatic determinants are the tropical maritime air masses of Pacific origin during the summer and the polar continental air masses originating over Siberia during the winter. In summer, warm moisture-laden air masses move across Japan from a southeasterly direction. As they ascend over the mainland, they are cooled and their moisture-carrying capacity is reduced. This results in the heavy rainfall associated with the Asian monsoon. For most of Japan the summer monsoon period has the heaviest precipitation. In areas more directly exposed to the late summer typhoons, the heaviest rainfall may occur during the August-October period.

JAPAN: AVERAGE ANNUAL RAINFALL



With the advent of winter, continental air masses moving southeastward from Siberia become the dominating influence. As the cold dry air moves across the Sea of Japan, it is warmed and moistened, thus permitting a much milder winter than that experienced by latitudinally comparable regions on the Asian mainland.

Although precipitation is distributed throughout the year, the peak occurs during the summer growing season. Rainfall ranges from 40 to 80 inches per year, with the heaviest rainfall being in the south. Hokkaido and the northwestern coast of Honshu receive sizable quantities of precipitation in the form of snow. Rapid spring thawing on typically steep slopes causes flash floods, sometimes of damaging proportions.

The frost-free season ranges from 120 days in central Hokkaido to 250 days along the southeastern coast. Central Hokkaido has the lowest annual mean temperature of 41.4° F., while



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the warmer points of Kyushu have an annual mean of 61.9°. The long, severe winters of Hokkaido limit production to one crop annually, whereas some of the southern area can be cropped throughout much of the year.

Ocean currents strongly affect temperature, particularly in the coastal areas. The Japanese Current, approaching the islands from the south, warms the southern and eastern coastal regions, while the cold currents from the north chill the coasts of Hokkaido and northern Honshu.

The persistent threat of crop destruction by natural disasters is an outstanding feature of Japan's geographic and climatic setting. Floods and typhoons are rather common occurrences. Crop damage from floods alone is estimated at several million dollars.

## Soils

Unlike many soils of volcanic origin, Japan's soils are inherently infertile. Most have developed under conditions of forest vegetation and heavy rainfall. In much of the country, soil erosion has been serious, and many of the hill soils are shallow and poorly developed.

Lithosols, which are agriculturally insignificant, occupy 68 percent of total land area. Another 8 percent is comprised of dark well-drained ando soils which are derived from wind-blown deposits of volcanic ash. Soils of this type are cultivated for the most part without irrigation. Alluvial soils, which are formed from water-deposited materials, comprise the coastal plains, river flood plains, and interior mountain basins. These relatively fertile alluvial soils, which occupy 14 percent of the land area and comprise much of the agricultural area, are intensively farmed.

Although notably infertile and generally acidic, these arable soils respond well to fertilizer and lime application and the skillful management of Japanese farmers.

Centuries of tillage and the unremitting labor of Japanese farmers have resulted in widespread alteration of the land surface in the form of level and bench terraces and irrigation development.

## DEMOGRAPHIC ASPECTS

Japan's 1900 population of 93.6 million is the fifth largest in the world. This population -- over one-half that of the United States -- is being supported on an area slightly smaller than California. Tokyo, the largest city, with an estimated 8 million people, Osaka with 2.5 million, and Nagoya, Yokohama, and Kobe with about a million each are all situated on the coastal plain. Of the principal urban centers, only Kyoto is an inland city. The sparse population of the northernmost island of Hokkaido is due in part to the lower year-round temperature and severe winters.

Faced with the heavy pressure of population on the land, the Japanese Government has enacted legislation encouraging family planning and birth control. Rather widespread acceptance of these ideas by the people reduced the rate of growth from over 2 percent in 1947 to less than 1 percent in 1957. Present demographic projections indicate a continuous decline in the rate of growth, with the eventual stabilization of population at about 105 million within the next decade.

Unlike the densely populated countries of Europe which had ready emigration outlets in the New World during comparable stages of their economic development, Japan has virtually no outlet for its expanding population. The current life expectancy of 66 years is the highest in Asia and approaches that of the United States. In recent years, both birth and death rates have dropped below those of the United States.

## AGRICULTURE IN THE ECONOMY

Agriculture currently accounts for 14 percent of Japan's gross national product. The agricultural sector, which produces an estimated 80 percent of Japan's food requirements, employs one-third of the labor force. Agriculture has historically provided the capital required for industrialization. This capital was originally collected through rent paid to landlords, but is currently accumulated through the individual savings of farmers or taxes paid to government. In the present advanced stage of economic development, agriculture now provides only a small proportion of the total investment capital.

The agricultural sector also serves as a labor reservoir for the remainder of the economy. In times of business depressions, underemployment on farms becomes widespread as unemployed workers move back to the farms. These additional laborers can not generally be efficiently employed since labor inputs are already high and any additional labor inputs further diminish

returns per unit of labor. Returns per unit of agricultural labor input, therefore, vary directly with the level of economic activity of the country as a whole. Past emphasis on increasing output per acre has resulted in the neglect of output per man, with the result that per capita output and income for farmers are far below the remainder of the population. The cost of exploiting limited agricultural resources to support a large population is high and, despite increases in the productivity of farm labor, per capita income remains low. The farmers' plight could be far worse except for heavy government subsidization of agriculture and the large portion of income derived from nonfarm employment.

TABLE 1.--Cash income and expenditure of farm household, 1958

Item	Income and expenditure
	Dollars
Agricultural receipts.....	549
Agricultural expenditures.....	- 220
Agricultural income .....	329
Nonagricultural receipts.....	455
Nonagricultural expenditures.....	- 71
Nonagricultural income .....	384
Agricultural income .....	329
Nonagricultural income .....	384
Total income per farm .....	713

Sixty percent of farm households are dependent upon income from nonfarm employment. The proportion of cash farm income derived from nonfarm sources is rising rapidly, having increased from 39 percent in 1956 to 54 percent in 1958.

The agricultural population has historically remained rather stationary, as industrialization has not much reduced farm population. Only recently has the urban sector begun to absorb more than the natural increase of the farm population. Older members of the agricultural labor force are rather immobile and unlikely to move out of agriculture. Young people, however, find it relatively easy to leave the farm and join industry. This trend is likely to continue with further industrialization.

According to the 1955 census, females in the agricultural labor force out-number males by 8,070,000 to 7,640,000. This has likely resulted from a greater demand for males in nonfarm employment.

## AGRICULTURE IN A SOCIAL CONTEXT

The Japanese farmer is better educated and enjoys a higher level of living than farmers anywhere else in Asia. Japan is one of the few Asian societies in which the rural citizen is realizing considerable improvements in his living standards and may even be narrowing the gap between himself and his urban counterpart. A 75-year history of compulsory education has produced a level of literacy comparable to that of the United States, and has facilitated the rapid dissemination of new ideas and techniques.

With the increasing realization among economists that economic development is principally a function of social change, it becomes easier for them to explain the phenomenon of continually rising yields in a country where yields already are among the world's highest. It is widely recognized that the industrious, disciplined, and resourceful nature of the Japanese farmer has been more responsible for raising yields than economic factors alone.

## LAND

### Utilization

Fourteen percent, or 12.7 million acres, of Japan's land area is cultivated. Fifty-five percent of the cultivated land is paddy land, used to produce irrigated rice.

The remaining 45 percent is upland which produces nonirrigated crops. The utilization of arable land is largely determined by the man-land ratio: Over 90 percent is in food crops, the

TABLE 2.--Cultivated land area, 1958

Use	Area	
	1,000 acres	Percent
Paddy field.....	7,035	55.4
Upland field .....	5,666	44.6
Total.....	12,701	100.0

preponderance of which are high-calorie yielding cereals and starchy tubers. Less than 10 percent is planted to nonfood crops, such as mulberry, tobacco, and fibers.

In 1957 the planted area was 59 percent greater than the cultivated area. Multiple cropping is concentrated in the southern and eastern part of the islands where the growing season is longest.

TABLE 3.--Japan: Cropping pattern according to planted acreage of major crops, 1959

Crop	Acreage	
	1,000 acres	Percent
Grain:		
Rice .....	8,125	43.0
Wheat .....	1,486	8.0
Common barley .....	1,042	6.0
Naked barley .....	1,164	6.0
Other grains .....	599	3.0
Potatoes:		
Sweetpotatoes .....	905	5.0
White potatoes.....	495	3.0
Pulses:		
Adzuki beans .....	357	2.0
Kidney beans.....	253	1.0
Other.....	120	.6
Oil-bearing crops:		
Soybeans .....	837	4.0
Rapeseed .....	465	2.0
Peanuts .....	106	.6
Other.....	57	.3
Sugar crops:		
Sugar beets .....	97	.5
Sugarcane.....	19	.1
Soft fibers:		
Flax .....	35	.2
Other.....	9	<sup>2</sup>
Other crops:		
Vegetables.....	1,350	7.0
Fruits and nuts .....	530	3.0
Tea .....	<sup>1</sup> 111	.6
Tobacco .....	158	.8
Mulberry .....	<sup>1</sup> 482	3.0
Total .....	18,802	<sup>3</sup> 99.7

<sup>1</sup>Estimated.

<sup>2</sup>Less than one-tenth of 1 percent.

<sup>3</sup>Less than 100 because of rounding.

In contrast, only about one-sixth of the cultivated area is double cropped in Hokkaido and north-western Honshu. The use of plant beds, the development of earlier maturing varieties, and the increasing use of polyethylene for early-spring frost protection are aiding in the expansion of the multiple-cropped area.

### Distribution

Japan's 6 million farmers cultivate 12.7 million acres of land, or an average of just over 2.1 acres per farm. Although Japan is smaller than California and has a lower percentage of arable land, it has more farms than all of the United States. An estimated 41 percent of all farmers cultivate less than 1 acre each and 73 percent cultivate less than 2.5 acres. Initially small holdings have become severely fragmented as a result of centuries of inheritance and subdivision. Farm size generally increases with latitude, as the intensity of cultivation is much greater in the south than in the north.

### Tenure

During the two decades preceding World War II, excessive rental rates and a general insecurity of tenure caused widespread agrarian unrest. Rent on paddy land was usually paid in kind and frequently amounted to one-half of the total yield. From the remaining one-half, the farmer had to deduct all other production expenses before realizing any real income.

Shortly after the cessation of World War II hostilities, the Supreme Command of Allied Powers issued a directive which stated that measures should be taken to insure "that those who till the soil shall have a more equal opportunity to share in the fruits of their labor." Legislation designed to accomplish this end was enacted in the Land Reform Law of 1947. This law has enabled the number of farmers owning land to increase until today 88 percent own half or more of the land they cultivate. The percentage of tenanted land was reduced from 47 percent before the war to 11 percent by 1950. For the remaining minority who continue to lease land, safeguards have been established to limit rental rates and prevent unwarranted eviction.

The land reform of the immediate postwar period has wrought many changes including a considerable leveling of the agrarian society. It has also provided a broad background for agricultural progress. Prior to land reform, an estimated 30 percent of agrarian expenditures went for the rent of land. Now that most of the farms are owner-operated, farmers are encouraged to make more long-term capital improvements. Furthermore, farmers have more funds available for investment in production-increasing measures because of the favorable prices at which they bought land under the reform program. The successful implementation of the land reform program has enabled the country to capitalize more fully on the initiative and industry of its farmers.

### Reclamation Potential

One-third of all reclaimable land is in Hokkaido; however, low temperatures and a short growing season minimize the potential production increment. This is also true for northern Honshu where much of the remaining reclaimable land is located. The acute need for land has historically stimulated interest in land reclamation by the government. Government reclamation projects have been in operation since 1899. During the 1920-48 period, however, only 800,000 hectares were reclaimed and rehabilitated, while 1,200,000 hectares were lost by the encroachment of cities, roads, air fields, and factories. Recent efforts to increase the arable land area have been frustrated, for as marginal land has been reclaimed on the periphery of presently cultivated areas, some of the more productive agricultural land has been lost to urban and industrial expansion. Land reclamation is not therefore expected to increase the arable land area but rather to partially offset the unavoidable loss to other uses. The marginal nature of much of the land brought under cultivation in recent years has tended to reduce per acre yields. This tendency, however, has been more than offset by the yield-increasing effects of improved technology. The topography of the land is such that the reclamation of any large areas is now considered to be uneconomic if not impossible.

# CROP PRODUCTION

## Food Crops

Rice. -- Rice is by far the most important crop and source of income in Japan, as well as the staple food of the diet. It is grown on more than four-fifths of all farms, occupies two-fifths of the planted area, and accounts for half of all crop production. Favorable government support prices have encouraged farmers to utilize all possible means for increasing production. As a result, Japan has become virtually self-sufficient in the production of this important food crop.

Although rice cultural practices are ingeniously varied to fit local soil, climatic, and other conditions, they follow a rather consistent pattern. The rice seed is first treated with a fungicide and then hand seeded in a carefully prepared seedbed. After 30 to 50 days, depending on temperatures, the seedlings are transplanted into the irrigated fields in rows, which are so spaced as to permit the operation of hand-operated cultivators in the field.

The transplanting system of rice production has many advantages over the direct seeding methods practiced in much of the remainder of Asia. Some of these are: The more efficient and less costly weed control, more economic use of seed, and a shortening of the field growing season and, hence, the field irrigation period. The shortening of the field growing season permits double cropping in many areas where this would otherwise be impossible. It also permits earlier harvesting, thus avoiding hazards of the fall typhoons. The use of a protected seedbed can shorten the field growing season by as much as one-fourth. The chief disadvantage of the transplanting system is the additional labor required.

Organic manures, commercial phosphates, potash, and a portion of the nitrogenous fertilizers to be used are applied to the paddy field prior to plowing or hand spading. After the initial tilling operation, fields are flooded with just enough water to cover the soil. The land is then harrowed several times, puddled (worked while wet) and flooded with 2-4 inches of water. Seedlings are planted in clumps or hills, usually of three to seven seedlings each, spaced 4-8 inches apart in 8-12 inch rows. Suspended strings or other markers are used to maintain uniform spacing. As soon as a field is planted, the water level is raised to 10-14 inches to provide support for the young seedlings until they become established. Once the plantings are established, water is drained and the field is cultivated and weeded. The field is then flooded again and the water level is maintained, except for some brief intervals, at 4-8 inches until harvest season. During these brief intervals, when the field is drained, the rice is top dressed with nitrogenous fertilizers, cultivated, and weeded. A typical cultural pattern would involve 3 top dressings of nitrogenous fertilizer, three cultivations and one hand weeding during the growing season. In recent years, much of the hand weeding has been eliminated by the use of herbicides, such as 2,4-D.

Field harvesting has remained largely a hand operation, as fields are often so small and wet as to make mechanization of the operation impractical. The rice is usually cut with a sickle, tied in bundles, and dried on racks, fences, or any other convenient structure. The rice is cut as near the ground as possible to maximize the straw yield.

The grain is usually separated from the straw by small, power-driven, stationary threshers, after which, it is mechanically dehulled. The resulting brown rice is marketed or stored for home consumption. Rice straw is utilized in many ways: It is fed to livestock, used as livestock bedding, twisted into rope, and commonly substituted for more costly fibers in the manufacture of floor mats and bags to contain rice and other commodities. In areas not directly exposed to the typhoons, it can be used for roof thatching. When not utilized otherwise, it is returned to the soil as fertilizer.

Wheat. -- Wheat, the second most important cereal crop, occupies 8 percent of the total planted area. It competes directly with barley for growing area, but is at somewhat of a disadvantage as barley ripens earlier and thus fits rotational systems better. In the north, wheat is grown as an upland crop, while in the south it is grown mainly on paddy land, usually as a winter crop. The demand for domestically produced wheat, mostly soft red winter wheat, is not particularly strong because of its inferior milling quality.

Wheat, like rice, is sown in rows to permit several hand weedings and cultivations during the growing season. The bulk of the fertilizer is applied in the fall with one or two top dressings, usually of nitrogen, applied in the early spring. The harvesting, drying, and threshing practices are very similar to those of rice. A large proportion of the crop is milled directly into flour; however, a sizable quantity is used in soy sauce in a whole grain or unmilled form.



Top left, Japanese farmer and his wife cover rice seedlings with polyethylene to cut field-growing time.

Top right, rice is threshed with small power thresher.

Left, farmer cutting wheat by hand.

Barley. -- Two distinct types of barley are produced in Japan -- naked barley, a hullless type, and common barley, a covered or hull type. The acreage of common and naked barley combined is greater than any other crop except rice. Naked barley predominates in the south, while common barley is largely confined to the north. Barley is frequently grown as a winter crop on paddy land in the south. In the north, it is also grown as a winter crop and is frequently followed by soybeans, sweetpotatoes, and other summer crops. Barley has long been used for human consumption in pressed or pearl form in a mixture with rice. It is generally regarded as an inferior foodstuff. Its consumption as food is declining as the living standard rises and as the availability of indigenous rice increases.

Minor Grains. -- The four minor grains,-- rye, oats, corn, and millet -- occupy only 3 percent of the crop area. With the exception of millet, all are concentrated in the northernmost island of Hokkaido. These grains are usually produced in small quantities for home consumption either as food or as animal feed. A small portion of the corn produced is processed into starch, but the principal use of this crop is for animal feed.

White Potatoes. -- White potato production is concentrated in the northern part of Japan, mostly in Hokkaido, where the cooler climate is conducive to higher yields. Similar climatic requirements of white potatoes and sugar beets cause the two crops to compete for land. As a result of this competition, the acreage of white potatoes is declining because of the more strongly supported price of sugar beets. In localized areas where conditions are much more favorable for the production of white potatoes than of rice, potatoes sometimes supplant rice as the food staple. Sixty percent of the white potato production is utilized as food; 24 percent is processed into starch and alcohol, while the remainder is used as seed and livestock feed.

TABLE 4.-- Japan: Agricultural cash receipts per farm household, 1958

Item	Cash receipts		Percent of total	
	Dollars		Percent	
Rice.....	264		48.1	
Wheat and barley .....	26		4.7	
Vegetables .....	46		8.4	
Fruits.....	30		5.5	
Industrial crops .....	41		7.5	
Sericulture .....	21		3.8	
Livestock and livestock products .....	77		14.0	
Other .....	44		8.0	
Total.....	549		100.0	

Sweetpotatoes. -- Sweetpotatoes, one of the most important upland crops and the most important vegetable, are grown by 70 percent of all farmers and rank high as a source of food. Sweetpotatoes yield larger quantities of food per acre than most other food crops grown in Japan and were thus of particular importance during the critical postwar food shortages.

The production of sweetpotatoes, a summer crop commonly grown in rotation with winter grains, is confined to the southern two-thirds of the country. The crop is propagated vegetatively and started in hotbeds, heated either electrically or by compost fermentation. Transplanting into the open field usually coincides with the arrival of the summer monsoon. The abundant rainfall and warm weather associated with the monsoon enable the sweetpotatoes to become quickly established. As a result of an extensive breeding and selection program and more intensive cultural practices, yields are currently more than double those of the United States.

Approximately 50 percent of the sweetpotatoes produced are consumed as food and 15 percent are used for feed for livestock. Of the remainder, a small amount is used as seed while most of the rest is processed into starch, alcohol, and glucose. Government-supported starch prices are increasing the demand for sweetpotatoes for starch manufacture; however, the demand as a source of food is declining. Acreage is expected to decline slightly as aggregate demand declines.

Soybeans. -- Soybeans, the most important leguminous crop, are a staple food and a principal source of essential proteins. In 1959, they accounted for 4 percent of the total planted area. Some varieties are particularly adapted to seed production, while others are heavy foliage producers and hence best for green manure crops. Still other varieties are cultivated as vegetables. These beans are picked green and served in the pod. A great deal of intervarietal variation exists in regard to the length of time required to reach maturity. Some varieties, grown as vegetables, produce edible pods in 40 days, while varieties planted for seed production purposes sometimes require 150 days to mature. Soybeans do best on medium to light-textured, well-drained soils.

Production is rather evenly distributed throughout Japan but commercial production is concentrated in Hokkaido. Some 80 percent of the Hokkaido crop is sold off the farms compared to little more than one-third in the rest of Japan.

Soybeans for direct consumption are usually grown on upland fields or on dikes around paddy fields, but are sometimes interplanted between rows of fruit trees or mulberry shrubs. When cultivated alone they are usually planted in rows. When grown as a summer green manure crop, they are often grown in rotation with rice and plowed under 2 or 3 weeks before rice transplanting. In some areas, soybeans are started in a nursery and transplanted to the field after about 4 weeks, thus enabling the field growing season to be shortened and the double-cropping area to be expanded.

Upon maturity, soybeans grown for food are threshed and put in rice straw bags and either stored or marketed. Soybeans produced domestically are consumed largely as food, whereas most of the imported soybeans are processed into soybean oil and meal. The greater consumption of vegetable oils, associated with the rising level of living and improved dietary habits, is increasing the demand for soybean oil. Demand for meal as a feedstuff is increasing as the livestock industry expands. Domestic production, however, is not likely to remain at present levels, as the government support for soybeans is not as strong as for some of the grains.

Sugar Beets. -- Sugar beet processing is centered in the cool northernmost island of Hokkaido. Domestic sugar production satisfies only a fraction of the total demand. Acreage is expected to increase sharply, for processing facilities are being expanded. A recent increase in the import tariff on sugar is likely to further stimulate production.

Sugarcane. -- Production is limited to the southwestern part of Japan and is expected to remain stable. A limited area with suitable climatic conditions is likely to prohibit expansion of the cane acreage.

Rapeseed. -- Rapeseed, an important domestic source of edible oils, is cultivated throughout Japan, mainly as a winter crop on both paddy and upland fields. About one-third of the total planted area is found in the southern island of Kyushu. In the vicinity of Nagoya is a second area of concentration, while a third area includes Hokkaido and the northern tip of Honshu.

Three-fourths of the crop is marketed, and it ranks second only to soybeans in the oil-seed category. It is the leading source of domestically produced vegetable oil, however, as most of the indigenously produced soybeans are consumed directly and not crushed for oil.

Vegetables. -- Vegetables are grown throughout Japan. Some concentrated vegetable growing areas are found adjacent to large cities but most of the vegetables are locally produced for on-farm consumption or for sale in local markets. Vegetables are intensively cultivated, whether for home use or for sale. Interculture is widely practiced. As one crop approaches maturity, another is seeded between the rows and is usually well started when the first is harvested. In some areas, this is practiced throughout the year; cool-season crops, such as cabbage or white potatoes, are grown during the cooler months, while warm-season crops, such as sweetpotatoes or peanuts, are cultivated during the summer. In the southernmost areas, where continuous year-round cropping is practiced, as many as five crops may be harvested during the year. Another variation of the intercultural or intercropping practice consists of planting two crops, with widely varying maturation periods, such as turnips and potatoes, simultaneously in alternate rows.

Nine vegetable crops represent about 80 percent of the total vegetable tonnage. The most important of these, the Japanese radish, comprises a third of the total tonnage. It is a quick-maturing, large, white, icicle-shaped root which fits nicely into rotations and is frequently planted after sweetpotatoes in late summer. The radish is frequently eaten raw but it is also boiled, dried, and sometimes pickled. The other vegetables are, in order of quantity produced, the dasheen (a large starchy tuber), eggplant, Chinese cabbage, common cabbage, onions, pumpkins,



Southern sloping hill is used to produce strawberries on small Japanese farm, Farm woman spreads compost on her vegetable crop.



squash, and cucumbers. The remaining 20 percent of the vegetables produced is comprised of small quantities of green beans, peas, carrots, turnips, tomatoes, peppers, oriental pickling melons, spinach, lettuce, lotus, bamboo shoots, and many other vegetables.

TABLE 5.-- Japan: Crop production, average 1935-39 and 1952-54 and annual 1957-60

Commodity	Average 1935-39	Average 1952-54	1957	1958	1959	1960
	1,000 <u>m. t.</u>	1,000 <u>m. t.</u>	1,000 <u>m. t.</u>	1,000 <u>m. t.</u>	1,000 <u>m. t.</u>	1,000 <u>m. t.</u>
Rice, milled <sup>1</sup> .....	8,950	8,703	10,432	10,914	11,305	11,771
Wheat.....	1,360	1,476	1,330	1,281	1,416	1,531
Barley .....	1,592	2,277	2,160	2,066	2,300	2,300
Corn.....	56	64	97	111	104	99
Millet and sorghum .....	169	121	95	104	88	82
Other grains .....	246	191	230	241	220	211
Pulses.....	264	227	305	350	363	343
White potatoes .....	1,745	2,558	3,372	3,396	3,183	3,243
Sweet potatoes.....	3,134	5,607	6,228	6,369	6,981	6,632
Sugar, centrifugal.....	42	41	90	127	149	179
Sugar, noncentrifugal .....	18	24	20	22	28	33
Flaxseed.....	5	4	4	4	4	4
Peanuts, shelled .....	9	22	48	58	59	69
Rape and mustard seed.....	122	264	286	267	261	264
Soybeans .....	336	442	458	391	437	395
Tobacco.....	67	104	145	139	129	126
Tea .....	52	60	72	75	75	81
Fruit .....	1,266	1,538	2,417	2,507	2,725	2,990

<sup>1</sup>Reported as brown rice. Conversion rate to milled 91.7 percent before 1956; 91 percent after that date.

The high temperatures and high humidity, so conducive to the growth of vegetables, also provide ideal conditions for the development and spread of plant diseases. The crop losses associated with these diseases and the cost of controlling them have resulted in greater emphasis on the development of disease-resistant varieties.

Fruit. -- The wide variety of fruits grown in Japan occupies about one-half million acres, or 3 percent of the total planted area. Nearly one-third of all the fruit produced comes from individually planted and managed trees rather than from orchards. Orchards cannot usually compete with cereal grains on the limited level land; hence, fruit production is largely confined to steeply sloping land. Fruit production consists of about one-third citrus and two-thirds deciduous fruits.

Citrus does best on southern slopes as it requires warmer temperatures than other fruit. For the same reason, citrus plantings are generally situated near the coast where ocean currents temper climatic fluctuations and thus reduce the damage from frost. The popularity of the mandarin orange, which accounts for 80 percent of the citrus produced, results largely from its greater tolerance of low temperature. The mandarin orange is produced almost exclusively south of Tokyo. Concentration is greatest in Shizuoka and Wakayama Prefectures, which together account for nearly two-fifths of the total output.

Apples, the chief deciduous fruit, supply about one-third of the total fruit tonnage. Half of all the apples grown in Japan are produced in Aomori Prefecture at the northern end of Honshu Island. Nagano Prefecture in the mountains west of Tokyo accounts for about one-fifth of the total. Trees are carefully pruned and fruit is painstakingly thinned by hand, after which each apple is encased in a small paper bag to protect it from insect damage. The bags are removed a few days before picking to permit better coloring.

Persimmons, the third major fruit, are frequently preferred over oranges or apples by Japanese consumers. They are often stored or marketed in the dried form. Pears usually account for nearly one-tenth of the total fruit tonnage. The pear trees are often trained on horizontal trellises no more than 6 feet above the ground. This system makes harvesting easier and increases the yield per unit area. Like apples, pears are enclosed in individual paper bags to protect them from insects. Other important fruits grown are peaches, grapes, Japanese apricots, loquats, and cherries.

### Nonfood Crops

Tea. -- Japan, a traditional tea-consuming country, ranks fourth or fifth among the tea producing countries of the world. The production of tea, a very labor intensive operation, has been carried on for some 12 centuries. Tea -- a perennial, subtropical, evergreen plant -- is usually raised on hilly, well-drained soil, well above sea level, and usually south of the 37th parallel. It is usually grown as a secondary crop, sometimes in a row as a windbreak and even occasionally as an ornamental plant. Two-fifths of the tea crop is produced in Shizuoka Prefecture.

The tea plant thrives in moist, sunny, warm weather. Tea flavor is sensitive to soil type, and the flavor of that produced on loose sandy soils is generally considered superior. Tea plants are scientifically managed so as to obtain the finest quality leaves. Plants are carefully pruned to develop a densely foliated circular bush about 3 feet wide and 3 feet high. The first picking of the year, usually harvested from May 1 to June 15, customarily accounts for one-half of the annual yield. The next three pickings, each of which is successively smaller, are picked at 3 to 5-week intervals throughout the remainder of the summer. Tea plants are productive for 30 to 75 years but usually reach maximum production levels in about 10 years. They are heavily fertilized and frequently interplanted with green manure crops, such as soybeans. The interplanted soybeans, which are plowed under at summer's end, supply nutrients as well as the organic matter needed to maintain soil structure.

Production is not expected to increase very much, as a future export potential has not been promising and the younger generation has indicated a preference for coffee. Tea is a major agricultural export item even though only 0.5 percent of the planted crop area is allocated to its production.

Tobacco. -- The production of tobacco is under the supervision of The Japanese Monopoly Corporation. It controls production and adjusts the annual acreage allotment after studying the supply and distribution situation. Farmers are licensed to grow tobacco on the basis of their skill as tobacco producers, their location in regard to the corporation's leaf purchasing stations, and the soil types on individual farms. Some one-half million farmers are licensed to produce tobacco. About one-fourth of the tobacco is produced on the Kanto plain north of Tokyo, and the remainder is produced in localized areas throughout the three southern islands.

Tobacco production trended steadily upward until 1957 when it started to decline. Japan both exports and imports tobacco, but imports have been substantially above exports in recent years.

Fiber Crops. -- Most of Japan's fiber needs are satisfied either by imports or by the widespread use of rice straw. However, small quantities of various fibers are produced domestically in localized areas. Hemp is cultivated in scattered areas for the purpose of manufacturing fish nets, rope and clothing. Ramie, found mostly in the south, is used for the manufacture of both clothing and fish nets. Small quantities of jute are produced, but the bulk of the jute used in Japan is imported. A small amount of flax is produced in Hokkaido.

## THE LIVESTOCK INDUSTRY

The Japanese livestock industry is important principally as a source of draft power and secondarily as a source of food and fertilizer. Development of the industry has been hindered by a lack of land for the production of feed. As long as an acre planted to rice will yield 6 to 7 times as many calories as the same acre planted to forage or feed grains to be fed to livestock, it is not likely that land suitable for producing food staples will be diverted to the production of livestock.

Animals are barn-fed except in the less densely populated areas of Hokkaido where they are pastured. Rice straw is the main source of roughage, but native grasses, gathered from

nearby mountains, dikes, river sites, field borders, and roadsides, are also used. Livestock are fed little grain or concentrates, and thus provide an efficient means of converting waste forage products into draft power, manure, and meat. Dairy cows, hogs, and chickens are more dependent on commercial imported feed grains than are draft animals. This was clearly demonstrated when these segments of the livestock industry declined sharply following World War II when feed grains were in short supply.

The cultivation of fodder for cattle has previously been a concept foreign to the Japanese farmer. A government grassland improvement program now encourages farmers to produce grass and other forage crops. This program particularly stresses the utilization of steeply sloping land that would otherwise be unproductive.

Although income from the sale of livestock products is at present very small, it is comprising an increasingly large share of total agricultural income. In recent years, a greater availability of foreign exchange for feed grain imports and favorable prices for milk, butter, meat, and meat products have stimulated development of the livestock industry.

TABLE 6.-- Livestock and poultry numbers, selected years

Type	1942	1950	1960
	Thousands	Thousands	Thousands
Cattle:			
Dairy .....	223	198	824
Draft and beef .....	1,940	2,252	2,340
Horses .....	1,046	1,071	673
Sheep .....	155	359	788
Goats .....	215	413	561
Hogs .....	544	608	1,918
Chickens .....	38,288	16,545	54,627

## Dairy

Prior to World War II, the dairy industry was of little importance; however, since the war it has grown rapidly. The number of dairy cows has increased from 100,000 before the war to 824,000 in 1960. Indigenous breeds have been largely replaced by higher producing Holstein-Freisians from the West. Milk production, in 1959, was 10 percent greater than in 1958. Milk products are finding increasing acceptance by the Japanese, particularly among the higher income groups, and this growing demand will likely stimulate a continuing expansion of the dairy industry. Too, government agricultural policy appears to favor long-term expansion. Milk utilized in the school lunch program was once all imported dried milk but is now partly domestically produced whole milk. Butter production is continuing to increase, along with the general development of the dairy industry.

Hokkaido, with its cool, moist, pastoral climate has the greatest livestock potential. Transportation limitations, however, restrict its development as a source of dairy products, particularly milk, for the distant more densely populated southern areas. Also, farmers have traditionally produced livestock for draft purposes and are hence inexperienced at maintaining livestock for the commercial production of food products.

## Poultry

Most of the chickens in Japan are found in small farm flocks with large-scale commercial poultry production limited to the areas adjacent to large cities. Ready access to the larger urban markets partially accounts for this. Also large cities are usually ports, thus farmers benefit from the lower transportation costs of imported feed grains.

About three-fourths of the eggs produced in Japan are marketed. Domestic egg production, currently 80 eggs per capita yearly, is on the upward trend. Demand for eggs is rather irregular, however, as consumers are fairly sensitive to price changes. The broiler industry is in its infancy, and most of the meat is produced by the slaughter of old laying hens.

TABLE 7.-- Production of livestock commodities, Averages 1935-39 and 1952-54, annual 1957-60

Commodity	1935-39	1952-54	1957	1958	1959	1960
	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.
Milk <sup>1</sup> .....	309	742	1,361	1,548	1,715	1,886
Meat <sup>2</sup> .....	167	205	321	356	406	410
Eggs .....	197	279	430	435	448	499

<sup>1</sup>Cow's milk only.

<sup>2</sup>Includes beef, veal, horse, pork, lamb, mutton, and goat.

## Hogs

The number of hogs produced in Japan is extremely small as compared with the country's large population. Hog numbers tend to be more sensitive to prices than do other types of livestock. About 90 percent of the animals raised are of the Yorkshire breed; the remainder are Berkshires. The leading areas of production are the Prefectures in the immediate vicinity of Tokyo and Kagoshima at the southern end of Kyushu Island. Domestic production of lard is increasing, but much lard is imported, either as lard or as hog grease, which is then processed into lard.

## Sheep and Goats

Sheep production, concentrated mainly on the northernmost island of Hokkaido, grew rapidly during the early postwar years, but numbers have declined each year since the peak reached in 1957. The wool produced satisfies only a small fraction of domestic requirements, and mutton constitutes only a small part of Japan's meat output.

The number of goats also grew rapidly until 1957. Their ability to thrive on rough forage is an advantage, particularly in the hilly areas, but farmers are now shifting toward more intensive livestock enterprise. Very little goat milk is marketed, as most of it is consumed by individual farm families.

## Beef

Both beef production and consumption are rising rapidly; however, consumption is rising more rapidly than production, thus necessitating greater imports. Beef is produced mainly from draft cattle that have reached 4 to 6 years of age. They are commonly fattened for several months before slaughter. The production of tallow is very small in comparison to imports and the rising demand by processors, mainly for the production of soap, is expected to expand the volume of imports.

## Draft Animals

Draft animals subsist largely on farm-supplied feed. Cattle, used more for draft purposes than horses, are found throughout the country, whereas horses tend to be concentrated in Hokkaido and northern Honshu. The displacement of horses by both the small individually owned tractors and large cooperatively owned tractors is causing their numbers to drop rapidly. Less than 15 percent of farmers owning draft animals have more than one; only one-third of all farms keep draft cattle, and about one-tenth keep horses. Both horses and draft cattle are slaughtered for meat when they are no longer useful as draft animals.

# SERICULTURE

About 700,000 farm households, or 12 percent, are engaged in sericulture -- the production of silk cocoons. The cultivation of mulberries and the production of silk, started some time before the fourth century in Japan, received a strong impetus when Japan entered into international commerce in 1853. In 1958, Japan accounted for 44 percent of the world cocoon production of

269,110 tons. In terms of silk, Japan produced 60.5 percent of the 552,000 bale world total.

Although Japan continues to dominate the international scene as a silk producer, the relative importance of silk in the economy has declined considerably. Cocoon production dropped from a high of 400,000 metric tons in 1930 to 53,000 tons in 1947. It has since recovered somewhat, but is still less than one-third the prewar high. Principal among the factors contributing to its decline was the development of the synthetic fiber industry in the United States and the reduced foreign demand resulting from the World War II suspension of trade. Also of importance was the greater emphasis on food production both during and since the war. Land formerly planted to mulberry trees, the leaves of which are fed to silkworms, has been gradually transferred to food crop production. The acreage planted to mulberries accounted for 12 percent of the total planted area in 1930, and 6 percent in 1941, but by 1959 it had been reduced to 3 percent.

Silkworms are lepidopterous insects undergoing complete metamorphosis. The cocoons are spun during the larval stage just prior to entering the pupal stage. Raw silk is obtained by unwinding the cocoon. Silkworm eggs are prepared for hatching in late April when the first tender mulberry leaves are ready for picking. Four to five weeks are required for a newly hatched egg to reach the cocoon stage. Both temperature and humidity must be carefully controlled throughout the silkworm's life. Three generations of silkworms can be grown per year except in the cooler areas where low temperature limits production to two crops per year.

Young freshly matured leaves of the mulberry plant, the only satisfactory source of food for the commercial production of silkworms, are desired for silkworm feeding. Mulberry trees are best adapted to sandy loam soils and areas favored with abundant sunshine. The culture of mulberry leaves is of considerable importance to the silkworm industry, as it represents the major cost factor.

Although small quantities are produced throughout Japan, the combined influence of soils, topography, and climate have confined most of the cocoon production to the central Prefectures. In the north, winters are too cold to permit mulberries to thrive. In the warmer southern regions, land can be more efficiently utilized by the double cropping of short season crops.

Sericulture is a highly commercialized type of agricultural production, as all cocoons are marketed. They are usually marketed through agricultural or sericultural marketing associations. The production and export of silk, a labor-intensive operation, were once ideal means of exporting surplus Japanese labor. Silk products made up a third of all exports in the early 1930's, but today account for less than 3 percent of the total. Other forms of employment have become increasingly more attractive.

## RELATIONSHIP OF INPUT FACTORS

The incessant pressure of population on the land has resulted in a labor-intensive type of agricultural production. The Japanese farmer has become a master of land-saving devices but has been much less concerned with developing and using labor-saving devices. Limited land resources and the need for obtaining high yields also require large capital inputs particularly in the form of fertilizers. Increases in the capital to land ratio, paralleling population growth, have made the remarkable expansion of farm output possible. It now appears, however, that the point of diminishing returns has been reached in regard to labor inputs.

TABLE 8.--Agricultural cash expenditures per Japanese farm household, 1958

Item	Agricultural expenditures	Percent of total
	Dollars	Percent
Fertilizer .....	69	31.4
Feed .....	43	19.5
Pesticides .....	11	5.0
Agricultural implements .....	11	5.0
Agricultural wages .....	14	6.4
Others .....	72	32.7

The disadvantage of a limited amount of land has been partially offset by the substitution of labor for land. The use of 72 man-days to produce an acre of rice contrasts strongly with the highly mechanized capital intensive rice production of the United States which utilizes only 2 man-days per acre.

Agricultural investment in production capital has doubled since 1936. Capital investments have been largely directed toward increasing yields rather than saving labor. The success of initial postwar technological innovation has stimulated further investment. In 1958, nearly one-third of all agricultural expenditures were allotted to the purchase of fertilizer alone.

The loss of overseas territories at the end of World War II and the need to maintain a reasonable degree of self-sufficiency have accelerated efforts toward increasing production per unit of land.

## LEVEL OF TECHNOLOGY

### Mechanization

The ratio of the factors of production determines the nature of the technology adopted. In Japan, the critical ratio is the arable land-labor ratio. This ratio is most unfavorable, but little can be done to alter it; hence, the technology developed has made the best use of it. The mechanization pattern of Japanese agriculture reflects a greater emphasis on increasing yields and a lesser stress on saving labor than has mechanization in most Western countries, where machines have usually replaced animals. In Japan, machines have oftentimes been directly substituted for human labor.

Mechanization has been confined largely to preseedling and postharvest operations. Interim processes, such as seeding, transplanting, and harvesting, are still largely hand operations. Although the number of tractors is increasing rapidly, draft animals are still depended upon for many of the heavier field operations, such as plowing. Recent trends in tractor purchasing indicate a decline in popularity of 6 to 7-horsepower tractors which were too large for individual cultivators and too small for collective use. Farmers now prefer individually owned 2 to 3-horsepower tillers or cooperatively owned 20 to 30-horsepower tractors.

The insecticides, herbicides, and fungicides used by nearly all farmers are applied by small one-man portable dusters and sprayers. These may be hand operated or they may be powered by electric and gasoline engines found on many Japanese farms. Virtually all grain is threshed by small electric or gasoline powered stationary threshing units. The prevalence of electric engines is explained by the relative abundance of electrical power. Few countries have as high a percentage of farms with electric power as does Japan where over 90 percent of all farms have electricity. About one-sixth of all farms have an electric motor.

Several factors have operated to restrict the mechanization of Japanese agriculture. Among these are the abundant supply of cheap labor, the scarcity of land, and, to a somewhat lesser extent, a scarcity of capital. Traditionally small farms divided into several small, noncontiguous plots have resulted in fields much too small to accommodate large machines. In addition, irrigated crops which comprise a large portion of the total planted acreage, do not lend themselves to mechanization as readily as do upland crops.

TABLE 9.--Number of farm machines owned by Japanese farmers, selected years

Item	1942	1950	1955	1959
	Thousands	Thousands	Thousands	Thousands
Electric motor .....	145	601	956	1,042
Engine .....	317	<sup>2</sup> 345	1,134	1,756
Power cultivator .....	<sup>1</sup> 3	13	82	338
Power sprayer .....	5	16	76	—
Power threshing machine .....	357	828	2,038	2,343
Power rice hulling machine.....	180	379	696	711

Adapted from Statistics of Agriculture-Forestry Ministry and Farm Appliances Year Book.

<sup>1</sup>Number in 1937.      <sup>2</sup>Number in 1949.

A greater capital supply, accruing from consecutive bumper harvests and supplementary nonfarm employment, has accelerated the trend toward mechanization. This has put the smaller farms at a competitive disadvantage, as they cannot get full use of the different machines required for each operation and so are forced to overcapitalize. Despite these numerous handicaps, agriculture is much more mechanized in Japan than elsewhere in the Far East.

### Use of Fertilizer

The use of fertilizer is a practice easily adaptable to small-scale operations, and its widespread use by Japanese farmers has undoubtedly been the most important single factor behind postwar yield increases. In 1958, fertilizer accounted for nearly one-third of all agricultural expenditures. Only in the Netherlands are fertilizer applications per acre of land higher.

Traditionally, such organic fertilizers as fish, soybean cake, and nightsoil have been used. In 1887, a small amount of chemical fertilizer was imported from abroad, and in the following year small quantities were being produced domestically. The fertilizer industry now produces several million tons annually. Production is centered around nitrogenous fertilizers, principally ammonium sulphate, and phosphatic fertilizers, mostly superphosphate.

Also of importance is a complete fertilizer (nitrogen -- 8 percent, phosphorous -- 8 percent, and potassium -- 5 percent). Production of this fertilizer has increased from 157,000 tons in 1950 to 2,033,000 tons in 1959. Total production of all chemical fertilizers reached 7 million tons in 1959. Exports, mostly ammonium sulphate, exceed 1 million tons annually. Potassium fertilizers and fertilizer materials are imported in increasing quantities, reaching 1 million tons in 1960.

TABLE 10.--Domestic production of principal chemical fertilizers, selected years

Fertilizer year <sup>1</sup>	Nitrogenous fertilizers			Phosphate fertilizers		Complete fertilizer
	Ammonium sulphate (N-20 percent and over)	Calcium cyanamide (N-21 percent)	Urea (N-45 percent)	Super-phosphate (P-16 percent)	Fused phosphate (P-18 to 20 percent)	8-8-5 analysis
	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.	1,000 m.t.
1950.....	1,571	432	21	1,353	47	157
1954.....	2,100	488	142	1,523	280	961
1957.....	2,563	455	381	1,303	354	1,394
1959.....	2,396	361	532	1,402	373	2,033

<sup>1</sup>Year beginning August 1 of year shown.

TABLE 11.--Consumption of major fertilizer nutrients, Japan average 1948-49 to 1952-53, annual 1956-57 to 1958-59

Year	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
	1,000 m. t.	1,000 m. t.	1,000 m. t.
1948-49 to 1952-53 .....	368	224	145
1956-57 .....	590	337	450
1957-58 .....	629	290	320
1958-59 .....	683	300	435

FAO Production Yearbook, 1959.

The long-term heavy application of chemical fertilizers has raised the phosphatic reserves to a high level, with the result that the immediate response to phosphate applications is rather small. In Hokkaido, which is cool and has a short growing season, phosphates have a particular advantage, in that they speed up early growth and therefore enhance the possibilities of maturing before the damaging frosts begin.

The long-term application of nitrogen and potassium has resulted in a disequilibrium between

inorganic and organic matter. This condition, known in Japan as "akiochi", is characterized by a stunting of plant growth. Rice plants affected by this condition appear normal until just before maturity when the plant abruptly stops growing and fails to mature.

## Chemicals

The use of chemicals to control insects, diseases, and weeds has probably been the most important labor-saving innovation next to mechanization. The control of insects and diseases achieved by the use of chemicals has increased the flexibility of planting dates, as it is no longer necessary to plant when the incidence of disease or damage from insects is lowest.

Following World War II, 2,4-D was introduced as a weed killer. Its use spread rapidly, and by 1956 1 planted acre in every 5 was weeded with 2,4-D. During the same year, insecticides were applied to over one-half of the planted acreage.

## Irrigation

Irrigation is largely limited to paddy land, as natural rainfall normally provides sufficient water for other crops. The irrigated and naturally flooded area, therefore, closely approximates the 8 million acres planted to rice. Over one-half of the cultivated land is irrigated.

Rivers are the principal source of irrigation water, with ponds and sometimes wells serving as secondary sources. There are numerous small irrigation projects but few large ones in Japan, as rivers are steeply graded and thus have limited reservoir capacities. Over centuries of time the Japanese have developed an extensive and intricate system of irrigation canals to convey water from the rivers to oftentimes distant paddy fields. Whenever sufficient quantities of irrigation water are available and land can be satisfactorily leveled to permit inundation, the land is usually planted to rice, often at considerable expense.

## Plant Improvement

Activities at the National Agricultural Experiment Station, established in 1890, have been directed primarily toward the improvement of rice varieties. Initial efforts were devoted to developing higher yielding varieties. More recently, research efforts have been diversified in order to develop earlier maturing varieties, greater hardiness, and greater response to fertilizer. Nearly all of the currently cultivated varieties of rice are indigenously developed hybrids. Numerous Prefectural and local experiment stations have developed varieties particularly adapted to local soils and climatic conditions. Research in most other crops has lagged far behind rice and was entirely neglected until recent decades. Hybrid varieties of many vegetable crops, however, were developed prior to World War II. During the past few years programs have been initiated to develop forage crops for the expanding livestock industry.

# PRODUCTIVITY

## History

The production of the six major crops (rice, wheat, barley, naked barley, sweetpotatoes and white potatoes), which account for 80 percent of Japan's food production, increased 77 percent during the 30-year period from 1885 to 1915. This increase was accompanied by a 14-percent reduction in the agricultural labor force. The net effect of these changes amounted to a virtual doubling of labor productivity. This increase is principally attributable to two developments -- the liberal application of fertilizer and the improvement of rice varieties.

Unlike increased agricultural productivity attained elsewhere, the increase in Japan arose largely from nonmechanical means. It was obtained largely through short-term capital outlay, mostly for fertilizer. The increased agricultural production and the subsequent release of agricultural labor were essential to the development of industry. Increases in agricultural labor productivity did not result in any appreciable rise in the rural living standards because a major part of the increase in national production was used for financing the capital accumulation necessary for industrialization.



## Levels and Trends

Production per unit of land in Japan is now among the highest in the world and is continuing to rise. Increases in postwar production have been attributed to the adjustment of the production pattern to farm and soil conditions as well as to the adoption of improved farming techniques. No country has attained such high yields of rice under such a variety of conditions as has Japan. It is not likely, however, that substantial further increases will be easily achieved.

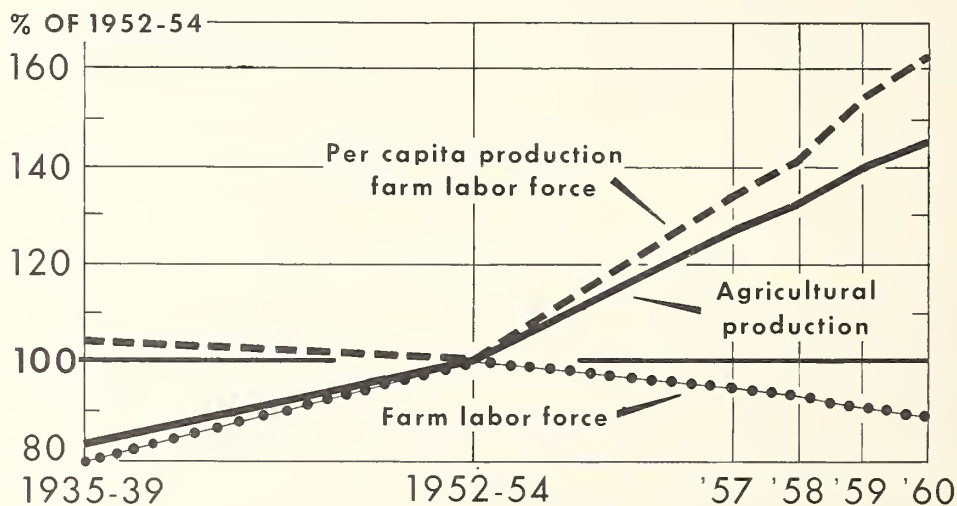
In recent years, several hundred Japanese have been sent abroad, particularly to the United States, as members of agricultural productivity teams. After observing methods of increasing production in other countries, team members return home to demonstrate and teach these methods to farmers.

TABLE 12. -- Selected indices pertaining to Japanese agricultural production, average 1935-39 and 1952-54 and average 1957-60

	Average 1935-39	Average 1952-54	1957	1958	1959	1960
Agricultural production .....	83	100	127	132	140	145
Population index .....	81	100	105	106	107	108
Farm labor force .....	80	100	95	93	91	89
Per capita agricultural production .....	102	100	121	125	131	134
Per capita production farm labor force .....	—	100	134	142	154	163

The agricultural production index (1952-54 = 100), which has trended steadily upward during the past decade, reached 145 in 1960. Modest population increases for the same period held per capita production at 134. Overall agricultural production has increased approximately 6 percent per year, slightly below the rate of growth for the economy as a whole.

## Japan: Agricultural Production and Farm Labor Productivity



# AGRICULTURAL INSTITUTIONS

Cooperatives, experiment stations, agricultural colleges, and an agricultural extension service patterned after that of the United States are the dominant agricultural institutions.

## Cooperatives

Cooperative associations have enabled the Japanese farmers, with characteristically small individual holdings, to pool their efforts and resources. Following the enactment of cooperative legislation in 1900, cooperatives spread rapidly until, at present, every rural village and town has at least one cooperative.

During World War II, cooperatives became semigovernment agencies, with membership required of all farmers, thus providing the means for agricultural regimentation. The Agricultural Cooperation Association Law of 1947 provided for reorganization of cooperatives along the universally accepted principles of voluntary membership, with one vote per member, and dividend participation.

Japanese cooperatives may be classified into stock and nonstock, or general and specialized cooperatives. General-purpose cooperatives are usually stock holding, whereas those which provide a specialized service are not.

Functions of Japanese cooperatives are many. In addition to the major functions of marketing and purchasing, cooperatives are organized to provide credit, reclaim land, process agricultural products, transport produce, and insure crops and livestock. Organization of cooperatives is on a local, Prefectural, and national basis.

TABLE 13.--Local Japanese cooperatives, by type of functions, as of March 1960

Function	Stock	Nonstock	Total
General purpose.....	12,327	545	12,872
Sericulture .....	138	6,800	6,938
Livestock .....	1,504	1,548	3,052
Horticulture .....	569	144	713
Rural industry .....	578	67	645
Reclamation .....	2,313	2,521	4,834
Miscellaneous .....	214	718	932
<b>Total.....</b>	<b>17,643</b>	<b>12,343</b>	<b>29,986</b>

## Credit

A chronic capital scarcity, prevailing low farm income, and risks arising from frequently disastrous natural calamities make loan procurement difficult for Japanese farmers. Commercial bank reluctance to loan has necessitated the development of cooperative and government credit facilities.

Heavy farmer deposits associated with rice marketing and a strong demand for capital at planting time result in extreme seasonal fluctuations in the availability of capital from credit cooperatives.

Production credit shortages have been alleviated through the acceptance of promissory notes by cooperatives. These notes, which require crop mortgaging by the producer, are discounted with the Central Cooperative Bank. This bank then uses the notes as collateral to secure additional funds from the Bank of Japan during the growing season.

This system increases the efficiency of capital utilization while providing maximum benefits to farmers. After the harvesting season, surplus capital accruing from sales of farm commodities is channeled into the monetary system via the network of credit cooperatives and the Bank of Japan.

## Agricultural Insurance

Insurance of staple food crops is compulsory, but the program is subsidized by the govern-

ment. Crops are insured for up to one-half of normal expected value. Premiums paid by farmers are sufficient to cover normal risks only, and the government subsidy is expected to provide for unusual risks, such as typhoons and other disasters.

Insurance on livestock is not compulsory, unless more than two-thirds of the members of an organized group, such as a cooperative, request it. This insurance covers up to 80 percent of the assessed value.

### Agricultural Education

As a result of a compulsory educational system adopted in the latter decades of the last century, Japan now has a literacy rate comparable to that of the United States. This has greatly facilitated the dissemination of new ideas among the rural populace. Education has also increased the farmers' susceptibility to change, thus enabling them to easily discard traditional practices in favor of newer, more progressive cultural and managerial techniques.

Prefectural governments operate local agricultural high schools designed to graduate progressive, scientific farmers and well-informed rural workers. Over 300 agricultural high schools, with an enrollment of 75,000, were in existence by 1940. Agriculture is taught in several agricultural colleges and the Imperial Universities. Courses of study in the colleges and universities are usually research oriented.

A large proportion of the graduates of the agricultural colleges and training centers found throughout Japan work in research and extension or other jobs related to agriculture. Only a small proportion of college graduates become farmers.

### Agricultural Research

Japan's agricultural research system is one of the most extensive in existence, particularly when related to its limited cultivated area. An estimated 6,500 scientists and technicians are engaged in full-time research. Experiment stations were first established near the middle of the last century and, by 1900, several were in operation. Research was initially limited to rice, but has gradually broadened until it now encompasses all phases of agricultural production and marketing.

Research is conducted by the Imperial and Prefectural agricultural experiment stations, Imperial universities, a number of colleges and also private institutions and corporations. Each of the 46 Prefectures in Japan has its own experiment station. The Imperial experiment stations are primarily engaged in basic research and problems of national importance, whereas Prefectural



Farm family discusses problems with extension worker. Extension provides the vehicle for getting research to farmers.

experiment stations concentrate efforts on local problems with results of an immediate practical value.

The stations are relatively small and numerous, with rather specialized but well coordinated areas of research. Diverse climatic and soil conditions make the large number of small scattered stations feasible. Major agricultural research objectives have been to increase production, improve quality, and reduce production costs. Projects designed to increase per acre yields have been of primary importance. Some of the more remarkable achievements have been the development of new, more efficient varieties of silkworms, varieties of rice more responsive to heavy fertilizer applications, effective methods of controlling insects and diseases, and a marked reduction in the cost of harvesting and curing of tea leaves. Numerous seed farms, located throughout the country, produce foundation seed stock for both standard and newly developed varieties. This network of seed propagation farms, operating in conjunction with the agricultural extension service, provides a means of distributing new and improved varieties to farmers.

### Agricultural Extension Service

Extension activities have been carried on in Japan for several decades. Prior to World War II, the benefits of research were usually passed on to farmers by means of farm organizations, mostly cooperatives. In some instances, information was provided directly by the experiment station.

The Extension Service, as it now exists, was set up after World War II, and now has 12,000 extension workers. The technical guidance which they provide is designed to increase agricultural production and improve living conditions. Approximately 2,000 of the extension personnel are women who specialize in home economics mostly in the field of nutrition. In addition to the local advisers, each Prefecture has a number of extension specialists who advise in such specific areas as soils, irrigation, and entomology.

The Extension Service has played an important role in advancing the technology of Japanese agriculture. It has also been instrumental in encouraging farmers to adopt progressive management practices.

## MARKETING

The proportion of agricultural production marketed varies with the size of farm, nature of the crop, and the proximity to market. Larger farms may market the greater part of their total production, whereas most of the smaller farms use what they produce. In general, the proportion of production marketed is higher for fruits, industrial crops, and livestock products than for vegetables and food staples, such as rice, wheat, barley, and sweetpotatoes. The proportion of grain marketed, when considered aggregately, is just under 50 percent and that of vegetables is just over 50 percent. In contrast, the proportion of apples marketed is 86 percent, oranges 96 percent, grapes 92 percent, and milk 93 percent. For industrial crops the percentage marketed is 99 percent for tea, 59 percent for rapeseed, 100 percent for ramie, and 100 percent for silk cocoons.

Cooperatives, either specialized or multipurpose, play a major role in the marketing of agricultural commodities. An estimated 50 percent of all rice and 62 percent of wheat are marketed through cooperatives. For fresh fruit and vegetables the percentages are 38 percent and 14 percent, respectively. For livestock products the figure is 17 percent. Agricultural production not marketed through co-ops is marketed by individuals through merchants and processors.

### Transportation

Historically, the Japanese have depended heavily upon ocean transport to move food to the large cities, since their rivers are generally unnavigable. This arrangement proved quite satisfactory, as many of the major cities were on the coast and no point was more than 90 miles inland. During World War I and again in World War II, however, the need of all available shipping for military purposes stimulated the development of overland rail transport, in which the government played a major role. In 1955, the government owned 3,234 refrigerator cars and 1,847 ventilated cars, all of which were specially designed for the transport of fresh foodstuffs. Since World War II, the expansion of the highway system and growing numbers of trucks have further developed the overland transport system. The development of rail transportation and a highway system provided a strong impetus for regional agricultural specialization. This in turn hastened the transition from a subsistence type of agricultural production to a market-oriented agricultural economy.

## Distribution

As a consequence of being a leading trading nation, Japan has a well-developed distribution system. Several of the major cities now have large central wholesale markets which handle fruit, vegetables, and fresh and processed fish. The capital for the establishment of these markets is provided jointly by the central and municipal governments. One-third of the construction cost is provided by the central government and two-thirds by the municipal government. The handling of goods at these terminal markets is not well mechanized and consequently involves much hand labor. From these large wholesale centers, foodstuffs are distributed to small shops and markets throughout Japan.

## The Demand Structure

The overall demand for agricultural commodities increased by about 10 percent per year from the end of the war until 1953. After 1953, when consumption returned to the prewar level, demand tended to level off. This is largely attributable to a low income elasticity for farm products. The income elasticity of demand for some items, such as fruit, milk, meat, dairy products, and eggs, is greater than 1; for many it is less than 1, and for some even negative. Also contributing to the leveling off of consumption was an increase in the propensity to save, which reduced the proportion of incomes spent, and the rapid rise in expenditures for household appliances.

TABLE 14.-- Income elasticity coefficients of selected foods and their projected per capita consumption in Japan, 1962

Food	Income elasticity co-efficient	Consumption per day per capita		Change
		1956	1962	
		Grams	Grams	Percent
Rice .....	+0.1	297	297	0
Barley, polished .....	- .6	47	38	-19
Wheat.....	+ .1	69	71	+ 3
Sweetpotatoes .....	-1.2	75	49	-35
White potatoes .....	- .1	47	50	<sup>5</sup> + 7
Soybeans.....	<sup>1</sup> + .2	11	13	+22
Other pulses.....	.0	10	10	0
Fruits .....	+1.2	35	52	+48
Vegetables.....	+ .3	200	204	+ 2
Meat.....	+1.2	7.2	9	+25
Eggs .....	+2.0	9.2	13.6	+48
Milk .....	+3.0	<sup>2</sup> 39	<sup>2</sup> 69	<sup>2</sup> +77
Butter .....	+1.8			
Fats and oils .....	<sup>3</sup> +1.7	8.2	12.1	+48
Sugar .....	+ .5	35	43	+22
Total intake:				
Calories .....	—	<sup>4</sup> 2,143	<sup>4</sup> 2,209	+ 3.1
Protein.....	—	65.1	68.2	+ 4.8

<sup>1</sup>Includes azuki beans. <sup>2</sup>Milk and milk products. <sup>3</sup>Edible oil. <sup>4</sup>Calories. <sup>5</sup>The increase in consumption occurring when the income elasticity co-efficient is negative may be inconsistent with the other calculations. "Estimation of Demands for Food"; document submitted by the Japanese Government to the third session of the ECAFE Working Party on Economic Development and Planning. "Reference Tables for the Agriculture, Forestry and Fisheries Sections of the New Long Term Economic Development Plan" (in Japanese).

# FOOD CONSUMPTION

## Level of Caloric Intake

According to a food balance calculated for the 1958 consumption year, per capita daily caloric intake in Japan was 2,310 calories. This approximates the level recommended for the inhabitants of the area by FAO and is among the highest in the Far East. Although the caloric intake level is relatively high, diets are preponderantly starchy and hence often nutritionally inadequate.

## Nature of Consumption

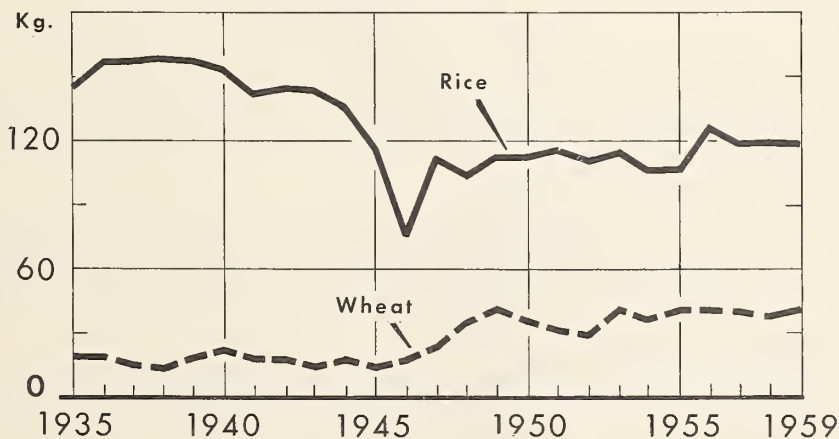
The Japanese consumption pattern is characterized by the direct utilization of foods of plant origin. The costly 7 to 1 ratio required to convert plant calories into animal calories prohibits the widespread consumption of animal products. Japanese agriculture, furthermore, concentrates on raising crops which have very high calorie yields per acre, such as rice. The limited availability of plant materials for conversion into animal products has resulted in a heavy reliance on the sea as a source of animal protein. Fish provide most of the animal protein in the diet. The Japanese fishing fleet, the largest in the world, accounts for one-sixth of the world's fish catch.

Nearly one-half of all calories consumed are derived from rice. When wheat, barley, and other grains are added, the proportion of calories supplied by grains exceeds two-thirds of the total, and sugar and other starchy foods, such as roots and tubers, account for 15 percent of the calories consumed. Fats, oils, and oilseeds contribute an additional 4 percent of the total. About 4 percent is supplied by fruits and vegetables, 5 percent by meat, fish, poultry, and eggs, and 1 percent by milk and dairy products.

## Trends in Consumption Pattern

World War II, with the accompanying disruption of trade and production, caused some permanent shifts in the consumption pattern. One of the more significant changes has been in the limited substitution of wheat for rice. In the years immediately preceding the war, rice consumption averaged 340 pounds per capita per year. The postwar rice shortage, which was partially offset by heavy wheat imports, reduced per capita rice consumption to 242 pounds. During the years that rice was in short supply, the Japanese developed a taste for wheat, and in recent years, per capita consumption has averaged 88 pounds per year as compared with 37 pounds before the

### Japan: Per Capita Annual Consumption of Wheat and Rice



U. S. DEPARTMENT OF AGRICULTURE

NEG. ERS 122-61 (4) ECONOMIC RESEARCH SERVICE

war. There is now considerable evidence that a permanent place for wheat and wheat products has been established; however, the preference of many consumers for rice is still strong, and it is likely that some of the demand lost to wheat could be recaptured if rice were to become sufficiently competitive in price and quality.

The food consumption pattern of urban and rural inhabitants differs. In rural areas, consumer preferences are more rigid and diets are less varied. The income elasticity of demand for rice before the war was slightly negative for urban dwellers but positive for farmers. In times of prosperity (rising incomes), rice consumption increases in rural areas while concomitantly decreasing in urban areas. During periods of depression, the situation is reversed. In recent years, however, the income elasticity of demand for rice in the rural sector has also become negative.

### Nutritional Education

Extensive work is being done in both the public and private field in nutritional education. At present, 9 million children are being fed an improved diet through the school lunch program. A number of "kitchen car" buses publicly demonstrate methods of preparing food made from wheat flour and provide free food samples and instructive literature. Many of the colleges and universities now offer courses of study with a major in nutrition.

## NATIONAL AGRICULTURAL POLICY

The formulation of Japan's agricultural policy has not been governed by conditions in the agricultural sector alone, but more by the special relationship of agriculture to the remainder of the economy. Government agricultural policy has a threefold purpose: To increase farm income, to maintain low foodstuff prices to consumers, and to conserve foreign exchange required for the import of industrial raw materials. To these stated objectives may be added the feeling in Japan that a self-sufficiency in farm-produced food of 80 per cent is highly desirable for security reasons.

During and immediately after the war when the country suffered from widespread food shortages, controls were designed primarily to protect consumers. Although the principle of controls has been retained, actual controls have relaxed. Controls now have a price-supporting effect and appear to favor the farmers. Recent marked increases in domestic agricultural production have resulted in a greater availability of foodstuffs and a subsequent price decline.

Prices of food grains, particularly rice, are strongly controlled by government measures. All marketed rice is purchased by a government agency at a price well above the price at which it is sold to consumers. The financial loss incurred in this transaction is largely offset by earnings from the sale of large quantities of imported wheat which the government sells at a price considerably above the import price. Other domestically produced food grains, such as wheat and barley, are indirectly supported. As prices fall to a predefined level, the government purchases the amount necessary to prevent any further decline. Prices of oil-bearing crops, such as rapeseed and soybeans, are supported in a similar manner. Prices of sweetpotatoes and white potatoes are indirectly supported through favorable government support prices for potato starch. Over one-half of the expenditures of the Ministry of Agriculture and Forestry have been used for price-supporting purposes. The stabilization of farm incomes is accomplished also through government subsidy of crop and livestock insurance.

Government policy has been formulated to exploit all possible means of expanding agricultural production. This has included the vast program of agricultural research and subsidies granted to farmers for the procurement of production supplies. The maintenance of a relatively high level of self-sufficiency in food production and the associated savings in foreign exchange, much needed for heavy machinery and industrial raw material imports, have been instrumental in reaching the present stage of development.

Government investment in the agricultural sector has increased in recent years. Policymakers now feel that progress can best be achieved through large-scale projects, such as irrigation, drainage, and reclamation. These are areas in which private investors are traditionally reluctant to invest.

In the future, low labor productivity in agriculture as compared with industry and foreign agriculture is likely to influence policymaking.

# AGRICULTURAL TRADE POLICY

Japan's trade policy has strongly affected the composition of its agricultural imports. As a result of the very high population-land ratio and of limited mineral resources, it has been based on the necessity of exporting Japanese labor and technical skills, in the form of manufactured goods, in exchange for food and industrial raw materials.

Sustained economic expansion requires accelerated exports and this in turn requires a constantly expanding volume of imported essential raw materials. The expansion of trade is, therefore, of strategic importance to Japan. This contrasts strongly with the United States where indigenous supplies of raw materials have permitted the economy to function much more independently of the level of trade.

Few import restrictions are placed on agricultural raw materials for industrial use, but duties on nonessential or luxury foodstuffs may range from 20 to 50 percent ad valorem.

A chronic foreign exchange problem throughout much of the postwar period has necessitated the imposition of import licensing on all commercial imports. Goods may be imported under one of three systems -- the Automatic Approval System, the Fund Allocation System, or the Global Quota System. Foreign exchange allotments for each of the three systems are determined by the semiannual foreign exchange budget. Essential foodstuffs and industrial raw materials are given licensing priority.

The Automatic Approval system provides for the issuance of import licenses for specified commodities. There are no limitations on the quantity of the specific commodities to be imported but restrictions may be placed on the area from which the item may be procured.

The Fund Allocation system, a more restrictive system than the Automatic Approval system, may restrict both the quantity to be imported and the area of procurement.

The Global Quota System provides quantitative restrictions on a commodity basis but does not discriminate as to the area of origin.

Japanese reparations, private investment, and technical assistance programs throughout Asia will undoubtedly serve to encourage trade with recipient countries.

## AGRICULTURAL TRADE

### Agricultural Exports

Agricultural exports, which account for less than 5 percent of Japan's total exports, are not generally competitive with those of the United States. Silk and mandarin oranges together

TABLE 15.-- Japan's agricultural trade, 1959

Agricultural exports	Value	Agricultural imports	Value
	Million dollars		Million dollars
Silk, raw .....	45.6	Raw cotton .....	341.0
Mandarin oranges .....	20.2	Wool .....	209.9
Seasoning, monosodium glutamate .....	10.5	Wheat .....	160.6
Soybean oil .....	6.4	Sugar .....	104.7
Tea .....	4.2	Soybeans .....	96.2
Mushrooms, dried (shiitake) .....	3.1	Rice .....	37.7
Tobacco, unmanuf. ....	4.4	Rubber .....	113.1
Beer .....	1.8	Oilseeds, excl. soybeans .....	68.0
Potatoes .....	1.5	Barley .....	28.3
Red pepper .....	1.3	Corn .....	53.4
Sugar, refined .....	1.9	Hides and skins .....	40.6
Ginseng .....	.7	Beef tallow .....	27.2
Bulbs, etc. ....	1.0	Hard fibers .....	29.5
		Pulses .....	11.1
Total above .....	102.6	Total above .....	1,321.3
Other, mostly nonagric. ....	3,353.9	Other, mostly nonagric. ....	2,278.2
Total all commodities .....	3,456.5	Total all commodities .....	3,599.5



account for well over one-half of all agricultural exports. Tea, dried mushrooms, soybean oil, and monosodium glutamate comprise much of the remainder. The total annual export volume of about \$100 million amounts to scarcely more than \$1 per capita. The present degree of agricultural insufficiency, coupled with the growing industrialization, is likely to preclude any appreciable expansion of the current volume of agricultural exports.

## Agricultural Imports

Agricultural imports are vitally important to Japan. Forty percent of Japan's total import volume of \$3 billion to \$4 billion per year normally consists of agricultural commodities. Imported foodstuffs make up the sizable deficit between food consumption and domestic food production. In addition, agricultural commodities are a major source of raw materials for Japan's industries. Two natural fibers -- cotton and wool -- are imported at the combined rate of over one-half billion dollars annually. These two commodities form the basis of the internationally important Japanese textile industry. Other imported agricultural commodities figuring prominently as industrial raw materials are rubber, hides and skins, beef tallow, and hard fibers.

A large proportion of wheat, Japan's second food staple, is imported. Other major foodstuff imports are sugar, soybeans, rice, barley, corn, pulses, and other oilseeds. In the future, improvements in the diet will likely be achieved largely through further diversification of food consumption. The scarcity of land does not permit the flexibility in the domestic agricultural production pattern needed to satisfy the diversified demand for foodstuffs. It is therefore likely that the more diversified demand will be satisfied through imports.

## Trade With the U. S.

The United States is both Japan's principal supplier and most important customer. In 1959, for the first time since World War II, the value of total U.S. imports from Japan exceeded the value of total U.S. exports to Japan.

For the past decade, 1950-59, Japan has consistently ranked at or near the top as a U.S. agricultural market. Only Great Britain has seriously contended the No. 1 position. On a calendar-year basis, Britain ranked first five times and Japan four times. Considering total U. S. agricultural exports for the whole decade, Japan ranks in the lead. The value of agricultural exports to that country average \$391 million for the period, as compared with \$383 million to Great Britain.

TABLE 16.--Ranking of foreign markets according to value of agricultural imports from the United States

Year	First place		Second place		Third place	
	Country	Value	Country	Value	Country	Value
		Million dollars		Million dollars		Million dollars
1950.....	W. Germany	358.0	<u>Japan</u>	349.0	U.K.	265.0
1951.....	U.K.	501.0	<u>Japan</u>	420.0	W. Germany	366.0
1952.....	<u>Japan</u>	428.7	W. Germany	279.3	U.K.	273.9
1953.....	<u>Japan</u>	367.2	U.K.	295.9	Canada	246.3
1954.....	<u>Japan</u>	417.7	U.K.	362.7	Canada	298.5
1955.....	<u>Japan</u>	386.1	U.K.	376.9	Canada	282.3
1956.....	U.K.	421.9	<u>Japan</u>	391.5	W. Germany	365.6
1957.....	U.K.	500.7	<u>Japan</u>	454.1	Canada	355.0
1958.....	U.K.	409.3	<u>Japan</u>	361.1	Canada	344.0
1959.....	U.K.	425.4	<u>Canada</u>	384.6	<u>Japan</u>	334.1
10 yr. avg. ....	<u>Japan</u>	390.95	U.K.	383.27	W. Germany	309.85

On the opposite side of the ledger, the United States has been Japan's largest agricultural market. A third or more of Japan's relatively small volume of agricultural exports normally goes to the United States. However, this is only a fraction, usually about one-tenth, of Japan's agricultural imports from the United States. One item -- raw silk -- has traditionally accounted for one half of the total.

Seven commodities -- cotton, soybeans, wheat, tallow, hides and skins, corn, and barley --

account for the great bulk of U. S. agricultural exports to Japan. During the 1956-59 period, the aggregate value of these seven commodities ranged from \$292.5 million to \$445.0 million annually. In the past few years, the United States has supplied 40-50 percent of Japan's imports of the "big 7" commodities. Imports of these commodities from the United States account for roughly one-fourth of all Japan's agricultural imports.

TABLE 17.-- United States-Japan agricultural trade, 1958-59

U. S. exports to Japan	1959	U. S. imports from Japan	1959
	Million dollars		Million dollars
Cotton, excl. linters .....	91.3	Silk, raw .....	21.8
Soybeans .....	86.9	Mandarin oranges, canned .....	5.8
Wheat, grain .....	56.1	Tea .....	.8
Barley, grain .....	6.5	Canned vegetables .....	.3
Tallow, inedible .....	20.0	Ajinomoto and other monosodium prep. ....	.7
Corn .....	15.4	Drugs, herbs, roots, etc. ....	.2
Hides and skins .....	14.6	Mushrooms, dried .....	.6
Tobacco, unmf. ....	11.2	Capsicum or red pepper .....	.4
Dairy products .....	3.1	Bulbs, roots and corn .....	.5
Wheat flour .....	4.1	Frog legs .....	.4
Other oilseeds .....	8.5	Other vegetables and prep. ....	1.3
Wheat feeds .....	1.4	Other agricultural .....	5.5
Cottonseed oil, refined .....	0.5	Total agricultural .....	38.3
Lemons and limes, fresh .....	0.5	Nonagricultural .....	979.6
Other agricultural .....	14.0	Total all commodities .....	1,017.9
Total agricultural .....	334.1		
Nonagricultural .....	596.4		
Total all commodities .....	930.5		

Only in the export of one commodity, soybeans, has the United States enjoyed a relative lack of competition. The break in trade relations between Japan and Mainland China in 1958 eliminated the only other important supplier of the Japanese soybean market. The current rising demand for soybeans, along with the stabilization or decline in domestic production, thus represents one of the most promising spots in the entire market.

TABLE 18.-- Value of selected Japanese agricultural imports from the United States, 1959-60

Product	1956	1957	1958	1959	1960
	Million dollars	Million dollars	Million dollars	Million dollars	Million dollars
Wheat .....	76.0	93.9	75.1	58.0	63.0
Barley .....	26.8	12.1	24.2	7.5	0
Corn .....	10.0	17.0	20.9	19.9	11.2
Soybeans .....	62.0	69.6	77.3	90.2	103.0
Cotton .....	160.3	212.6	128.0	78.2	215.2
Hides and skins .....	19.2	17.8	15.5	16.8	24.6
Tallow .....	19.9	22.0	20.2	21.9	23.0
Total .....	374.2	445.0	361.2	292.5	440.0

Competition for sales of the other major agricultural export items -- cotton, wheat, corn, hides and skins, tallow and barley -- is very strong. Cotton leads the list of U.S. exports to Japan. The United States has been the principal source of raw cotton in the postwar period, but in recent years, Mexico's share of the cotton market has increased, and in 1959 that country was the leading supplier. Trade returns for 1960, however, show the United States well in the lead again. Japan is developing a sizable synthetic textile industry and this will undoubtedly become an even stronger competitor of the natural fibers in the future.

U. S. tallow exports to Japan have gained slowly both in respect to total quantity and share of the market. The United States has supplied between 80 and 90 percent of tallow imports, and New Zealand and Australia, most of the remainder.

Domestic production of hides and skins satisfies only a fraction of total requirements. The rapid rise in both domestic utilization and exports of leather items has expanded the total import of hides and skins. The quantity of imports from the United States has gained somewhat and thus maintained the U.S. share of the total.

Wheat imports are trending upward, but purchases of U.S. wheat have dropped from \$76 million in 1956 to \$58 million in 1959. A shift in demand from soft wheats to hard bread-type wheats, in which the United States is less competitive, has been principally responsible. A bilateral trade agreement with Australia has served to reduce soft wheat imports of U.S. origin.

Imports of barley have declined sharply over the last few years. The value of imports from the United States dropped from \$26.8 million in 1956 to \$7.5 million in 1959. In 1960, domestic production fully satisfied domestic needs and no barley was imported.

## Balance of Trade

During the immediate postwar years, Japan's imports greatly exceeded exports. As the productive capacity of the economy has increased, however, the gap between imports and exports has narrowed, with the two being approximately in balance in 1958 and 1959. In recent years, the net deficit has been more than offset by the provision of such services as shipping. The net result has been a long-term increase in gold and foreign exchange holdings.

TABLE 19.-- Japan's balance of trade, 1952-59

Item	1952	1953	1954	1955	1956	1957	1958	1959
	Million dollars							
Imports .....	2,028.9	2,409.7	2,399.4	2,471.4	3,229.7	4,283.6	3,033.0	3,599.4
Exports .....	1,272.8	1,274.7	1,629.2	2,010.6	2,500.6	2,858.0	2,876.7	3,456.4
Balance .....	-756.1	-1,135.0	-770.2	-460.8	-729.1	-1,425.6	-156.3	-143.0

Japan's alltime high gold and foreign exchange holdings of \$1.82 billion in 1960 represented the highest level of international reserves held by a Far Eastern Country in recent years. These holdings were as follows:

	<u>Mil. dol.</u>
1952 <sup>1</sup> . . . . .	979
1953 . . . . .	823
1954 . . . . .	738
1955 . . . . .	769
1956 . . . . .	941
1957 . . . . .	524
1958 . . . . .	861
1959 . . . . .	1,322
1960 . . . . .	1,824

<sup>1</sup>At year end.

The same is true for gold and dollar assets (public and private) held in Japan:

	<u>Mil. dol.</u>
1950 <sup>1</sup> . . . . .	589
1951 . . . . .	731
1952 . . . . .	931
1953 . . . . .	953
1954 . . . . .	854
1955 . . . . .	1,033
1956 . . . . .	1,149
1957 . . . . .	716
1958 . . . . .	1,095
1959 . . . . .	1,566
1960 . . . . .	2,171

<sup>1</sup>At year end.

An unusual degree of dependence on trade has made Japan's level of economic activity particularly sensitive to lulls in economic activity elsewhere in the world. The economy is especially sensitive to economic downturns in the United States, as exports suffer considerably when American purchases decline.

## AGRICULTURE IN THE FUTURE

As Japan industrializes, the share of the gross national product accruing to agriculture is steadily diminishing. It is likely that this trend will continue for some years to come. One of the more obvious indicators of rapid economic growth and a rising standard of living is seen in the pronounced change in the composition of the projected agricultural production pattern. The value of livestock commodities produced, expressed as a percentage of the value of total agricultural production, is expected to increase from 14.6 percent in 1958 to 28.8 percent by 1969. A similar comparison for fruit production shows an increase from 4.7 to 7.0 percent. Largely offsetting this will be a decline in the position of rice, as production will drop from 51.3 to 40.8 percent of total output. The value of production of other starches is expected to show a similar decline.

TABLE 20.--Production of specified agricultural commodities in Japan as percent of total value of agricultural production in 1958 and projected to 1969

Commodity	1958	1969
	<u>Percent</u>	<u>Percent</u>
Rice .....	51.3	40.8
Wheat .....	7.8	5.1
Sweetpotatoes .....	5.0	3.9
Pulses and cereals .....	3.4	2.7
Industrial crops .....	4.2	4.5
Vegetables .....	6.8	5.6
Fruit .....	4.9	7.0
Livestock .....	14.6	28.8
Sericulture .....	2.1	1.5
Total .....	100.0	100.0

Statistical Data, Investigation Commission on Basic Problems of Agriculture, Forestry and Fisheries, Japan - May 1960.

Government planners expect the gross national product to double during the next decade. During this period, population is expected to increase only about 10 percent, thus making it possible for per capita incomes to almost double as well. This rise in income will be reflected in the food consumption pattern -- the consumption of high protein foods will increase, while the consumption of starchy foods will decline.

Incomes in the agricultural sector are expected to rise but not as rapidly as in the non-agricultural sector. As the level of living rises, emphasis will shift from increased yields per acre to higher productivity per farm worker. This will require fewer people on the land and a consolidation of many, uneconomically small, farm units. Land reform legislation limiting the size of farms will likely be revised. The ultimate goal of the Japanese land reform program will have been reached -- per capita production of farmers will have increased sufficiently beyond farm consumption to permit the enlargement of farming units and the acceleration of mechanization. The accelerated application of agricultural technology will also continue to raise yields and per capita productivity.

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