Agriculture in Japan

A paper read by

PROFESSOR KOIDE

before the

Agricultural Section of the Royal Society

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"It is a great honour for me to be invited to speak from such a platform—the highest of knowledge in N.S.W. I must admit, however, when I came here to teach Japanese, I was not prepared to give a lecture on agriculture. Owing to the fact that I brought no books on agriculture with me, I cannot treat in detail every branch of our agriculture, and I should be very grateful if you would be patient and sit for some minutes to hear a native's exposition of his poor country.

Position: Area.—Japan is composed of a long chain of islands, which lie between north latitude 20° 45′ and 50° 56′; and between east latitude 119° 18′ and 156° 32′. These islands contain an area of about 176,000 square miles, 15 per cent. of this total being taken up by Formosa and Saghalien. Japan proper has an area of about 148,000 square miles, less than one half of New South Wales.

There are four main islands:—Honshu, the largest, takes up 87,000 square miles, being about the size of Great Britain. Kyushu is about equal to one half of Ireland, and Shikoku to Wales. Hokkaido is somewhat smaller than Scotland.

Besides these chief islands, there are about 600 small islands not deserving of mention.

It was called in ancient time "Oyashima" in Japanese—that means "Great Eight Islands."

Japan extends for about 2,100 miles with a width of 200 miles at her widest part, and is a very mountainous country. There is a solid backbone of mountains running through each of the chief islands. We count six mounts which are over 10,000 feet high, and nine over 9,000 feet. So a great portion of the whole area is taken up by the mountains which can never be utilised for agriculture. The mountains form a divide or watershed in each island, so rivers which flow down on both sides are mostly short and rapid, though numerous.

Of the areas unoccupied by mountains, hills, rivers or lakes, about 70 per cent. are taken by upland and 30 per cent. by low plains. The uplands are mostly on the skirts of volcanic mountains. They are generally covered with grass, among which grow several varieties of lilies and other flowering herbs. They present a gay aspect, but are not much used for agriculture.

Low plains are distributed along the courses of rivers everywhere, and there all sorts of agriculture are carried on, every corner of land being used as far as possible to the utmost degree.

Climate.—Japan is much elongated from north to south, almost reaching to the frigid zone and the tropical zone at each end, and the country is also influenced much by the cold current of the Okhotsk Sea in the north and a warm current in the south. A great variation of climate is a matter of course. But with the exception of the two extremities, Japan proper lies within the temperate zone. I can say with all confidence that we enjoy, both in temperature and humidity, practically the golden mean. The four seasons are quite regular with

some beautiful flowers in each. Still, if we compared Japan with New South Wales, the former has greater extremes both in winter and summer. The mean temperature at Tokyo is 38.9 degrees in winter and 73.9 degrees in summer, while at Sydney it is 53.9 degrees and 71.3 degrees respectively. The summer temperature in Japan is modified by a larger proportion of cloudy and dull weather. Again, the incidence of the rainy season tends to lower the early summer heat, owing to the necessary absorption of part of the rainfall. The winter temperature is largely governed by the prevailing winds. These, from some particular directions, are bitterly cold. The wind during the cold season, beginning with September and ending with April, comes from the Asiatic Continent. The difference between the average pressures of atmosphere at the Continent and in the Pacific shows 22 m.m. So we have often strong winds in winter. During the warmer season extending from May to September, the south-western wind of weak force prevails. The most striking fact about wind in Japan is the periodical visit of the typhoon which generally originates in the vicinity of Luzon. Japan has about nine or ten such visits every year, generally between June and October; their velocity attains sometimes as much as 70 miles an hour.

Japan is said to be the rainiest region in the world, the average rainfall being 1,750 m.m. There are many places where the amounts reach over 3,000 m.m., and many days yearly. At Tokyo we have 140 days rain on the average. June or July is generally the rainy season throughout the country. We do not often have droughts, but as rice-culture especially needs moisture, farmers are sometimes obliged to take great trouble to keep their fields moist. The reverse of too much wet is not rare. The rainfall in early summer causes great damage to the crops of barley, and in some years reduces the yields of rice.

Floods, which are not rare, cause sometimes serious injuries, not only to crops, but to life and property, although

we have often to blame ourselves for this on account of neglecting the necessary precautions.

Population.—The inhabitants of Japan proper number 55,000,000; the average rate of annual increase being 14-16 per 1,000. The average density of population throughout Japan proper is 356 per square mile, which makes her one of the most densely populated countries of the world, the only two more densely populated being Belgium (583) and Holland (442). Of the present population of Japan, 65 per cent. are engaged in agriculture, while the entire cultivated area is about 15,000,000 acres. As there are six million agricultural households, the average portion of each family is 2½ acres. If the average be taken locally, the more highly congested districts show as low as one acre per family, while even in the sparsely populated districts of North-Eastern Japan it is only 7½ acres.

Agriculture.—The history of our farming begins at the time we do not know anything about. In the mythological age, Japan was called "Toyoashihara-no-Mizuho-no-Kuni," which means a "fertile reed-covered country rich in grains"; and all ancient records which we have now show that rice-culture existed all over the country from long unknown periods. Even sericulture is said to have begun as early as 2nd century B.C.

Now the territorial extent of Japan remained practically the same till she acquired the Island of Formosa, which is already fairly densely populated. And with no outlet for her natural increase of population, and having not much land to bring under cultivation, Japan has had to resort to intense cultivation of her soil in order to support her people. How intensely the agricultural land has been utilised is almost beyond imagination.

Terraced Fields.—So-called terraced fields, which are found everywhere in Japan, are often referred to as one of the good

examples of high intensive agriculture. Many irregular terraces are made along hill-sides, which rise hundreds or thousands of feet above the level, with very steep sides. The terrace fields are both short and narrow, with a width of seldom more than thirty feet and often less. The front of each terrace may be bounded by earth walls on three sides, and sometimes by stone walls 3 feet or 5 feet high, and sometimes higher than 12 feet. On the walls or between them footpaths are formed, sloping down the hill from the height of the back terrace to the ground level, leading up the slope occasionally with two or three steps. The terrace field is, indeed, the result of bitter toil extending over many years, especially when the fields are laid out for rice culture, and which must be irrigated.

Irrigation.—Irrigation was considered from the beginning to be inseparable to rice-culture. At a time, as far back as the first century B.C., a number of reservoirs were built by the special patronage of the Emperor. Some of these remain to-day and are still working.

The opening of new land has always coincided with some system of irrigation. The fields have all been graded to a water level and surrounded by low, narrow, raised rims. If the country was not level, then the slopes have been graded into horizontal terraces, varying in size according to the steepness of the area in which they were cut. The laying out and shaping of so many fields into these level basins are an enormous aggregate annual asset. At present, rivers supply water for 64.4 per cent. of the whole irrigated area, while reservoirs supply 20.9 per cent. and other means 14.7 per cent.

It is difficult to convey by word an adequate conception of the magnitude of the systems of canalization which contribute primarily to rice culture. When water does not naturally run in, it is applied to the rice field by various methods

of pumping, among the most numerous being current wheels, an occasional power-pumping wheel driven by cattle, and very commonly the foot-power wheel where the man walks on the circumference, steadying himself with a long pole. But at the present time, at about 80 places, improved mechanical contrivances are at work, while in a similar way an improved system of drainage has been adapted for over 50 places.

Crop Crowding.—Another illustration of our intensive cultivation is seen in the crowding of crops in the field. Many fields in Japan are used continuously throughout the year. They are always under cultivation of some description, the ground getting no rest at all. It is not rare throughout the country to find, even in the narrow dividing ridge only a foot wide, which retains the water on the rice paddies, a heavy crop of soy beans. In some districts narrow pear orchards are found standing on the slight rise of ground, not a foot above the water all around, which could, I think, better be left in grading the paddies to proper level. These crowding crops in the field require, of course, not only a high feeding, but also a great care and a close watchfulness in a hundred different ways.

The intensive cultivation of land, which is one of the most prominent features in our agriculture, prevails throughout the rural sections of the country. The average area of the rice field in Japan is less than five square rods, and that of her upland fields only about twenty. In the case of the rice fields, the small size is necessitated partly by the requirements of holding water on the sloping sides of the valley.

Cultivation is chiefly done by human labour. The farmer uses some implements, of course, most of which are of rude and simple construction and very handy, but naturally do not work much. Sometimes they are helped by a horse or an ox, but seldom by a team of animals, except in some quite recently opened part.

Another characteristic in the economy of our farming is the utilization of human waste. In Japan, night-soil constitutes by far the most important item of manure; and, indeed, in many districts it was almost, in addition to grass as green manure, the only manure used till some decades ago.

Manuring.—The cultivated soil of Japan is not naturally rich as a whole. The system of rotation of crops in Japan does not include any year of rest. The live stock being unimportant, there is not much indirect manuring so-called, such as may be seen in Europe, especially in the south and south-east of England with the Hampshire Down and South-down breeds of sheep.

The Japanese farmers have learned, through many centuries of continuous cultivation, that profitable crops could be grown only by a generous return to the land of the substances necessary for full plant growth. Hence the necessity arises for the comparatively liberal use of fertilisers which is said to be characteristic of our farming.

Manures used in Japan, besides night-soil, were stable composite, green manure, fish guano, rice bran, ashes, etc. To go a little more into detail: 1st. Potash manure is made from ashes of several kinds. The making of straw ash in Japan for fertiliser is said to be an ancient accidental discovery through increased growth of vegetation resulting from the scattering ashes. There are also used straw ash and wood ash, the latter being much derived from fuel. In some cases, potash compounds of vegetable origin are so concentrated as to contain 20 or more per cent. of pure potash (K_2O).

On the other hand, the system of cultivation—that is, hand culture—tends to render the potash compounds, naturally present in the soil, available quicker. It is explained that hand implements are much more effective than horse or power implements to make the dormant supply of potash and other plant food materials available for growing vege-

tation. And again, there is the practice of burning soil with vegetable matter, which corresponds closely with the clay or peatland burning in some parts of Europe. This process does more than render available the dormant potash in the soil so treated.

At a certain southern part of Japan, where tobacco culture is very noticeable, the burning of soil with straw just before planting is considered an absolute necessity, and the scientific investigation of it shows it to be very effective in several ways.

Really, the ordinary crops in many parts seem dependent for their necessary potash on the farm-made ashes. But in the cases where ash is necessary, some concentrated potash compounds must be used. Recently the importation of the mineral potash from Germany has been increasing year by year.

2nd. Phosphate manuring in Japan is said to be introduced from China. But it may be quite natural to observe incidentally, just as in the case of vegetable ashes, that the bones of animals or ashes obtained from the bones have a very good effect in the ground used to produce crops. Bone phosphate is slow in action, but not so slow as to prevent its application, and it is quicker than untreated mineral phosphate. Fish manure has been much used in Japan and this, with the phosphate compounds in vegetable manures, has supplied the necessary phosphorus (phosphoric-acid). But the necessity of more phosphate manure leads Japan to import the phosphate rock as raw material from Ocean Island, North Africa, etc., and the industry of superphosphate is comparatively old in my country.

The last but not least is nitrogen. There is so much free nitrogen in the atmosphere, but only a few low forms of vegetable life have the power to use this nitrogen directly. It is said that most plants had this power in the earliest stage in the world, but in the evolution this power degenerated. At

present the higher plants depend on the decomposition and fermentation of dead organic matter containing compounds of nitrogen. In the decomposition and fermentation of the dead organic matter, there are two stages at which the combined nitrogen can, as a solution, enter plant roots, i.e., the nitrate and the ammonia. The statement that the dry land plants can utilise only a nitrate and the irrigated only an ammonia, was commonly believed till recently; but it seems not to be true. It is now generally accepted that plants in either case can utilize both forms of nitrogen at certain stages. Both of these stages are very limited, for nitrate compounds are liable to loss by being carried away in the drainage water; and ammonia compounds are liable to loss by evaporation. This state of matters induced the farmer to think that nitrogen manuring is far more risky than the others.

The nodule bacteria associated with the roots of Leguminosae are a familiar example of the power to utilise the atmospheric nitrogen. In Japan, centuries of practice had taught the farmer that the culture and use of leguminous crops are essential to maintain the soil fertility, and so there has been included for a long time in their crop rotation, the growing of legumes. Without any knowledge of bacteria, very extensive growing of beans in rotation with other crops, with the expressed purpose of fertilizing the soil, has been one of the old fixed practices.

Green Manure.—Apart from the question of night-soil, it will be proper to say here a word about green manures. On the practices of green manuring, Japan is in an inconvenient position on account of lack of the animal industry. The products of crops which are sown as manure, in most cases, are ploughed in without being consumed by animals either on or off the land. This direct use of green manuring crops is not economical, especially in such a country like Japan where the extent of land available for total cultivation is very limited. Still, the farmers are keen to use the natural grass which

they get wherever found, mostly from hills at miles distance. The first cutting of this herbage is mainly used on the rice fields, being tramped into the mud between the rows. The second and third cuttings from the upland plain are used for the preparation of compost.

The natural grass is not very nutritious for animals, neither is it of very high manure value, but when it is tramped into the soil it adds to the amount of organic matter in the soil. This produces a good effect in land under continuous cultivation.

In some parts the beans are largely sown, and the whole of them used as green manure before the seed is ripe. The most common crops used as green manure are Genge (astragalus) and Umagoyashi (medicago). "Genge" and "Umagoyashi" are grown in the winter time in paddy fields where, through lack of drainage or for other reasons, a winter crop such as barley, wheat or linseed could not be profitably grown. "Genge" is grown on the drier sorts of fields, while "Umagoyashi" stands more damp and more cold than "Genge" and is grown in such fields as are too wet for "Genge." They are often sown just before or immediately after the rice crop is harvested, and allowed to grow until near the next transplanting time when they are turned under directly.

The total money value of manures used in Japan yearly is impossible to estimate, as the farm production could never correctly be accounted. Two hundred to two hundred and fifty million yen is said to be an approximate amount. It is, however, safe to assume from many estimates that the Japanese farmers spend annually between 70 to 80 million yen for fertilising materials which come under the heading of merchandise or trade goods—"money manure" so-called in Japan.

In regard to the application of fertilisers, our farmers are very keen and skilful. Even in the old practices it was considered perfectly rational. Rape seek cake, fish manures,

and others which are considered slow acting because they require to decompose before being useful to the plant, were always applied early. Night-soil was allowed to ferment and decompose in tubs until it became a quick-acting chemical manure, and was applied as a dressing after plant growth began.

The farmers of to-day are quick to learn the nature and the time of application of modern fertilisers. Most of the modern fertilisers were, till very recent times, altogether unknown to our farmers. The Government controls all those artificial fertilisers to prevent adulteration. At first the mixed or perfect fertilisers were very popular, for farmers were ignorant how to properly use different ingredients. But now, having had sufficient experience, they prefer to purchase the ingredients and to mix for themselves.

Now for a word about the people.

Agricultural People.—The agricultural people live in compact villages, going often a considerable distance to their work, especially when they go to get their fuel or grass over the hills. The lands worked by one family are seldom continuous; they may even be widely scattered, and very often rented.

There are a good many small landlords, who own 30 to 50 acres in all, and do not do much themselves, all land being rented to others. These landlords live always among their tenants in the village, and in some districts they are still to-day acting something like the English squires of those happy days. But the time of their disappearance is near. Nobody can help it. The tenant in general has to pay the rent of 57 per cent. of the total yield in regard to rice paddy, the rent always in rice. The rent for upland fields is 44 per cent., generally in cash. The tax and most of the public burdens are paid by the owner, and as these amount to 30 to 35 per cent. of the rent, the actual income enjoyed by landowners

is not large. The tenant-farmers have to pay out of their share all expenses incidental to manuring and sundries. The yields from an area of 2½ acres on the average is barely sufficient to maintain themselves, were it not for the subsidiary occupations which go to increase their income. The foremost rural industries are the silk and tea industries. Both are carried on to a great extent by women, who are, in Japan, very great economic factors.

Really, the amount of work carried on in our farmers' households by the women and children, and by the men when they are not otherwise employed, is very large, and the earnings of this subsidiary work have materially helped to make up the meagre income. Thus by hard work our people in rural districts have been keeping their living fairly well, though not very happily. But they must have a great social and economic change. We are now striving in every direction for improvement of their industry and their welfare—rural education, experiment stations, credit system, and co-operative societies, etc., being the chief items. How they will be in future nobody but one high above can say at present.

Food Production.—Rice is our staple food and the most important crop in Japan. The annual amount of her production is only excelled by China and India; and as regards the quality, Japanese rice is considered superior to either.

Of the entire cultivated area, more than half is taken by irrigated paddy fields.

The annual yield of rice in Japan is 250 to 290 million bushels. A considerable amount of rice is used every year for brewing of "Sake"—a Japanese liquor. So at present we may be said to be producing just as much rice as the whole people consume, with the tendency for the recent rapid growth of population to exceed the increase of yield. When the year is very good, we have been able to export some quantity of

rice. But if the year is bad, Japan stands at once in a great need of rice importation, in spite of barley or millet taking the place of rice.

The average yield of rice per acre is about 33 bushels, which can be increased through intensive cultivation to the amount of 40 bushels. In southern parts where the climate admits of two crops, it is not a rare thing to produce 60 bushels of rice and 20 bushels of barley each year successively.

We have still a margin of land available for cultivation. The whole area now under cultivation is 15,000,000 acres—only about 15 per cent. of the whole land. Another five million acres of arable land are to be added, provided one half of such land is inclined less than 15 degrees.

Another method of extending the cultivated area is by reclaiming waste lands by means of the adjustment of fields. For the adjustment of farm lands, the Government has passed laws and has been encouraging the work since 1900 by setting apart for the purpose a special sum, and by training experts qualified to undertake it. The legislation provides for the exchange of lands; for changing boundaries; for changing or abolishing roads, embankments, ridges or canals; and for alterations in irrigation and drainage. This would ensure larger areas with channels and straightened roads, less waste of time, labour and land. According to the official calculation, the adjustment will increase the yield by 15 per cent., while the unproductive areas utilized are expected to amount to 3 per cent. of the area adjusted. This estimate seems to be a safe one.

Now, just a word on the cultivation of rice.

Rice Cultivation.—After the separating of inferior seeds by dropping them in a heavy solution, salt water being generally

used, seed rice is first soaked in water for some days to stimulate germination; and then it is set in well-prepared nursery beds. There is no need to say that it is most important to treat the seedlings very carefully. When the seedlings are fully grown, some four weeks after sowing, they are transplanted into the proper paddy fields in small bunches about a foot apart. This transplanting is "Tane" in Japanese and is a great event with the farmers' household. Not only the whole family, but neighbours come to help. It was a cheerful scene in some parts till quite recently to see all old and young people, men as well as women, engaged in this operation, merrily singing songs, and very often accompanied with a certain drum and gong. But all this is gone now. The push of civilization does not allow things like that. The transplanting is just before or during the rainy season—which comes at the beginning of June. This is a busy time for farming in Japan, because, besides taking great care of the rice, we must be quite ready for the harvest of winter crops, as barley and wheat ripen just at this time. And in some districts the sericulture comes at its busiest season, just at the same time.

After transplanting, the farmers are careful to see that the land is kept well watered. The weeding, which must be done in the hottest season, between the growing rice plants is a very hard piece of work. Men and women wade in the warm filthy water and remove the weeds with their hands. Certain simple implements for this work are made and are gradually increasing their use, but not rapidly, because the human hands work the best in spite of all these inventions.

The end of August or beginning of September, according to the varieties, is the flourishing time, and too often the dreaded hurricane comes on to effect some damage. When the ears begin to ripen, irrigation is stopped, and when they are fully ripe the stalks are cut off close to the ground. They are next exposed to the sun and dried; and then the unhulled

grains are taken off by means of a hackle. These are then hulled and put into straw bags, commonly containing about two bushels.

In Japan there are cultivated about 4,000 varieties of rice plants. Of these the Government prefectors choose three or four of the best in their district and improve them in their own Government field and distribute seeds from it to the farmers.

Of the three main varieties, namely, early, middle and late ripening, the middle variety is most productive. If classified as to the kind of rice and of fields in which they grow, the ordinary rice constitutes about 90 per cent of the total output, the glutinous rice amounts to 8.3 per cent., and the upland rice accounts for the balance of only 1.6 per cent. of the total. The two first are raised in regular paddy fields. The glutinous variety is used for making **mochi**—rice dumpling—a most important diet for some occasions like New Year's Day.

Next to Rice, Barley and Wheat are extensively cultivated. Barley is principally used for food for men, generally mixed with rice. This mixed diet is almost universally used by rural people and also by those who prefer it to rice, on account of it being more easily digestible than the other. For beer-brewing our barley does not seem to be good enough. There are two chief varieties of Barley: the original and the naked.

Wheat is used more as a subsidiary foodstuff, such as for making maccaroni, confectionery, etc., The amount consumed for brewing Japanese soy and bean paste (miso) is quite enormous. Lately the demand for it has greatly increased since we learned to make bread and biscuit. Wheat is imported in large quantities from U.S.A. and other countries, either in original form or as flour.

The annual yielding of the ordinal and naked barleys and wheat is about 49, 36, and 24 million bushels respectively, yielding about 27 bushels per acre on the average.

Amongst the other grains, two or three kinds of millets are to be mentioned here, their yield reaching over 70 millions bushels yearly. They are raised in mountainous districts not fit for rice paddies, and are also sown as substitutes for rice when, owing to unfavorable conditions, the season of planting rice is passed. They are used as a staple diet by poorer folks living in remote districts. Maize grown in Japan proper is chiefly used as food taken between regular meals, while only in Hokkaido is it more extensively cultivated and the ears are used for making flour or for feeding cattle.

Buckwheat may be seen everywhere, and is indispensable for making buckwheat maccaroni, a popular article of diet in Japan, but small in quantity.

Legumes are very important crops in two ways, namely the maintenance of nitrogen in the soil by means of a rotation crop, and because in Japan people were not much used to eating meat, for one reason or another, so the protein in the diet is supplied by the leguminous fruits.

Beans produced in Japan amount to some 27 million bushels, of which soy beans comprise 68 per cent. and red beans 18 per cent., and others in small proportion.

Soy beans play an important part in the Japanese kitchen. The three daily articles of diet for all classes, viz., soy, miso (Japanese soup), and "tofu" (bean curd), are made with this bean either in part or wholly. These articles are cheap and highly nutritious and indispensable in our cooking.

Then, for extracting oils as food for cattle, beans are equally important. The supply is insufficient, and a very large quantity comes in from Manchuria.

Potatoes.—Potatoes were introduced first by the Dutch in 1589, but remained comparatively neglected till a few decades ago, when the importation of superior varieties drew the great attention of farmers. They began to grow them more and more extensively as the demand for the tubers increased with the gradual spread of the European style of cooking.

Sweet potatoes occupy an important place in our agriculture, yielding four times the amount of the ordinary potatoes. In the southern part of Japan they have been for many years almost the staple foodstuff next to rice and millet. The tubers are also used for making starch and some alcoholic drink. The baked sweet potatoes are a favourite and usual accompaniment at tea hours for ordinary people. Both are used as substitutes for rice by poor folk and both being climatically antagonistic to each other are playing particular roles; one in the warmer districts and the other in the cooler districts in Japan, although both can grow more or less throughout the country.

Tea.—The cultivation of tea is another of the great things in our agriculture. It plays an important part in the welfare of the people, taking rank with that of sericulture, if not above it. It has, however, curiously remained stationary, both in gross output and volume of export. The export, principally to America, has even declined because there our leaves have formidable rivals in Ceylon and Chinese teas. Japanese tea has a flavour quite different from that produced in India and China, and can preserve its quality much longer than its rivals. But the cost of production is much higher in Japan than in the others; labour-saving appliances being less used than in India. In general, Japanese teas are said to be about 50 per cent. higher than the other brands.

By the way, we have a funny custom of tea drinking in Japan which is sometimes called "Tea ceremony" by foreigners. In this occasion we are used to take the best kinds of tea which are made only from the newest and tenderest leaves

of old plants, some of them 200 years old. These plants must be kept well manured, and before the leaves come out they must be placed under awnings of some kind in order to protect the tender leaves from the direct action of the sun.

The best kinds of tea often cost more than eight shillings per lb., while there can be obtained a fairly good ordinary tea for one shilling per lb.

I do not know whether this kind of ceremony will last long in the future, although this is advocated more as a means of discipline or culture of mind than for merely drinking tea.

Minor Crops.—Among other crops, leaf tobacco cultivation shows perceptible progress, it being under the special protection of the Government tobacco monopoly.

Leaf indigo and cotton were commonly cultivated, but now, owing to the encroachment of imported goods, both have markedly fallen off.

The giant radish, pickled in rice-water and salt, is the most universal condiment, forming an indispensable adjunct to the daily meals, both of the upper and lower classes.

And taro is another crop which is used as one of the important subsidiary vegetables.

Fruits.—Fruit culture has recently shown a marked activity. Formerly our fruit culture was very poor. There were several kinds of fruits in Japan. Numbers of trees were planted just in the space around houses everywhere. They felt no great need of fruits before, as people abstained from animal meat. At present, with the introduction of the meat-eating custom and the improved facilities of transportation, a great change has come over the habit of the people in the use of fruits. Thus fruit culture has become a great topic of the farmers; hillsides are now extensively opened up to lay out

orchards of apples, peaches, oranges, etc. A certain kind of plum, urne, is universally used as a special kind of pickle and preserved in almost every household, though only a small quantity is at present generally grown.

Apples, though introduced less than 50 years ago, have become very plentiful, especially in the northern part of Japan, i.e., in the cooler district. Oranges are flourishing in the southern parts of the country. In some places we have one or two extremely good kinds of oranges, though not yet widely known.

The persimmon is a characteristic fruit of Japan and is present in several varieties, large and small. Fermentation ripening is not necessary in many of them, while some are always dried in the shade. They may be said to grow everywhere, though seldom in orchards, and occupy the foremost position next to oranges amongst our fruit production.

Grapes are not so important in general. They are found in some quantity only in such places as are favourably situated.

Live Stock.—As to live stock in Japan. Animal industries used not to be at all important, and have not yet attained any great development, in spite of an earnest attention both from the Government and general public of late. It is rather strange to find in Japan that the number of horses always exceeds that of horned cattle. I think this strange phenomenon will probably disappear before long from Japan. Still, this fact shows that horned cattle were intended for the sole purpose of serving as beasts of burden, and for many centuries, and until the present generation, our farmers used to keep cattle for that purpose, but not for dairy farming at all.

Sheep we also want. For some time we have been always trying but have never succeeded in this industry. We have no hope at present of keeping such good breeds like the

merino. Our statistics show that only some 3,000 head of sheep are in the whole country. We are still in the course of experiment on some inferior breeds only. Last year my country was fortunate to introduce a number of Shropshire ewes from the Commonwealth and New Zealand. They will be distributed in groups of five or ten head per family in some agricultural villages. It is on a very small scale. This is the only thing we can do now. I think Japan must be in a great portion dependent upon Australia for wool, as long as you have the kindness to spare it.

Sericulture.—Silk is Japan's staple commodity on the export list, supplying about 28 per cent. of the total consumption in the world. It has always been encouraged by the Imperial Court, and great improvements have been introduced in successive ages. To-day there are produced annually some 23 million bushels of cocoons, valued at about 17 million pounds. The part sericulture is playing in the farmer's economy is almost as important as rice culture. The worms are reared in two seasons of spring and autumn—some even undertake the intermediary rearing too—and the farmers can at least double the amount from ordinary farming alone.

Sericulture has never succeeded when conducted on a large scale. It is, indeed, specially designed for the benefit of small farmers like those in Japan. But this work is very hard.

Naturally Japan is not more blessed for sericulture than Italy and the greater part of China. Italian silk is finer, Chinese worms are better. So about 75 per cent. of the total output of raw silk produced in Japan is of coarse fibre. Still, the Japanese are often believed to do the job with better success than their rivals. If so, it must be due to the human skill and not nature.

The domestic system of rearing, however, is attended by a serious drawback, namely, lack of uniformity as to quality

of the filaments. The question of how to remove this defect, with many other problems, has begun to attract wide attention.

There are many varieties of silkworms, over 700 "annual" breeds, nearly 500 "bivoltini" breeds, and about 40 other "polyvoltini" breeds are known.

In connection with sericulture, there must be sufficient mulberry trees. There are 400 varieties of mulberry trees. Great care is always taken by our farmers in the plantation of this tree. Now over one million acres are taken up the tree in Japan.

In concluding this paper, let me just tell you what are the greatest agrarian problems at present in Japan.

Japan has no special legislation as to land holding, such as the Agricultural Holding Act in England. A long lease of farm land is defined in the civil code as one extending over a period of from 20 to 50 years. This is rather exceptional in real cases; and though usually 10 or 20 years, contracts prevail, tenancy, with no agreement as to the term of years the lease is to run, may be seen everywhere in older rural districts.

The modern industrial tendency of the nation and the migration of rural population towards big towns are making it more and more difficult for the landlords to find tenants. Rural reorganization is an important economic problem.

Now the weakness in our agriculture, in spite of all other advantages, is that it is too much of a "petit culture." It barely enables farmers to subsist but does not leave them any surplus by which to elevate the standard of living and to extend on other items contributing to the higher aims of life. The result is that the national wealth is still on a comparatively low scale. To increase the area of land per capita, without decreasing the average yield, must be the aim of the agrarian policy of Japan.

Another serious problem is how to adjust the ratio of the population to the arable land. To accomplish this, we are compelled at the present time to follow, chiefly, the policy of domestic colonization. The modern progress of Japan was in the direction from an agricultural to an industrial nation, and greater technical improvement in agriculture may be mentioned in this connection.

In short, for a country like Japan, which has no extensive colonies beyond the seas, the most important thing for the good of the nation is to make the best use of its lands for economical purposes. On this account our agrarian policy stands preeminent, in its importance and bearings, above all the other economic and industrial policies of the nation.

As to technics, I mean agricultural practices, there are some merits in our agriculture. I admire British agricultural practices which were, in some things, taken from Holland. At present the influence of the British and Dutch practices is widely spread over the world. The whole of the agricultural practices of North America is based on their ideals modified to suit the circumstances of the environment. Not only America, but a great portion of Africa, the Straits Settlements, Java, and Australia too, show traces of the same influences.

Here it might be better not to mention, for the present, anything about German chemistry. And it will hardly be necessary to recall to your minds the high position of American investigations into soil physics which have in practice resulted in what is called "dry farming."

Japanese agriculture, as a whole, has not yet become a great influencing force at all external to its own boundaries. Only within very recent years has there been an opportunity for our agricultural ideas to spread outside the country itself into the two places which have recently come under our rule, i.e., Formosa and Korea. In Formosa the principal development

has been in sugar cane, and that was quite different from anything in Japan proper. It was illustrated by some author as a kind of combination and compromise between Haiwaiian and Javanese procedures.

Really, we learned much from both the Sandwich Islands and the Dutch East Indies at the time when we first took over the Formosan sugar industry. Quite recently, however, we have been rather inclined to think it best to apply there more of our own methods which have long been nourished in some southern parts of Japan.

In Korea we expect there will be a considerable development of sericulture and gardening, especially fruit culture, also some important improvement in the lines of cultivation of rice and other grain crops.

Not to go too far in detail, let me take manuring just as an example. In the manuring of rice, Japan is very far in advance of any other rice-growing country. In the manuring of tea, she is in advance of China, if not so of Ceylon; and in the manuring of sugar cane, in advance of Philippines, though behind Hawaii.

Briefly, the large consumption of fertilisers in Japan and the skill shown in their application may possibly be considered to do some good over some parts of Asia, if not over the world.

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