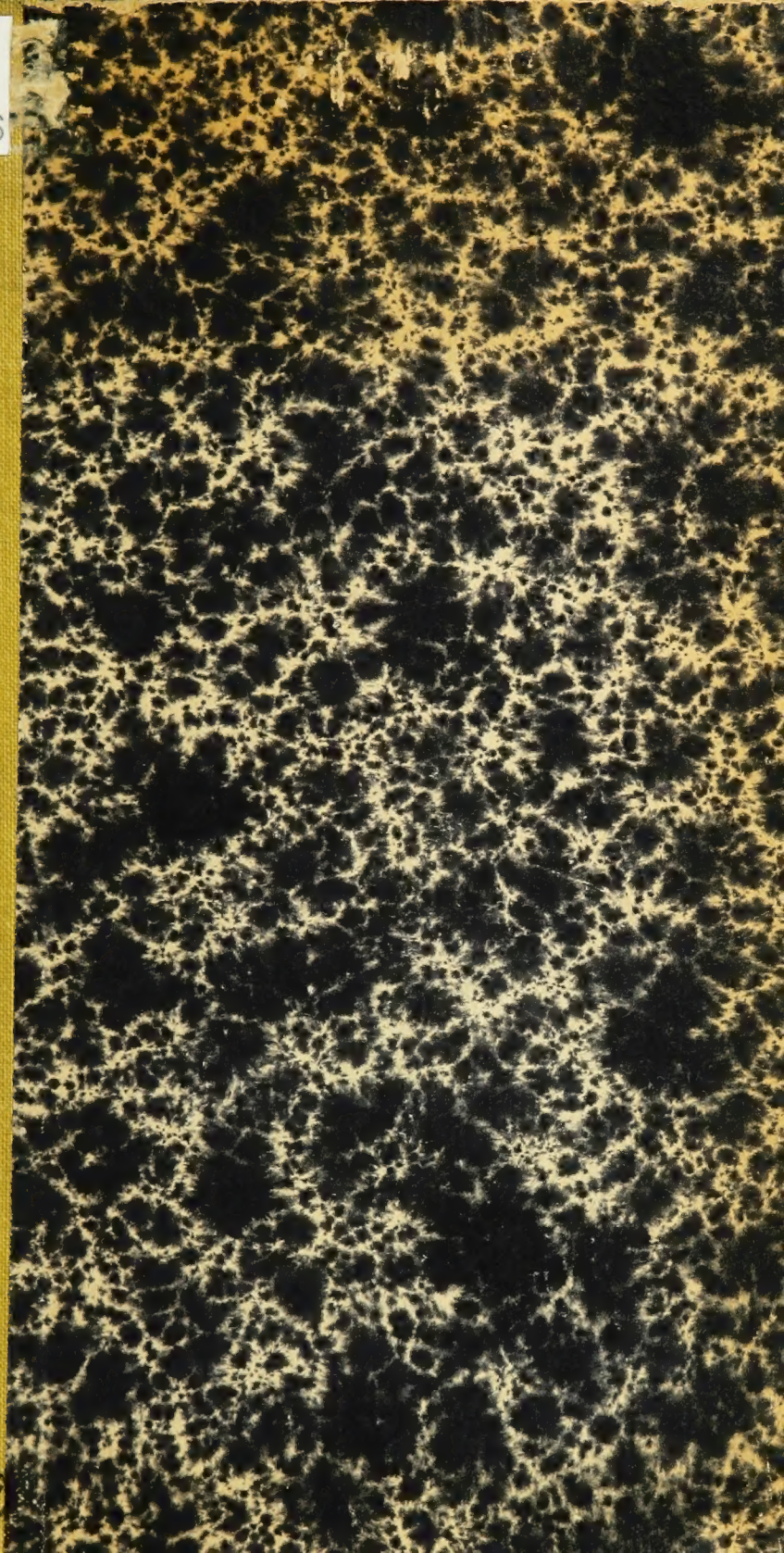

THE

FRUIT CULTURE

IN JAPAN

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Introduction.

In Japan, arable land is limited in extent, and the population numerous, and owing to the lack of capital the area cultivated by individual farmers is small. The plains, and level ground generally, come first in value, as these are utilised for the cultivation of those cereals which form the principal diet of the Japanese; and on such land no room is found for other produce, including fruits, and orchards are rarely if ever seen. What fruit trees there are, have been planted in spare ground, around peasant's cottages, on embankments, by the roadside, in temple grounds, on steep slopes and on table-lands which are not easily utilised on account of water facilities; also on the outer edge of the embankments of rivers, which are often subject to destruction by floods. It would appear that hill slopes, notwithstanding the heavy growth of wild vegetation they bear, even on a poor and shallow soil, have not been taken advantage of for the cultivation of fruit trees. These conditions still exist, and have done in Japan from ancient times. As instances of this, the persimmon may often be seen flourishing in the situations mentioned above; the pear and peach are found in the dry beds of rivers; and the orange tree and grape-vine are often planted on the slopes of hills. Fine fruit has often been produced under such conditions, without much effort, and where the soil and climate are favourable and the grower has paid some attention to the cultivation of his trees, good results have been obtained. But the cultivation of fruit trees in Japan may still be said to be in its infancy when compared with the

horticulture of Europe and America, and to account for this it must be stated that the lack of a arboricultural knowledge in the direction of pomonology is largely due in this country to the want of a market, in other words to a paucity of consumers, fruit being regarded as an article of food of dietetic value only by those above the middle class, and by the majority of the community as a luxury only and as the comestibles of children; consequently even high-class fruit has not been appreciated to the extent it deserved nor the grower awarded the merit to which he was entitled. The time has not yet arrived apparently, for competition in the production of fruit, the main effort put forth being in the cultivation of the universal daily food of the people. Although some progress has been made in fruit culture the general tardiness in its advancement cannot be denied, and it has been stated that not one person out of ten is acquainted with the names of the ordinary fruits grown. Japanese do not, apparently, care for fruit as do the peoples of the West, and this may be owing partly to the difference in the dietary of the nations of the East and West. In Japan albuminous food is not taken as the principal portion of a meal, but is served as side dishes. Thus while rice, barley, sweet potatoes, onions, maize and other vegetables form the staple of the people, fish and fowl are the adjuncts to the general diet, the opposite being the case in the West where albuminous substances are the principal and starchy and sugary substances the auxiliary food of the people. After the introduction of Buddhism into Japan the converts to that faith subsisted upon a so-called vegetarian diet, the use of wine and meat being prohibited, the consequence being that only vegetables were served with the starchy food mentioned above. From remote ages Buddhism has been a widely spread religion in Japan, and the adherents to that faith have always been in considerable numbers and it is due to this fact that the production of meat for human consumption has largely fallen off, and as the use of meat declined that of

vegetables increased. Among the Japanese the natural demand for a highly nourishing diet has always been smaller than among the nations of Europe and America, and this, together with the influence of Buddhism, is the reason that there has been so limited a demand in Japan for food in the nature of fruits, consequently their cultivation has never been fostered to any extent and has made but little progress. On the contrary, in Japan there are numerous varieties af vegetables, many of which are of a high character, and in the neighbourhood of the larger cities there are extensive market gardens whose products are quite celebrated. There is no doubt that Europe and America are well advanced in the production of vegetables, especially in the art of forcing, which method has not been adopted in Japan; but it is nevertheless a fact that vegetables grown in Japan in the open ground are not only not inferior, but are in some instances superior, in quality, to those raised in Europe or America. It is seldom in Japan that the ground becomes frozen to the extent that work becomes impossible in winter, as is commonly the case in many other countries, and market gardens around cities like Tokyo and Yokohama are kept in continuous cultivation. This fact together with the acquisition of vegetables from warmer districts diminishes the necessity for the forcing processes adopted in Europe and America. It has been stated that there are in the suburbs of Tokyo only two establishments which have adopted the European style of forcing, and the largest of these has only eighty frames working on a quarter of an acre of ground.

Whatever may be said of our vegetables, it is but natural that we should have some fine fruits among the variety grown in such an extended latitude and the various altitudes found in Japan, and many of these are abundant in quantity and of a superior quality; but notwithstanding this, they are generally regarded by the Japanese—who have no idea of their hygienic value—as a luxury and to be used

as are candies and sweetmeats, and these conditions remain to the present day.

For a long period in ancient times there was no communication between Japan and foreign countries, and even for a long time after the end of the Tokugawa era there was no importation of the fine fruit of Europe and America, and consequently the Japanese lack of knowledge of foreign fruits and plants. Had it been otherwise, there is no doubt that the cultivation of foreign fruit in Japan would have made more progress than it has done. Due to the great variety of latitude and altitude previously mentioned, foreign fruits planted in Japan have done fairly well, and annual crops, good both in quantity and quality, have been gathered; and this notwithstanding the fact that the growers give but scant attention to the trees and rest satisfied so long as the yield is good, neither manuring nor pruning, and the majority of fruit trees in Japan are treated in this way to the present day. The persimmon is treated in like manner, with the exception that its branches are occacionally thinned out. Orange trees have received some attention in the matter of manuring, as have also chesnut trees, but these are neither pruned nor trained; but Japanese have been taught by experience that pear-trees and grape-vines will not bear good crops of fruit without pruning and training and consequently they have fallen into these methods as a matter of necessity.

Many suitable situations, having regard to mountain side and soil, for the cultivation of fruit trees are to be found in Japan if sought for, and people generally seem to have relied upon situation and the soil only. The consequence has been that no improvement has taken place in fruit culture; and this fact, together with extensive seri-culture, which has been for many years a growing industery of farmers and now and for some time past has produced the principal export of Japan, has no doubt largely contributed to and been the means of retarding the progress of fruit culture.

In Japan the national drink is sake (i.e. rice-wine). This liquor is used universally and by all classes, from Mikado to the lowest members of the community, and is to be found in evidence on all occasions of joy or grief, fortune or misfortune. As a beverage, it may be considered inferior to the liquors of Europe and America, but it is not likely that these will take the place of sake in this country, seeing that the latter has been in use for many centuries in close association with all rites and ceremonies. In recent times scientific investigators have introduced an improved process in the brewing of sake by adopting the pure yeast culture of western methods, and thus are enabled to manufacture a better liquor than formerly, and whatever hygienic value and fine flavour may be possessed by the fruit wines of the west, they do not take any strong hold on the appreciation of the Japanese.

Another cause of neglect in the cultivation of fruit trees is the fact that a large area that would be suitable for that purpose is occupied and has to be maintained under forest for the production of fire-wood and charcoal. The amount of land required for this purpose is enormous, for up to the time of the Restoration the only fuel used in Japan was wood and charcoal, and even now coal forms but a small percentage of the country's fuel. These forests require but little attention and are profitable to the owners on that account.

Finally, to summarize the causes why in Japan fruit culture has not been taken up to any extent, it may be stated:—

(1.) That as the principal food of the Japanese consisted of starchy and sugary substances, these have not developed a taste or desire for fruit.

(2.) Japan being surrounded by the sea, fisheries developed to a great extent, and consequently fish were consumed very generally while the consumption of the flesh of cattle was but little. The former has lighter taste than the latter.

(3.) In all Japan, pickled vegetables have taken the

place of salads and fruits at the end of meals, and this is the case among all classes without distinction.

(4.) The consumption of fruit was small, and it was rarely used in cooking. The canning of fruit was unknown, and liquors from fruits have only been made on a small scale.

(5.) That the community regarded fruit as a luxury and not as a necessary.

(6.) That the people had no knowledge of the beneficial qualities and the hygienic value of fruits.

(7.) That on the introduction of Buddhism, vegetarianism prevailed and the consumption of animal food was checked.

(8.) That the seclusion of Japan for a long period and no communication with the west, where fruits are extensively grown, until about 50 years ago, deprived the country of gaining a knowledge of foreign fruits.

(9.) That most fruits, though grown in a semi-wild state, yet produced crops annually or in alternate years, and thus called for little attention as to cultivation.

(10.) That the extensve demand for rice-wine considerably limits that of fruit-wine and beer.

(11.) That the seri-culture having been so important a part of the farmer's work, he has devoted no time to the culture of fruit.

(12.) That land has been largely used for the production of fire-wood and charcoal.

Special features of the Japanese fruit industry.

(1.) Though the cultivation of fruit in Japan has existed from ancient times, it never took the form of planting gardens or orchards until a comparatively modern date.

(2.) To those trees that do not give an annual crop or that bear unsatisfactorily, a certain amount of atten-

tion has been given in the form of pruning and training, but others that bore fruit annually were permitted to grow in a semi-wild state.

(3.) With the exception of oranges (especially the mandarin), there are no plantations of fruit trees.

(4.) Fruit-trees are usually low trained and those which are left nearly in their natural states resemble the standards, but there are no standards as are seen in Europe and America, nor are there such roadside trees as may be seen in Germany.

(5.) There is a special method of training in Japan, and it differs greatly from that in vogue in the west.

(6.) There are special measures taken in Japan, for instance enveloping fruit in hanging bags.

(7.) Irrigation is not required in Japanese fruit gardens during summer, while drainage is usually very necessary and in case when the latter is unsatisfactory, though the trees may fruit, the result is always very bad.

(8.) Fruit culture in Japan is almost always a by-production of farmers, and as such the cultivation is encouraged.

(9.) Districts specially devoted to fruit culture are few.

(10.) There is no horse-power or machine power used in fruit gardens. This is because manual labour is cheap, and besides the gardens are on too small a scale or their grounds are too precipitous to use those powers.

(11.) Our fruit culture is intensive in labour but lacking capital.

(12.) The variety of fruit trees also the stock plants, and the methods of propagation are widely different from those of Europe and America.

(13.) The fruit-growers of Japan are careless in packing and pay little attention to trade marks, consequently well-grown fruit when placed on the market does not obtain its proper value.

(14.) The customs of the fruit and vegetable markets in

Japan differ from those of the west. Here we have the broker as well as the agent. Goods pass from the grower to the agent through the broker, and thence from the agent through another broker to the retail dealer. This process may have some facilities but at the same time it involves considerable disadvantages. In certian markets this practice has been altered by eliminating the brokers, the markets of Biwajima near Nagoya being cases in point; but in the larger cities such as Tokyo, Osaka, Kyoto, etc., the broker reigns supreme, and the grower's profits are thereby very much reduced. The agents do not gain much in this business and are considered generally to be fairly honest in their dealings with the grower, but a radical alteration is called for in the matter of brokerage, but as the system is of many year's standing it will probably take some time before a change is effected. The grower—who is also usually the consignor—generally remains in the country, and he has generally deficient knowledge on the condition of the market. Thus the agents and brokers are enabled to make large profits. Should the growers' knowledge not advance, the situation may remain forever and he will not be able to compete successfully with the merchant.

Special features of Japanese fruits.

(1.) In respect of the shape, quality, and yield of fruit in Japan it may be stated that it is not inferior to that produced in Europe and America. The use of cover bags induces growths of uniformity in size and shape. Generally speaking, our fruit culture is conducted on a much smaller scale than that of the west and its system is very intensive, in consequence of which our fruits frequently excel in size and shape; but as to flavour, aroma, colour etc. they are generally inferior

to that of continental productions. It is the general opinion that fruits produced in China, Korea, and California have strong aroma, while ours are very weak in it. This is due to the moist climate of Japan at the ripening period.

(2.) The Japanese prefer fruit of the crisp, fleshy kind, and do not care for those that dissolve easily on the palate. This is a taste of long standing, and still exists, and it is probably due to this fact that so few soft fruits are grown in Japan.

(3.) Formerly our people regarded fruits as they do candy or sweetmeats. They were not esteemed for their acid qualities or their flavour, and aroma but for their sweetness. Sweet stuff was regarded as a relish in Japan, but this habit has diminished and is diminishing in sympathy with the general advancement.

CHAPTER I.

The Climate of Japan and Its Local Modifications.

Unrivalled in her physical endowment, our insular empire, though trifling in area, is characterised by specific climates and soils with numberless variations. From the extreme north to Formosa, spanning 28 degrees of latitude, some 2,500 miles long, our floral paradise is said to be without parallel in the world.

The empire abounds in fruits, both tropical and temperate, partly indigenuous and partly exotic. Our continental brethren, have often had the good opportunities to introduce their fruits, most of them with high qualities, with their civilization. The western fruits, especially of the Old World have frequently been introduced with the opening of commercial intercourse mainly at Nagasaki through the hands of the Dutch, Portuguese and Spaniards. Beside, there are a number of introduced fruits dating since the Restoration of 1867.

Most of these exotic fruits, both of tropical and temperate, varieties, thrive well and some have been found to grow with great luxuriance.

The archipelago of Japan consists of four major islands, Formosa excepted, and three chains of oceanic islands.

Being in proximity to the Asiatic Continent, our insular climate has undergone certain disturbance through continental influence. So we find that extreme conditions of climate are greater than those of oceanic islands.

Thus the difference between the average temperatures of the summer and winter amounts to about 30 degrees or more Centigrade in the north and over 20 degrees even in the south.

The influence of the continent differs in different parts of the country. The mountain chains, most of which run through our archipelago from north to south divides the empire lengthwise into two main regions, and the climatic features of the two regions show quite a radical difference, in consequence. The half lying west or north-west of the back bone of our country being called "Ura-Nippon,"* ("Ura" means ventral) the other half lying on the other side is called "Omote-Nippon"† ("Omote" means dorsal).

Generally speaking, our winter temperatures are much lower owing to the heavy cooling influence of the Asiatic continent. So, north of 30 degree N. (Riukiu Chain) the average minimum temperature in winter descends below zero everywhere; hence, more or less snow falls. The cooling below zero takes place not only in mid-winter, but also in late autumn and early spring. So, frost prevails from the middle of November to the end of March in every part of the country except the extreme south, that is to say, south of 30 degrees N.

According to the observations made at Sapporo (about 43 degrees 5 minutes N. L.), Hokkaido, earliest frost occurs in the first week of October and latest spring frosts extend to the middle of May.

In Tokio (35 degrees 40 minutes N. L.) frost begins in the late November and lasts until the first week of May. Finally, in Kagoshima (about 31 degrees and 30 minutes N. L.), the frost begins in late December and disappears by the end of March.

The Riukiu Islands have no frost throughout the year, but the case is different in Formosa, where light frosts are often formed in the northern districts. The climate of Formosa differs from that of oceanic islands, owing to its nearness to the Continent.

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* May be called the Continental Belt.

† May be called the Pacific Belt.

Thus the frost season extends over seven months in the far northern territory, while our southernmost province has the shortest period of only three months.

Though frost forms in almost all regions, it is, as a matter of fact, harmless in south Japan, except . . . great altitudes. It is a noticeable fact that the north and north-west regions, or greater part of the so called Ura-Nippon has never suffered damages of early and late frosts. This fact has been constantly confirmed by the reports from local authorities.

Upon close examination of the reports, it has also been found that the east and south-east half or Omote-Nippon, except the warm southern provinces as well as the central plateau of Shinano and Kai provinces, have often suffered rather severe damages from frost, while the narrow belts under the influence of large bodies of water have always escaped them.

It is not uncommon that orchards in those regions have suffered occasional injuries during the flowering period, while enormous loss is caused on young mulberry and tea leaves. In the last spring the same damages happened in Fukushima-Ken. Mulberry leaves were entirely destroyed in one night, the loss being estimated by the authorities at some £130,000.

In the summer, owing to the strong heating of the Continent our thermometers show relatively high temperatures, which are, however, not so extreme as the low temperatures of the winter.

So, in the summer a south or south-east breeze blows from the Pacific toward the Continent across our lands, while in the winter the direction of the wind is quite contrary. Thus the normal directions of the wind in the summer and winter are always fixed, and the two prevailing winds or monsoons change to each other in April and October. The isobars, during the winter and autumn runs south-south-west and north-north-east and make close curves convex towards the Continent. When the warm spell comes in spring, these curves gradually change

their direction and character and gradually come to present their convex sides towards the ocean.

The prevailing north-west wind of the winter sweeping across the Sea of Japan is loaded with moisture. When it strikes against the mountain barriers lying along the sea coast at various distances, it at once unloads its moisture Where the barrier stand near the coast and directly face it, heavy precipitations are always the result.

Above all others, the provinces of Kaga, Echizen, Etchu, Echigo, Uzen, Ugo and Mutsu are known for the heaviest snowfall in Japan. The depth of snow near the sea-coast reaches over 3 feet, while it increases to 9–13 feet at the foot of the mountains.

Snowstorms accompanied by cold north or north-west winds is one of the characteristic features of Ura-Nippon in winter. For about five months from November to March dull, rainy or snowy weather always prevails. Rivers, streams, low paddy rice fields are flooded, the fields often remaining submerged in water during the whole winter.

The cold wind from the frozen Continent becomes much drier in passing to the other side of the mountains. So, the south or south-east side or the so-called "Omote-Nippon" regions are always scanty in rain and snow in winter. The valleys of the interior of Central Japan, especially those of Kai and Shinano Provinces have therefore cold and dry winters.

Generally speaking, the Pacific Belt and the interior valley regions of Central Japan, being quite shut out from influence of humid winds, always have clear weather during the winter months.

So, it is not an uncommon thing for a traveller to see the striking contrast of weather in the two belts when he arrives on his way from Echigo to Tokio, at Mikuni Pass, the watershed in Central Japan.

In the summer the contrary is the case. The prevailing

south or south-east wind from the Pacific sweeps over the land towards the Continent, and becomes heated during its course.

The humid atmosphere, on coming in contact with the mountains of our Pacific Belt, discharges its moisture and causes heavy rainfalls.

In particular, during the period of change from north to south monsoons and vice versa, the warm humid atmosphere is brought in contact with the cold currents from the Continent and long and heavy rainfalls are the result. This period of rainfall called " Tsuyu " lasts for about one month beginning in the second week of June. Indeed, during this period the sun can not be seen frequently. Floods followed by destruction of roads, dwellings and fields occur here and there in large numbers. Strongly protected river embankments are often destroyed, changing fertile fields into waste. The air and soils become always saturated with moisture under rather high temperatures. The fruit trees make rapid and sappy growth. For fungus and other microbes, it is now the best time to show their activity. The unfavorable conditions of things are the commonest phenomena in the Pacific Belt of Japan, in summer especially in its Southern territories.

While the Pacific Belt is suffering from rain, the other belt does not receive such abundant precipitation, and enjoys a rather clear spring sunshine after the long dull weather has been swept away. But the sky is not quite so clear as in the Pacific Belt in winter. The annual precipitation in the Continental Belt reaches its maximum in December, and its minimum in May, the range between the two extremes being rather small; in other words, precipitations are rather uniformly distributed through the year. The case is quite contrary and more or less varied, in the Pacific Belt, and the range of variation is far greater than in the Ura-Nippon. For convenience sake, I will divide it into five sections, as follows :—

1. North-West Part of Kiushu. In this section the mini-

mum precipitation is in winter, and gradually increases towards the summer, reaching its maximum in June. The range amounts to over 13% of the total annual precipitation.

2. The long Pacific Belt from the south-east part of Kiushu to Mito (36 degrees and 30 minutes N. L.), the north limit of Tokaido, including the Inland Sea Region, Island of Shikoku and Tokaido. In this section the rainfall reaches its minimum between December and February and increases gradually until June. These features are the same as in section 1; but afterwards in August the rainfall quickly diminishes and again increases in September. The difference between the two extremes amounts to 11% of the total precipitation of the year.

3. East Coast of Hondo (Main Island). The variations are almost equal to section 2 but the amount of precipitation in September is far greater than in June. Besides second minimum occurs in July instead of August.

4. The Central Part of Hondo. The changes are similar to those of the first section, except that the maximum occurs in July and not in June.

5. Hokkaido, the west coast excepted. The minimum of precipitation occurs in February, and the maximum in September. Its amount in autumn far exceeds that of any other section.

The phases of variations above described are shown by the following figures:—

	Ura-Nippon	Omote-Nippon	West Coast of Kiushu	South Coast of Hondo	East Coast of Hondo	Central Japan	Hokkaido
January.....	10.3 %	3.7 %	3.9 %	3.4 %	4.0 %	3.7 %	3.6 %
February	7.0	3 6	3.9	4.2	4.7	3.7	2.0
March	6.1	6.2	5.9	7.3	6.7	6.0	5.0
April	6.9	8.2	10 4	10.9	6.0	8.3	7.7
May	5.4	9.1	10.7	10.3	6.7	8.3	11 0
June	7.3	11.8	16.6	14.3	13.3	11.3	8.5
July	8.4	12.0	16.4	11.0	9.0	18.3	9.5
August	6.7	10.0	8.6	7.1	11.0	11.0	11.0
September	10.6	14.0	10.1	12.0	18.0	11.0	10.0

	Ura-Nippon	Omote-Nippon	West Coast of Kiushu	South Coast of Hondo	East Coast of Hondo	Central Japan	Hokkaido
October.....	9.4	10.1	5.4	10.4	10.7	8.7	10.5
November.....	10.7	6.2	3.9	5.5	5.7	5.3	8.5
December.....	11.6	5.0	4.3	3.4	4.3	4.3	8.0

(From Observations of Central Meteorological Observatory.)

Also figures showing precipitations in various stations run as follows :—

Stations	Sections	Ave. Ann. Pptns. *Mm.*	Stations	Sections	Ave. Ann. Pptns. *Mm.*
Nawa	Kiushu	2193.3	Hiroshima	Hondo	1480.9
Kagoshima	,,	1193.6	Kure	,,	1269.0
Miyazaki	,,	2539.6	Matsuyama	Shikoku	1157.7
Kochi	Shikoku	2675.5	Tadotsu	,,	963.7
Tokushima	,,	1745.7	Ajino	,,	873.8
Wakayama	Hondo	1361.2	Okayama	Hondo	988.0
Oita	Kiushu	1585.3	Kyoto	,,	1516.0
Yamaguchi	Hondo	1878.0	Osaka	,,	1283.8
Kumamoto	Kiushu	1477.9	Kanazawa	,,	2478.8
Saga	,,	1461.4	Fushiki	,,	2077.7
Nagasaki	,,	1963.9	Nagano	,,	906.1
Saseho	,,	1318.4	Niigata	,,	1696.9
Fukuoka	,,	1432.3	Yamagata	,,	1173.4
Itsugahara	,,	2240.6	Akita	,,	1684.3
Akamagaseki	Hondo	1568.2	Fukushima	,,	1185.7
Hamada	,,	1461.9	Ishinomaki	,,	1085.1
Sakai	,,	1902.8	Miyako	,,	1342.9
Hikone	,,	1461.2	Awomori	,,	1251.2
Tsu	,,	1655.2	Hakodate	Hokkaido	1103.5
Nagoya	,,	1561.0	Shutzu	,,	1231.5
Gifu	,,	1919.6	Sapporo	,,	967.9
Hamamatsu	,,	1766.7	Kamikawa	,,	1085.3
Kofu	,,	1068.2	Soya	,,	868.9
Numazu	,,	1779.7	Abashiri	,,	691.1
Yokosuka	,,	1460.7	Nemuro	,,	987.3
Tokio	,,	1467.6	Kushiro	,,	1024.7
Utsunomiya	,,	1571.7	Erimo	,,	997.9
Choshi	,,	1560.5	Tokachi	,,	924.2

The amount of rainfall thus ranges between 3100 *mm.* at Shingu, a station in Kii Province and 691.1 *mm.* at Abashiri, Hokkaido. The heaviest rainfall in summer therefore occurs on the Pacific coast of Kii, and it is the maximum in our country. Next comes the Pacific coast of Kiushu, and Shikoku in the Omote-Nippon, and the Provinces of Kaga and Echizen in the Ura-Nippon. In these districts the total amounts to over 2500 *mm.*

The driest region next to the north-east Hokkaido is Shinano, a province in Cent'l Japan; then follow the Inland Sea Region and the Province of Kai. In Shinano, the total never reaches over 900 mm. It is also under 1000 mm. in the Inland Sea Region (the outlying Provinces of Bizen, Bichu and Sanuki and the islands) and under 1100 mm. in Kai, a Province next to Shinano. These are the drier regions of Japan, considering the rainfall of the whole year.

Aside from some local disturbances due to topographical irregularities, the rainfall seems to diminish from the south-west to the north-east parts of Japan. Thus the amount in Hokkaido is no more than $\frac{1}{3}$ of that of Kiushu.

I shall now proceed to examine the conditions of cloudiness and relative humidity.

The variations of cloudiness are quite similar in their phases to those of the rainfall. In the Pacific Belt it is little in winter and great in summer. that is, during the six months from April to September its amount is above the average, while during the other half of the year it is below the average. Here however, I must mention some exceptions. The Inland Sea Region, the Pacific Belt, as well as the west coast of Kiushu in Ura-Nippon show some deviations from this rule, the minimum cloudiness being in November, and never in December. (See the Table)

The phases of cloudiness are generally reverse in Ura-Nippon being very coudy in winter and comparatively clear in summer, the monthly amount is under the average from

March to October, while for the rest of the year is considerably above the average.

As to the seasonal distribution of clouds I can clearly say that in Ura-Nippon, it is almost uniform through all seasons except winter and far less than the amount in winter. On the contrary, the sky is most cloudy in the summer and clearest in the winter in the Pacific Belt, while in the spring and autumn it falls between the two extremities.

In the west coast of Japan the conditions of cloudiness are uniformly distributed between the winter, spring and summer, the autumn being the clearest season. In the Inland Sea Region, the spring and summer are rather cloudy, and the other seasons clearer.

The variations of relative humidity show a parallelism to those of the average temperatures of the respective places. It is great in summer and small in winter. The maximum falls in August, and the minimum in January. The average of the two extremes amounts to some 15 mm. in the south and diminishes gradually northwards to 13 mms. in Hokkaido.

The annual variations of humidity show two maximum and minimum in Ura-Nippon, while in Omote-Nippon, there is only one minimum and maximum, as shown in the following table:—

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Ura-Nippon		83	82	78	76	76	82	84	82	82	80	80	82	81
Omote-Nippon	S. Coast	69	68	71	76	76	81	84	82	82	78	75	73	76
	E. Coast	77	76	74	72	73	83	86	85	85	81	77	73	79
	Hokkaido	81	84	85	82	83	89	91	90	88	82	79	80	85

Thus, one can see the great humidity of our climate, Hokkaido standing highest in the scale as shown in the table. This phenomenon is caused by cooling effect of the "Oyashiwo," a cold current sweeping parallel to and along the

Kurile Islands southwards towards the Pacific coast of Hokkaido. The dense fogs which cover this part of Hokkaido and the northern parts of Hondo are due to this current.

Next to Hokkaido, the east or pacific coast of Hondo often show the highest percentage. This part is also quite foggy in the summer, though not so densely as in Hokkaido.

Ura-Nippon shows, on the whole, a higher percentage than the East Coast of Japan. But it is less humid than the East Coast in summer.

As regards the air temperature I may add a few words. According to the reports of the authorities, the minimum temperature is in January or often in the early part of February. It then gradually rises with the monthly rate of 4 degrees C.' and finally reaches its maximum in August. Then it slowly decreases at the rate of 3.5 degrees C. through September and October when the rate suddenly drops to 6 degrees C. per month.

Thus the rise of monthly temperatures is slow taking seven months, while its fall is quicker and requires only five months.

From the foregoing one can see that the temperature of the air falls below zero in all districts except the extreme south. But there is no serious damages to the growing vegetation. Fruit trees thrives well in the open air. Even the tender ones such as oranges and lemons, grow well without protection up to 35 degrees 30 minutes N.L. Of the severe freezing of the soil familiar to continental people we have no experience. Except in the extreme north our open fields abounds in crops and vegetables in winter, and in some sheltered corners peas and rapes often break the monotony of winter with white and golden flowers.

Probably such a state of things would deserve your wonder.

As above stated, Ura-Nippon is quite free from frost (or other cooling injuries) the ground being always covered with deep snow, or the sky clouded during the winter and early

spring. Grape vines are always mulched in this part before winter sets in; but it is merely to prevent their breaking down by heavy snowfalls and has nothing to do with frost or freezing.

Owing to the winter drought the Pacific Belt is much liable to the winter injuries of frost and freezing. These injuries are severe especially in the cold dry interior valleys of Kai, Shinano and Iwashiro, as well as on the open plains of Kwanto.

The ocean currents having most influence on our climate seem to be the two large ones called the Tsushima Current and the "Oya-Shiwo" (Main Current). The former passes through the Korean Channel from south to north into the Sea of Japan, and sweeps along the coast of Ura-Nippon. The north-west winds prevalent in the winter, which take up warmth in sweeping over the current, have the effect of ameliorating to some extent the winter cold of Ura-Nippon.

On the other hand, the "Oya-Shiwo", or the cold current running southwards along the east and south coasts of Hokkaido and the east coast of Hondo, is largely influential in lowering the temperatures of those regions in summer.

Besides these two currents, there is another large warm current called "Kuro-Shiwo" (Black Current) which sweeps along the south and east coasts of Japan. It is larger and higher in temperature than the above currents. But its influence on the land is rather small since in winter the north-west winds prevail as above stated. In summer the winds from the Pacific become heavily charged with moisture in crossing this current and cause abundant rainfall upon their arrival on the land; but the land is then heated to a much higher temperature than the current and the warming effects of the latter are quite imperceptible, only causing heavy rainfalls on the Pacific Belt.

The facts presented above will enable one to grasp the general features of our climate, and certain of its characteristics. They are quite different from those of other countries. Moreover, the two Belts of Omote and Ura-Nippon present a striking contrast. Generally speaking, the continental features

appear in the north-west and north Japan, including the greater part of Ura-Nippon and Hokkaido. The central dry valleys of Shinano and Kai as well as the Inland Sea Region have also similar climate. On the contrary, the south and south-eastern parts, in other words, the Pacific Belt show more characteristics of insular climate.

The great difference in adaptability of fruits in those districts, to be detailed in the next chapter, will be intelligible on the basis of these facts.

CHAPTER II.

The Adaptive Ranges of Fruits in Japan.

Fruit trees growing in Japan comprise almost all kinds of warm and temperate origin. The climate and soil are varied enough for them to flourish in the open air. Exotic fruits have also been quite naturalized in various districts, and many of them have borne good fruits. Amongst them, apples, pears and American grapes have found a wide field for adaptation since their introduction some 30 years ago. Apple growing now forms the leading industry of North Japan.

Generally speaking, no fruits, except those of tropical and sub-tropical origin, suffer from want of summer heat, but owing to the high degree of humidity in summer, our fruits are clearly different from those grown on the Continent or in drier regions. Their flavour or aroma is markedly inferior to that of the fruits grown in the continental climate.

CRABS AND APPLES.

"Ringo," a Japanese crab apple and "Rinki," a variety of the Siberian crab, both of which are indigenous to Japan grow wild in almost any part of the Ura-Nippon, north Japan with Hokkaido and central Japan (Provinces of Kai and Shinano). According to our old records and reports of local experts, the fruits have never been found wild or naturalized in the south east parts of Hondo, Shikoku and Kiushu, or in the Omote-Nippon, except the North.

Cultivated apples, most of which are of American origin, thrive well in Hokkaido, north and north-west Japan. The area of their plantations in these centres amounts to several hundreds

of acres. Their cultivation has also proved very promising in Central Japan, where, however, they have not been grown so extensively. In the rather dry regions bordering the Inland Sea (Provinces of Bizen, Sanuki and Iyo) apple growing has become a profitable industry in late years. But the climatic factors are not so favorable as in the above districts, and some early and mid-season varieties alone are cultivated with success. Besides, there is a small apple district in Kawasaki, between Tokio and Yokohama, where only the earliest variety (Red Astrachan) is grown to supply the markets of those cities.

The apples are seldom found in south and south-east Japan. The summer heat of these regions is too high for the proper growth of apples, while the excessive humidity in summer is liable to induce over luxuriance of the vegetative parts and check the fruit bearing in consequence. So, it is necessary to care for the selection of aspects, altitudes and soils in order to raise good apples (most of them belong to the late varieties) in south-east Japan. Otherwise, the trees grow vigorously but remain fruitless for ever.

It is now a settled opinion that the apples of Hokkaido are handsome in appearance, rather similar to those of such favoured districts as Canada and Pacific States of the United States, whilst they are poorer in flavour, especially in sugary contents. Perhaps the summer is not long enough to bring their full ripening. The produce of Yoichi, a littoral village not far from Sapporo is said to be excellent in quality and appearance, and very large in quantity. Next follows Sapporo.

In north and north-west Japan, the apples of Awomori and Akita have gained mastery over all the other districts. Next comes those of Iwate and Yamagata. The provinces of Echigo, Kaga and Echizen standing far behind the others in every respect. It seems to me, as above stated, that the poor quality of the apples of the latter districts is to be ascribed to the hot summer, as is also the case in south Japan.

Of the practical apple growing centers, Tsugaru or Hirosaki region in Awomori-Ken* and Kazuno or Hanawa region in Akita-Ken have long since taken the leadership in the central markets of Tokio and other cities. Their fruits are unsurpassed in quantity and in flavour and keeping quality. As regards appearance, they are often inferior to those of Hokkaido. Here they are planted on steep hill-sides or in rich alluvial deposits with gravelly subsoil. They are also often grown in humous soils with fair success, although would remain fruitless in such soils in south Japan. Hence it is clear that in North Japan climate is the primary factor in the production of good apples, while the soil plays only a subordinate part.

Though apples are grown with best results in these districts insects and disease give trouble. Fungi are kept away by means of spraying and bagging, and those neglected are always subject to the harm of parasites.

The spot fungus and sooty mould, both of which are saprophytes, grow on the fruit skin and thus spoil their appearance.

Aside from the parasites of fruits and trees, the abundance of these saprophytes on the fruit skin would surprise any continental growers, and are unmistakable proofs of our warm and humid climate.

Finally, apples grown in south Japan, that is, in the provinces of the Inland Sea Region, are characterised by poor quality, dull appearance, deformity, dry and mealy texture, want of keeping quality, etc. The late varieties behave like the early ones. The ripening process appears to be much accelerated, the fruits cease to grow at an early period and tend to premature colouring. Therefore they are markedly small, dry in texture, light, and keep badly. As compared with the same variety grown in north Japan, how wide a difference!

* "Ken" means Prefecture.

Though producing apples of varied qualities, all these regions present more or less similarities in climatic factors, such as humidity, cloudiness and precipitation, but the temperature varying. Hence we may conclude that the adaptive range for apples depends mainly on the amount of precipitation during the period of vegetation.

SAND AND WILD PEARS.

Sand pears grow throughout Japan, except the Riukiu Isles and Formosa. They have a wide range of adaptation as regards climate and soil. They mostly grow very healthy, are productive, and seem to attain the fruiting age earlier than the European pears, other conditions being equal. They are adapted to the warmer parts of Japan better than European pears. Pears of good quality are now grown in north Japan and Hokkaido. Their flavour and appearance seem to excel those grown in the more southern parts of Japan.

The growing of sand pears is one of the most advanced and important line of business for Japanese growers. They seem to flourish equally well in Omote-Nippon. The best kinds are grown in the provinces of Echigo, Kaga, Echu and Echizen. Though North Japan has also good kinds of native pears. Of late years, an expert grower called Chojuro Taima has succeeded in bringing out a novel breed, to which his name has been given. It is almost unsurpassed in quality and other characteristics as a market pear. It has a wide reputation among growers and salesmen and has spread throughout the country with great rapidity. In Omote-Nippon, good pears have long been cultivated in the villages on rich, alluvial deposits of the Tamagawa, some six miles south of Tokio. Besides, native pear orchards abound in regions with rich river bottoms and in littoral districts. Low paddy fields are often inter-planted with sand pear trees with good success. In an extensive pear region of Nara, pear-trees are planted on low ridges, side by side with rice

plants. Owing to the heavy nature of the soil and narrow limit of root extension, they begin to fruit very early and heavily. But they tend to deteriorate while rather young. They attain full fruiting at seven years from planting and at fifteen years deterioration is nearly complete whereupon the orchards are planted anew. Most Japanese growers firmly believe in the old saying, that where the water stands, pears thrive, hence our pear culture in rice fields. Recently, pear orchards have largely been laid out on steep hillsides, at several localities on the Inland Sea.

Wild pear trees commonly used as stocks, "Inunashi" (Pirus Calleryana), and "Tanenashi Inunashi," its seedless variety has a similar range of adaptation to the wild apples, predominating in the north, north-west and central Japan. "Inunashi" growing by the road-sides often bears an immense crop every year. Its pips are gathered and sown to raise stocks. It is unparalleled in its hardiness, health and productiveness. Among the wild pears, some varieties are eatable, especially the seed less variety. These wild species grow largely in many parts of the Province of Rikuchu.

QUINCES.

The species of Cydonia have become naturalized since their introduction at a remote period. They were imported from Cambodia through the hands of the Portuguese in Nagasaki in 1634. "Marumero," our name for Cydonia Vulgaris, is derived from the same Portuguese word. Species closely similar to ours also grown in Korea and North China.

Beside these exotic kinds, we have many Cydonias as Ornamentals. The edible quinces have an almost similar distribution to the native apples and wild pears in our country. They flourish and fruit profusely in north Japan in low moist corners near farmers' dwellings. Besides, beautiful specimens grow in Hokkaido and central Japan. Travellers

are often surprised at seeing the growth of wild quinces on the banks of Shinanogawa in the province of Echigo. On the lake side of Suwa, they are planted on low wet lands, newly prepared for them by hilling up the soil from the water. Here they thrive and fruit in the best conditions. The ornamental Cydonias grow more widely than the edible species; they thrive equally well in both halves of the country.

KAKIS (Date Plums of Japan).

We have about 800 named varieties of date plums which can be divided into sweet and astringent varieties. They have a wider range of adaptation than the native pears, and almost equal to the peaches, as will be shown later. They are grown and gathered by the aborigines in Formosa in the extreme south, but I have heard of no trees growing in the Riukiu and Bonin Islands. In Kiushu, Shikoku and the Main Island they thrive well in any district. It is a rather difficult thing to travel without seeing a few lots of Kaki trees planted on road-sides and odd lands around farmers' cottages in every village. They have never been planted in regular orchards or gardens, but any vacant lot is used for them.

Kaki, Kaki, everywhere; it is as common a scene in Japan as the water in Holland! But, generally speaking, the date plums gradually lessen in number from the south to the north, and the weet varieties, common in south and central Japan gradually decrease towards the north and are replaced by the astringent ones. Good fruits are produced up to 38 degrees N. L. but from this limit northwards, the fruits become inferior in all respects, until one comes to Tsugaru Strait, which is the extreme north limit of the Kaki. Hokkaido has Kaki trees growing quite wild in its southern provinces, but they have proved there unfit for cultivation.

The date plum has no distinct preference between the climates of the two longitudinal halves of Japan. They suc-

ceed equally well in both sections; but the best named varieties are mostly found in the south parts of Omote-Nippon. They grow and fruit freely in a variety of soils. The colour and quality of the fruits as well as their yield seem to be promoted by planting them on heavy, but well-drained loams. They are very water-loving in habit and require a constant and sufficient supply of soil water. Soil variable in their water contents are unfit for their cultivation, causing the premature dropping of the fruit, especially in and after the rainy season ("Tsuyu").

CITROUS FRUITS.

Citrous plants can grow from about 37 degrees N. L. southwards. Their growing centers, however, are located from 35 degrees N. L. southwards, but owing to the influence of the warm current (Kuroshiwo in the Pacific Ocean and Tsushima Current in the Sea of Japan) their north limit extends up to the 37 degrees N. L. on the sea coast. Inland valleys of central Japan are not favourable for the growth of citrous fruits because of the effects of high altitude. Only in a small part of Shinano and Kai some of the hardiest kinds are grown but not on a commercial scale.

Near the north limit or frontier of the citrous area are trifoliate orange (Aegle Sepiaria), "Yuzu" and often "Daidai" (Bitter orange, Citrous Bigaradia). Next follow the mandarin (C. Nobilis), Kinkans (C. N. Var. Microcarpa) and "Natsumikan" (C. Bigaradia Var. Sinense). Then come the region of sweet oranges (C. Aurantium) whose north limit extends to about 35.5° N. L. on the sea coast. South of the oranges come the pomelos and grape fruits (C. Decumana), followed by Fingered Citrons (C. Medica Var. Chirocarpus), lemons and citrons. Their north limits are likely to coincide with those of the Myrica and the olives. The limes are not yet cultivated in our country. The flavour of the dessert kind of citrous fruits, such as oranges, pomelos and mandarins become

gradually improved southwards, owing to the richer contents of saccharine principles. Besides, the colour deepens and the rind tends to become more and more smooth, accompanied by the diminution of its thickness. Finally, in Riukiu Isles and Formosa, the sugary contents entirely replace the acid substances. It becomes simply very sweet and thus the true flavour of the fruits are rather lost. The distribution of our citrous fruits seem mainly influenced by the average minimum temperatures of the winter months. According to the observations of the Central Meteorological Observatory, the north limits of the hardiest kinds seem to coincide more or less perfectly with the winter isothermal of 3 degrees C., and those of more tender species, as citrons and lemons are roughly coincident with 5 degrees C. winter isothermal.

Of the many kinds, mandarins, Natsudaidai and oranges are the most extensively cultivated, the two latter being rather recent introductions. They attain the highest perfection only in south Japan. Of the sweet oranges, Washington Navel and Thomson's Improved are exclusively planted on a large scale. Many of the groves are young and a few have been fruiting for several years. In my opinion, the sweet oranges are difficult to grow in our humid atmosphere, and the soils of south Japan, where the mandarins reach perfection as to the quality and yield, do not seem to be suited to them. In America, it is known that the orange fails in Florida, and succeeds in California, while the mandarin, which flourish in Florida, can not be cultivated with success in California. The climates of Florida and our south have a certain similarity though they differ in degree. More over, the famous orange regions of the world and the natural habitat of the plant, for example, the Mediterranean countries, Bahia in Brazil, and California, have something in common in their climatic conditions. In other words, these are regions of moist winter and dry summer; oecologically the so-called Sclerophilous wood-land climate!

From the foregoing, it may be inferred that the oranges rather enjoy a drier climate than the mandarins, whilst the latter show themselves to be adapted to grow and fruit in damp rainy climate, under the so-called warm temperate rain-forest climate.

The citrous fruits of Omote-Nippon are said to be much superior in all respects to those of Ura-Nippon. The growing centres are located in the north-western part of Kii, and in Izumi, and the neighboring provinces, in south Japan. Here the mandarins are planted on steep hills in terraces. The terraces are supported with stone blocks piled up like a stone wall. The growing of citrous fruits is an important branch of our fruit industry. Its acreage is shown in the following table.

Prefectures	1901		1902		1903	
	Citrous Fruits	Mandarins (Unshu)	Citrous Fruits	Mandarins (Unshu)	Citrous Fruits	Mandarins (Unshu)
	cho	cho	cho	cho	cho	cho
Wakayama	3487	1862	3432	1745	3521	1997
Osaka	1216	1173	1255	1209	1296	1246
Oita	438	363	300	230	517	437
Kanazawa	505	348	666	494	662	509
Kumamoto	573	113	651	166	—	—
Aichi	311	293	368	350	490	464
Yehime	321	183	373	224	398	235
Yamaguchi	489	21	509	23	532	32
Kagoshima	459	—	459	—	459	—
Kyoto	246	144	260	156	264	157
Nara	211	170	235	182	261	200
Shizuoka	200	113	169	105	219	104
Hyogo	181	127	192	135	206	140
Tokushima	186	65	213	128	238	151
Formosa	244	—	259	—	—	—
Miye	157	44	166	50	178	54
Gifu	97	76	99	78	108	86

Prefectures	1901 Citrous Fruits	1901 Mandarins (Unshu)	1902 Citrous Fruits	1902 Mandarins (Unshu)	1903 Citrous Fruits	1903 Mandarins (Unshu)
	cho	cho	cho	cho	cho	cho
Nagasaki	92	54	98	56	69	39
Fukuoka	124	—	128	—	141	—
Hiroshima	101	22	100	20	98	17
Saga	82	33	104	41	95	40
Shimane	91	3	87	3	94	3
Kochi	74	11	79	82	12	12
Ibaraki	50	10	51	12	52	14
Miyasaki	52	1	55	1	58	1
Okayama	39	2	41	2	44	3
Okinawa	29	—	30	—	32	—
Kaga	28	1	36	2	46	3
Fukui	19	4	27	5	28	7
Saitama	18	—	18	—	18	—
Tottori	15	—	16	—	18	—
Niigata	10	—	10	—	10	—
Ishikawa	3	—	3	—	3	—
Shiga	—	—	—	—	1	—
Total	10152	5254	10485	5971	10165	5761

N.B. Our "Cho " is nearly equivalent to 2.5 acres.

LOQUATS (The Japanese Medlar).

The north boundary runs almost parallel to that of the citrous plants but being hardier, it extends somwhat more northwards. They seem to enjoy mild climates in the proximity of large bodies of water. Large loquat groves flourish and fruit abundantly in the littoral districts of south and southeast Japan, only a few districts being noted on the west coast of Wakasa on the Sea of Japan. At any rate, famous loquat regions always stand by the sea, the plantations often directly facing the breeze, being located on steep hillsides rising directly from the waters. The new shoots come out in spring

and in late summer, some of them have become spur-like and begin to show flower clusters at the top. The other rapidly grown shoots never bear flowers on them. The flowering begins usually in late October and continues till early December. The plant is evergreen, and the fruits continue to grow larger gradually during the winter and ripen in the early part of June. From its flowering habit it is well considered that the larger part of Ura-Nippon is not favourable for loquat culture, owing to the heavy rain or snow-falls which always prevail in the late autumn and winter. But the case is quite different in Omote-Nippon. The dry, sunny weather from the autumn to winter in Omote-Nippon has no little favoured the setting of fruits. Thus, loquat growing has arisen and developed in many parts of Omote-Nippon. At present, the best fruits are produced in localities from 35 degrees N. L. southwards. Amongst them, the groves of Mogi, a fishing village near Nagasaki and Sakurajima, an Island in the Gulf of Kagoshima produce immense crops, while those of Tamura in the province of Kii and Namuya in the province of Awa have also been famed for their superior produce.

PEACHES AND NECTARINES.

There are a number of varieties of our native peaches and nectarines. From the extreme south of Formosa to Hokkaido, local forms are cultivated side by side with Western and Chinese varieties, which are all much superior to ours in all respects. During the past twenty years, the growing of introduced peaches has replaced the native one with striking rapidity. Their growing seems to be naturally limited in Hokkaido to the south part up to about 43 degrees N. L. The midseason and late varieties do not properly ripen there and peach growing consequently does not develop to be a profitable industry in Hokkaido. Peaches are rather easy to cultivate and seem to be less susceptible to the effects of

climate, than apples, provided suitable sites and soil be given. Consequently peach orchards are found scattered here and there all over the country. For the peaches there is no difference between the two longitudinal halves of Japan. At present, large orchards of peaches, regularly planted and trained, are found on the alluvial lowlands and hillsides. The heavy rainfall during June and July causes an overluxuriance of growth and considerable portion of the fruits drop down without reaching maturity. To prevent the damage from the parasites our people have learned through experience the important operation of bagging. On the loamy soils, good qualities of fruits may be attained, but the growers are accustomed to prefer light sandy soils to insure success. Sometimes rather dry hillsides give good results.

Our damp climate is always apt to induce sappy growth of shoots, from which the gum disease follows. This is the case in loamy soils in particular, and the custom of planting them in sandy soils must have resulted, partly at least, from this cause.

JAPANESE PLUMS.

Plums behave like peaches, and none have been found growing in Riukiu, Bonin Isles or Formosa. The north limit of plum culture lies in the south part of Hokkaido. But its range seems capable of being extended farther north by the selection o hardier varieties. Japanese plums are more adaptive to climatic conditions than the Kernel fruits and vinifera grapes. Some varieties can be found in Ura-Nippon and Omote-Nippon. They are more healthy, vigorous and fertile than Domestic and American varieties. Exotic plums are rarely seen, except in amateur's gardens. They seem to be more exacting as to climatic conditions than the native plums for the perfection of fruitage.

Native plums are cultivated with much less care than pears and peaches. They are like Kaki to the growers. From

the cultural point of view, the plum hardly deserves mention. Little cared for they regularly bear good crops of excellent quality year after year. Though the Americans have imported many noted varieties from our country and the fruit has undergone improvements by the breeder, there still remain some native varieties untested by them. The best plums come from the villages of Teradamura and Tominoshio, villages several miles southwest of Kyoto, they are noted by their appearance, very best quality, ferility and earliness. No one can forget their flavour after one trial as dessert. The plantations cover about 245 acres in the village of Terada alone. The total produce of this village amounted to 690 tons last year and sold for £4,000. The plums of Ochiai, a rural district in the province of Kai, have also had a wide reputation for many years. Besides, in far southern they Kagoshima produce beautiful plums. Their beauty, flavour and productiveness are unrivalled by any native plums. Above all others, the late varieties have had a world-wide reputation. There are 68,475 native plum trees in Sakurajima and produce amounted to 140 tons valuing £1,827 in 1904. They are mainly grown on the west coast of the island.

In these districts, they are planted on dry hill-sides with a gentle slope. The soil is well drained, but rather poor and shallow, and underlaid with stiff subsoil of granite origin. Soils of this kind are very common in the south-west part of Japan. In Sakurajima, the soils are of volcanic origin. The orchards at Ochiai (Province of Kai), are located on gravelly loam with well-drained sub-soil. The soil of Terada is a light sandy loam underlaid with heavy clay.

The early frost comes in Terada about the middle of October and the late frost ends in early April. Although any site may be selected, the best is thought to be the side of a gentle slope with north exposure. In this position not only the injuries from late frosts can be avoided, but the best quality and appearance of the fruits can be secured, since on a sunny exposure the fruit skin tends to become

hardened too early. In sunny positions the fruits are often covered with numerous brown patches owing to the action of intense light. Such fruits not only lose in appearance but are of inferior quality as dessert. On the contrary, fruits grown on the north side are superior as above stated, in many respects, of which thick bloom and the delicateness of the skin are noticeable. On a loose subsoil plum roots freely penetrate and the result is a greater or less sterility. Plum trees do not fruit well in wet low-lands and in rainy seasons, the fruits are moreover apt to drop prematurely. They also remain inferior in appearence and flavour and are more subject to gum disease.

APRICOTS.

The apricot has long been cultivated in our land in a half wild condition. It grows very widely in Japan. Its north and south limits almost coincide with those of the plums. It seems to require a similar climate as the hardy plums and rather different from that required by peaches. They are grown with good success in the drier parts of Japan, that is, in the provinces of Kai and Shinano in central Japan, as well as the north-west part of Hondo and the Inland Sea Region. The environs of Nagano in the Province of Shinano, have particulary wide reputation for them since remote antiquity. We have no districts, famous for growing apricots in Omote-Nippon. The fruiting conditions for apricots are more difficult than for the "Ume," the only nearly allied species. They seem to enjoy a rather dry summer and loamy soil. The best apricots are grown in rich alluvial deposits of more or less varying texture, but always with gravelly subsoil. Such soils are found in the growing centers of Hanishina, Sarashina, and Kami-minachi in the Province of Shinano. Frequent rains before ripening induce the fruits to drop down prematurely, while summer drought make them shrivel. The severest

damages are sometimes, though seldom, done by late frosts on flowers in the early weeks of May.

"UMES" ("Japan Apricot" of American Authors)

In the range of adaptation they are similar to the two foregoing. They are more fruitful in all parts of Japan than the plums and apricots. Any climate and soil seem to suit them equally well. Only the selection of a proper site is of the hightest importance to avoid spring frosts, since the umes are the first to bloom among our orchard fruit trees. In Tokio, they begin to flower in late January. So, it is important to obtain a northern exposure and some elevations where the frost injuries are out of reach. Besides, under these conditions, good quality and appearance of the fruits can be secured. The Ume (Prunus Mume) to which the name of "Japan Apricot" has been given is something quite different from any native or exotic apricots. It has descended from our forefathers and is much esteemed. The plants are used both for ornamental and utilitarian purposes. The fruits are gathered while unripe about the middle of June, and are preserved in salt under pressure. During the clear hot weather from late July to August the squeezed fruits are dried in the sun in the open air on trays. When enough drying has been done, they are placed in a salt solution coloured crimson with the leaves of Perilla Nankinensis. The drying is repeated a number of times and the fruits are finally preserved in the juice. The Ume fruits are very acid when fully ripe, it contains a high percentage of free citric acid, and can not be used as desserts. In this way the Ume fruits can be kept safe for several years and though not highly palatable, they have a place of their own among household fruits not easily replaceable by any other articles. The preserve is called "Umeboshi", and the housewife prepares them. Our forefathers used always to carry them in the camp. In the late Russo-Japanese War, some hundreds of tons of "Ume-

boshi " were sent out for the use of our fellowmen at the front. The " Umeboshi " is believed by some people to have a medicinal value, and so it is usual to see it served at breakfast in many hotels and private families.

CHERRIES.

The native cherry-trees bear poor fruits and do not belong to the category of orchard fruits in the strict sense. They are valued as ornaments and take in our national life the place of the Roses of western nations. The fruits are small, round, deep purple, and rather bitter in taste. Besides, there are dwarf wild cherries called Fujisakura, growing wild in the high altitudes of Mt. Fuji, Hakone a .l other mountains. These bear fruits similar to those of the ordinary cherry trees but small. They are dwarfed in pots and used for ornamental purposes, trees have been recently used as dwarfing stock for grafting European cherry trees. This use is quite a new thing. The result is very satisfactory, and European cherry trees can be made by this means to fruit very profusely while young. Flowering cherries have been used as stocks in our country, but they have no dwarfing effects on cherries and require some particular attention as to soil and managements to let them bear freely. The cultivated fruit cherries are entirely introductions from Europe and America. One kind from China is also now grown. The western varieties succeed well only in districts with cool and dry summer. The suburbs of Yamagata, the metropolis of the Province of Uzen and Sapporo in Hokkaido are noted for its culture. The profitable boundaries for cherries appear to be more restricted than those for apples and quinces. On the contrary, the Chinese edible cherry seems to be better adapted to the warmer and moister parts of our country where the European varieties are apt to run to wood at the expense of the fruits.

JUJUBES.

They grow well in a quite abandoned state in drier parts of our country. They seem to succeed especially well in continental climates. The finest specimens are produced in Shinano and Kai provinces in central Japan. In the south, from 34 degrees N. L. southwards, they are rarely cultivated. The native species are inferior in quality and size of fruits to those of Korea and North China. In the north parts of Korea, and in north China, especially near Shan-hai-Kwan travellers are always agreeably surprised to see extensive bushes of jujubes in a quite wild condition. They seem to thrive very well in about 40 degrees N. L. on the Continent. The Chinese jujube has very large fruits with thick pulp and tough smooth skin. Californians have early paid attention to them and succeeded in introducing them into their own country. Their dried fruits have been seen in late years in our grocer's stores in Tokio.

MYRICAS.

These are natives of warm temperate zones like the loquats and oranges, and more tender. They grow in the south part of Japan where they attain perfection in growth and fruitage. They are adapted to an equable climate near large bodies of water. Their north limit is far lower than for the hardier citrous fruits, and approximately the same as for the more tender species, such as lemons, citrons etc., and with the camphor tree. It reaches up to about 35 degrees and 20 minutes N. L. on the Pacific coast but only 34 degrees N. L. on the west coast. The quality of the fruits become gradually inferior with higher latitudes. The case is quite similar to that of the citrous fruits. The pulp becomes thinner, and poorer in dessert qualities. Our southern provinces, such as Chikuzen, Tosa, Awa and Hyuga produce the largest fruits, equal in size to the larger specimens of strawberries.

Ryukiu 'Isles also produce the best fruits, but none comes from Formosa. There are two varieties, red and white.

GOOSEBERRIES AND CURRANTS.

The cultivated varieties are introduced from America and Europe. The allied species grow wild in the north eastern part of Hokkaido and the south parts of the Kurile Isles and Sakhalin. Their horizontal distribution seems to be restricted to north Japan, but they are also well adapted to the mountain districts of central Japan. I have never heard of their occurrence in our southern provinces, even at high altitudes. They seem to grow and bear the best kind of fruits between 42 degrees and 44 degrees N. L. in north Japan.

BRAMBLES.

Many species of brambles grow quite wild in the mountainous parts of our south and the plains of north Japan and Hokkaido. The wild fruits are gathered and used but no cultivation has been carried on. The cultivation of the bush fruits being still in its infancy, our people have not paid sufficient attention to this interesting branch of fruit culture. There is little demand in the market and no supply in consequence.

MULBERRIES.

Our mulberry plantations increase from year to year with wonderful rapidity for sericultural purposes. Silk-worms are now raised three times a year; spring, summer and autumn crops being not uncommon. The area of the plantations amounted to 2,000,000 acres in 1904. Wood-lands and fields are often turned into mulberry plantations. They are as familiar to our people as the vineyards are to the French. But no cultivation of this plant for fruits has ever been carried on anywhere in Japan. The plants have a very wide distribution from Hokkaido to Formosa.

STRAWBERRIES.

All the cultivated varieties are exotics. They flourish well throughout the country, excepting the extreme south. In the southern littoral districts of Kii Province, with the heaviest rainfall in our country during summer, the plants show often excessive vigour in ample, tall foliage, but always remain fruitless. In other parts of Japan, the strawberries have adapted themselves with ease and have now become a popular fruit in early summer. They require some protection only in winter in north Japan.

FIGS.

Figs grow up to 40 degrees N. L. in Japan. Its south boundary may extend to Formosa, although I have never heard of its growing in the extreme south. They luxuriate with abundant crops between 37 to 36 degrees N. L. From Tokio northwards, the growth is poor. Our growers do not pay attention to their culture, although they prosper well anywhere in wet places along streams and ditches. Our humid climate does not materially affect the bearing of this fruit. Farmers and cottagers plant a few trees in their inclosures. It should be the poor man's fruit in Japan. The figs bear crops only twice in Tokio and like latitudes. The summer figs are marketed about the middle of July and the next crop, with smaller fruits, comes in September and October. In warmer districts a third crop is obtainable. But from Tokio northwards, the half grown young fruits, near the apex of the current year's shoots, shrivel on the coming of cold and drop down.

GRAPE VINES.

We have two distinct species of the wild and cultivated vines. Vitis Coignetiae and Vitis Thunbergii grow wild throughout our country. Cottagers make a kind of wine from

the fruits of the former. It has recently been introduced into England and gained reputation as an ornamental plant. This species is wonderfully prolific in a quite abandoned state, growing together with brambles and bushes. The cultivated kind known as "Koshu" are said by some experts to belong to the vinifera type. They seem, in my opinion, to be an intermediate type between the European and America vines. They are wonderfully vigorous in growth, throwing out shoots over fifteen feet long very commonly when young. The shoots light purple, smooth; leaf stalks and leaves are smooth; canes, light brown when well matured; internodes long. Leaves, large, slightly serrated, smooth on both sides. They closely resemble those of the vinifera type. Though vigorous in constitution, they can hardly rival the aestivalis and labrusca types of American grapes. Bunches loose and long, often heavily shouldered; berries of medium size, slightly elliptical, translucent, deeply amber-coloured, and tinged with purple when fully ripe. Skin thick and tough; pulp soft, rather acid, readily separating from both seeds and skin. Juice colorless and very sugary. It ripens from late September to early October.

Though superior in dessert qualities to the majority of American grapes, and of admirable keeping quality, they are inferior when compared to English specimens grown under glass. The "Koshu", being resistant towards phylloxera, may perhaps belong to a quite different species from the Vinifera grapes. "Koshu" vines are known to have been cultivated now for 900 years in the province of Kai, whence the name has been derived. In the days of the Tokugawa Shogunate, the produce was carried to Yedo on horse-back, across the steep Sasago pass. Of late years, these vines have been grown in other provinces, especially in Katashita (formerly in the near village of Sawada), Province Kawachi, some ten miles from Osaka. In these two centers, the "Koshu" vines are planted mostly on hill-sides or on flat

river bottoms. Not only their aspect, soil and other requirements seem very favourable to them, but the climatic suitability has rendered these regions without parallel for their cultivation. The province of Kai belongs to central Japan, and Kawachi is under the influence of the Indand Sea. Both regions have relatively poor precipitations throughout the year. That is, favoured by the early rise of temperature in the spring the bud starts its growth, favoured by the rains usual in this period, the new shoots undergo rapid and steady growth. Afterwards, though its flowering season falls in our rainy period, in the middle of June the injury is not so great as in Omote-Nippon. On the contrary, after the fruits have set frequent rain would rather favor the growth of the vines and fruits. Dry summer and intense insolation would check more or less the action of insects and fungi. After the rain season, which continues for about one month, our summer, becomes hot and dry until late August; then comes frequently the large amount of precipitations accompanied by storm, and succeeded by the autumn drought; thus favouring their ripening and vintage. The weather of the late autumn differs in Omote-Nippon and Ura-Nippon, as repeatedly shown in the preceding chapter. In the villages of Katsunuma and Iwai, the famous growing centers in Kai, the vines are cultivated on horizontal bamboo trellis called "Tana" in Japanese. These vine-yards have an elevation of some 450 meters above sea-level. The relatively cool, dry, cloudless summer produces grapes famed for their excellent qualities.

Finally, I can introduce to you an indigenous vine, the so-called "Juraku" (or "Murasaki") of Kyoto. The name is derived from a village in the suburbs of Kyoto, where the variety has been cultivated for a long period. The grapes differ from "Koshu" only in color. In this village, vines are peculiarly trained over cottage roofs upon high bamboo trellis, 10 feet or more in height. The "Tanas" are not repaired by the holders or cottagers themselves, but com-

mitted into the hands of professional men called "Budoshi" who annually make rounds of visits in winter from cottage to cottage offering their services. The work of pruning and training are in the hands of the specialists. Thus a good deal of division of labour has been brought about. Our native vines differ widely from those of China and Korea. In these countries, excellent varieties, both of native and foreign origin, are now cultivated with good results. They belong to the true vinifera type and are similar in some respects to English choice green-house varieties.

Viticulture passed many hundreds of years in infancy and the acreage of vine-yards was trifling. During the past twenty years, our viticulture has made large strides in many respects. American varieties, except the resistant vines, were first introduced as also some European varieties; and these have spread through the whole country. Western procedures were blindly imitated. The old, superior vines of "Koshu" have largely been supplanted by the American "foxy" vines, in their growing centers. Even at present, Catawba, Isabella, Concord, Adirondac and other numerous inferior kinds are grown for their early ripening and large crops. No advance has been made on the cultivation of European grapes. Growers are ignorant about the selection of varieties, protection against foes, while planting at random in large areas. Most of these vineyards have resulted in utter failure from various causes, particularly from severe ravages of insects and fungi. The wine made from these inferior "foxy" grapes are rejected everywhere, though cheap. Until recently, the healthiest and most productive kinds of these American grapes continued to remain but the others have vanished from our vineyards.

Aside from the cultivation of American vines, a number of viniferas have been introduced from France. Amongst the vine-yards of this category, an experimental farm of the Central Government has the largest acreage and fullest equipments. It was

a pioneer vineyard with foreign methods. Owing to the good climate the farm has been successful and wine-making promises to be a lucrative industry. Of late years, viticulture of this kind has sprung up in many districts. Among them I may mention the following as the largest and most reliable ones: Iwanohara Vineyard, province Echigo; Fujita Vineyard, Hirosaki, Province Mutsu. Besides, smaller ones in the environs of Yonezawa, Province Uzen; and those in Kai, Shinano and Niigata, and finally their culture in cold vineries in Kaidani near Okayama are all brilliant examples of success of the cultivation of European vines for the market. Cultivation under glass has been carried on for about two decades in the Emperor's Garden. Moreover, in gardens of amateurs, colleges and experimental stations, it has been tried with fair results. Though the vinifera grapes easily grow and fruit under glass structures, they are not perfectly healthy and set freely in the open air in some parts of Japan, particularly in the south and south-east Japan. So it is difficult to get ripe fruits from them, even when the soil conditions are favourable.

The causes of failure have been often discussed by growers and specialists. It is my opinion that the principal cause lies in the weakening of the vines, owing to diverse climatic conditions, especially by poor illumination, dampness both in the air and soil and by the prevailing rain during the flowering period. Lack of heat is responsible only in some varieties like Muscats in north Japan and Hokkaido. It is needless to say that the vinifera type of grapes has attained the highest perfection in the Mediterranean countries, California, and other arid States in the United States.

Similar types of vegetation flourish under similar oecological conditions. Generally speaking, dry summer and moist winter prevails in these countries. This is a radical difference as compared with our own climate. The soils, though variable in texture and in fertility in different districts, appear, however, to be adapted to a proper growth of vinifera

vines. The remedies against enemies are at our disposal. But the vines grow sickly and often fall a prey to their enemies, their tender parts being especially subject to the ravages of micro-organisms. During the period of flowering long and heavy rainfalls are apt to check pollination and prevent fruiting.

Such unfavourable state of things, however, does not appear in many districts of the other half of Japan, the central Japan and the Inland Sea Regions. The above named vineyards of Iwanohara and Hirosaki belong to Ura-Nippon. The vineyards of Iwanohara are located on the table-lands formerly treeless grasslands and long abandoned on account of the lack of irrigation ; but the soil has been found suited to vines. The vineyards as a whole face north-west toward the Sea of Japan. The soil is variable in texture in different parts of the vineyards, and the best fruits are obtained on gravelly loam. Hirosaki Vineyard has been established on flat, alluvial deposits. The finest specimens are obtained from rich, heavy loam with gravelly subsoil. Besides, small vineyards near Yonezawa have produced vinifera grapes, such as Black Hambro', Feher Szagos and Green Hungarian. Both of these vineyards have long since produced choice dessert and wine grapes quite in open air. Mr. Fukuba, Gardener to H. I. M. the Emperor, has told me that it is difficult to grow such fine specimens as those of Hirosaki even by the most experienced hands under glass. The Black Hambro' from this locality have long been in the service of the Imperial Household by special appointment. Besides, the French wine grapes are grown there and fine claret is produced.

In the Iwanohara Vineyards, all of the above named varieties of European, Californian and American origin have been imported during the past fifteen years. Though the relative merits vary according to the soil, season and variety, the followlng sorts are having good success :—

Black Hambro'	Black Malvoise.
Chasselas Rose.	Malbec.
Golden Champion.	Pondicherry.
Golden Queen.	Seedless Sultans.
Golden Chasselas.	Sweet Water.
Muscat of Alexandria.	Charboneaux.
Muscat Hambro'.	Palestine.
Madresfield Court.	Purple Damascus.
Malaga Muscatella.	Flame Tokay,
Muscat Frontignan,	White St. Peters.
Royal Muscadine.	White Nice.
Muscat Rose.	Bowker.
Mataro.	Zinfandel.
Orlean's Riessling.	Pinot Noire.
Johannisberg Riessling.	Black Burgandy.
Sauvignon Jaune.	White Malaga.
Chauche Noire.	Bordeaux Noire.
Griesa.	Semillion Blanc.

For further reference I will show you the table of analysis of these varieties:

Variety.	Date of ripening.	Glucose in must%		Tartaric acid%
		Beaume	Fehling	
Orlean's Riessling	Sept. 20	17.82	16.200	0.600
"Koshu"	Oct. 5	17.50	16.800	0.650
Griesa	„ 5	15.12	—	—
Golden Chasselas	Sept. 22	17.02	16 750	0.670
Golden Champion	Oct. 23	—	19.600	0.410
Sauvignon Jaune	Sept. 22	19.44	18.250	0.450
Seedless Sultana	„ 17	18.00	16.100	0.470
Sweet Water	„ 3	16.74	14.300	0.600
Charboneaux	„ 28	20.16	17.640	0.525
Chauche Gris	„ 20	19.80	19.230	0.600
Chauche Noire	„ 20	19.26	19.230	0.450
Semillion Blanc	„ 10	19.08	14.300	0.450

Variety	Date of ripening	Glucose in must % Beaume	Glucose in must % Fehling	Tartaric acid %
Johanisberg Riessling	Sept. 15	15.68	—	—
Zinfandel	„ 27	18.54	19.800	0.600
Purple Damascus	Oct. 5	16.20	—	—
Palestine	„ 3	18.72	17.580	0.500
Pinot Gris	Sept. 12	18.54	19.230	0.750
Pinot Noire	„ 13	20.52	17.151	0.810
Pinot Blanc	„ 15	18.54	17.151	0.675
Flame Takay	„ 15	—	—	—
Black Hambro'	„ 25	21.96	18.540	0.450
„ Burgandy	„ 17	18.72	18.520	0.450
„ Muscatello	„ 12	19.44	18.520	0.825
White St. Peters	Aug. 27	16.20	13.500	0.413
„ Nice	Oct. 17	—	—	—
„ Malaga	„ 10	15.12	14.300	0.650
Bowker	Sept. 23	—	14.800	0.750
Bordeaux Noire	„ 25	20.70	16.66	0.810
Muscat of Alexandria	Oct. 7	—	19.850	0.425
Muscat Frontignan	Sept. 24	22.96	21.080	0.500
Mataro	„ 20	19.00	18.540	0.650
Madresfield Court	„ 13	18.00	16.500	0.660
Malaga Muscatella	Oct. 9	—	—	—
Black Malvoise	„ 10	18.50	17.500	0.650
Malbec	„ 10	14.76	—	—
„	Sept. 17	17.82	14.300	0.525
Chaseelas Rose	Oct. 13	16.92	—	—
Royal Muscadine	Sept. 20	—	—	—

(After the report of Iwanohara Vineyard).

N. B. The above table gives the maximum percentage of glucose as determined with Beaume's Saccharometer, during the ten years from 1892 to 1902. The same as determined by Fehling's method refers to the crop of 1900 only.

A similar success has been obtained in Kai. Chasselas Rose, Sweetwater, Malaga Muscatella and the like have already been grown with ease on bamboo trellis on hillsides.

Finally, Hokkaido ought to be suited for the cultivation of vinifera grapes as judged from the dryness of the summer, but the lack of temperature sufficiently high to ripen them, has proved an insurmountable obstacle so far.

The fact presented above would enable one to see that the successful cultivation of European grapes in our country is much restricted by the influence of precipitations.

LITCHI AND RIUGANNIKU.

These two fruits are intimately related. Both of them thrive in the warm temperate climate of Formosa and the Riukiu Isles, and up to about 31 degrees and 20 minutes N.L. They also grow in the extreme south of the province of Satsuma, but they are cultivated mainly in regions lying between 30 degrees N. L. and the Tropic of Cancer. Recently, fresh fruits have come to appear in the markets of Tokio about the middle of July. Besides, dried fruits are annually imported in large quantities from South China and Formosa. They are sold cheap in home markets. The plants grow freely out-of-doors in summer from early May to late September in Tokio, but are reared in green houses in other seasons.

GINKGOS (The Maidenhair Tree).

The important Ginkgo fruits are grown neither in orchards nor in gardens. We only gather them from gigantic trees which are left untouched in a quite wild condition. No manuring, pruning and other operations are carried on on these sacred trees, mostly planted within the enclosures of temples and shrines. The plant is dioecious, and two trees at least are necessary for fruiting. People are well aware of this fact and often plant the female trees to the leeward to give them every opportunity for pollination. The plant occurs in

the warmer part of Japan up to 36 degrees N.L. The ripe fruits nearly equal in size to the olives, are buried in the ground to hasten the decay of the pulp, and are afterwards rinsed and sun-dried. The dried nuts of Ginkgo are used mainly in cooking. They are very nutritious, having a peculiar flavour. The demand for them stands next to that of the chestnuts in the home market.

WALNUTS.

Japanese walnuts comprise the three distinct species of Juglans Cordiformis, J. Regia Var. Sinensis, J. Sieboldiana. They grow all over the country, but require certain altitudes to thrive in the warmer parts. They seem to flourish in north-west Japan in a quite abandoned state. The produce from Echizen, Kaga, Echu and Iwate are noted in the market.

CHESTNUTS.

Nothing is so important as chestnuts to our mountaineers and farmers as one of the staple food articles. Aside from their staple use, chestnuts form an important material for Japanese cookery. The dried and shelled fruits, the so-called "Kachiguri" are used after the fresh ones have disappeared from the market. Trees stand neither in orchards nor in gardens, but in odd lands around cottages, river banks, road sides, very irregularly, like the Kaki trees. Only in late years, a few orchards or groves of this fruit tree have been started. Besides trimming, no manuring, cultivation, or protection is given. The trees begin to bear fruit in the third year from germination. They are propagated mainly by seeds, and the art of grafting and budding is rarely performed. They are markedly hardy, healthy, productive and almost free from the attacks of enemies. When the plants become too old to bear good fruits, which occurs about 30 years from germination, they are cut down and turned out as timber. The old trees are replaced with young plants from the nursery grown.

from selected seeds. The nuts in a single burr number at most three. In this case, the two side nuts are always compressed and small, while the middle one is very large. The latter is preferred as seed for wood-trees, while the thin, smaller nuts are always used for the fruit-trees. The thick well developed nuts produce, other conditions being equal, more vigorous seedlings than the smaller ones, fruit later, and produce better wood. The chestnut-trees grow all over the country, except the Riukiu Isles and Formosa. In the south part of Japan they grow only above certain altitudes, but from 35 degrees N.L. northwards they grow luxuriantly in the woods and elsewhere. From 38 degrees N.L. northwards, the native chestnut trees abound in fields and woodlands in a quite wild condition. The region lying between about 35 degrees and 42 degrees N. L. is termed "Chestnut Belt" in view of the horizontal distribution of the plant. Beyond this south limit they grow in nature only in mountainous forests. The chestnut tree is apparently well adapted anywhere within the limits above specified, without regard to the character of the soil and the atmospheric conditions. Their adaptability to soil is without parallel. The great chestnut centers are in the provinces of Kai; Funai, Kita-Kuwada Counties in the province of Tamba, and Shuhi, a western county in the province of Mino. The three regions are also the centers for dried chestnuts.

TROPICAL FRUITS.

Bananas, Pineapples, Jambos, Mangos, and Papayas etc. are grown recently in glass structures in Tokyo. They require heated houses during the winter but grow and bear freely out-of-doors in the hottest summer months even in this high latitude. Their natural distribution is limited to Riukiu, Bonin Isles and Formosa. In the extreme south of Kiushu, they grow in the open air but it is rather difficult to get the fruits even in the most favourable seasons. Allied to the Bananas,

there is a hardy native species, the Musa Basho. This ranges as far north as about 36 degrees N. L. The plants grow in spring, flower in summer and bear small fruits in clusters, but these never ripen even in the far south of Kiushu. With the oncoming of cold, they are frost-bitten, leaving only their subterranean parts intact. They are simply ornamental plants.

CHAPTER III.

The Fruit Soils of Japan.

As stated in the foregoing chapter, our damp and hot summer and cold winter, though less extreme than on the continent, has greatly affected the decomposition and removal of rocks and soils. So, it is not uncommon that soils derived from the same mother rock have widely different properties and further on slopes it frequently happens that the texture of the soil differs in different layers, being clayey at the bottom, loamy in the middle part, and rocky at the top. Such a great variation of soil texture in a small area seems never to occur on the continents. Furthermore, the water-holding capacity of our soils is great and therefore their productivity is highest in rather light and permeable loams, whilst the clay soils commonly regarded as most fertile in Europe, are too heavy for general agricultural purposes, especially in rice fields. There are, however, exceptions to this rule in fruit growing. Some kinds of fruits produce the best crops in heavy soils, thus behaving differently from most farm crops.

The influence of the climate is shown not only in the physical texture of the soils, but also in their chemical composition, which is widely different from that of the soils of foreign countries. The fertilising elements differ greatly in their qualities in the top and the subsoils. They are either lost by washing, or permeate into the subsoil, which always contains a greater percentage of them. According to the observations of the Fertiliser Survey, the contents of phosphoric acid in the arable soil of our fields are only one third of the subsoil contents. Sometimes, it scarcely reaches

to one-tenth of that of the subsoil, as in an old Quaternary field in Kiushu. The case is quite different on the continent; for instance, in an arable soil in Germany and Belgium, the contents of fertilising elements are about equal both in the top- and the subsoil. Also it is an established fact that the top soil is more fertile than the subsoil. The important constituents formed by the action of weathering or added by manuring, thus tend to pass away more quickly than on the continent. But, on the other hand, there is an advantage derived from this quick weathering, viz., that our farmers are able to restore the lost fertility by the art of cultivation, ploughing and trenching in relatively short periods. The rocks may be classified as follows :—

1. Old Eruptive Rocks,
   Plutonic Rocks (Granite, Quartz-porphyry, etc).
2. Young Eruptive Rocks,
   Volcanic Rocks (Andesite, Volcanic tuffs, Volcanic ashes and gravels.)
3. Metamorphic Rocks,
   Archean Formation (Granite Gneiss, Crystalline Schist, Chlorite Schist, etc.)
4. Sedimentary Rocks,
   Paleozoic Rocks (Schalstein, Quartzite, etc.)
   Mesozoic Rocks (Trias, Jurassic, Cretaceous.)
   Tertiary Rocks (Phylite, Tuffs, etc.)
   Old Quaternary (Alternate Strata of Soil, Sand and Gravel. Sometimes covered with volcanic ashes with admixture of humus.)
   Young Quaternary (Consisting of rich alluvial deposits near streams, rivers and seas.)

Formations.	Mountains.	Flat lands (below 15 inclination)	Total area.
	cho	cho	cho
Plutonic rocks	3,862,082.0	774,183.6	4,638,266.5
Volcanic rocks	5,655,850.2	1,959,69.19	7,615,542.1
Archean rocks	1,244,027.6	228,480.8	1,472,518.4
Paleozoic rocks	4,488,836.2	802,935.0	5,291,771.2
Mesozoic rocks	2,370,631.5	638,426.5	3,009,056.0
Tertiary	4,005,492.7	3,496,152.6	7,501,645.3
Old Quaternary	78,787.5	2,542,578.6	2,621,366.1
Young Quaternary	171,779.2	4,331,195.8	4,502,975.0
Total	21,877,487.8	14,775,654.8	36,653,142.6

N.B. "cho" is nearly equivalent to 2.5 acres.

As shown in the table, the volcanic rocks occupy the largest area and the Tertiary formations follow next, whilst the area of the former as flat land is far less than that of the Tertiary. Paleozoic and Plutonic Rocks occur widely, but their area as flat land is comparatively little. The Old and Young Quaternary formations appear to occupy more flat land than slopes.

1. SOILS FROM VOLCANIC ROCKS.

Of volcanic rocks, andesite, basalt, trachyte, volcanic tuff and ashes prevail in this country occupying the widest area. But the larger part of the land occupied by them has large inclinations, that is, flat land with an inclination of less than 15 degrees is 34% of its total area. These flat lands remain still uncultivated as grasslands in north Japan.

Though widely differing in the nature of the rocks from which they were derived and their chemical constituents, most of them are rich in potash, phosphoric acid, lime, magnesia,

alumina and ferrous oxide. Besides, in humus loam of north Japan, nitrogen is present in rather large quantities.

The presence of the low oxidized compounds of iron show an imperfect aeration of such soils and their productivity is low in consequence.

Their physical properties are also inferior in most cases from the agricultural standpoint, being mostly stiff and impermeable when wet and very difficult of aeration. The water holding capacity is generally large. But they are apt to dry up and become very open into deep strata when dry weather prevails.

These characteristics of the soils prove very disadvantageous for fruit growing, unless their texture undergoes radical improvements.

The absorptive capacity, on the whole, is large, especially when humus is present. Experiments show that the presence of humus always heightens the absorptive capacity of the soil, whatever its nature may be. Soils of this category, when mixed with volcanic ashes and pumice, improve more or less in fertility and power of absorption, whilst becoming much inferior in texture and in productivity.

The only exception to this rule is found in Kiusiu, where the poor soils have good texture and have proved productive under good management.

As shown later in the accompanying table, fruit growing is successfully carried on in this kind of soil only in Kiusiu. The loquat and mandarin groves of Sakurajima, a small volcanic island in the Gulf of Kagoshima, the mandarin groves of Ikiriki, near Nagasaki; and the same in Kotemmura near Kumamoto are the only brilliant examples of fruit growing carried on in soils of above category. Outside of Kiusiu, one can hardly find good examples of orchards on soils of this description.

Soils derived from basalt and trachite differ widely in their chemical and physical properties from those of andesitic origin.

In rocks of this category a high percentage of lime, potash and soda has always been found. Their absorptive capacity being moderate, it remains generally inferior in texture, but they can be improved by artificial means, and seem promising for fruit culture.

Soils of trachite origin resemble in every respect those of granite. They are heavier, and lower in absorptive capacity. The physical texture is rather inferior to that of granitic soil but can be improved and turned useful for fruit growing.

2. SOILS FROM PLUTONIC ROCKS.

Soils derived from granite and quartz-porphyry are the principal ones of Plutonic origin. They occupy large areas in the south-west part of this country. Alluvial soils of the same source are also extensive. Lands of this origin have mostly large inclinations, that is, only 1 % of the whole area is flat arable land. Moreover, in south-west Japan where the land is scarce in proportion to the dense population, hillsides with more than 15 degrees of inclination have already been cultivated and planted with peaches, pears, plums and apples. Besides, there are usually tea and mulberry plantations in such places.

Soils of granite and quartz-porphyry origin differ in fertility as well as in texture, but the majority of them are loamy and rather sandy but not clayey. Generally speaking, they are poor in fertilising elements, but are highly productive on account of their good physical properties. The best kinds of rice are always produced in soils of this category, which also produce fruits of good qualities. The trees fruit with the utmost ease, but the fruits tend to dwindle away while rather young if not subjected to proper management. They are also likely to suffer from serious droughts in summer without mulch. Usually, the summits of these hills are thinly wooded or quite bare. Tourists are pleased with the picturesque landscape of the famous Inland Sea Region. Rocky islands

stand out from the water with their naked or lightly wooded crowns. Their arid, red brown summits remain scarcely protected from weathering by the deep-rooted pines. The chains of mountains seen in the background of this grand panorama also show similar features.

The whole scenery is located on lands made of granite and quartz porphyry.

The absorptive capacity of these soils for the fertilising elements is fairly good, but they are poor in phosphoric acid. Hence, in soils of this category and alluvial deposits derived therefrom, soluble phosphates prove less effective, especially in rainy seasons. Thus, our growers are accustomed to use certain phosphatic manures, such as bone meals, fish oil cakes, dried fish, etc. as most effective.

The famous peach and apple orchards of Okayama, Sanuki and Iyo are mostly located on soils of this class. Besides, good orange groves have been established on this soil in Hagi, province Nagato and in Kiusiu, as shown in the tables.

3. SOILS DERIVED FROM ARCHEAN FORMATION.

The archean formations occupy the smallest area in this country and is very fragmentary in its distribution. It consists of gneiss and crystalline schists. The larger part of the land is hilly and only 15 per cent of the whole area is flat land.

The gneiss system includes many kinds of rocks, of which the granite gneiss forms the main part of the cultivated land. It resembles granite, but gives rise to a soil of different properties. In the south-west part of Japan, orange, mandarin and loquat groves are planted in soils of Archean origin.

Paddy fields and farms are rarely met with on such soils. But special plants like the mulberry, tobacco and often "Konniak" (Amorphophalus Riveri) are grown with best results.

Forest trees luxuriate in such soils and the best kinds of wood are grown there.

Rocks of this system are rich in potash and other fertile elements and the soils derived from them have a good texture similar to that of granitic soils. Their capacity of absorption is in general greater than that of granitic soils.

In south-west Japan, lands even if inclined, are made into paddy fields, and where there are irrigation facilities, produce rice of the best quality. In the Province of Kii and Izumi, these slopes are cultivated up to the summit, and planted with citrous trees, arranged in regular terraces.

The Crystalline schist system also form steep lands. The soils are rich in fertile elements, particularly in magnesia. Moreover, they have a large capacity of absorption especially for nitrogen and phosphoric acid. While thay are rich in the fertile elements, the productivity differs widely for different kind of crops, and according to the site of the plantations and the nature of the subsoil. It also varies as to the admixture of gravel. Where the natural drainage is sufficient in elevated situations, or where they are underlaid by a porous subsoil on flat land they have proved highly productive. Moreover, as they usually contain gravel or fragments of chlorite schist, their texture becomes much more improved and productivity is increased. Fruit trees have mostly been grown with complete success in such soils in south Japan, especially citrous fruits and loquat trees as well as vines, both in the quantity and quality of the produce. Besides, the famous growing centers of tobacco, tea and mulberry are located in soils of this category.

They are often too heavy and retentive for rice growing and require improvements of drainage for making paddy fields.

4. SOILS OF PALEOZOIC ORIGIN.

The Paleozoic formations extend through the whole country from Formosa to Hokkaido. They form the backbon of the country and the larger part is much elevated and inclined. The cultivated parts amount only to 15% of the whole. The Soils of Paleozoic Origin may be divided into two classes, from the nature of the mother rocks. Soils from schalstein and quartzite prevail, and they form almost two extremes as regards texture. Schalstein produces clay and quartzite sandy soils. The richness of the former in the fertile elements, indeed, is probably without parallel in this country. It has also a high capacity of absorption. But generally speaking, soils of this category are lacking in the requisite texture. They are too heavy and retentive for rice growing or other farming purposes on level land, unless the drainage facilities are exceptionally great. Thus, the productivity seems variable according to the situation, subsoil, kind of crops, etc. Where the soil has some admixture of gravel or rock fragments and the natural drainage is ample, the best kinds of fruits can be grown, as shown in the accompanying tables. Vinifera grapes, mandarins, oranges, loquats, peaches and pears flourish and yield first rate crops. Most extensive and finest citrous groves, orchards and vineyards have long been established on soils of this category. Moreover, mulberry, tea and other deep-rooting plants thrive best in this soil. Wild tea plants have frequently been found in this soil in south Japan.

Quite opposite to the above, are soils derived from quartzite. They are moderately fertile, but markedly wanting in absorptive capacity. They are exceedingly porous and crops are often liable to suffer from summer drought, except rice plants, which yield crops of higher quality, though less in amount.

5. SOILS OF MESOZOIC ORIGIN.

Of the Mesozoic formations, the Trias system occupies a very trifling area, next comes the Jurassic and finally the Cretaceous has the largest area. Arable soils are largely found in the Cretaceous system. Phyllite, sandstone and conglomerate contribute mainly to the production of soils.

Soils derived from the Trias have a low absorptive capacity but otherwise good physical properties. They are moderately fertile and have proved good for rice fields; but they have no importance for fruit trees in this country.

The Jurassic soils have by far the greatest absorptive capacity, and the physical properties appear to be generally good.

The Cretaceous rocks mostly form gravelly loam, phyllite and sandstone being the main source. About 25% is very gravelly. The soils are very light and open, and are rich in potash, but very poor in phosphoric acid. They are, however, apt to dry up and be subject to drought. They are suited to rice growing but valueless for fruits.

6. TERTIARY SOILS.

Soils of Tertiary origin occur over an extensive area, being next to those of volcanic origin in the area they cover. They are especially common in Hokkaido, north and north-west Japan. Most of these lands still remain in a virgin state. The Tertiary soils of south Japan has already been cultivated.

The Teriary lands have generally gentle elevations, whilst the flat lands covering 48% of the whole area are available for agricultural purposes.

The prevalent rocks of the Tertiary formations are phyllite, tuffs and sandstone. They are rich in phosphoric acid, potash, alumina and magnesia. Low-oxidation product of iron exists in the Tertiary soils of Hokkaido and north

Japan. Their capacity of absorption is very great, especially for phosphoric acid. This is due to the presence of ferrous oxide. The physical properties need to be improved by the addition of humus into the soil so as to make them open and friable, while aeration goes on more easily than in the case of volcanic soils. Generally speaking, though these soils are rich in manurial elements, they are defective in texture, owing to the action of low temperatures.

Where drainage is good owing to the natural situation or the character of the subsoil, apple and pear orchards have shown good results, especially when the soil contains gravel. The soil becomes very stiff and retentive when wet and splits into hard blocks when dry. This defect can be overcome by adding humus or by application of lime in proper quantities.

Amongst the Tertiary soils, those derived from sandstone are of exceptionally good texture, being not so retentive as the above. Those of conglomerate origin are poor both in texture and fertility, and need improvements for successful fruit growing.

7. OLDER QUATERNARY SOILS.

During this period, volcanoes seem to have been very active, hence most of the quaternary soils have admixtures of the weathered products of volcanic ashes. They occur in relatively small areas in this country. They are rich in humus nitrogen, lime and ferrous oxide. While having a strong affinity for phosphoric acid owing to the presence of ferrous oxide, their absorptive capacity for other nutriments is moderate. The presence of iron compounds in the soil would tend to hinder aeration and would prove injurious to vegetation. In north Japan lands of this category remain barren as grasslands or plains.

The case rather differs in the Old Quaternary soils near Tokio, or in the so-called "Kwanto plain." Here the soil readily becomes wet and dry, aeration being checked in the

wet state and the soil drying up to quite a depth, when dry weather continues. The roots of trees can penetrate into a great depth to seek moisture and nutriment. The mechanical resistance to the growth of the roots being much less than in the case of loamy soils, they are apt to grow vigorously and extend farther and wider and deeper into the soil than in the latter case. Fruit trees planted in such a soil commonly develop a few strong roots in place of fibrous ones. Fine, compact root-system can solely be obtained by checking their quick growth by some artificial means. Root pruning, transplanting and pot culture, answer well for this purpose and to promote fruiting in such unfavorable kinds of soils.

Fruits of good qualities can never be obtained from such soils even if rich manuring is done.

In such light, friable soil, however, when mixed with rich humus, root crops have shown excellent results. Long, beautiful specimens of the native radish, carrot, burdock, turnip and the like have long since been grown by the suburban kitchen gardeners of Tokio on such kinds of soils. Their beauty is unsurpassed and they always command a high price in the market.

Thus, the Old Quaternary soils have after all contributed very little to the fruit industry of this country.

8. YOUNGER QUATERNARY SOILS.

They occupy the largest part of the flat land of this country. Agriculture has been most extensively carried on in this soil. The soils differ in their physical and chemical properties according to the nature of the mother rocks.

Generally they have a good texture for fruit growing, but those formed by the action of the sea waves are often too light and permeable, and renders irrigation necessary in dry seasons. The alluvial deposits on river beds have more or less a loamy texture, and are mostly underlaid by porous and

well-drained subsoil. In such a case, they have proved almost ideal as fruit land.

But one exception is to be noticed. Where large amount of precipitation occur in summer, rather light soils prove excellent for the wellbeing of fruit trees, especially on flat land.

The amount of humus tends in our country to increase with the latitude. Soils with humus are rather extensive and the percentage of the humus is relatively high. The alluvial deposits on river bottoms and sea shores are exceptions. The quaternary soils of north Japan, Hokkaido excepted generally contain much humus in particular especially those of Volcanic, Tertiary and Old Quaternary origin. The humus has been gradually accumulated in these colder regions; it decomposes very slowly and the acid is produced as a consequence of the imperfect aeration of the soil.

Soils rich in humus appear to be highly productive and beneficial on the continents, but it is not so in our climate. The humous soils of north Japan may be ameliorated by the addition of lime and by thorough drainage. In the apple growing centers of the north, trees planted on such soils are said to be liable to disease and insects injuries. The soils of Hokkaido are less rich in humus than in the above districts. This is probably due to the dry climate.

Fruit culture in Japan is carried on in any kind of soil, but generally speaking, it is largely conducted on alluvial lowlands on rivers, lakes and sea coasts. Most of them have proved very productive from their native fertility and good texture. These lowlands are occupied mainly by rice fields, and by vegetable farms in the proximity of large cities. Pear orchards under skillful management are also found by their side. The orchards suffer in some places from occasional flood. Peaches and plums are often grown together with pears on such lowlands. Pears do not materially suffer, while the other fruits undergo severe damage. Next, fruits are grown on soils of Tertiary, Paleozoic, Archean and Plutonic origin with

the best results. The area of plantations on these soils is most extensive. Those derived from the Older Quaternaries and from Volcanic rocks are far inferior to these soils, though some kinds of the fruits, have given good results owing to the beneficial action of the climate on the soils from Volcanic ashes with humus give poor results for fruit growing and are entirely disregarded by fruit growers. Soils of Mesozoic origin show intermediate results. Lastly, I show you for further reference the following table:—

N. B.—Asterisk refers to the growing centers of respective fruits.

1. APPLE ORCHARDS.

Prefectures	Districts	Rocks or Formations	Soils
Hokkaido	Sapporo	Alluvial	Sandy loam
„	*Yoichi	„	Loam
„	Takikawa	„	„
Aomori-ken	*Hirosaki	„	„
„	*Kuroishi	Old Quaternary	„
„	Shimizu	Tertiary	Clayey loam
Iwate-ken	Kisen-gori	Clay Slate	Gravelly loam
„	*Morioka	Granite	Loam
„	Ninohe gori	Conglomerate	Humus soil
Akita-ken	*Akita	Alluvial	Clayey loam
„	Gojono-me	—	„
„	Noshiro	Alluvial	Sandy loam
„	Kado	„	Sandy soil
„	Yamada	—	Clay
„	Komagata	Volcanic	Humus loam
„	*Hanawa	Alluvial	Loam
„	*Shibahira	—	Humus soil
„	Ogida	—	Gravelly loam
„	Daigo	—	Humous loam
„	Yamauchi	Tertiary	Loam
„	Asamai	Alluvial	Humus loam
„	Honjo	„	Sandy soil
Yamagata-ken	Tsuruoka	„	Clayey loam
„	*Yonezawa	„	Loam
„	*Yamagata	„	„
Ishikawa-ken	*Kanazawa	„	Sandy Loam

Prefectures	Districts	Rocks or Formations	Soils
Ishikawa-ken	Kanazawa	Alluvial	Gravelly loam
„	„	„	Sandy loam with Limonite
Fukui-ken	Oseki	„	Clay
„	Takamuku	„	„
„	*Nishitsu	„	„
„	*Fukui	„	Gravelly loam
Kanagawa-ken	Kawasaki	„	Loam
„	„	„	Clayey loam
Yamanashi-ken	Obuchizawa		
„	Yutaka	Tertiary	Sandy loam
„	Kofu	Old Quaternary	Loam
„	Mikage	„	Gravelly loam
Nagano-ken	Nagano	„	Loam
„	*Watauchi	Alluvial	Loam
Okayama-ken	*Akaiwa	Granite	„
„	„	Paleozoic	Clayey loam
Kagawa-ken	Kamikasai	Granite	Sandy loam
Ehime-ken	*Gogoshima	„	„

2. PEACH ORCHARDS.

Formosa	Shiran-Ippo	Andesite	Red clay
Miyazaki-ken	Obi	Clay slate	Clayey loam
Ehime-ken	*Gogoshima	Granite	Sandy loam
Okayama-ken	*Akaiwa	„	„
„	„	Paleozoic	Clayey loam
„	Hirohama	Granite	Sandy loam
Hiroshima-ken	*Mitarai	Paleozoic	Sandy loam
Kagawa-ken	Kamikasai	Granite	Sandy loam
Hiogo-ken	Suma	Tertiary	Sandy soil
Fukui-ken	Fukui	Alluvial	Gravelly loam
Kanagawa-ken	Hiratsuka	„	Sandy soil
„	*Kawasaki	„	„
„	„	„	Clayey loam
Tokio-fu	*Rokugo	„	Loam
„	Kabata	„	Clayey loam
Chiba-ken	Ichikawa	„	Sandy soil
Saitama-ken	Koshigaya	Alluvial	Loam
„	Kitakatsushika	„	Sandy soil
Nagano-ken	*Komoro	Paleozoic	Loam
Hokkaido	Hakodate	Alluvial	Sandy loam
„	„	Tuff	„

3. MANDARIN GROVES.

Prefectures	Districts	Rocks or Formations	Soils
Formosa	Shiran-niho	—	Clayey loam
Okinawa-ken	Hajimagiri	Lime Stone	Clay
Nagasaki-ken	*Ikiriki	Hornblende-Andesite	Gravelly clay
Kumamoto-ken	*Kotenmura	Andesite	Clayey loam
„	*Kawachi-mura	Volcanic	Clay
Miyazaki-ken	Obi	Clay slate	Clayey loam
Kagoshima-ken	Kita-Tanega-shima	Tertiaty	Sandy soil
„	*Nishi-Sakura-jima	Volcanic	„
Saga-ken	Kasuga	Granite	Sandy loam
„	Kawakami	„	„
„	Matsu-ume	„	„
„	Kan-Zaki	„	„
„	Koshiro	Hornolende granite	„
„	Kine Shima	Andesite	Gravelly clay
„	„	„	Loam
„	Fujitsu	—	„
„	„	—	Clay
„	Higashi-matsu-ura	Granite	Sandy loam
Oita-ken	*Tsukumi	Paleozoic	„
Fukuoka-ken	Yamada	—	Red clay
„	Kamitsuyaku	—	Loam
„	Yanagi	—	„
„	Hiyoshi	Granite	Sandy loam
„	Minaki	Chlorite Schist	Loam
„	Ukinane	Granite & Basalt	Sandy loam
„	Aka-mura	Andesite	„
„	Tsunoda	Sandstone	Clay
Ehime-ken	*Tatsuma	Granite	Sandy loam
„	Hido-mura	Crystalline Schist	Sandy loam
Kochi ken	Takaoka	Alluvial	Sandy loam
„	Yamakita	Alluvial and Mesozoic	Gravelly loam
Tokushima-ken	Asagawa	Mesozoic	Sandy loam
„	*Tanano	Paleozoic	Loam
„	„	Archean	Clayey loam
Yamaguchi-ken	*Hagi	Granite	Sandy loam

Prefectures	Districts	Rocks or Formations	Soils
Wakayama-ken	Kaiso-Gun	Archean	Sandy loam
"	"	Paleozoic	Gravelly loam
"	"	Granite	"
"	"	Mesozoic	—
"	"	Serpentine	—
Wakayama-ken	*Naka-Gun	Archean	Red clay loam
"	"	Tertiary	—
"	"	Mesozoic	—
"	"	Serpentine	—
"	Ito Gun	Mesozoic Tertiary cryst. Schist	Gravelly loam
"	*Arita-Gun	Mesozoic Paleozoic	Gravelly loam
Osaka-fu	*Yamataki	Tertiary	Loam
"	"	Archean	Loamy clay
"	Minami Yokohama	"	Loam
"	Minami Ikeda	Tertiary	Loam clay
"	*Sennan Gun	Archean	Loam
"	"	Tertiary	"
Hiogo-ken	*Sumoto	Alluvial	"
"	Yura	Mesozoic	Sandy loam
Aichi-ken	*Nezaki	Tertiary	Sandy loam
"	"	Old Quaternary	Clayey loam
"	"	Alluvial	"
"	Mitsu-mura	Granite	Loam
"	Shizosato-mura	"	"
"	Kaminogo	"	"
"	Karukaya	Alluvial	Clayey loam
Shizuoka-ken	*Shida-Gun	Mesozoic	Sandy loam
"	"	Tertiary	Clayey loam
"	"	Alluvial	Loam
Shizuoka-ken	*Ibara-Gun	Tertiary	Clayey loam
Kanagawa-ken	Kozu	"	Loam
"	"	Old Quaternary	Sandy loam
"	*Yoshihama	Volcanic	Loam
Ibaraki-ken	Sonobe	Old Quaternary	"
"	"	Granite	"
"	"	Paleozoic	Clayey loam
Niigata-ken	Itoigawa	Tertiary	Clay
Tottori-ken	Seihaku-Gun	Alluvial	Sandy soil

4. LOQUAT GROVES.

Prefecture.	Districts	Rocks or Formations	Soils
Nagasaki-ken	*Mogi	Cryst. Schist	Gravelly clay
Kagoshima-ken	*Nishi-Sakura-jima	Volcanic	Sandy soil
Chiba-ken	*Namuya	Tertiary	Clayey loam
Tochigi-ken	Himuro	Paleozoic	Gravelly loam
Fukui-ken	Tai mura	Granite	Sandy loam
„	Oshima	Paleozoic	Gravelly Clay
„	Wada-mura	Alluvial	Sand
„	Fukui	Alluvial	Gravelly loam
Hiogo-ken	Sumoto	Alluvial	Loam
Kyoto-fu	*Saga-mura	Old Quaternary	„
„	Nishi-oura	Granite	Sandy loam

5. VINIFERA VINEYARDS.

Aomori-ken	*Hirosaki	Old Quaternary	Loam
Yamagata-ken	Yonezawa	Alluvial	„
Niigata-ken	*Iwanohara	Tertiary	Gravelly loam
Nagano-ken	Kikyogahara	Old Quaternary	loam
„	Ofuse	„	„
„	Nagano	„	„
Yamanashi-ken	*Kofu	Tertiary	„
„	*Katsunuma	Paleozoic	Gravelly loam
„	Takata	Tertiary	Loam
Osaka-Fu	*Katashita	Archean	Clayey loam
Okayama-ken	Kaidani	Granite	Loam

(Compiled from reports of local authorities.)

CHAPTER V.

Indigenous and Introduced Fruits,

NATIVE FRUITS OF JAPAN.

Comprising Fruits of Old Foreign Introductions. Asterisk refers to the native fruits.

1. Kernel Fruits.

1	Japanese Crab	Rinki	Pirus baccata var. mandshurica.
2	„	Ringo	*P. Malus var. tomentosa.
3	Wild Pear	Inunashi	*P. Calleryana.
4	Sand Pear	Nashi	*P. sinensis.
5		Tōri	P. betulaefolia.
6		Zumi	*P. Toringo.
7		Ōzumi	P. sp.
8	Japanese Quince	Marumero	Cydonia vulgaris.
9	„	Kwarin	C. sinensis.
10	„	Boke	C. japonica.
11	„	Kusaboke	*C. japonica var. pygmæa.
12		Kempo-nashi	*Hovenia Dulcis.
13		Sanzashi	*Mespilus cuneata.
14		Ōsanzashi	*M. sanguinea.
15	Kaki	Kaki	*Diospyros Kaki.
16		Mamegaki	*D. lotus.
17	Loquat	Biwa	*Eriobotrya japonica.
18	Pomegranate	Zakuro	Punica granatum.
19	„	Himezakuro	P. nana.
20	Bitter Orange	Daidai	Citrus bigaradia.
21	Kumquats	Kinkan-rui	*C. japonica.
22	Mandarins	Mikan-rui	C nobilis.

23	Pomelo, Shaddock	Zabon, Uchimurasaki	C. decumana.
24	Fingered Citron	Bushukan	C. medica.
25	„	Marubushukan	„ var. chirocarpus.
26		Yuzu	C. medica var. acida.
27	Trifoliate Orange	Kikoku	*Aegle Sepiaria. Syn. C. trifoliata.
28	Sweet Orange	Amadaidai	C. Aurantium

2. Stone Fruits.

29	Japanese Apricot	Anzu	Prunus Armeniaca var. ansu.
30		Ume	P. Mume.
31	Japanese Plum	Sumomo	P. communis.
32	Peach	Momo	*Persica vulgaris
33	Nectarine	Zubai-momo	*P. vulgaris var. laevis.
34		Yusura-ume	P. tomentosa.
35		Niwa-ume	P. japonica.
36		Ko-ume	„ var. glandulosa.
37	Jujube	Natsume	*Zizyphus vulgaris var. inermis.
38	Rose Apple	Hotō, Futomomo	Eugenia jambos.
39	Litchi	Reishi	*Nephelium Litchi.
40		Riuganniku	*N. longana
41	Flowering Cherry	Yamazakura	*P. pseudo-cerasus, var. spontanea.

3. Nuts.

42	Chestnut	Kuri	*Castanea vulgaris var. japonica.
43	Walnut	Hime-gurumi	*Juglans cordiformis.
44	„	Oni-gurumi	*J. Sieboldiana.
45	„	Chōsen-gurumi	*J. regia var. sinensis.
46	Ginkgo, Maiden-hair-tree	Ginnan	*Ginkgo biloba.

47		Kaya	*Torreya nucifera.
48		Mateba-shii	Pasania glabra.
49		Shii	*Pasania cuspidata.
50			Syn. Quercus cuspidata.
50	Filbert	Hachibami	*Corylus heterophylla.
51	Hazelnut	Naga-hashibami	*C. rostrata var. Sieboldiana.
52	White Pine	Chosenmatsu	*Pinus Koraiensis.
53	Cycas cone	Sotetsunomi	*Cycas revoluta.
54		Ichii	*Taxas cuspidata.
55		Onibasunomi	*Euriale ferox.
56	Water Lily	Hasu-no-mi	*Nelumbo nucifera.
57		Hishi-no-mi	*Trapa chinensis.

4. Berries.

58	Grape	Budō	*Vitis vinifera.
59	Wild Grape	Yamabudō	*V. Coignetiae.
60	„	Ebizuru	*V. Thunbergii.
61		Sarunashi	*V. Actinidiae arguta.
62		Hime-Kōzo	*Brousonetia papyrifera.
63		Yama-momo	*Myrica rubra.
64		Nawashiro-ichigo	*Rubus parvifolius.
65	Wineberry	Ebigara-ichigo	*R. phoenicolasius.
66	Brambles	Fuyu-ichigo	*R. Buergeri.
67	„	Awa-ichigo	*R. palmatus.
68	„	Niga-ichigo	*R. incisus.
69	„	Kaji-ichigo	*R. trifidus.
70	„	Knma-ichigo	*R. morifolius.
71	A kind of Cranberry	Koke-momo	*Vaccinium Vitis-idaca.
72	Tsuru Cranberry	Tsuru-kokemomo	*V. oxycoccos.

73		Shashampo	*V. bracteatum. Syn. V. Wrightii.
74		Iwa-nashi	*Epigae asiatica.
75		Gankōran	*Empetrum nigrum.
76	Goumi	Natsu-gumi	*Elaegnus multiflora.
77	„	Aki-gumi	*E. umbellata. Syn. E. reflexa.
78	„	Nawashiro-gumi or Tawara-gumi	*E. pungens.
79		Kwakwatsu-gayu	*Cudrania javanensis.
80	Jap. Gooseberry	Suguri	*Ribes grossularioides.
81	Jap. Currant	Fusa-Suguri	*R. rubrum var. bracteosum. *R. petraeum var. tomentosum.
82	Fig	Ichijiku	Ficus carica.
83		Mube or Tokiwa-Akebi	*Stauntonia hexaphylla.
84	Mulberry	Kuwa-no-mi	*Morus alba, vars.
85		Akebi	*Akebia quinata.
86		Yashabishaku	Ribes ambignum.

5. Miscellaneous.

87	Dwarf Banana or Chinese Banana	Sanjaku-bashō	Musa chinensis. Syn. M. Cavendishii.
88	Plantain	Mi-Basho	M. paradisiaca.
89	Banana or Horse Banana		
90		Yama-bōshi	*Cornus Kousa.
91		Sanshuyu	*C. officinalis.
92		Gozen-tachibana	*C. canadensis.
93		Aogiri	*Sterculia Platanifolia.
94		Mukunoki	*Aphananthe aspera.

DOMESTIC FRUITS UNDER CULTIVATION.

Asterisk refers to those under most intensive culture.

1. Kernel Fruits.

1 Japanese Crab (Rinki)
2 „ (Ringo)
3 Wild Pear (Inu-nashi) Only raised for seeds or pips, whose seedlings are largely used as stocks.
4 *Sand Pear (Nashi)
5 Japanese Quince (Marumero)
6 „ (Kwarin)
7 „ (Boke and Kusaboke) Only as ornamentals.
8 Kaki or Date Plum (Kaki)
9 Loquat (Biwa)
10 Pomegranate (Zakuro)
11 Bitter Orange (Daidai)
12 Kumquat (Kinkan)
13* Mandarin (Mikan)
14 Pomelo, Grape Fruit (Zabon, Uchimurasaki, Jagatara, Buntan, etc.)
15 Fingered Citrons (Bushukan-rui) Mostly as ornamentals in pots.
16 Yuzu.
17 Trifoliate Orange (Kikoku) Raised for hedge plants or stocks for various citrous fruits.
18* Sweet Orange (Ama-daidai).

2. Stone Fruits.

19 Ume.
20 Japanese Apricot (Anzu)
21 Japanese Plum (Sumomo).
22* Japanese Peach and Nectarine.
23 Yusura-ume } Both for flowers and fruits.
24 Niwa-ume }

25 Ko-ume.
26 Jujube (Natsume)
27 Litchii (Reishi).
28 Riuganniku.

3. NUTS.

29 Chestnut (Kuri).
30 Walnut (Kurumi).
31 Ginkgo or Maidenhair Tree (Ginnan).

4. BERRIES.

32* Grape (Budō)
33 Yama-momo (Myrica).
34 Goumi (Gumi)
35 Fig (Ichijiku).
36 Mube (or Tokiwa-Akebi).

5. MISCELLANEOUS.

37* All kinds of Banana (Basho-no-mi).

EXOTIC FRUITS

CULTIVATED IN JAPAN.

Asterisk refers to those under most intensive culture.

1*Apples
2*Pears
3 Quinces
4 Medlar
5 Cherries
6 Apricots
7 Plums
8*Peaches
9*Nectarines
10 Olives
11 Figs
12*Strawberries
13*American Vines
14*European Vines
15 Gooseberries
16 Currants
17 Blackberries
18*Sweet Oranges
19*Lemons
20 Citrons
21 Raspberries
22 Pine-apples
23 Melon Papaw
24 Mango etc.

FRUITS FOR PROFIT

For Home Growers and Farmers.

1**Apples (Occidental)
2**Sand Pears
3 Pears
4 Quinces
5 *Cherries
6 *Apricots
7 *Umes
8 *Japanese Plums
9**Peaches
10 *Nectarines
11**Kakis
12**Loquats
13 Pomegranates
14 *Oranges
15**Mandarins
16 *Kumquats
17 *Pomelos and Shaddocks
18 *Strawberries
19 Gooseberries
20 Currants
21 Pine-apples
22 *Bananas
23 *American Grapes
24 European Vines
25 *Figs
26**Chestnuts
27 Walnuts
28 *Ginkgos
29 *Native Grapes
30 Myricas
31 Olives
32 Lemons
33 Litchis and Its Allies.

N.B. Asterisk shows the fruit trees, nuts and berries, extensively cultivated and immensely produced as general market products. Some of them are exported via Oriental and American ports. Double asterisks show those exported.

CHAPTER IV.

List of Varieties of Leading Fruits in Japan.

SAND PEARS.

(Pirus sinensis, Syn. P. Usuriensis)

(Nashi, Arinomi.)

1 Asahi
2 Awayuki
3 Akarin
4 Awo-nashi
5 Akappo
6 Awo-maru
7 Aka-maru
8 Asashimo
9 Asahi-maru
10 Aka-nashi
11 Arame
12 Awaichi
13 Aworin
14 Asahirin
15 Doyo-wase
16 Gozen-nashi
17 Gosho-maru
18 Heishi (Waseroku, Doyomaru)
19 Hinode
20 Hada (Haneda)
21 Hagoromo
22 Hoshoji
23 Hase (Nagatani)
24 Himewatari
25 Hosoguchi
26 Harukoshi
27 Goshu
28 Hakurin
29 Kinchakutataki
30 Koma (Korai)
31 Kuruma
32 Konowatari
33 Kanno
34 Kansei
35 Kinchaku
36 Kakuto (Kakuzu)
37 Koyuki
38 Kompei
39 Jobana
40 Echu-Hoshoji
41 Minobako
42 Aki-nashi
43 Baba-koroshi
44 Chojuro
45 Doitsu
46 Doyo-kinko
47 Edoya
48 Demono
49 Debeso
50 Ekubo
51 Nakaya
52 Natsu-nashi
53 Hakuteiriu
54 Okoga
55 Okuroku
56 Okusankichi
57 Orisuke
58 Koshukoga
59 Obusa
60 Okuzo
61 Okuma
62 Oshumaru
63 Akashi
64 Tamamizu
65 Shinchu
66 Ichimatsu
67 Imamura
68 Jujiro

69 Kozo
70 Koga
71 Kinriu
72 Kinko
73 Kanaya
74 Kiku-nashi
75 Nijisseiki
76 Shimada
77 Tora
78 Teruyo
79 Tokuzo
80 Tamagawa
81 Toho
82 Taniwatari
83 Otani
84 Ohiromaru
85 Yaemon
86 Ese-Awayuki
87 Zuiken
88 Shirataki
89 Ruizo
90 Meigetsu
91 Hinoshita
92 Marubako
93 Mizukuma (Waseaka)
94 Goto
95 Kobu-nashi
96 Misu-no-uchi
97 Matsuwo
98 Mizu-nashi
99 Yaji
100 Yonezawa
101 Yokogoshi(Yokogoye)
102 Kinae (Kie)
103 Tampo
104 Taihei
105 Tosajo
106 Toemon
107 Rikiya
108 Sekaiichi
109 Sujiaka
110 Taihaku
111 Tosa-maru
112 Torafu
113 Tamago
114 Shiratama
115 Yamamaru
116 Yukidoshi
117 Shimojima
118 Ringo-nashi
119 Sakae
120 Shinose-nashi (Sasase nashi)
121 Nekokoroshi
122 Shokichi-nashi
123 Segawa
124 Shota (Masata)
125 Ueda
126 Tetsubin
127 Reizan

CHOICE DESSERT VARIETIES.

18 Varieties.

Asahi
Chojuro (Decho)
Doitsu (Kinchakutataki)
Gozen-nashi
Heishi
Imamura
Kozo
Kinriu
Meigetsu
Nakaya
Hakuteiriu
Shinchu
Sekaiichi
Taihaku
Shiratama
Nijisseiki
Asahiriu
Okusankichi

ELEVEN BEST DESSERT VARIETIES.

Asahi
Chojuro (Decho)
Meigetsu
Hakuteiriu
Kinriu
Asahiriu

Doitsu	Sekaiichi	Okusankichi
Imamura	Nijisseiki	

26 Choice Market Varieties.

Awayuki	Kozo	Taihaku
Asahiriu	Koyuki	Tamago
Akariu	Mizukuma (Waseaka)	Shimada
Akappo	Nakaya	Segawa
Chojuro (Decho)	Okoga	Shiratama
Doitsu (Kinchakutataki)	Okuroku	
Edoya	Okusankichi	
Doyokiniko	Shinchu	
Debeso	Taihei (Oiran)	
Heishi	Rikiya	
Jujiro		

BEST MARKET VARIETIES.

(15 Vars.)

Asahiriu	Kozo	Segawa
Awayuki	Mizukuma (Waseaka)	Okusankichi
Akarin	Okoga	Kinriu
Chojuro (Decho)	Shinchu	
Edoya	Taihei (Oiran)	
Heishi	Shimada	

7 Select Market Varieties.

Awayuki	Okusankichi	Shinchu
Akarin	Mizukuma (Waseaka)	Taihei (Oiran)
Chojuro		

LOQUATS.

1 Obiwa (Syn. To-biwa)

2 Tanaka-biwa { Maru-mi / Naga-mi }

3 Wase-biwa

4*Shiro-biwa

5 Kogane

6*To-biwa (Nankin-biwa, Shina-biwa, Sakurajima-biwa)

7 Kuro-biwa

8 Yatsubusa-biwa
9 Shinchu
10 Akagane
11 Bankin-biwa
12 Naga-biwa
13 Maru-biwa
14 Kishu-biwa
15 Nakate-biwa
16 Yamato-biwa
17 Okute-biwa
18 Akajiku
19 Awojiku
20*Mizuwo-biwa
21 Ikeda-biwa
22 Todoroki-biwa
23 Sagatsu-biwa
24 Ko-biwa
25 Yama-biwa
26 Yabu-biwa
27*Tamura-biwa
28 Tochiya-biwa
29 Ji-biwa (Syn. Ko-biwa)
30 Kusunoki-biwa
31 Obusa-biwa
32 Kobusa-biwa
33 Kanro-biwa
34*Suisho-biwa (Syn. Shiro-biwa)
35*Mogi-biwa (Syn. To-biwa)
36 Mame-biwa (Syn. Ko-biwa)
37*To-biwa, One-Seeded.
38 Me-biwa
39 Kagura-suzu
59*Aka-biwa
41 Obiwa
42 Bussho-biwa
43 Hiwa
44 Oshima-biwa
45*To-biwa, Two-seeded
46*Ma-biwa

N. B.—Asterisk shows the standard varieties either for market or for pleasure.

BEST DESSERT VARIETIES OF LOQUATS.

1 To-biwa, One-Seeded.
2 „ „ Two-Seeded.
3 To-biwa (Many-Seeded)
4 Tanaka-biwa.
5 Bankin-biwa.
6 Mogi-biwa (To-biwa)
7 Shiro-biwa.
8 Aka-biwa.

Amongst them, first three varieties may be recommended as best in quality.

POMEGRANATES (ZAKURO).

1*Ama-zakuro
2*Shiro-zakuro
3 Aka-zakuro
4 Nami-zakuro

5 Hana-zakuro
6 Hime-zakuro (Chosen-zakuro)

*Standard Varieties.

CITROUS FRUITS.

1 MANDARINES (Mikan-rui).

1*Unshu (Satsuma, Seedless, Rifujin, Nakajima-Mikan)
2 Hira-mikan
3*Kunembo
4 Ko-mikan
5 To-mikan
6*Koji-mikan {Doro-koji / Kin-koji}
7*Kishu-mikan (Kinokuni-mikan)
8 Shirawa
9 Yuko
10*Yatsushiro-mikan
11 Eta-mikan
12 Usukawa-mikan
13 Beni-mikan
14 Kinuji-mikan
15 Daito-mikan
16 Yama-mikan
17 Fukure-mikan
18 Sakurajima-mikan
19*Ponkan }
20 Tankan } Formosa
21 Suikan }
22 Tachibana

N. B.—Asterisk refers to best market varieties.

2 HYBRIDS DERIVED FROM BITTER ORANGES.

1 Asahikan
2*Naruto-mikan
3*Natsu-daidai
4 Tengu-mikan (Shigetomi-Kinkunembo)
5*Iyo-mikan etc., etc.

3. POMELOS AND SHADDOCKS.

1 Yamabuki-mikan (Ujukitsu)
2*Buntan (Bontan)
3*Zabon (Jabon, Zampo,)
4 Jagatara
5*Uchi-murasaki

4. KINKANS.

1*Marumi
2*Nagami

5. SWEET ORANGES.

*Kin-Kunembo (Chosendaidai, Satsuma-orenji)

6. Miscellaneous.

1*Sudachi (Sutachi)
2*Yuzu (Citrus medica var. acida)
3*Hiuga-natsu-mikan.

N. B.—Asterisk shows the leading varieties.

KAKI or DATE PLUM.

According to my recent study there are some 800 named varieties, either sweet or astringent. Now for convenience sake, I will select some useful varieties from this large collection of Kaki.

1*Zenji-maru
2*Yamato-Gosho
3 Toyama
4*Joren
5*Sawashi
6 Aka-gaki
7 Mino-tsurushi
8*Shibu-gaki
9 Rendaiji
10*Nabezumi
11 Eboshi
12 Ohira
13 Edoichi
14 Shimo-shirazu
15 Shimo-Kaburi
16*Imon (Emon, Tarugaki)
17 Koshibu
18 Sato-gaki
19 Shimmio
20*Fuji
21*Fuyu
22*Tenjin-gosho
23 Anzai
24 Bongaki
25*Tendai
26 Mishirazu
27 Beni-gaki
28 Mizugaki
29 Awoso
30 Tamago
31*Hiakume
32 Hiakume
33 Okame
34 Ogaki
35 Hashidani
36 Yotani
37*Sagami-maru
38*Giboshi
39*Saburoza
40 Mizushima
41 Takura
42 Hakkiri
43*Toyoka
44*Gosho-nitari
45 Hassaku
46 Nagara

47 Renge
48*Otera.
49 Tsurigane
50 Shimoneri (Shimo-maru)
51*Hachiya
52 Bonneri
53 Mizi-gaki
54 Koneri (Kineri)
55*Koshu-maru
56*Hagakushi
57*Giombo
58*Gosho (Hongosho)
59*Saijo
60 Shibu-kaki
61 Higaki
62*Mino
63 Koriyama
64*Tsurunoko
65 Kumonosu
66 Kurokuma
67 Hiragaki
68 Watanabe
69*Enza .
70 Koharu
71 Genzan
72 Kyara
73 Issaigaki
74 Jurenji
75*Kubo
76 Usuzumi
77*Tane-nashi (Sane-nashi)
78*Wasehei
79*Daidai-maru
80 Yamagaki
81 Hachwoji
82*Miotan
83 Kawazoko
84*Seihakuji
85*Daitsuki
86*Gottemmaru
87*Egosho
88*Mombei
89*Tsurukame
90*Okame
91*Yamato-gaki

N. B.—Asterisk refers to those varieties best suited for dessert or drying.

APRICOTS (ANZU).

1*Taue-momo
2*Maru-manju
3*Ko-manju
4*Ama-manju
5*Beni-manju
6*Ko-Kinchaku
7 Ko-mikan
8 O-mikan
9*Mame-Kanro
10 Ko-mame-momo
11 O-mame-momo
12*Shiro-momo
13*Shiro-anzu
14 Karakara-momo

15*Beni-momo
16*Beni-chu-anzu
17*Kita-beni-anzu
18 Nagamanju
19 Akao-mikan
20 Ume-anzu
21 Akao-mame-momo
22 Shiro-mikan
23 Maru-kanro
24 Yawaraka-manju
25 Kata-manju
26 Shibori manju
27 Otaki-momo

N. B.—Asterisk refers to the standard sorts either for table or for drying or canning.

Choice Varieties for Drying.

1 Shiro-anzu 2 Shiro-momo 3 Ama-manju

Choice Varieties for Canning.

1 Ko-manju 2 Beni-manju 3 Beni-momo

JAPANESE PLUMS (SUMOMO).

1*Sumomo
2*Urabeni-sumomo
3*Shiro-sumomo
4*Togari-sumomo
5*Wase-sumomo
6*Wase-O-sumomo
7 Benkei-sumomo
8*Wase-shiro-sumomo
9*Ki-sumomo
10*Botankio
11*Aka-sumomo
12 Uchie-sumomo
13 Bunhichi-sumomo
14*Ikuri
15 Shiro-Ikuri
16*Beni-botan
(Terada-Sumomo)
17 Otafuku
18 Kwanji
19 Kishu-dama
20 Hari
21 O-beni
22 O-momo
23 Yedo
24 Genshiro
25*Yone-sumomo
26*Ochiai-botankio
27*Suikwa-momo
28 Sarugawa
29*Beni-sumomo
30 Hayashi-sumomo
31 Yamadoro-sumomo
32 Murasaki-sumomo
33 Hachiwoji
34 Hatakake
35 Oba-Botankio

36 Beniba-Botankio
37 Tane-sumomo
38 Usuki
39 Beni-kake
40 Doyo-sumomo
41 Sashihei
42 Tanebanare
43 Bushu
44 Hange-Otama
45 Hiyatsu-sumomo
46 Oku-Kotsubu
47 Basu-sumomo
48 Daikichi-maru
49 Yrozuya
50 Komugiwara
51 Mugiwara-sumomo
52*Kan-sumomo
53*Yone-bake
54*Ichinari-momo
55*Jinno-uchi
56*Hon-sumomo (Satsuma, Yone-momo, Ushiro-seko-momo, Urabeni-sumomo)
57 Kajiya
58 Konosu
59 Tabiya
60 Bunnemon
61 Biwa-momo
62 Kiauri
63 Ukon-sumomo (Kogane)
64 Kawara-sumomo
65 Katansho
66 Natsu-naka-sumomo
67 Too
68 Kuroya
69 Awada-sumomo
70 Ringo-sumomo
71 Bungo-sumomo
72 Samomo
73 Zenjiro
74 Bekko-sumomo
75*Manzemon
76*Nishida-momo
77*Fujinozaki

N. B.—Asterisk refers to the standard varieties for dessert. Amongst these, best dessert varieties for market are as follows:

Best Dessert Plums.

1 Hatankio (Kelsey)
2 Botankio
3 Yone-sumomo
4 Yone-momo (Satsuma)
5 Ichinari
6 Jinnouchi
7 Ochiai-Botankio
8 Beni-sumomo
9 Terada-sumomo
10 Yone-bake
11 Nishida-momo
12 Manzemon

Six Choice Dessert Plums.

1 Yone-momo (Satsuma)
2 Ichinari
3 Jinnouchi
4 Nishida-momo
5 Terada-sumomo
6 Ochiai-Botankio

Two Choicest Dessert Plums.

1 Ichinari
2 Terada-sumomo.

UME.

1 Ko-ume
2 Yoro-ume
3 Minari-Naniwa
4 Kashiwagi-bungo
5 Bungo-ume
6 Minari-Bungo
7 Oya
8 Sakata
9 Rinshubai
10 Shiro-bana
11 Samidare
12 Su-ume
13 Shiro-Kaga-ume
14 Beni-Kaga-ume

Best Sorts for Pickling.

1 Ko-ume
2 Yoro-ume
3 Shirobana
4 Shiro-Kaga-ume.

PEACHES and NECTARINES.

N. B.—Asterisk shows the leading varieties, grown for market.

1*Tsubame-momo
2*Wase-hange
3*Hange
4*Yama-hange
5 Wase-Kintoki
6*Yanagiba-Kintoki
7*Tobe-Kintoki
8 Akambo
9*Wase-Doyo-maru
10 Yasoji-maru
11 Kusai-Doyo-maru
12*Tanigoro
13*Inada-momo (Kawachi-momo)
14 Kizu-momo
15 Satsuki-momo
16 Sa-momo
17*Toba
18*Kanoko
19*Kuroni
20*Taruya
21 Kawanaka

22 Taihaku-momo
23*Tachiyama-Doyo-maru
24*Kahei-Doyo-maru
25 Oku-Kahei-Doyo-maru
26 Wase-maru
27*Ko-maru
28*Nakate-maru
29 Domen-maru
30 Awoso
31*Shiromomo
32*Yoroi-doshi
33*Amento
34 Wase-Kaminiwa
35 Nakate-Kaminiwa
36 Kam-momo
37 Kio-momo
38 Natsu-momo
39 Aki-momo
40 Chawam-momo
41 Sane-momo
42*Seiwobo
43 Jimbei-momo
44 Hiodoshi
45 Sanebeni-momo
46 Bom-momo
47 Yoroi-gaeshi
48 Kara-momo
49 Fushigaeri
50 Abemmomo
51 Usuya
52 Maruya
53 Nagadairiya
54 Suitari
55 Hioi
56 Hikobei
57*Asahi-maru
58 Okute-Kaminiwa
59 Ke-momo
60 Heishiro
61 Gempei-momo
62 Yedo-momo
63 Yoro-momo
64 Shiratama
65 Tsuwa-momo
66 Sudare-momo
67 Jugatsu-momo
68 Watamomo
69 Benkei-momo
70 Furugiya
71 Kensaki
72 Taihei
73 Kinta
74 Kabuto
75 Kaburi-momo
76 Tango-momo
77 Yani-momo
78 Wakasa-momo
79 Hinode
80 Nagamomo
81 Beni-Kio-momo
82 Tsuyu-momo
83 Tobosaku-Beni-momo
84 Kaizuka-momo
85 Daibutsu-momo
86 Issaito
87 Hachwoji
88 Hange-shirazu
89*Hino-maru
90 Gonzaemon-momo
91 Yotsuya-momo

92 Uma-gao
93*Tachiyama-Kintoki
94 Sozaemon
95 Inubusa

Nectarines.

96 Zubai-momo (Katashi-mo-mo, Katachi-momo, Zunbai-momo, Kenashi-momo, Hadaka-momo)
97*Daicho-momo

NUTS.

Chestnuts.

1 Hiyaku-kujugonichi-guri ("195 Days")
2 Nihiaku-toka-guri ("210 Days")
3*Bon-guri
4 Wase-guri
5 Asagi-guri
6 Shiba-guri
7*Tamba-guri
8 Moheiguri
9*Oguri (Tamba-guri)
10 Hakoguri
11 Sando-guri
12*Shimo-kaburi (Hibuta, Shimo Kazuki)
13*Hanaya-guri
14 Asahi-zakura
15*Otomune
16 Ribadane
17*Higan-guri
18*Fuku-nishi
19 Fujio
20 Ginyori
21 Kuragake
22 Imakita
23 Tamida-guri
24 Chokoji
25*Doyo-guri

N.B.—Asterisk refers to the standard market variety.

Walnuts.

1 Kwashi-gurumi (Chosen-gurumi, To-gurumi)
2 Shishi-gurumi
3 Hime-grumi (Megurumi, Juglans Cordiformis)
4 Oni-gurumi (Kurumi, J. Sieboldiana)
5 Okurumi
6 Shina-gurumi (J. regia var. sinensis)

TORREYA NUCIFERA (Kaya).

1 Omi-Kaya
2 Marumi-Kaya
3 Nami-Kaya
4 Hidarimaki-Kaya
5 Shibunashi-Kaya
6 Inu-Kaya

BERRIES.

GRAPE VINES.

1 Wase-budo
2*Koshu-budo
3 Marumi-budo
4 Nagami-budo
5 Juraku-budo
(Murasaki-budo)

N. B.—Asterisk refers to most important market variety.

MYRICA RUBRA (Yama-momo).

1 Kuma-yamamomo
2 Yamamomo

CHAPTER VI.

Propagation of Fruit Trees.

Nothing is so simple as the propagation of fruit trees in Japan. The familiar methods of grafting or cutting fruit trees are only one or two and performed with highest skill, without seeking after many ingenious modes of foreign origin. Our forefathers had known the art of grafting, cutting, layering and the like, as practised in Europe and America.

Only the art of budding being entirely unknown has remained for us to acquire. With the introduction of western civilization it was introduced among us. It has spread throughout the country with successful results everywhere. Our fruit growers acknowledge its merit through experience but being highly skilled by their ordinary methods of grafting they do not come to rely upon the ingenious methods of budding as is done in the West, except in the case of peaches and nectarines. These two fruit trees being quite stable in the striking percentage attained by our common methods of grafting, even if by most skillful hands they became used gradually to adopt budding in recent years.

The popular methods widely used among our nurserymen and growers are methods of grafting, while by seeds, and by cuttings, stocks are raised. Among methods of grafting, the following are most in use :—

1. Kiritsugi. Similar to the Crown Grafting of Americans.
2. Inarching or Grafting by approach. (Yobi-tsugi)
3. Splice Grafting. (Sogi-tsugi)
4. Side Grafting. (Hara-tsugi)
5. Cleft Grafting. (Wari-tsugi)
6. Cutting Grafting. (Sashi-tsugi)
7. Root Grafting. (Ne-tsugi)

Without going into details of each mode of grafting I will show you our modes of propagation of each fruit. Crabs and apples are propagated by grafting. Many kinds of stocks are used as follows :—

Rin-Ki (Pirus Malus var. tormentosa) Koringo (Baccota var. mandshurica) Kaido (Spectabilis) Inunashi or Yamanashi (P. Calleryana), Kozumi (P. Toringo), Sand pear seedings, Quince (Cydonia Vulgaris) Kwarin (C. Sinensis) Boke (C. Japonica).

Amongst them, Rinki, Koringo, Kaido, Yamanashi and Kozumi are commonly used as best stocks. The season of grafting is long, while the period from March to middle April is said to be the best. Usual time to cut scions is February. The young shoots are cut and buried shallow in shaded and sheltered position for at least one week before grafting. The duration of storing scions may be prolonged at will. Common method of growing stocks is by cuttings, root cuttings, division, layering and by seeds.

Sand pears and pears are commonly propagated by grafting of which Kiritsugi, splice grafting and top-working are mainly performed, Cuttings and layering are seldom used. Yamanashi, Quince, Koringo and Kempo-nashi (Hovenia dulcis), are used as stocks. Among them, seedlings of Yamanashi are exclusively used. Japanese pears do not strike well on Quinces, except a few kinds. Results of double grafting of our pears on quince have lately been cared for in this country. Pears are wide in grafting period. They are grafted in spring from March to early April. Beyond this period they can unite by regrafting, which is often done in May. To cut scions, nurserymen select February. But they may be cut and stored in the preceding month. Shrivelled scions unite rather better than newly cut scions. Stocks are grown by seeds, cuttings and layering.

Quinces are propagated by layering, cuttings and grafting. Yamanashi, Koringo, Pear seedlings and quinces are used as

stocks. Stocks are propagated by seeds, cuttings, layerings and division.

Pomegranates are grown by cuttings, layering, inarching, cutting-grafting and root-grafting. Our gardeners used the same species as stocks. They are propagated by seeds and other means.

Kaki or Date Plums are commonly propagated by grafting, layering, root-cutting, etc. Shibukaki, are astringent variety and mamegaki (Diospyros lotus) are stocks. Common seedlings of sweet varieties are also available. Average season of grafting begins by the beginning of spring. Shoots cut for scions should be stored for some days to good advantage by the same methods as the kernel fruits. Whole parts of scions are never buried in the soil. Stocks are raised by seeds. They are slow in its growth and require at least 3 years from seed to reach graftable size.

Loquats propagated by grafting in which Kiritsugi, splice-grafting and cleft-grafting are commonly used. Besides, cuttings and layerings are familiar methods. Loquats and Quince are used as stocks. By April 10th. we graft them. They may be grafted at once after cutting scions.

Citrous fruits commonly propagate by grafting. Amongst them fingered citrons only propagate by cutting in the open air. Trifoliate orange and Yuzu (Citrus Medica var. Acida) are used as stocks. The former has a dwarfing effect on the scion, while the latter has no such influence. By the late April, just before sprouting they are grafted. Trifoliate oranges are necessary to graft on them after they have begun to bleed. As to other kind of stocks, this rule does not apply.

Peaches and nectarines are commonly propagated by grafting. Lately, growers and nurserymen have adopted budding. Besides, cuttings, layering, inarching are seldom used. By grafting the results are very unstable, while by budding it has high striking percentage. Wild peaches, peach seedings, dwarf peaches (Amento) and Japanese plums are used

as stocks. Amongst them, the two former have been widely used. They are grafted in March. Scions may be cut in January or in February. Late cut scions do not strike well. Stocks are raised exclusively by seeds. Japanese plums are propagated mainly by grafting, while cuttings, division and suckering are often used. They strike well on their seedlings, peaches, ume and apricots. Graft them in the same season as peaches. Scions may be cut before grafting as peach stocks are raised from cuttings or by seeds. Japanese apricots propagate by grafting. Other means are seldom used. Seedling apricots and Japanese prunes are best stocks. Besides, umes are often used. Graft them in March and treat the scions as in peaches.

Ume trees are commonly grafted on wild species called "Yabai", Bungo-ume and Naniwa, and another wild variety. The latter roots freely by cuttings. Besides grafting, cuttings and division are used. They are best grafted in the middle of March and afterwards till the end of the month. Graft at once on cutting scions. Cherries are grown by grafts. Other means are rarely used. Wild flowering cherry (Prunus Pseudo-cerasus var. Spontanea), Yoshino (P. Pseudo-cerasus var. Sieboldi), Higanzakura (P. Miqueliana) and Fujizakura (P. Incisa) are common stocks. Among them, the last one has a markedly dwarfing effect upon cherries as your mahalebs. Late February or early March are the best season to graft. Care as regards scions are similar to peaches. All sorts of cherries are easy to strike. Stocks are readily grown by cuttings.

Yusura (P. Tomentosa) is an ornamental shrub. Also its fruit being palatable like cherries, it is much admired by the people.

They are easy to propagate by division, cutting and layering. Grafting is rarely used. They unite well upon peaches.

Niwa-ume (P. Japonica) has a similar habit as above and is similarly propagated.

Jujube propagates by seeds, layering, division and cuttings.

Myricas are grown from seeds, root cuttings, layering, division and grafting. The same species are used as stocks.

Chestnuts propagate by seeds, inarching, side-grafting, cutting-grafting and other means. Wild chestnuts and common seedlings are used as stocks. Graft in March. Scions have to be cut and stored for about three to five weeks before grafting.

Japanese walnuts are propagated by seeds. In the case of grafting, walnuts are used as stocks. Ginkgos are propagated by seeds. Grafting is seldom used. They are grafted on Ginkgo by Kiritsugi and splice grafting.

Torreya are grafted by inarching on its wild species. Seeds are often used to grow them.

White Pines (Pinus Koraiensis) are grafted by inarching or cleft grafting upon wild-grown black pine (P. Thumbergii).

Vines have long been propagated by layering in its growing centers of Kai. Cuttings, division and grafting are also familiar methods. Eye-cuttings have lately been introduced from Europe. They are grafted on other grape cuttings or on the wild grape (vilis Coignetiae). Cuttings are best done from November to May. But late February to March is best to make them root. Graftings are best performed in March.

Mulberries are grown by division, layering, cuttings and grafting. They are very easy to strike. Divide in May, when shoots have grown 1 foot or more. Cutting is done in February. Graft at the same time.

Goumi are easy to divide while cuttings are also easy. Work in spring before sprouting.

Japanese gooseberries will propagate by suckering, cuttings, layering and division. Insert cuttings in beds in February. Mound in May around the shoots, and then divide.

Brambles readily propagate by suckering and cuttings Begin the work before sprouting.

CHAPTER VII.

Modes of Pruning and Training Fruit Trees in Japan.

Favored by natural facilities our fruit growing has long been neglected in every side of its management. Of our leading fruits, those readily bear have always been left alone to its growth without legitimate practice of prunning and training. Such examples are citrous fruits, loquats, plums, apricots and apples. On the other hand, fruit trees of late fruiting quickly degenerate without those treatments, for instance, pears, peaches and vines have long been cultivated with more or less pruning and training. Date plums have often received pruning but the large part remains in their natural shape and stature.

Our modes of training differ widely from those adopted by the western nations. The prevalent forms of training fruit trees are restricted to "Tanazukuri" (similar to your "table cordons") for such kinds of fruit trees as bear on spurs as well as for vines. It is a mode of training on support and mainly carried on for pears and vines. Apples and plums are often trained by this system. Besides these, peaches are grown nowadays after regular modes of training, while they require no support and stand firmly as a dwarf bush. They receive some pruning every year to be trained after the so-called open-centre system.

Thus, a few kinds of fruit trees alone receive more or less pruning in a regular manner, whilst others grow quite untouched. Citrous fruit trees, loquats, date plums, cherries, apricots, Ume trees, plums, quinces, chestnuts, walnuts and

moreover, pears, and apples in some localities are left quite untrained.

So, it is not uncommon in our orchards that pears, date plums, chestnuts and citrous fruit trees have acquired the defective habit of fruiting in alternate years. Such a state of things, the majority of our growers believe due to Nature and irreparable by man.

Even if quite abandoned, some kinds of fruit trees as loquats, mandarins and chestnuts make rather handsome trees, being regular in their modes of branching. But they bear in alternate years; uniformity of size and quality of fruits, it is clear, are impaired in such an unpruned tree. So long as growers remain indifferent to modern methods fruit growing in a strict sense is nowhere seen in this country.

Of most irregular shape, are date plums, ume trees, apricots and plums. They have crooked stems straggling in a most curious manner. Trunks are often decayed and hollow in the centre. It has long been admired as an ornament by some people. Such a diseased condition of trees is not only worthless but rather injurious to the welfare of fruit trees. Indeed, our gardeners always turn their attention to the pruning and training of ornamentals while quite neglecting the care of our fruit trees.

Training trees for ornaments or the pruning of flowering plants have advanced through a long period among our gardeners. Topiary works on ornamental evergreens and pot-grown plants have already had a wide reputation in the world. Our people admire some fruit trees for flowers rather than for fruits. Gardeners always devote care to novelties to meet their demands, while neglecting attention as to their pomological value. For example, our peaches, ume trees and quinces flourish in flowering varieties but are markedly poor in those for fruits.

Such a circumstance would have induced our fruit growing to remain in its infancy and has at least partly checked the progress of our orchard work.

As above stated, pears and vines are trained on the horizontal trellis made of bamboo canes and supported on wooden posts. Recently they have been replaced with wire trellis in some localities. It is called "tana" and such a mode of training is called "tana-zukuri." Its height differs in localities and by the kind of fruit, but generally it measures 5-5. 5 ft., equal to the average height of our adult man. Women and children can work on the trellis by the aid of ladders or high wooden shoes, very popular in this country.

The training on supports, being restricted to the tana-training, our growers, especially those near cities have always be skillful. In a pear growing centre in the vicinity of Tokio there are trees over a century old, grown by this system. The present system of training is recorded to have been practiced by our fore-fathers. It has spread among our growers throughout this country in favour of easiness to get the material of construction as well as the simplicity of its own method. Bamboo canes, the principal material can be got anywhere by every farmer and grower. It has long been the custom to grow it for the purpose of cropping young shoots as spring vegetables and for windbreaks or the protection of river embankments. Thinned canes are used as materials. Even the small farmers can get them cheap.

Tana is constructed with long bamboo canes set about 1-2 ft. apart crosswise, and fixed unmovably with straw twine. It requires for the construction rather large amount of labour, while it does not much trouble our growers since it is usual to make the trellis in winter.

Young trees from the nursery being planted in a regular manner, are manured and subject to their own growth as such for three or four years to make them root well. When the trees are fully established with strong a root system, they undergo their first training. Among those shoots, growing erect on the top, those emerging about 5 ft. above ground are bent and fixed in position with straw twine on the trellis. Afterwards,

these shoots form the arms. Several shoots thus trained are fixed almost equidistant from each other. On each arm spurs, or the like growths readily start, while any effort to encourage their growth is quite unnecessary.

By this means, the arms being equal in condition, are easier to bring them into equilibrium of growth and thus fruiting condition than other systems, such as palmates, cordons, etc. Moreover, the symmetry of the tree can be easily restored even when the arms are lost by some accident, as in the fan-training.

Canes are durable for some five years, whilst straw twines have to be renewed every year during winter.

Arms, shoots and fruit spurs undergo renewal pruning at times in winter. In some parts, where trees are planted on rich, deep alluvial deposits, they are shifted and transplanted at intervals of 4 or 5 years, to check and moderate their luxuriance and to turn them prolific.

Besides repairing and tying new shoots on the trellis, light winter pruning is performed. No summer pruning is done by many growers. Fruit thinning, bagging and destroying insects are rigorously practiced by them. Of late years, poultry and sometimes swine are driven beneath the trees to make them feed on insects and vermin. In such a case, strong protection around the trees is of course necessary.

As regards the bamboo trellis there are two ways of construction. In the pear centres in the vicinity of Tokio, the trellis covers the whole plantation, whilst in orchards near Kyoto and Nara it has the shape of long rectangles which run parallel to each other. Between consecutive tanas, long narrow spaces are left and used for paddy fields. In the growing season of rice plants, water stands close to the pear roots, the difference of height between the tree crown and the water level being only one foot. Also the soil is markedly clayey, and pear roots remain markedly shallow. Consequently, they come to show signs of bearing while quite young, but they dwindle away some ten to fifteen years after the planting.

That is, trees begin to bear in the second year from planting. Growers let them fruit at such an early period. They are impatient, indeed, to get some return from them as soon as possible. Shoots emerging beneath the trellis are all retained to cause a large yield as soon as possible. Thus, the outlines of trained pear trees differ widely in two districts in the east and the west. The relative merits of these two systems of tana are still open to discussion and dispute among growers. Besides pears, plums and vines can be well trained by this system. Plums are grown lately by this method in Terada-mura near Kyoto. All those fruit trees which bear on fruit spurs can be similarly trainable. By this mode of training, it is clear, that early and profuse bearing can be brought out only with light pruning.

In some parts of west Japan where pears are grown on steep hillsides tana being made along the slope so as to cover the hillside and the leafy canopy covering the trellis protects the crop growing beneath it against heavy winds. In this case, the fruiting portion mainly seats under the trellis. Grapes until recently have exclusively been tana-trained. Its remarkable scenes are visible in growing centres of Katsunuma, Iwai and other villages in the Province of Kai and Katashita vineyard not far from Osaka. In the former, vines are widely planted at the rate of 40 trees per acre, while in the latter it numbers 120 vines per acre. In such a wide planting vines run freely on the trellis. Winter pruning, stopping, suckering, pinching or rubbing of surplus shoots, thinning and other treatments are regularly performed. Owing to the vigorous habit of the vine wide space is given to its free growth. Long pruning answers well. Thus, keeping moderate its growth makes it enter soon into a bearing condition.

Lately, foreign modes of training are being adopted among our vineyardists who grow foreign varieties for the purpose of wine-making or dessert. Their comparative merit, however, is quite open to future discussions.

The system of Tana-training has widely spread in this country, except those districts with heavy snowfall. In north-west Japan where heavy snowfalls occur, trees are trained to the irregular standard, branching its arms above the normal depth of snow. In some parts, twigs are bundled together before winter comes.

Grape vines in these territories are always mulched in the late autumn to prevent breakage of canes. By the above statements, tana-training seems to have sprung into wide-spread favor in virtue of the following merits:

1. The convenience of management, harvesting and control of enemies.
2. The simplicity and durability of the construction.
3. The easiness to induce trees to the fruiting condition.
4. The easiness and cheapness of getting material.
5. The prevention of damages by the storms prevalent in our country during late summer or when approaching harvest.
6. To secure the maximum surface in order to enjoy the full sunshine on the tree.
7. To protect against heavy rainfall during the flowering period.

Situated in the usual course of storms which attack our islands several times a year, our fruit growers have to protect themseves against serious damages. The heaviest one usually attacks about late August or early September. Fruit trees, particularly those without support suffer from the attack not only by losing their crop, but followed by injuries on the next years crop. Pears and apples near the seashore are covered with salt upon the foliage. It becomes brown and drops down prematurely, while the roots are still acting. Buds for the next year are forced to expand and flower in consequence. Fruit sets but can not grow, thus rendering the crop quite worthless. Thus it is not an uncommon event to our growers to lose their expected crop for the following year.

Peaches and nectarines have long been cultivated with a little care as regards pruning and training, but during past twenty years modes of treatment became improved and careful. Trees are mostly of dwarf bush form with an open centre. Still no summer pruning has been carried on.

The yearling trees are planted on stocks previously planted and grafted or budded. On planting, tap roots are removed. Watersprouts and suckers remain unpruned in the first winter pruning, whilst such strong growths are trained in position bending them down with straw lines, to keep the center spreading and open. Bending of shoots is adjusted according as the vigor of the shoot. Thus, the growth of the shoots being regulated, an equilibrium of growth can be acquired with ease. These modes of training which mainly aim at the early fruiting though simple and imperfect from the ornamental point of view, seem to answer well fort he purposes of our cottage farmers or small growers.

Citrous fruit trees and loquats are also left alone. They receive only manuring, mulching, cultivation and seldom spraying. But they produce an immense crop in alternate years. Lately, our veteran growers have become acquainted with the necessity of pruning for the well-being of the tree and come to practice the work in some parts.

Kaki has until recently taken leadership among our orchard fruits. They have been a most popular and wide-spread fruit for a long time. But their culture under rational treatment is of quite recent origin. Sweet varieties serve directly as dessert, but astringent ones become eatable as sweetened by curing or other processes. Cured products still have a large demand in our market. To cure, each fruit is peeled and sun-dried, suspended on straw twine. To facilitate this process, a bit of shoot remains attached to each fruit stalk like the letter T, and by this method the fruiting shoots are broken with the fruits. This process of breaking shoots has become by chance a mode of pruning. A far better

results have always been obtained than when the fruit alone is gathered. In the meantime, some growers became well acquainted of this fact and came to adopt this process. In Tomo-o-mura, a date plum region between Kyoto and Nara, an expert called Tajuro Yoshioka has independently brought about the same process and succeeded in renovating worn-out trees in his village. Afterwards his method has been improved. A medal was awarded his work at the Industrial Exhibition in 1895. His first method has nothing different from the process already practised in other localities. By his method, every fruiting shoot is broken at its own base, while the sterile or non-fruiting ones are left unpruned. By this treatment, new vigorous shoots start from buds of the remaining part, the next spring. They do not fruit in the same year, whilst they grow vigorously and develop plump and well-matured buds on the apex as well as the leaf-axiles of them. These buds, especially a few near the apex are always entitled to start fruiting shoots in the next year. On the contrary, as the fruiting shoots are left unpruned after harvest they being exhausted would start weak, slender sterile shoots in the next spring. Sometimes they would perish, worn-out by the overwork of fruiting. Next year again, if these weak shoots are left unpruned, worse results would follow. In such a manner, when no pruning is done, weak shoots grow in turn near the apex of the preceding ones until at last the tree abounds in weak and valueless shoots. Fruit borne on such a shoot is worthless or liable to drop down prematurely. In some varieties, for example, Zenji-maru, the pistillate flower always appears on the stronger shoots, whilst the staminate ones are always borne in clusters on weak, slender shoots. Thus, it is necessary to get the strong shoots by means of pruning (breaking) worn-out shoots to increase the yield, and make its growing profitable. Trees represent in this case a typical weeping appearance and quite differ in this respect from those grown under regular pruning. Yoshioka's first

method of pruning (breaking) shoots is nothing sort of the spur pruning of the fruiting shoots and quite similar to those commonly practised on the fruiting canes of vines grown under glass.

As you are aware, the Kaki tree has a similarity as to the habit of fruiting to the vines. It bears on the leaf-axiles of rather stronger shoots of the current year growth, which start from a few well-matured, plump buds near the apex of the mother shoot. That is, flowers are borne at most on the four nodes, from third to sixth from the base of the shoot. Weak, spur-like shoots are always sterile, while extravagant shoots of excessive vigor also have no fruit. Generally speaking, well-matured shoots of moderate length which have been sterile in the current year alone, are privileged to start fruiting shoots in the following year. Thus, we have to depend only upon the well-matured shoots and aim to produce such kinds of shoots as much as possible.

By this reason, renewed pruning or at least the breaking of shoots is of significance in the successful growing of Kaki trees.

Of late years, Mr. Yoshioka has brought out his second method of pruning by which better results have always been obtained. It consists of breaking the mother twig from which several fruiting shoots start. It differs from his first method only in severing the system of those shoots, not every fruiting shoot. By this process, shoots starting from the remaining parts grow more vigorously and improved results are always obtained by such a severe process rather than the former method.

By such means, the habit of alternate year fruiting is not corrected. Thinning fruits, in this case, answers well to correct this defective habit and let them bear uniformly every year.

In the vicinity of Tokio, are found its growing centres. Among them, two villages, Komae and Noborito, have long since co-operated in a curious manner to lessen and regulate the yield in order to avoid glut in the market. Owing to the

over-supply of fruit in the fruiting year no one can sell the produce at a paying price. To overcome this difficulty one of those villages ventured to practice the removal of flowers while young in the fruiting year and thus bring forth a crop in an off year by such an ingenious method. In such a way, Kaki trees in both villages come to bear in alternate years. Two villages do not agree in the season of bearing. Thus, the fruit market in the market being well regulated a glut in the market could be avoided.

Such a procedure seems to have been derived only from considerations of individual economy of the grower; but have not sprung from the co-operative idea of both villages.

It has long been said among our people that Kaki trees dislike pruning by knife or iron tools. This erroneous idea has spread and it is still maintained by our growers. The idea seems to have sprung from the fact of dull healing of wounds in the root, as well as the brittleness of shoots. They are indeed liable to suffer from severing of the roots in particular.

I have, however, had opportunity to practise knife pruning and succeeded in getting more handsome trees than in breaking shoots.

CHAPTER VIII.

Some Routine Operations in Japanese Orchards.

Of the ordinary processes in our orchards, irrigation and drainage, "bagging," manuring, cultivation, hoeing, protection against enemies are rather peculiar and noteworthy. Above all, the process of bagging has been extensively adopted by our growers as a preventive measure against insects and fungi. In this method, all fruit left after the final thinning is covered with small paper bags made of old newspapers or of "mino-gami," a strong Japanese paper. The bags are provided with fine holes in the corners to let out rain-water freely, and to prevent breaking.

Bags without bottoms are preferred by some. In South Japan, where peaches, pears and grape-vines are largely grown, bottomless bags made of newspaper are widely used. Near Tokio, growers use another kind of bag, made with native paper treated with "Kaki-shibu," a juice expressed from Kaki fruits. This juice make the paper water-tight, and from its antiseptic quality is extensively used for many purposes. The growing of date plums for the express purpose of obtaining the juice is extensively carried on in some parts of this country.* When newspapers are used, new bags are annually supplied, while in other cases they are only partially renewed, the same bags being used for three years or more until they are worn out.

An immense number of these bags being prepared, growers are always ready to use them at the right time. The time of bagging varies for different fruits. Lately, bagging has come to be done very early, to minimize insect and fungas injuries.

* Bull. of Our College, Tsukamoto:—On the "Kaki-shibu".

For instance, it is a good time to bag peaches by the end of the stoning period, whilst we are accustomed to begin the work of bagging much earlier, just as they reach the size of a ripe cherry.

The primary aim of bagging was to protect the fruits from injuries. It is recorded in our old writings used a long time ago by our forefathers. But it is now known that by this process, the growth of the fruit is favored and the ripening is accelerated by several days.

Morever, the skin remains very thin and delicate, and the fruits are larger in size, and above all they are more uniform, whether exposed or in shade, a point of high importance in the market.

There are still many other advantages derived from bagging.

Many kind of enemies increase rapidly in our favorable climate, and have to be contended with to insure success. These operations become sometimes very troublesome, and consume much time and labour beside entailing additional expenses. Moreover, they have to be performed over and above the primary occupation of our farmers and cultivators, which is rice culture. It is therefore too much to expect them to devote a large amount of labour to orchards or invest much capital in spraying and like operations. The wide-spread adoption of the process of bagging is to be attributed to these circumstances, as the simplest, most economical and most effective means for the protection of fruit.

The paper bags are removed at the harvest. In the large centre of orchard fruits between Tokio and Yokohama, the work is done several days prior to the harvest, in order to bring out the full colours of the fruits.

The work of bagging is exclusively done by women. A skillful hand can work 1500-2000 bags a day. Even unskilled hands can bag 500-700 peaches or pears in a day. The mouth of the bag is closed on covering, so as to keep out the enemies, and tied with twine, such as that of " Riusiu " (Scirpus triqueter,

L.), or young leaves of "Shuro" (Trachycarpus excelca, Wendl.) or with fine zinc or copper wires.

Bagging is mainly practised on peaches, pears and apples, while early varieties and those with hard flesh and less sugary contents are always grown uncovered. Recently, the vine growers of Kawachi and Kai have begun to adopt this method as a preventive against the so-called Oidium fungus. In this case, long bottomless bags covered inside with light sulphur paste are used.

The results have been fairly good but the superiority of spraying with Bordeaux mixture is also known.

Trials made with the Kaki fruits have proved that bagging is effective against premature dropping of the fruits due to insects and fungi. Morever as stated above, thin skin, smoothness, large size and uniformity of quality can be secured.

IRRIGATION AND DRAINAGE.

Our damp climate greatly reduces the neccessity of irrigation in summer. Though abundant water is one of the essential conditions for rice plants in their growing stage, there is very little need of it for orchards. The extensive irrigation system of the orchards of such a region as California, is a wonder for our home growers and is beyond their imagination.

Only those pear orchards which are located on sandy soils in river beds and seashores require some irrigation in midsummer. Even plantations on steep hillsides do not require much of a water supply in summer, while a light mulch is seldom necessary in this case. Cultivation and light mulch answer well in this case. Heavy mulch often injures the plants, the exclusion of the heat and light only favoring the work of fungi and vermin. Covering the ground to protect them from drying, such as is done in America is wholly unnecessary in our country. The essential point is to keep orchards clean and bare in most seasons, except during some short periods of severe

summer drought. We have to make use of the energy of the sun as much as possible and to take advantage, in every possible case, of its benefits.

Aeration of soil should be encouraged by every means. Drainage is the first thing to be considered for the welfare of fruit trees. Our orchards generally have excellent open drainage. Gutters run regularly beneath the horizontal trellis of our pear orchards. On stiff loamy soil, good results are obtained by planting trees on mounds or on ridges, so as to secure good drainage and active aeration. Underground drainage also answers well in this case. All these processes are important in regions with heavy precipitations, as in the south, and in the cold regions of the north in particular.

CULTIVATION AND HOEING.

These operations are done only by hand with small tools. Horse power and large implements such as are seen on the Continent, are never used in fruit plantations in this country.

The frequent rain and hot summer increase the trouble of weeding more than on the Continent. A large amount of labour is necessary to keep down the weeds in summer, especially in the rainy season. Farmers therefore strive to finish hoeing before the rain season sets in. The cultivation of orchards is also carried on by hand. It is performed in order to loosen the surface soil and assist in its aeration, and not to lessen the evaporation and prevent drought. Frequent rains are indeed apt to harden and cement together the surface soil, which is harmful to the well-being of fruit trees.

MANURING.

The application of manures to fruit trees has been long neglected, although manuring has been an important item in rice growing. Only recently, with the rapid progress of our fruit industry, experts have begun to pay attention to this subject

and are studying the effects of different manures on the quality and yield of fruits.

Chemical fertilizers have become familiar among growers, and phosphates have proved effective on some kinds of fruits, while other kinds of fertilizers have not been much used.

Night soil, stable manures, litter and weeds from the roadsides or meadows were almost exclusively used. Until recently there have been meadows reserved for the common use of each village. In some parts large quantities of weeds and under-growth are put thickly beneath the trees to serve as manure. The insufficiency of these manures has come to be acknowledged, and improvements are being introduced. Sea weeds are also often employed.

The application of potash, lime and other mineral ingredients as fertilizers is of great importance in this country, especially for fruit growing. But the majority of our growers and farmers still seem to be ignorant of it. Beside the customary use of night soil and stable manures, wood and straw ashes, rape seed cake, soy bean cakes, fish oil cakes are used more or less. Fish manures can now be supplied rather cheap. Fish manures have also been imported from America in recent years. Bone manures are seldom used in our farms and orchards, since cattle raising is hardly developed in this country.

Generally speaking, the majority of our farmers and growers are still ignorant of the use of manures for fruit raising, and no serious attention is paid to it, as in the case of rice culture.

Some experts have, however, made experiments on the relative value of different commercial fertilizers on orchards and other crops.

Particular kinds of manures, the nature of which is kept secret are also used by some. For citrous fruits, for example, an expert grower in the Province of Kii is said to use common salt to promote the keeping quality of oranges and mandarins. The first results were strikingly good, and since that time he

has continued its use. Besides, it is an established fact that the application of potash in reasonable quantities improves citrous fruits in many respects. Oranges and mandarins treated in this way improve in flavor, appearance and keeping quality. They also become much sweeter and agreeable to the taste; the rind becomes of a deeper color, thinner, more smooth and better attached to the pulp. The improved keeping quality is, however, the most important point.

I have heard also from the communications in an English Journal* that lemons improve in quality when soap-water is applied as manure. From these facts, it probably follows that the application of alkali in reasonable quantities improves markedly the quality of citrous fruits.

The above results have been verified in the Experiment Stations at Okitsu, and similar results have also been arrived at by others. This fact is well known to our growers in citrous centres, who use ashes and other potash manures.

Besides, our farmers are accustomed to use salt to date plums as a remedy against the premature dropping of the fruits. They bury empty salt packages, made of straw, near the roots or tie the package on the stems. Saline water is said to be often poured around the trees.

Though accurate experiments have never been made to prove this fact, I can say that the dropping is caused by the rapid growth of the shoots and roots as well as by the want of some nutriments. According to Dr. Yamada, chemist to Fukui Experiment Station, Kaki trees in off years are markedly poor in phosphoric acid and magnesia, and also deficient in soluble carbohydrates, proteids and amides. Particularly, the amides and magnesia show remarkably low percentage in off years.† From this fact the importance of magnesia salts for the bearing of date plums is clear. Thus, it is necessary to give such salts to exhausted trees in off years to improve fruiting in

* Journal of the R H.S. Vol. Part 1905.

† Report of the Station, No. 1, 1903.

the following year. Our custom of burying salt packages near the roots are justifiable from this point of view, because a mixture of sodium and magnesium salt is present in them. Furthermore, the dropping occurs when the shoots have grown with rapidity. It always happens in the rainy season, from the middle of June to July, when the roots are in great activity. In this case an abundance of soluble salts in the soil would retard the absorption by the roots. "Mixture of salts impedes absorption more than pure salts, and certain kinds, for example, sodium chloride, act more energetically than others, for example saltpeter," says Prof. Schimper.* "Sodium chloride acts on the vegetable organism in part physically, since like other saline solutions it impedes the osmotic absorption of water through the roots, and in part chemically, as after its entrance into the cells it affects metabolism." "Hansteen has made it probable that sodium chloride, as well as potassium chloride, stands in a certain relation to the manufacture of proteids from amides and carbohydrates."

From these results, it appears highly probable that Kaki trees are much impeded in absorption by the application of salt to the roots, thereby causing physiological drought to the roots, even if the soil be saturated with water. The growth of the shoots are consequently retarded or inhibited and the premature dropping of the fruits can be prevented.

Premature dropping of the fruit can also be secured by another means. In some parts oblique cuts are made on the stems to lessen the flow of sap to some extent.

* "Plant Geography Upon a Physiogical Basis," Eng. Translation 1903.

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