

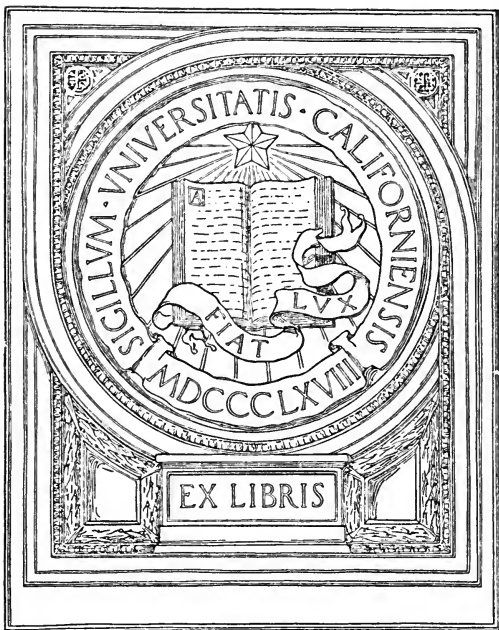
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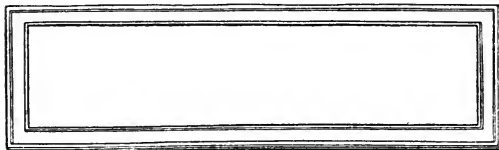


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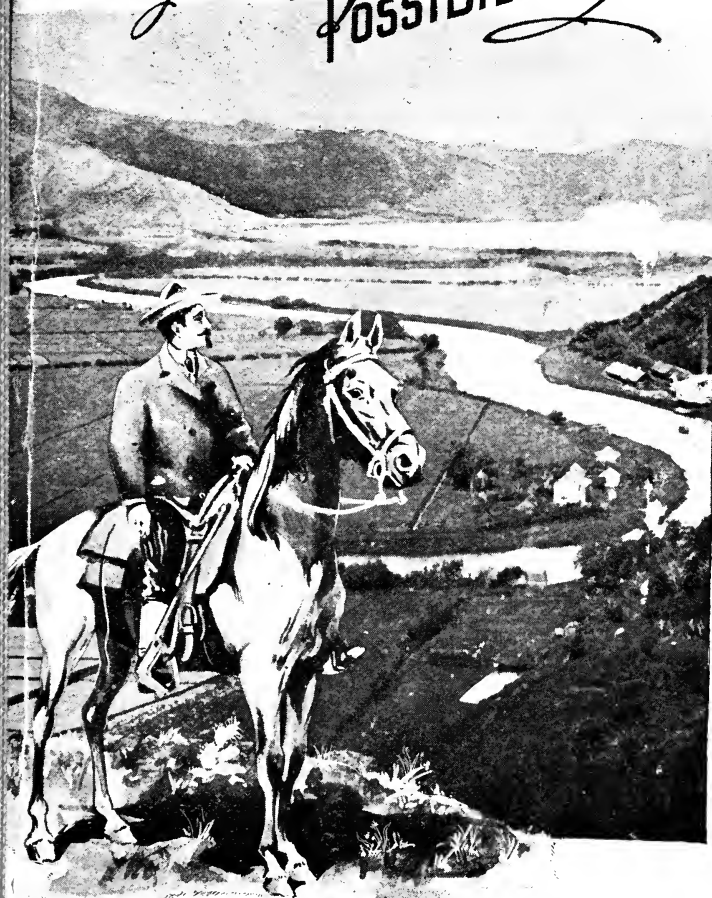


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HAWAII

ITS AGRICULTURAL
POSSIBILITIES





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COCOANUT GROVE.

THE CLIMATE OF HAWAII

One of the important factors in the agriculture of any country, is the climate. In this respect, Hawaii is very favorably situated, being favored with perhaps, as nearly as may be, an ideal climate. The slight daily and seasonal range of temperature is almost as striking in Hawaii as in any part of the tropics, while the maximum temperature is by no means high. A temperature of 90° F. is very high for Hawaii. In Honolulu, for example, the maximum temperature for the past fifteen years is 89°. The average annual temperature ranges in Honolulu from 72.9° to 74° for different years. During the same period, the lowest recorded temperature was 52° F., and such low temperatures ordinarily persist only for a few hours. The daily range of temperature is seldom greater than 11° F. While the temperature records are more complete for Honolulu than for other parts of the Islands, there are, nevertheless, long continued records at certain points on all the Islands; and these records show essentially the same conditions as those which prevail in Honolulu. It will be seen from these statements that there are no sudden changes of temperature and it should also be noted that there are only very slight and gradual seasonal changes. The average daily temperature gradually becomes lower during the winter and rises during the summer; but the variation is so slight that there may be summer days at any season of the year.

The climatic conditions for rapid growth of vegetation are, therefore, about as favorable as could possibly be found. Even the intensity of the sunlight, which is characteristic of tropical countries, is here tempered by the almost daily occurrence of light clouds which are formed on the mountains in the center of each island and are slowly drifted out over the leeward side.

While the climatic conditions nearer sea level are exceedingly uniform, it is, nevertheless, possible to secure a great variety of climate in the Territory by going to different altitudes and on different sides of the island. On account of the prevalence of gentle trade winds for about 260 days of the year, the islands are naturally divided into a windward and leeward side, the windward side lying on the northeast. On the windward side, the

temperature is uniformly lower than on the leeward side, while the moisture content of the air is higher and the rainfall greater. The climate of the Territory as a whole perhaps varies most in respect to rainfall, which may be 200 inches or more per year on the windward side of the islands, while it gradually diminishes to two inches, or even less, on some of the leeward shores. In fact, there are localities which receive no rain except during the occasional "Kona," or southwest storms.

The winds are ordinarily light, and Hawaii is never visited by the fierce hurricanes of most tropical countries. Paradoxical as it may seem, the winds are likely to be stronger on the side of the islands opposite that from which the wind comes. The humidity of the air is uniformly low, which makes even the moderate temperatures, which prevail in the Territory, seem lower than they really are. For this reason, sun strokes are of the rarest occurrence in the Territory. Electrical disturbances are also of exceedingly rare occurrence.

The slopes are relatively steep on all the islands except near the sea shore, and this brings about a rapid change of altitude as one goes from the shore-line toward the interior. The highest elevations on the various islands range from 1400 feet on Kahoolawe to 13,800 feet on Hawaii. At higher altitudes frost and snow are seen, particularly during the winter months. In several localities it is possible to enjoy a warm sea bath and reach snow within 25 or 30 miles. On account of the relatively low humidity and the absence of excessively high temperatures, the inhabitant of temperate climates upon coming to Hawaii is able to do physical labor in the open, such as he is accustomed to, and is better off in health for so doing. At ordinary elevations, the inhabitants of the Territory live practically in the open air the year round, since it is almost never necessary to close windows or to seek protection against the weather, except for occasional showers.

THE SOILS

The Hawaiian Islands, as a whole, are of volcanic origin and all the rocks from which our soils have been formed, may be considered as basaltic lava. This lava came from craters or crevices formed by volcanic eruption, under a considerable variety of forms, and the original rock material was, therefore, solid, smooth masses

of basalt, broken masses of such material containing cavities in which steam and other gases were formed, or finely divided volcanic cinder. From these materials, the present agricultural soils have been formed by processes of disintegration, due to chemical changes, the effects of water; and the growth of plants.

From the standpoint of geological chronology, the Islands, as a whole, are relatively new; and the soils have, therefore, not been subjected to as many changes as have occurred in older agricultural regions. Our soils differ greatly from those on the mainland, and cannot be classified without considerable qualification in the group names which have been adopted for mainland soils. Our soils are, on the whole, exceedingly fertile, due partly to the original abundant store of plant food in them, and the relatively short period to which they have been subjected to leaching.

The soils of the Hawaiian Islands are sometimes classified, according to color, into red, yellow and black soils. The red and yellow colors are due to the presence of iron oxide, the yellow soils being more highly transformed and somewhat less fertile than the red soils. The color of our black soils is due to the presence of humus, magnetic iron oxide, or manganese. As a rule, the soil are very deep, some of them being decomposed in place, while others are partly the results of washing from higher levels. Physically, our soils are characterized by the large percentage of exceedingly fine granules. In some localities, the fineness of the soils compares closely with that of precipitated chalk, being almost an impalpable powder. In other localities they show a large percentage of granules, giving rise to the term "shotty" soils. Most of our soils become sticky when wet, but readily disintegrate again upon drying out.

From a chemical standpoint, our soils are characterized by the high content of iron, which ranges from fifteen to forty or sixty, and in exceptional cases, 80%. The iron is present in all of the usual forms or oxide. The content of phosphoric acid and nitrogen is relatively high, but these elements are not always in the most available form. Potash is present in about the same percentage as occurs on the mainland. Manganese is found in our soils to a much higher degree than on the mainland, constituting, in some of the black soils, as much as ten per cent. of the total constituents. Titanium is also relatively abundant in the soils. Lime has been

leached out from many of the soils, but may be readily restored by applying coral sand, which is chiefly carbonate of lime, and in the best possible form for soil improvement.

When plowed deeply, our soils are exceedingly retentive of moisture, as evidenced by the fact that cotton and various other plants thrive in a wild condition where no rain falls except once or twice per year, and then only to the extent of one or two inches. Moreover, good crops of alfalfa and forty bushels of corn per year have been produced with two inches of rainfall without irrigation. One of the most important points in soil cultivation, which has been demonstrated by the sugar planters, is the great value of deep plowing. Some of our soils are commonly plowed to a depth of two or three feet, and are thus put in condition to hold and store the rainfall for the benefit of the crop. The soils are easily kept in good tilth and great fertility by deep plowing, suitable crop rotation, and the application of fertilizers to replace special elements of plant food removed by the crops.

On account of the porous nature of the underlying rocks in most localities, the rain may penetrate to great depths, but a large part of this water supply is recovered by means of artesian wells, which have been developed as extensively and as skillfully here as anywhere in the world.

UNLIMITED VARIETY OF CROPS.

On account of the range of altitude on the different islands, we have conditions suitable for the growth of almost all the agricultural crops of the world. While at present sugar is the main crop, there are also large plantations of coffee, rice, sisal, rubber, fruits, forage plants, etc. Various kinds of hay, alfalfa, matting plants, tobacco, corn, cotton, wheat and other cereals, sorghum, Manila hemp, Sansevieria, and other field crops are found in thriving condition in various parts of the islands. In the production of fruits, there is practically no limit, either in the fruits of temperate climates at higher altitudes, or of tropical fruits at lower altitudes. The fruits and nuts actually grown at the present time, include, pineapple, banana, mango, orange, citron, lemon, mandarin, pomelo, shaddock, lime, grape, avocado, fig, cocoonut, vanilla, strawberry, roselle, papaia, mangosteen, kumquat, loquat, monstera, sour sop, sweet sop, custard



BREAD FRUIT.



apple, cherimoya, macadamia nut, betel nut, dates, mountain apple, rose apple, water apple, cayenne cherry, bush cherry, jambolan plum, water lemon, guava, grenadilla, tamarind, cacao, castor bean, annatto, ginger, cashew nut, mammee apple, star apple, oil palm seeds, tuna, ohelo berry, carambola, bread fruit, durian, pomegranate, otaheite gooseberry, peach, apple, cherry, apricot, kukui nut, bhel fruit, indigo, sapodilla, longan, leitchee, wii, poha, wampii, cinnamon, cinchona, vegetable ivory palm, and nearly all of the known palms. In the line of garden vegetables, we can successfully raise almost the entire list of such crops, including sweet potato, Irish potato, taro, pia or cassava, tomato, pepper, cabbage, onion, beet, raddish, lettuce, asparagus, beans, peas, turnip, carrot, melons, squash, pumpkin, egg plant, celery, cauliflower, spinach; and a long list of oriental vegetables used chiefly by the asiatics. In the line of legumes, we are producing cow peas, soy beans, Jack beans, alfalfa, pigeon pea, lupines, beans, peas, sulla, etc.

The Hawaiian Islands may be said to be capable of developing an almost absolute independence so far as food supply, wearing material, and woods for fuel and construction are concerned. The long list of food products, which have already been mentioned, shows that we have everything which could be desired in that direction. In addition to vegetable food materials, we produce beef, mutton, pork, poultry of all kinds, and eggs, as also an abundance of deer, pheasants and other game birds, and an unusual variety of fish in our waters. Last year about 1,000 tons of honey were produced in the Islands. To those who are interested in fiber plants and wearing material, it is only necessary to mention that our sisal ranks the very highest on the market; that our cotton has been declared, by the Bremen Cotton Exchange, to be of the finest quality which they have ever seen; and that in addition to these fibers, we can produce Manila hemp, bow-string hemp, a long list of native fibers, silk and wool. We are also well supplied with leather made from the hides of cattle, sheep, goats and deer. In the matter of woods for furniture and ornamental purposes, there is nothing which can surpass the koa. Bamboo is also present in sufficient quantities for ornamental construction; and rattan has recently been introduced.

From this list of agricultural products, which are now successfully grown in Hawaii, it is apparent that the farmer from any country may make a selection which will

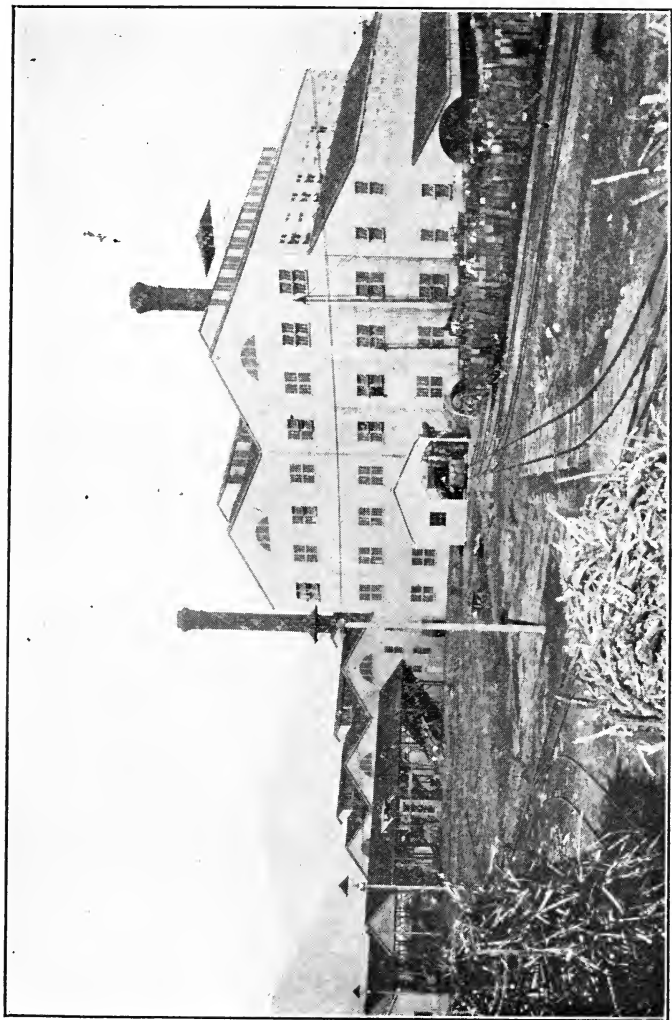
suit his own purposes. Many of the crops which have been shown to be profitable here have not been developed on their proper commercial basis, but for the commercial and profitable development of these minor industries, we need nothing but more farmers of skill and intelligence.

SUGAR.

Sugar cane is apparently indigenous to the Hawaiian Islands, as is also true for many Pacific islands. At any rate, at the time of the first visit of Captain Cook, sugar cane was grown and eaten by the natives. The first exportation of sugar was made in 1837, since which time the industry has grown until in 1908, the yield was 521,000 tons, valued at more than \$40,000,000. The varieties principally grown at present are "Lāhaina," "Rose Bamboo" and "Yellow Caledonia." The Sugar Planters' Association maintains an Experiment Station by assessment upon the various companies, devoting \$70,000 annually to the Experiment Station work. The chief work of the Station has been along the lines of insect control, the eradication of fungus diseases, examination of fertilizers, soil studies, cultural methods and the technical details of sugar manufacture. One of the most conspicuous practical results brought about by the Experiment Station is the successful control of a number of insect pests of sugar cane, particularly the leaf-hopper, which, before the introduction of parasites, did damage to the extent of millions of dollars; but was brought under practical control, by means of parasites, within two or three years. Attention has been given to the propagation of new varieties by means of hybridization and the growing of seedling canes, and some promising results have been obtained along that line.

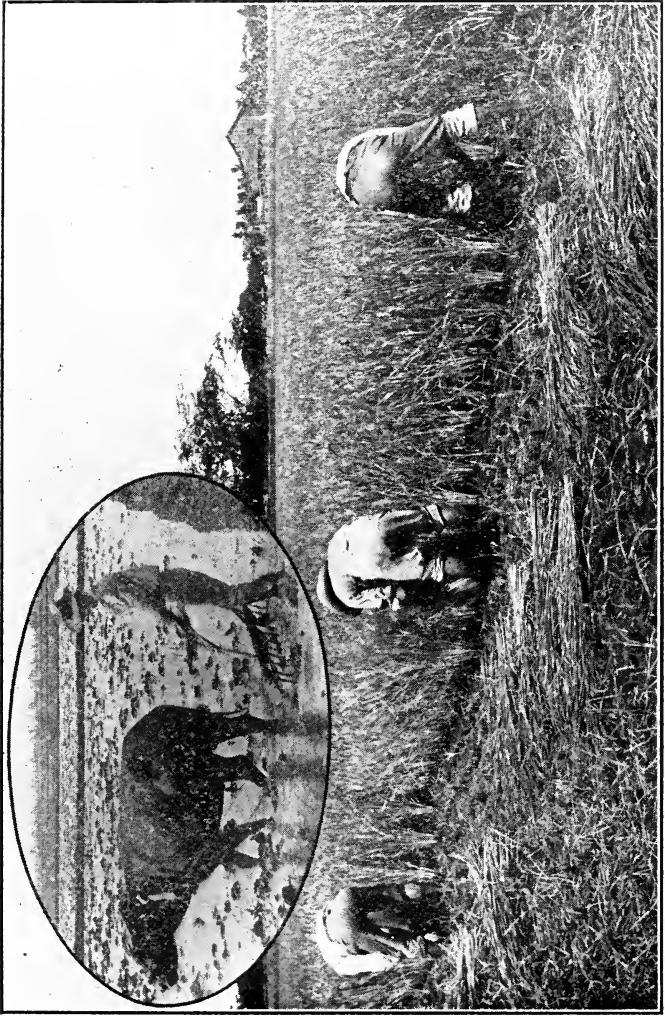
There are 213,000 acres planted in sugar cane, partly on land owned by sugar planters, and partly on leased land. About 105,000 acres of this land have been reclaimed by irrigation, at a cost of about \$15,000,000. About 41,000 tons of fertilizers, in addition to stable manure are used annually in the production of cane.

From these figures it is apparent that sugar is the chief agricultural industry of the Islands, and that the main industries of the Islands are at present, in one way or another, dependent upon the sugar industry. The agricultural and milling machinery used on the plantations is of the very best and most improved form. The chief



THE LARGEST SUGAR MILL IN THE WORLD.





CULTIVATING AND HARVESTING OF RICE.

lesson to be learned from the sugar industry by those engaging in other lines of agricultural work, is the thoroughness of cultivation which the planters perform, and the business-like methods which are characteristic of the whole industry. On all of the larger plantations, the land is plowed to a depth of from one to three feet, thus furnishing a soil reservoir for the retention of moisture and a deep feeding ground for the cane. The first crop of cane is obtained in about 18 months and is followed by a ratoon crop in 14 months; and the second ratoon crop, 18 months later. A third ratoon crop may be obtained, but seems not to be profitable under our conditions. The average yield of sugar per acre is a little more than four tons.

The land suitable for raising sugar cane has nearly all been taken up for that purpose. There are, here and there, however, small areas where farmers might raise cane and sell it to sugar mills. There are also a few areas suitable for large plantations which are now devoted to other purposes. The sugar planters employ a large number of trained agriculturists and engineers of various sorts in the management of their plantations.

RICE.

Rice was introduced into the Islands as a commercial cereal in 1858. Interest in this crop developed rapidly, and in 1862 the first exportation of rice took place. Since this date it has increased until now there are 12,000 acres cultivated in rice, producing an annual crop valued at \$2,500,000. Rice is the chief article of diet of the orientals, and its production is almost entirely in the hands of Chinese. Two crops are produced annually, one in the spring, and one in the fall; and corresponding with these semi-annual crops, are spring and fall varieties of rice. The annual yield of clean rice ranges from 3,000 to 6,000 pounds per acre, and the net profit per acre, from \$50 to \$100. Careful estimates place the cost of production at \$3.00 to \$3.75 per hundred pounds. The prices received for rice in 1908 ranged from \$4.25 to \$5.00 per hundred pounds. The rental ordinarily paid for rice land varies from \$10.00 to \$50.00 per acre.

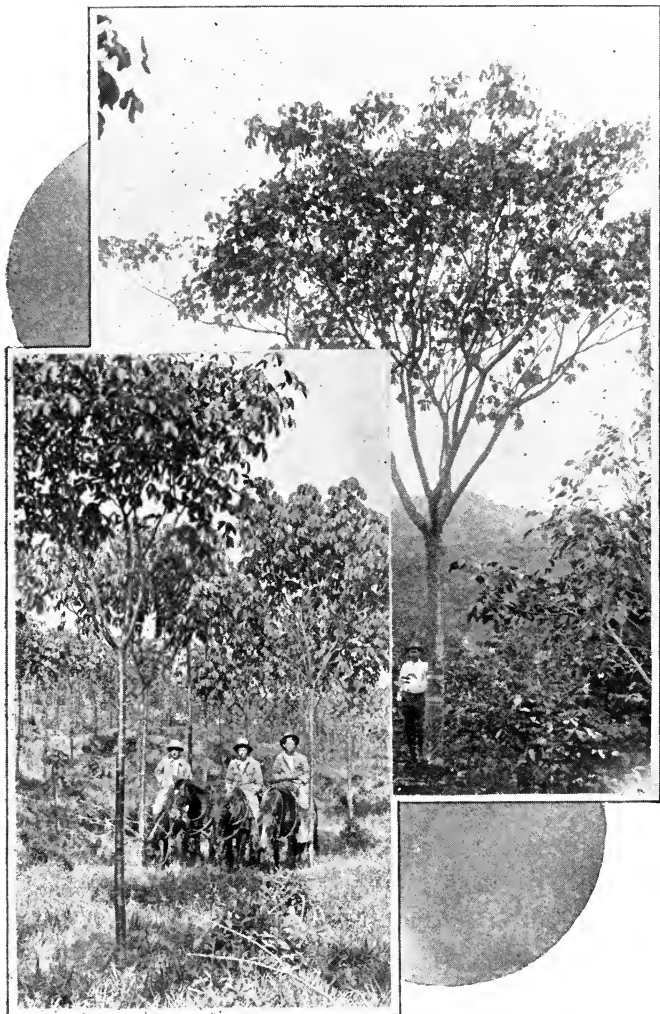
Cultivation of rice in the Islands is carried on by Chinese methods. These methods have been brought with the Chinese from their native country, and have been followed here ever since the cultivation of rice has been

carried on. The rice lands are for the most part divided into small areas, separated by dikes for irrigation purposes, and this method of culture renders impracticable the use of machinery such as is employed in the Southern States. The power for the cultivation of the soil is furnished by water buffalo and horses. The rice is sown in nursery beds and then transplanted. From three to seven seedlings are placed in clumps about one foot apart each way. The fields are submerged during about four-fifths of the growing season. While this method of cultivation seems tedious and wasteful of labor, it has been found that the yields are almost double those from direct sowing. The Chinese are so expert at transplanting that the method is unquestionably profitable.

There are about 16 important rice mills in the Islands, many of them being of quite antiquated pattern, but the work accomplished by them is satisfactory. The annual crop of rice in Hawaii is about 50,000,000 pounds, and in addition to this amount, 21,000,000 pounds are imported from Japan and China. The exportation of rice from Hawaii amounts to about 3,500,000 pounds per year.

The Hawaii Experiment Station has given considerable attention to the study of rice. Comparative tests have been made with more than 100 varieties, and a few of these have proved so superior in yield and quality that they are being generally adopted by the rice growers. An efficient program of fertilization has been worked out and is being followed by the rice producers. In addition to work with varieties of rice and fertilizers, the Hawaii Experiment Station has demonstrated that Upland rice and salt marsh rice may be cut for hay and furnish an excellent quality of forage, which compares favorably with imported cereal hays. The production of rice hay is now being tested in a number of widely separated localities and at different altitudes on the various islands.

When it is remembered that 21,000,000 pounds of rice are annually imported from Japan and China, it is apparent that there is room for the extension of the rice industry. There are a few locations where rice could be cultivated with profit, according to the methods adopted in the Southern States. There is a conspicuous lack of threshing machines, and these could most assuredly be used to advantage. At present most of the rice is tramped out by water buffalo on cement floors. The present preference shown for the imported Japanese rice could



RUBBER PLANTATION AND A TREE, SHOWING METHOD OF TAPPING.

be partly overcome by the formation of a business-like association among rice growers and the maintenance of a suitable campaign of education. It is believed that in the further development of the rice industry in the Islands, the white farmer must take an active part.

SISAL.

The only fiber plant at present grown on a commercial scale in Hawaii, is sisal. This plant was introduced in 1893, and its cultivation has increased until we now have about 1400 acres of sisal with an output of 200 tons of fiber annually, worth about \$20,000. The largest sisal plantation of the Islands will soon plant an additional 2,000 acres. This company has its business well organized and is in a thriving condition. If we may judge from the experience of sisal growers throughout the world, it may be safely stated that this is a crop which requires extensive plantings in order to yield satisfactory profits. In a thickly settled community it might be possible to produce small quantities of sisal, which could be milled in small machines and distributed by co-operative association. Under our conditions, however, the sisal industry must apparently be carried on in extensive plantations.

In Hawaii, only the true sisal is grown commercially, and the life of the plant with us extends from eight to ten years. This is a shorter life period than that of henequen in Yucatan, but the leaves have smooth edges, rather than spiny ones, as is the case with henequen; and the value of the fiber is considerably greater. Sisal, therefore, is to be preferred to henequen for our conditions. The stock for planting may be obtained from the growth of young plants in nurseries, or from the direct use of pole plants or suckers. Our growers plant from 600 to 900 suckers per acre. The first harvest occurs three years after planting, and the average yield of fiber per acre is about 500 pounds.

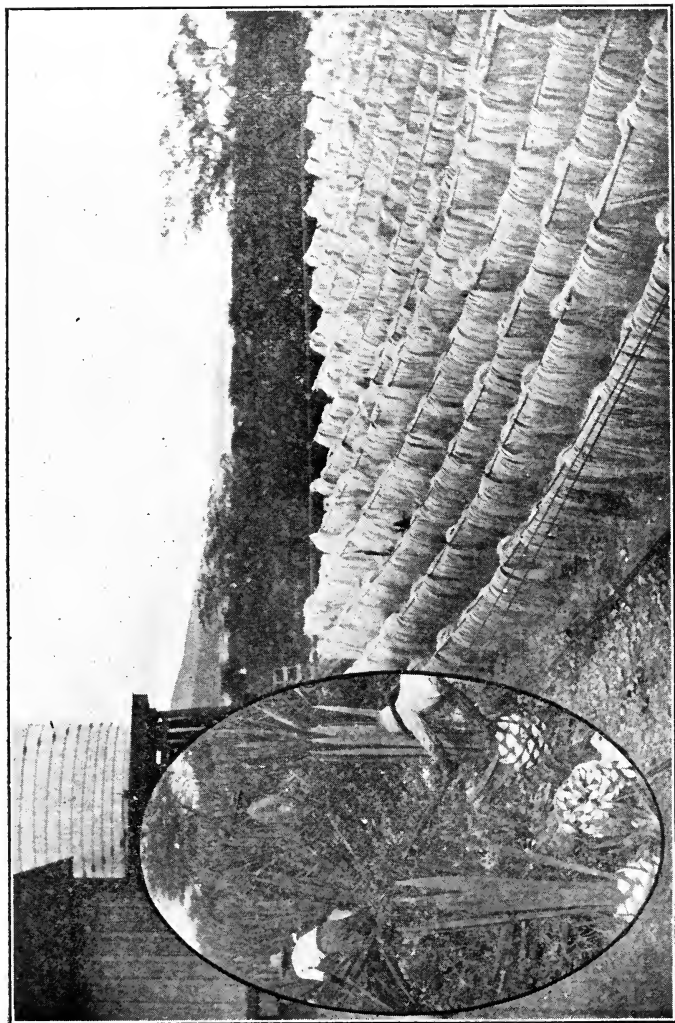
Sisal is commonly mentioned as a plant which will grow without care or cultivation. While this is true, it has been found that the growth of the plants may be greatly benefited by cultivation along the rows. This is a fortunate circumstance, since, if cultivation were of no benefit, the sisal plantation might be abandoned until shrubby weeds would make it an exceedingly difficult matter to harvest the sisal leaves. The water re-

quirements of sisal are very simple. It grows and produces a satisfactory crop where the rainfall is as low as two inches, or even less, per year. Cultivation may be confined to simply keeping the brush and weeds out of the rows. The growth of the sisal is much better, however, if the ground is plowed previous to planting than when the sisal is merely set in holes without plowing. The leaves are harvested when they assume a horizontal position, the work being done under contract, at a given price per hundred leaves. The largest sisal company on the Islands has perfected milling machinery for sisal, which removes the fiber so completely that the waste from the mill is valueless, except perhaps for feeding purposes. Before the most recent improvements were made, a considerable amount of fiber was lost in the waste and this was later recovered and baled as a coarse fiber material. Drying is accomplished by spreading the fiber out on clean coral sand, and since the mill is located in a region where rain very seldom occurs, a bright and clean fiber is obtained. The fiber is baled by machine in bales weighing 400 to 500 pounds.

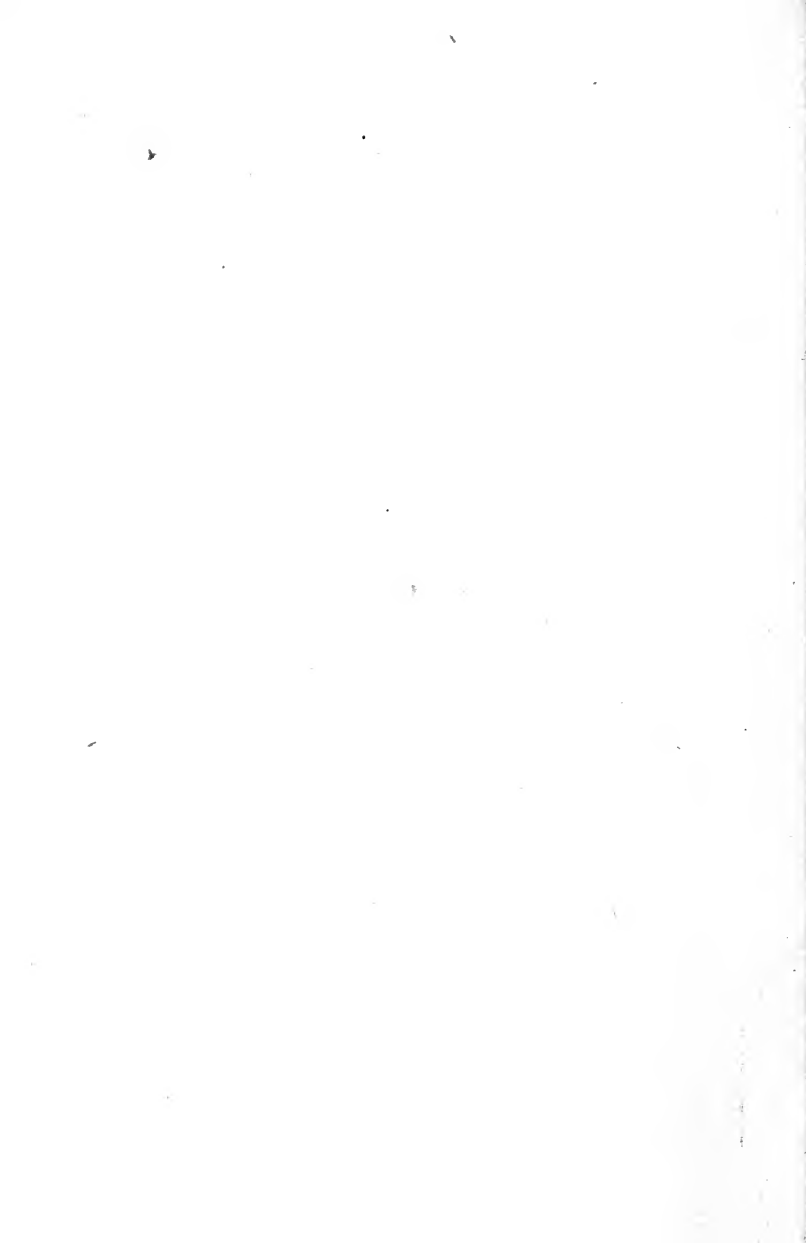
The prospects for the development of the sisal industry in these Islands are excellent. The United States imports nearly \$15,000,000 worth annually. Of this quantity, Mexico supplies 98%. The quality of Hawaiian grown fiber is superior to that of any other part of the world, except German East Africa, which it equals. The San Francisco markets alone would take 10,000 tons of our fiber, and at present we produce only 200 tons. There are numerous arid regions in the Islands where at present almost nothing else could be grown successfully as a commercial venture. Undoubtedly some of these areas will be planted to sisal in the near future. It obviously requires a company with some capital to engage in the sisal business, since it is necessary to wait three years for the first crop. The expense for agricultural and milling machinery, however, is not very great. It is not necessary to use the more expensive steam plow outfits, since in many localities, gasoline power can be used successfully.

RUBBER.

Rubber trees, particularly the Ceara rubber, were planted at various points in the Islands twenty years ago or more. The first regular companies, however, were



CUTTING SISAL LEAVES AND DRYING THE FIBRE.



started in 1905. At present there are five large rubber companies and many small plantations, with a total investment of \$290,000. On the island of Maui alone, there are 1,300 acres planted to rubber. This area contains about 400,000 Ceara rubber trees, 23,000 Hevea, and a thousand Castilloa. At first the commercial plantings were almost entirely of Ceara; at present, however, more Hevea than Ceara rubber is being planted. A great difference is observed in the width of planting adopted by the different companies. In some cases, the trees stand only six or eight feet apart each way, while on other plantations, they may be 15 to 20 feet apart. There is a growing tendency to adopt the wider planting space. Formerly the opinion prevailed that rubber could be treated as a forest tree, and that cultivation might, therefore, be neglected. This belief, however, has proved to be quite unfounded. One of the most conspicuous things to be observed on our rubber plantations is the greatly increased growth brought about by proper cultivation. It has been shown beyond question that in order to get a satisfactory rate of growth, of either Ceara or Hevea rubber, it is necessary to plow the ground and give careful attention to cultivation. The recognition of this fact has brought up the problem of what to do with the vacant land between rubber trees during the first year or two of their growth. The Hawaii Experiment Station is now carrying on experiments to determine the best use which can be made of the soil in rubber plantations until the trees get large enough to occupy the ground as an exclusive crop. For this purpose, we are testing rice hay, soy beans and other legumes.

While some income may be expected from crops planted between young rubber trees, the ultimate source of revenue is, of course, looked for in the rubber trees themselves. It is impossible at present to get large areas of mature rubber trees for tapping, and the preliminary experiments, therefore, had to be made on trees two or three years old. In these experiments, 400 trees were tapped for the purpose of determining how labor could best be manipulated and utilized most economically in tapping rubber trees; how expensive the collection of rubber would be under our conditions; and what yield of latex could be expected from Ceara rubber trees in our Islands. It was found in these experiments, that one laborer can tap 50 trees per hour, and can collect the latex from 100 trees in the same length of time.

The continuous tapping of trees six inches in diameter, indicates that a yield of one-third ounce of dry rubber per day may be expected. The experiment just mentioned, indicates that three men, working on mature trees, can obtain about one pound of dry rubber per hour. From these figures, it seems evident that the rubber industry rests upon a sure foundation and that a reasonable profit may be obtained from it. In order to utilize the land to the best advantage, however, it will obviously be necessary to practice intercropping with suitable crops during the first year or two of the plantations, and to keep the soil in good tilth, in order to bring about a sufficiently rapid growth of the trees. Experiments are also in progress to determine whether the growth of rubber trees may be benefited by fertilization, and whether the temporary stimulation of the latex flow may be accomplished by fertilizers. It appears, from experiments already carried out on Maui and Oahu, that the tapping period may extend from 6 A. M. to 10 A. M. This period is sufficiently long to allow the economic use of the laborers' time.

The prospects for rubber in the Islands seem bright. The rubber planter is constantly reminded that this industry is being enormously extended in other countries, particularly Ceylon and Mexico; but the rapidly increasing demand for rubber, in both old and new lines of manufacture, would seem to furnish an outlet for all of the rubber which can be produced for many years to come. At any rate, the best informed rubber producers and manufacturers can see no immediate prospect of an over-production. In these Islands we have considerable areas in which the rainfall and other conditions are suitable for rubber production. These areas are not desired for sugar or other crops, and, therefore, offer opportunity for a further extension of the rubber industry.

TOBACCO.

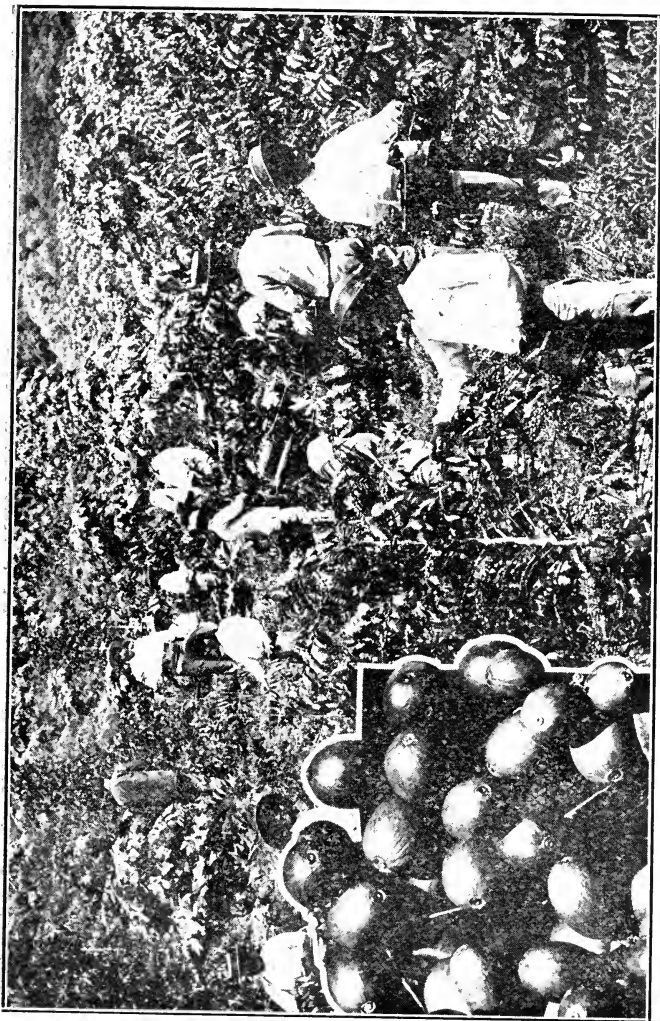
There has never been any reasonable doubt about the possibility of obtaining a good yield of tobacco from Hawaiian soils. The natives have long grown a coarse, strong grade of tobacco, chiefly for smoking purposes. Experiments in the culture of improved varieties of tobacco, demanded by modern markets, were begun about four years ago, and have led to the formation of three companies, one of which is already growing tobacco, and

to the cultivation of this crop, on a small scale, by two individual farmers. The cured crop of the present year amounts to about 7,500 pounds. One company, which is growing Cuban tobacco, intends to plant 60 acres during the coming season. Another company will have forty or fifty acres of Sumatra tobacco. The yield of all varieties of tobacco, thus far grown in the Territory is high, ranging from 900 to 1,500 pounds per acre. The burning quality is all that could be desired. In reports received from large tobacco dealers, in New York City and elsewhere, it appears that our tobacco is considered satisfactory in burn, texture and flavor when properly cured. The best results have not always been obtained in curing tobacco, but this fact appears to be due to a lack of experience with tobacco in this climate. The company, which is to grow Sumatra tobacco here, has had twelve years' experience with this tobacco in Sumatra, and will employ an expert in tobacco curing and fermentation. Some of the New York dealers, who have examined our tobacco, have stated that the Havana wrapper grown here would be worth from 75c. to \$1.00 a pound if properly cured; and that the Sumatra, in the condition in which it was submitted to them was worth from 50c. to 70c. per pound. A tobacco dealer, who recently visited the Islands, stated that Cuban filler produced here would readily bring a price of 35c. per pound. The duty already imposed upon tobacco is sufficient to give all the encouragement, which can be secured from that source, to the tobacco grower. The soils, as already stated, produce a tobacco of excellent burning quality and of a mild, agreeable aroma. The most essential factor, therefore, in the success of our tobacco industry is experience in curing under our conditions; and to this end it would seem wise for each company to obtain an expert in the process of curing. It has been estimated that there are least 30,000 acres of land suitable for tobacco culture, on which tobacco has never been grown. Such virgin soils give promise of excellent returns under proper management. This is a crop which can be grown on a large scale, by the organization of companies, or in small areas, by individual farmers. In the latter case, the larger companies will buy the tobacco and ferment it. This arrangement will enable the small farmer to engage in tobacco growing with a very small outlay of money and with quick returns, since it is a rapidly maturing crop.

COFFEE.

So far as can be judged from available data, coffee was first grown in Hawaii in 1817. The culture of this crop was taken up by white farmers and native Hawaiians and yielded such good returns that the industry developed rapidly. A setback was suffered a few years ago as a result of the fall in the prices of coffee; but by careful cultivation and the utilization of the soil between the rows during the first year or two in the growth of the plantation, it is still possible to make fair profits from coffee. There are about 4500 acres planted to coffee, the larger part of this area being in the Kona and Hamakua districts of Hawaii. Coffee is grown, however, on all of the larger islands. The amount of coffee exported last year was 25,000 bags, with a value of \$175,000. In the experience of our coffee planters, the yield per acre is about 650 pounds. The cost of production is estimated at from seven to ten cents per pound, and the wholesale price now received is twelve cents per pound. This gives only a narrow margin of profit, which it has been proposed to increase by a tariff on coffee; but in the event of failure to secure a tariff, the same result might readily be obtained by the formation of a co-operative association with agents on the mainland to distribute the coffee directly to consumers. In this way, the retailers' price, of twenty to thirty cents a pound, could be obtained by the producers without raising the price of coffee to the consumer. Coffee grows best in the Islands at altitudes of 1,000 to 2,500 feet. The first commercial crop is obtained four years from planting, but during the first two or three years, it is an easy matter to realize considerable returns from soy beans and other crops planted between the rows of coffee. With the present price of 3½ cents a pound for soy beans, it has been found that from \$75.00 to \$100.00 an acre can be obtained from this crop in young coffee plantations. The adoption of this method of intercropping has the further advantage that the soil is kept in good tilth for the growth of the coffee trees.

The present prospects of the coffee industry are brighter than they appear to some of the coffee growers. It is readily understood that the narrow margin of profit at the present cost of production and the present market prices, is not very attractive; but, on the other hand, it should be remembered that much of our coffee which is



COFFEE BERRIES AND A COFFEE-PICKING SCENE.



sold for twelve cents per pound, finally comes to the consumer at prices ranging from twenty to twenty-five cents per pound. The most logical business method of increasing the profit to the producer, and thus encouraging the coffee industry, is to form an association, as already mentioned, and thus secure the retail price of coffee, rather than the wholesale price. Greater difficulties than would be experienced in the formation of such an association, have already been overcome by groups of producers on the mainland.

The quality of our coffee is excellent, the flavor and aroma being mild. It requires slightly different treatment in roasting from that recommended for the coffee of Porto Rico, Central America and South America. If a business-like coffee association were formed, the market for our coffee could be carefully studied and developed in a progressive manner. At present, Hawaiian coffee is not well enough known on the mainland, and this is due to a lack of aggressiveness on the part of the producers. With the market difficulties solved, so as to render the profits from coffee still more attractive, it would soon be realized that there are large areas of land now lying idle, which are suitable for coffee culture.

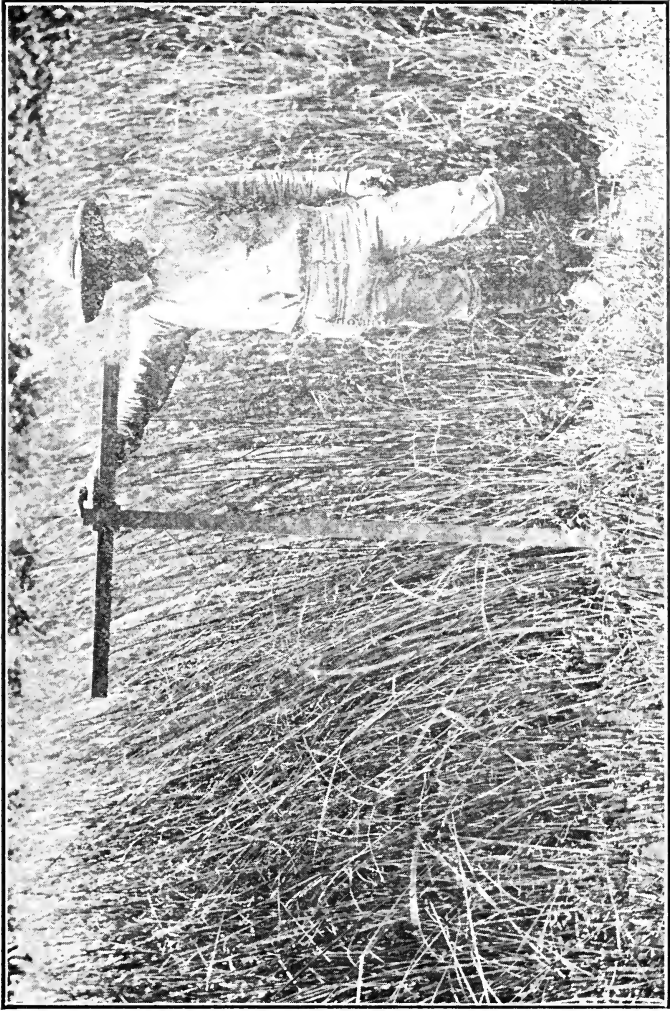
COTTON.

A species of smooth seeded cotton was observed by Captain Cook on his first voyage to the Hawaiian Islands. In addition to this species, which is closely related to Sea Island, two native species of cotton, with short, brown lint, were, at one time, quite abundant; but have gradually been exterminated by cattle, until at present, there are only a few plants in existence. One of these species is being propagated at the Hawaii Experiment Station and will be hybridized with Sea Island cotton. More or less attention has been given to cotton at various intervals in the past by native Hawaiians and others. In 1837 there was a cotton mill on Hawaii, which produced a good quality of cotton cloth. Following the Civil War, an interest was awakened in cotton on account of its high price, and Sea Island cotton of fine quality was raised for five or six years on nearly all of the Islands. Descendants of these plants are now seen in various localities, having perpetuated themselves as wild plants. Lint of good quality has been taken from trees 15 to 20

years old. All cotton varieties in these Islands naturally grow as perennials.

For three or four years the Hawaii Experiment Station has been investigating the possibilities of cotton culture. The varieties planted include several strains of Sea Island, three strains of Caravonica, Chinese Upland and Egyptian cotton. The Caravonica cotton, imported from Queensland, has proved to be a heavy yielding variety with a high percentage of lint of great strength. The only defects of this variety thus far observed, are the brittleness of stem and variability in type, due to the fact that it is a hybrid between Sea Island and Kidney cottons. The prices quoted by cotton experts, from samples of our Caravonica cotton, range from sixteen to twenty-four cents per pound. Selections have been made from two strains of Sea Island seed, with the result that lint of the very highest quality has been obtained. Not only is the yield considerably larger than in the Sea Island region of the mainland, but the length of staple is two inches, and the quality, as judged by cotton experts, superior to any that has been produced before. The cotton dealers have assured us that our Sea Island is in a class by itself. The Bremen Cotton Exchange pronounced the lint the best they had ever seen and worth thirty-six cents a pound.

These results are highly encouraging. About thirty companies and individuals are planting cotton this year in small areas, ranging from two to 25 acres. Larger plantations could not be made at present on account of the impossibility of securing good Sea Island or Caravonica seed in commercial quantities. From seed selections, which will be made from the present plantings, a sufficient supply will be had for much larger plantings, which are contemplated by commercial companies for next year. With the formation of a suitable cotton association here, it will be possible for small growers to find an immediate outlet for their seed cotton, at a profitable price, and with the present great increase in the demand for high grade cotton, there is no prospect of overstocking the market. In this respect, Hawaii will not be considered a competitor of the Sea Island district of the mainland. Our fiber is superior to the commercial product grown there and will be readily taken in Bremen, Liverpool, Paris and New York.



MATTING SEDGE, FROM WHICH FLOOR MATTING IS MADE.



CASSAVA.

Cassava is gradually taking the place of arrow root as a food plant for the native Hawaiians; and it is also being cultivated in increasing areas for the production of starch and as feed for animals. In our Territory, it grows as a perennial, if allowed to run wild, but is best treated commercially as an annual crop. It thrives well from sea level up to an altitude of 3,000 feet, except in very wet climates. The cuttings are planted in November to February, in furrows two to four feet apart. The soil is kept well cultivated and the roots are ready for harvest in October or November. The yield of roots ranges from five to ten tons per acre. From these roots the yield of starch is somewhat greater than that from corn. From five tons of roots, about 2,500 pounds of starch can be obtained. For sometime there was difficulty in finding a profitable market for cassava starch and little encouragement was met with in this industry. At present, however, the demand is active and the companies which are producing cassava are much encouraged. There is a good opening for the growth of cassava in this Territory for the production of tapioca, an industry which has, thus far, not been taken up in Hawaii. In addition to its uses for starch and tapioca, cassava is attracting more and more attention as a stock feed. The ranches are planting quite large areas of cassava as feed for hogs and cattle.

MATTING PLANTS.

Experiments with matting plants have now been carried on for two years, the species concerned being Chinese matting sedge and Japanese matting rush. It has been found that these plants thrive well in brackish or salt marshes along the sea coast, and that the yield is quite satisfactory. Chinese matting sedge, grown by the Hawaii Experiment Station, and sent to a manufacturing company on the mainland, has been declared to be of good quality; and valued at from \$40.00 to \$80.00 per ton. When well established, an acre will produce from three to four tons annually. The Japanese matting rush does not require splitting for the use of the manufacturer, but the Chinese matting sedge must be split before being used. The chief difficulty at present, in the commercial extension of this industry, is the lack of a suitable ma-

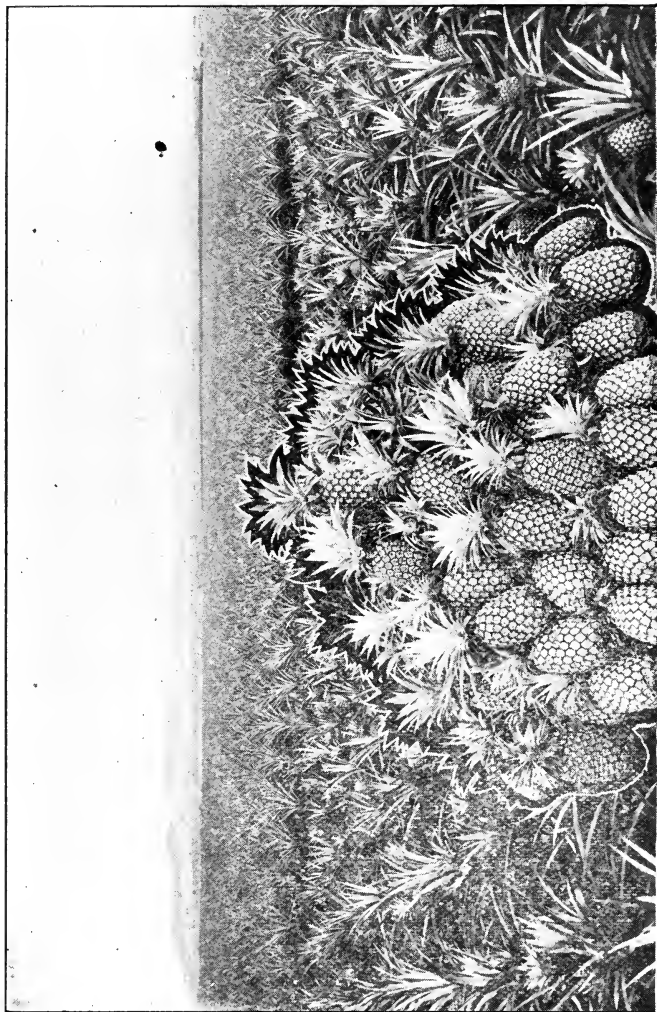
chine for splitting the sedge. Hand splitting is too expensive. There is a good prospect that such a machine will soon be perfected. When this is accomplished, there will be a profitable use for large areas of brackish and salt marshes at present unutilized.

CASTOR BEAN.

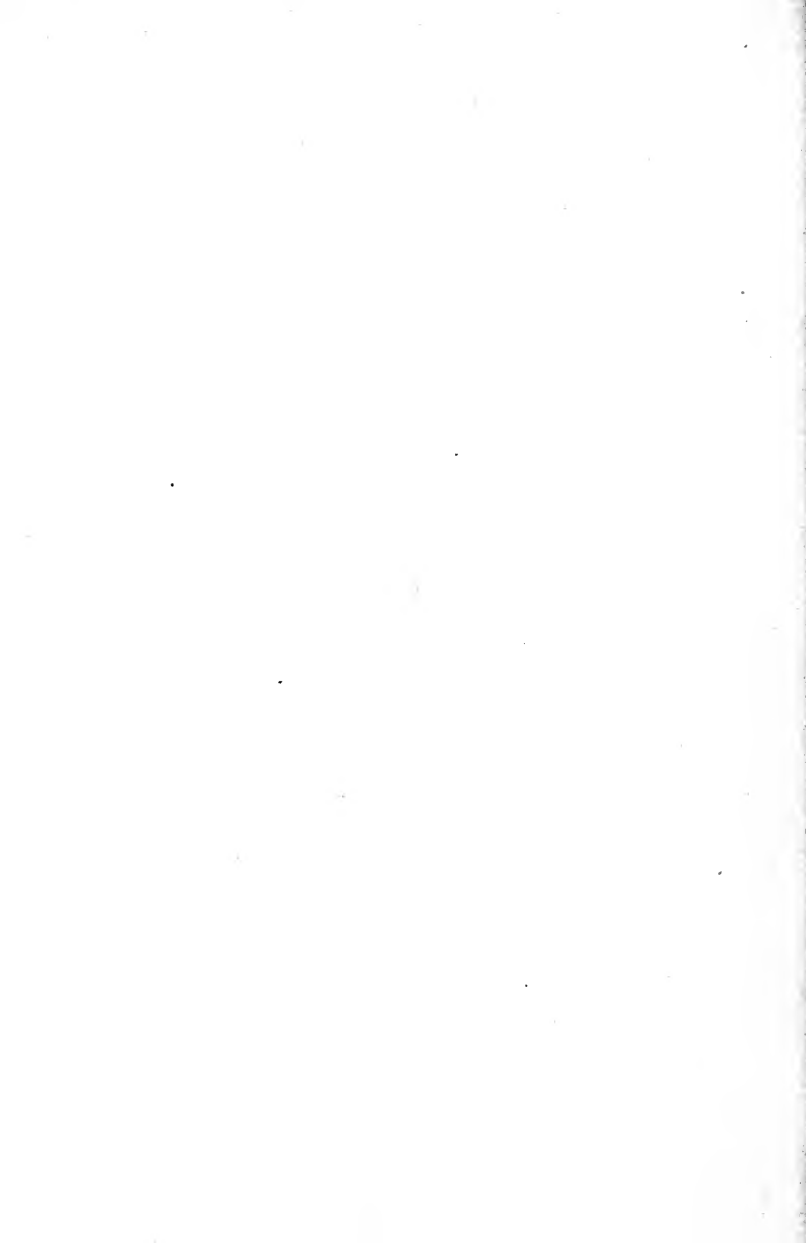
This plant has been known in Hawaii since early days. It grows wild as a perennial, sometimes developing into trees with trunks two feet in diameter. The plant thrives from sea level up to 4,000 feet or higher. In plantations, it is spaced about fifteen to twenty feet apart. Each plant may be expected to yield from twenty to twenty-five pounds of beans per year. The products from castor beans are castor oil and castor pomace. Castor oil finds a ready market and castor pomace is a valuable fertilizer, which could be used in many of our soils. The encouragement for the production of the castor bean has not been very great on account of the low prices at which it can be produced with cheap labor in India. Nevertheless, on a small scale, it may be depended upon to return reasonable profits. The simplest method by which this industry could be encouraged is to established a central oil mill, which would purchase the beans from small producers at a reasonable price.

MANILA HEMP.

There is a widely prevailing opinion, that Manila hemp of good quality can be grown only in the Philippines. Nevertheless, wherever Manila hemp has been planted in our Islands it has grown even more vigorously than the species of edible bananas. Manila hemp being a species of banana, may be rightly expected to require cultural conditions similar to those of the banana. Such conditions we already have fulfilled in many localities in respect to rainfall, soil fertility and uniformity of temperature. It is confidently believed that Manila hemp could be developed into a profitable industry in Hawaii. A number of groups of this plant have been observed on the windward side of the Islands in a very thriving condition, and even on the grounds of the Hawaii Experiment Station, where the rainfall does not exceed thirty inches per year, Manila hemp grows more vigorously than edible bananas. It is apparent that the development of Manila hemp would



LUSCIOUS PINEAPPLES AS FAR AS THE EYE CAN REACH.



in no way conflict or compete with the sisal industry. Sisal is grown on soil too rough and too dry for any other commercial crop, while Manila hemp requires a heavy rainfall, of fairly uniform distribution.

CORN.

Corn has long been cultivated, as a stock feed and for table purposes, in Hawaii. On the island of Maui there are about 5,000 acres in one region devoted to the production of corn. On Hawaii, at least one ranch is producing corn on a large scale, and will soon have 1,000 acres in this crop. Corn thrives from sea level up to an altitude of 5,000 feet. During the last season, on the Parker Ranch, at an elevation of 4,700 feet, a yield of forty bushels of corn per acre was obtained without irrigation, under a rainfall of only two inches. The quality of dent corn produced here is all that could be desired. Little attention has been given to the selection of seed corn, and for this reason, the ears would not take prizes in a corn exposition, but the percentage of kernel to cob is high, and the yield is quite satisfactory. Nearly all of the ranches are planning to raise corn in large quantities for the purpose of putting a finer finish on their beef, mutton and pork, and in the production of poultry.

PINEAPPLES.

For many years before commercial pineapple growing was established in Hawaii, a small native variety was known of excellent flavor. This variety is probably not indigenous, but is supposed by some to be a geographical modification of the "Red Spanish" pineapple. The variety almost exclusively grown at present is the "Smooth Cayenne." This variety was first introduced in 1884, and the pineapple industry began about 1890. There are now 4,500 acres in pineapples, chiefly on Oahu and Maui, but also on all of the other islands; and the plantations are constantly increasing. The output for 1908 was 350,000 cases of canned fruit and 1,000 tons of fresh fruit.

The altitudes most suitable for growing pineapples lie between 500 and 1,200 feet. It is desirable to have a rainfall of 35 to 60 inches or more. Pineapples will stand ordinary winds very successfully. Planting distances on different plantations vary considerably, and for this reason, the number of plants per acre ranges from

2,500 to 12,000. Where it is desired to grow large fruit for table use, the pineapples are commonly planted in rows six feet apart and 20 to 24 inches in the row. On some plantations the rows are four feet apart and the pineapples two feet in the row. Where smaller fruit for canning purposes is desired, the planting distance may be 18 inches to two feet each way, in beds of four rows with alleys between each bed. Another method of planting, which has been followed to some extent, consists in arranging the plants in groups of two rows, two feet apart, the groups being eight feet apart. Naturally, the size of the pineapples depends somewhat upon the spacing of the plants. Some of the canneries desire a fruit weighing from three to four pounds, and bring about this result by close planting. Where wide planting is followed, the fruit commonly attains a weight of six to ten pounds, and sometimes, much more.

The first crop of pineapples is obtained within 18 months to two years, and averages about ten tons. A ratoon crop follows twelve months later, in which the yield ranges from 15 to 20 tons per acre. The cost of production of pineapples is about \$15.00 per ton, and the cannery price is \$20.00 per ton or more. The mainland price for fresh fruit ranges from \$80.00 to \$150.00 per ton. There are now nine canneries in the Islands and about \$1,000,000 invested in the pineapple industry. The acreage of pineapples is constantly increasing, and for the past two or three years the output has been nearly doubled each year. The Hawaii Experiment Station is carrying on a series of fertilizer experiments with pineapples and is also investigating the cause of the yellowing of pineapple plants, and the best methods of rotation which may permanently maintain the adaptability of the soil for pineapple culture.

The prospects for pineapple culture seem good, despite the complaints which are occasionally heard. Some fear has been expressed that the market for canned pineapples is not being developed as rapidly as the output of canned pineapples. This market, however, when properly studied seems to be almost unlimited. The whole west coast of the mainland should be supplied with fresh pineapples from Hawaii. The flavor of our fruit is far better than that of the varieties which they now receive on the Pacific Coast. There is only one factor wanting for the successful occupation of that immense field for our fresh pineapples; and that factor is a business-like co-operative

association for the purpose of making known the merits of our fruit by actually distributing this fruit directly to the trade on the west coast. It is scarcely to be doubted that if pineapple growers, familiar with the systems of co-operative marketing in successful use on the mainland, would come to Hawaii and organize a business-like co-operative association along the same line, the markets for fresh pineapples could be developed sufficiently to consume all of the pineapples which could possibly be produced here for years to come.

BANANAS.

At least twenty varieties of bananas now growing in Hawaii, are considered indigenous. The actual origin of some of these varieties may never be thoroughly determined. Altogether, there are about fifty varieties of bananas in the Islands, the chief shipping varieties being Bluefield and Chinese. The Chinese banana is grown perhaps more extensively than the Bluefield, but does not endure shipping quite so well. The adaptability of our soil and climate to banana culture is evident from the jungles of bananas which grow wild without care or attention on nearly all of the islands.

The banana plant fruits at the age of fifteen to twenty-four months, and is then cut down, making room for the growth of suckers which spring from the ground near the base of the stem. Banana plantations may be allowed to reproduce themselves, by suckering, for two or three years; but the plantation gradually deteriorates unless it is replowed and planted anew. A rotation with other crops, therefore, ultimately becomes necessary, as is also the case with most all of our other money crops. A banana plantation produces 800 to 900 bunches per acre.

The prospects for banana culture in Hawaii are excellent, and the possibility of extending the industry, almost unlimited. The whole Pacific Coast of the mainland should be supplied with our bananas, and Hawaii is properly located to furnish them economically. San Francisco alone, would consume 75,000 bunches of bananas per year. The cooking banana trade has not been touched, in fact on the mainland, cooking bananas are little known; and most housewives have hardly heard of them. With our large variety of excellent cooking bananas, well adapted for shipping, it is high time that the possibilities of trade in this direction be realized by

making known the excellent flavor of our cooking bananas. If the banana industry were systematically developed in our Islands, the tonnage of this fruit alone would be enormous; and would surely appeal to transportation companies as a matter worthy of their consideration. Practically the only drawback thus far experienced in the banana business is the lack of suitable transportation. Sooner or later it will become necessary to have special fruit steamers for transporting Hawaiian fruit to the mainland. The development of such a traffic would be of immense importance, not only in the rapid and satisfactory transportation of fruits, but also in furnishing the means of bringing more visitors and settlers to the Islands. The influence of the fruit steamers, plying between New York and the West Indies and Central America has already become very conspicuous for this reason. The United States now imports bananas to the value of \$8,000,000 annually; and the banana trade of the whole west coast logically belongs to Hawaii.

MANGO.

We have forty or more varieties of seedling mangoes of all qualities and sizes, and also many introduced varieties from India, the Philippines and elsewhere. Some of the best of these introduced varieties are "Alphonse," "Mulgoba," "Totapari," etc. The planting distance of mangoes is about twenty to thirty feet each way, but as a rule, mangoes simply constitute a portion of the ornamental and economic trees in every dooryard. With us, the regular mango season extends from June to August. The trees begin to bear within six or seven years from seed, and thrive best at low altitudes. Mango trees bear very heavily, and the crop from a regular plantation is, therefore, large. The fruit will stand shipment in cold storage for a period of a month or longer, and have been successfully shipped from Hawaii to New York and to the Philippines.

There is a growing demand for mangoes on the mainland at good prices. Florida has already seen the profits to be derived from this industry and is pushing it to the fullest extent. As with bananas, and pineapples, so with mangoes, the Pacific Coast trade should logically be supplied by Hawaii. Methods have already been perfected for budding and inarching seedling mangoes with improved varieties, which are certain to make a large place for themselves in any market.

AVOCADO.

This tree grows vigorously on all the Islands from sea level to an altitude of 1,500 feet or more. There is a great variety of shapes and colors among the avocados on the local markets, but no well established varieties. It does not come true from the seed, and in order to secure the desired quality of fruit, it is, therefore, necessary to bud or graft the seedling trees. Not only do the shape and color vary, but the flavor is also noticeably different in different forms, as well as the texture. One of the important lines of horticultural work to be accomplished is the establishment of orchards of avocado all budded in a desirable variety. The trees bear within four to six years from the seed, and at the rate of 150 to 500 fruits per tree. The local price of avocado varies from three to twenty-five cents apiece, according to quality, the green fruits, as a rule, being superior to purple avocado. Avocado trees will develop fairly well and bear a reasonable quantity of fruit without any cultivation; but, like other fruit trees, are beneficially affected by cultivation, yielding more fruit of an improved quality. The fruit is easily shipped as far as the Coast. The Pacific Coast market makes greater and greater demands for avocado, and the prices are very remunerative. There is, perhaps, no fruit grown commercially in our Islands for which there is a greater possible market development with good profit, than is the case with the avocado. Practically unlimited quantities of uniform fruit of good quality can be marketed on the mainland.

CITRUS FRUIT.

Oranges and other citrus fruits have been known in Hawaii at least since the first visits of white men to these Islands. We now have all kinds of citrus fruits, including orange, lemon, citron, lime, pomelo, shaddock, kumquat and mandarin. Orange trees grow wild, and bear heavily of seedling oranges without cultivation or care of any sort. In a few locations, considerable profit has been derived from wild seedling oranges allowed to grow in pasture lands and areas covered with low brush. The quality and flavor of seedling Hawaiian oranges vary considerably, but are often quite excellent. Navel oranges have been grafted on to seedlings and produce large, juicy, fruits of good flavor. As a rule, they do not

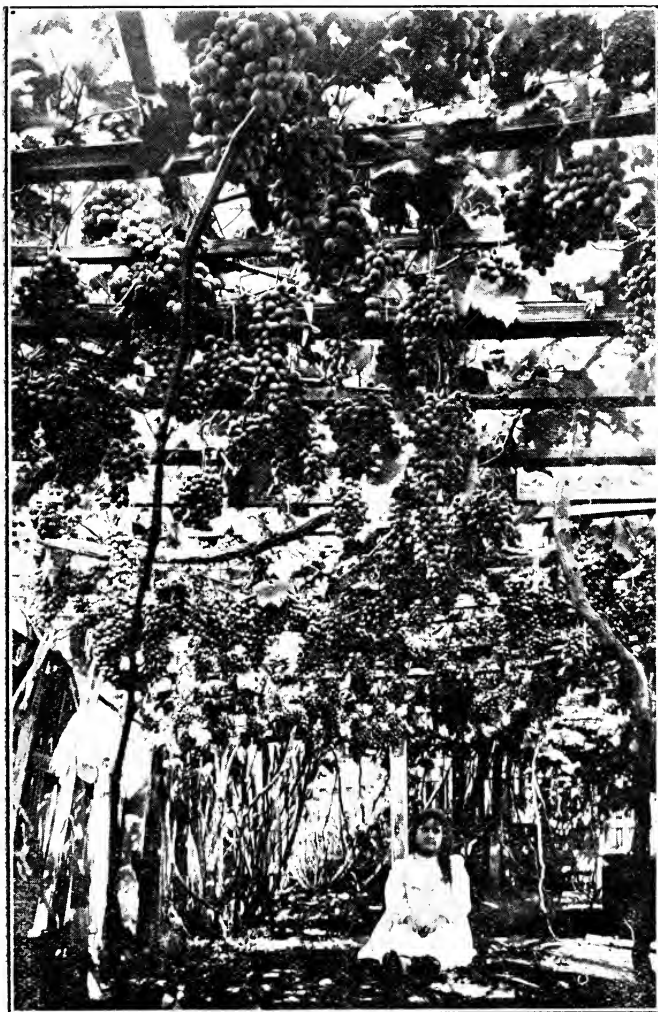
develop as rich or uniform color as is the case on the mainland. The flavor, however, is all that could be desired. Excellent limes and lemons are grown in all parts of the Islands. During 1908 citrus fruits, to the value of \$75,000, were imported into the Territory. With proper marketing facilities, and with a little attention to the cultivation of these fruits, the local markets could readily be supplied with all the necessary citrus fruits from small gardens and orchards on the various islands.

ROSELLE.

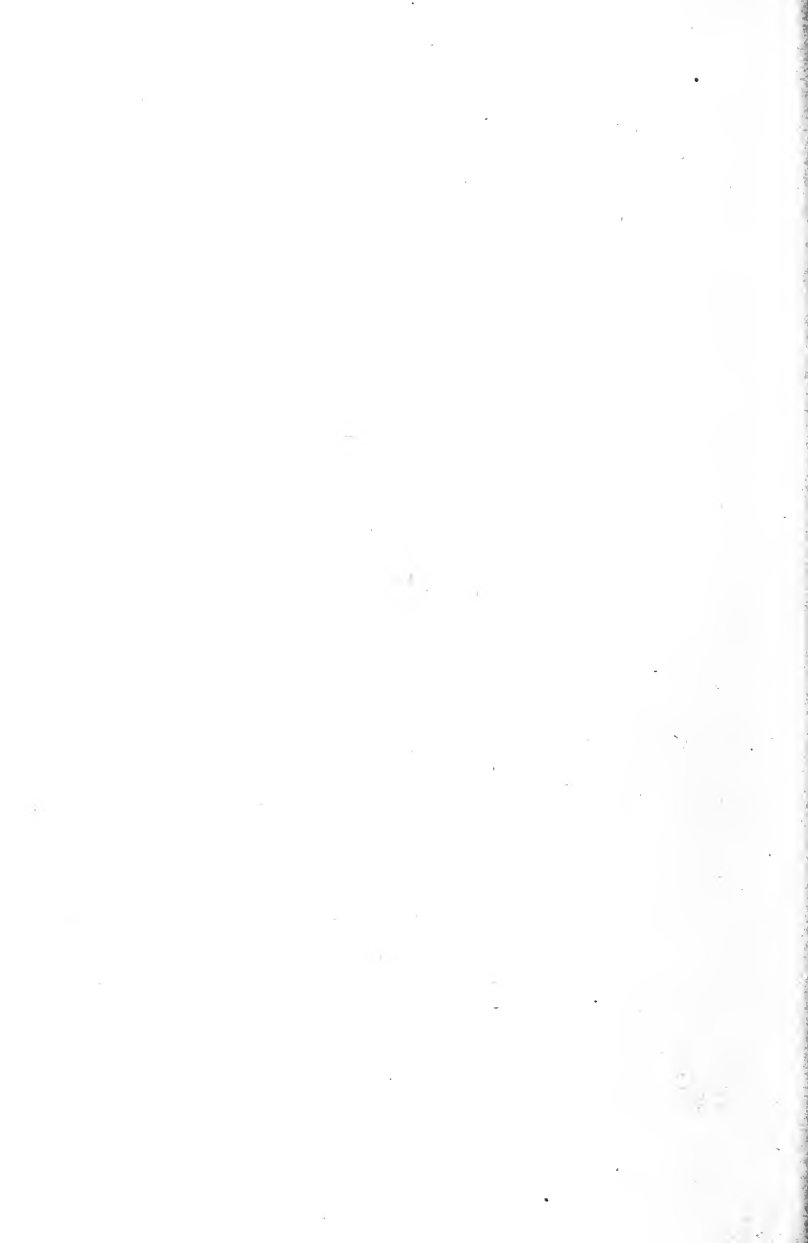
The cultivation and use of roselle have been rapidly extended during the past few years. The fleshy, rose-colored calyx of the fruit, and the young seed pod are used in the manufacture of jam and jelly. The plant is well adapted to Hawaii. It produces a yield of 6,000 to 10,000 pounds of fresh fruit per acre. Roselle will endure quite severe drought but naturally thrives better with a reasonable amount of rainfall. In our climate, it seems best to sow the seed in March; replant when the young plants are six to eight inches high, at a distance of 4x6 feet; and maintain the soil in good tilth. Several companies are manufacturing roselle jam and jelly for local consumption and for shipment to the mainland. The demand, however, is now in excess of the supply. Recently, a manufacturer in California has made request for 10,000 to 30,000 pounds of dried roselle calyces annually for use in his factory. A price of eighteen cents per pound is offered. The present supply is quite insufficient to fill this one order.

GRAPES.

The climate of Hawaii is adapted for the production of grapes, so that fresh fruit may be had for the table at any season of the year. This can most easily be accomplished by proper cultivation and pruning. At present the grape industry is largely in the hands of Portuguese, who produce grapes for table purposes and also for the manufacture of wine. At least two wineries are now in operation in the Islands, one of them being a co-operative enterprise. Not enough attention has been given to the cultivation of grapes to secure a good table fruit. Even in one of the chief grape regions, on the island of Maui, some of the grape vines are allowed to run over



GRAPE ARBOR IN BEARING. GRAPES MAY BE PICKED EVERY DAY IN THE YEAR IN HAWAII.



trellises, without pruning, until they attain a length of a hundred feet or more. Obviously, with such neglect, good table fruit cannot be expected; and with the absence of cultivation and insufficient sunlight, the sugar content of the grapes is too low. The only variety of grape grown commercially is the "Isabella." A number of other varieties, superior for table purposes, have been tested, and some of them have given good promise. Their cultivation, however, has not been prosecuted in a systematic manner.

COCOANUT.

This is perhaps one of the few palms which is indigenous to the Islands. It was propagated for centuries by the natives, being largely in control of the Chiefs. Some of the cocoanut groves, which are now conspicuous features of our landscape, are an inheritance from olden times. Since 1904, there has been a new interest in the planting of cocoanuts, and plantations of this nut are being increased on all of the islands. The cocoanut is one of the most ornamental of tropical trees and should ultimately constitute a fringe along the shore-line of our Islands. At least one company is going into the business of raising cocoanuts on a large scale. This seems to be a far-sighted policy, and might well be imitated by others who have interest in other things, and who can wait for the maturing of their plantations.

There is an increasing demand for the products obtained from the cocoanut. Cocoanut oil and butter everywhere find a ready market. The by-product, obtained from the manufacture of cocoanut oil, (and known as cocoanut meal), is valued as a concentrated stock feed and also as a fertilizer. The coir fiber obtained from the husks, is extensively used for cordage, matting and similar purposes; while the consumption of the dried meat of the cocoanut, or "copra," is increasing. The cocoanut seems to require fertile soil, good drainage and the prevalence of winds. In some of our plantations the trees are too close. The planting distance should be not less than thirty feet each way. While our climate is not strictly tropical, but rather sub-tropical, the yield of nuts is nevertheless satisfactory, varying from twelve to 250 nuts annually per tree, or about 12,000 nuts per acre. There is, of course, a long period to wait for income from plantations of cocoanuts; but after they once come into

bearing, they require little or no attention except the gathering of the nuts. There are many varieties of cocoa-nuts in Hawaii, but the Samoan variety is generally considered the most profitable to raise. A few trees of a strictly dwarf variety are known, on which the nuts are borne within three or four feet of the ground. This variety is not only highly ornamental, but a good yielder and a very convenient variety for picking.

VANILLA.

As is generally known, vanilla is the dried and fermented pod of a twining orchid, which requires a tropical climate for its growth. The plants are allowed to climb on a trellis or on the trunks of trees. Propagation is by means of cuttings. The vanilla plant blooms at the third year from planting, and the pods mature about six to eight months later. The flowers require pollination by hand; but this process is readily learned. The curing and fermentation of vanilla pods is a somewhat difficult and complicated manipulation.

There are only two or three commercial plantings of vanilla on our Islands, and reliable statistics regarding the yield are not yet forthcoming. The quality, however, is excellent; and the estimated yield, about 120 pounds of fermented pods per acre. At this rate, the money value of the crop should be about \$100 per acre. There are large tracts of land which could be devoted to vanilla, particularly in the Kona district of Hawaii.

PAPAYA.

The papaya is the universal breakfast fruit of the majority of the inhabitants of Hawaii. The trees are found in every dooryard on all the islands. It would seem at first thought, therefore, that everyone's table must be supplied from his own yard, and that there would be commercial market for this fruit. Nevertheless, good profits are being made from the commercial cultivation of papaya. In regular orchards, they should be planted about eight feet apart each way, in well drained and cultivated soils, where an average rainfall may be expected, or where irrigation can be practiced. The papaya bears in about one year from the seed. The apparent varieties are numerous, although few of them have been well established; and the seed does not breed

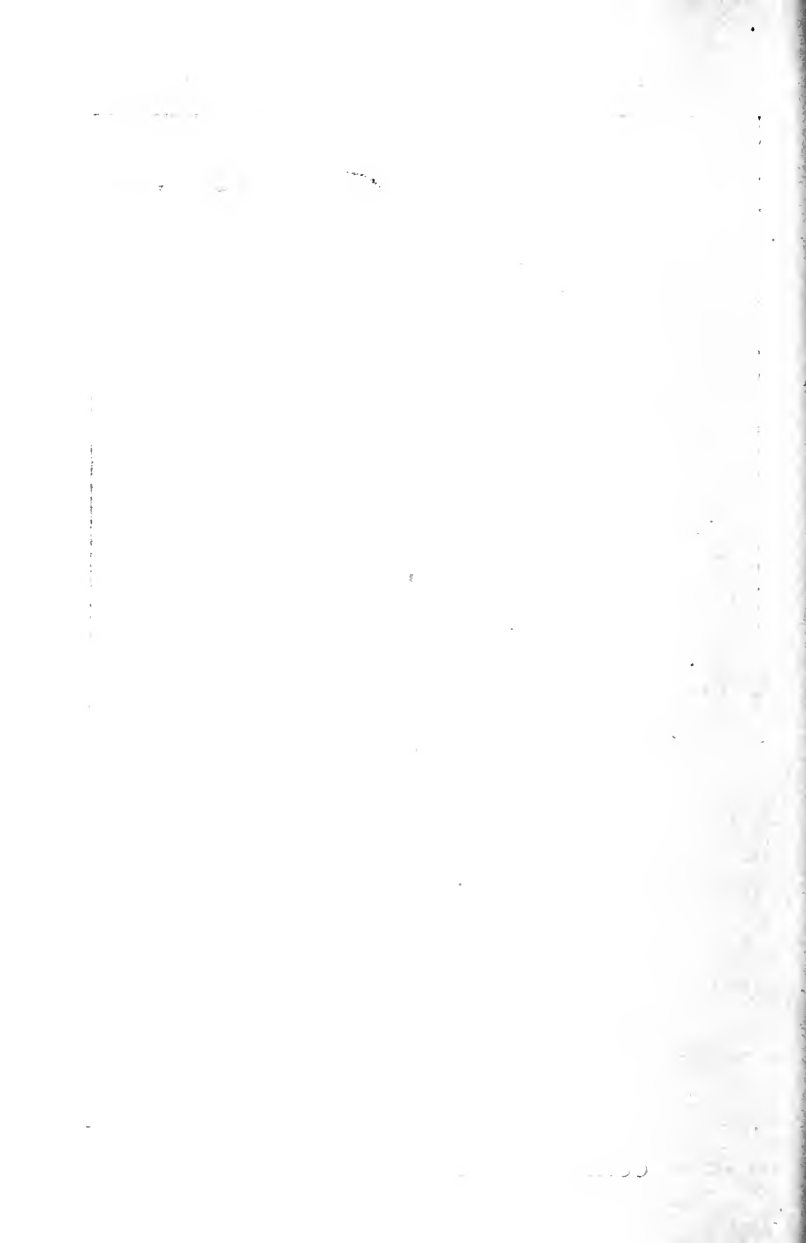


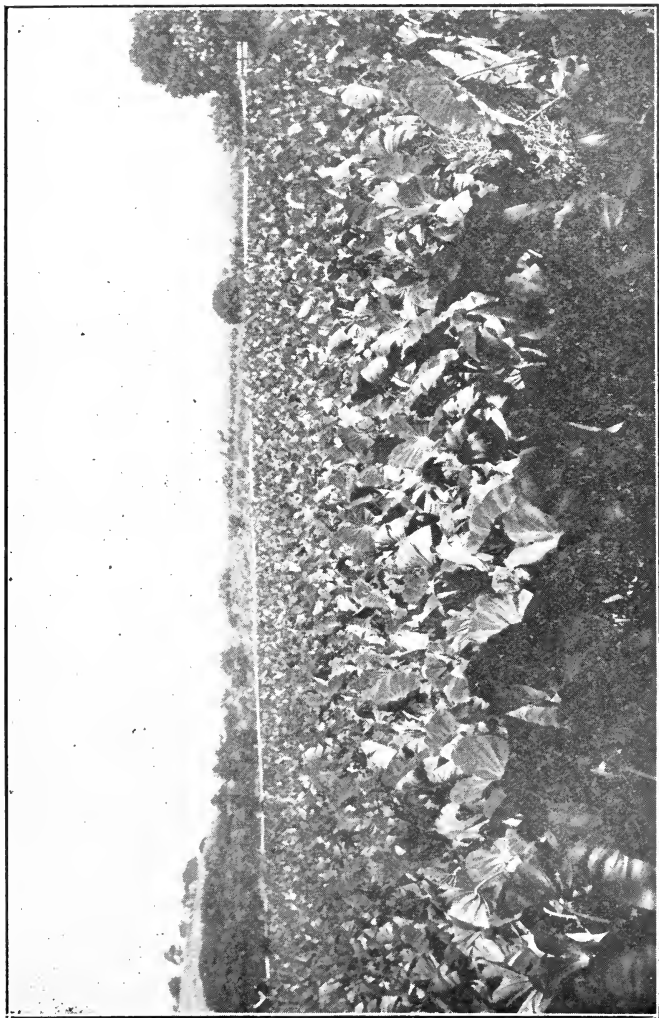
VANILLA, SHOWING PODS AND MANNER OF GROWTH.



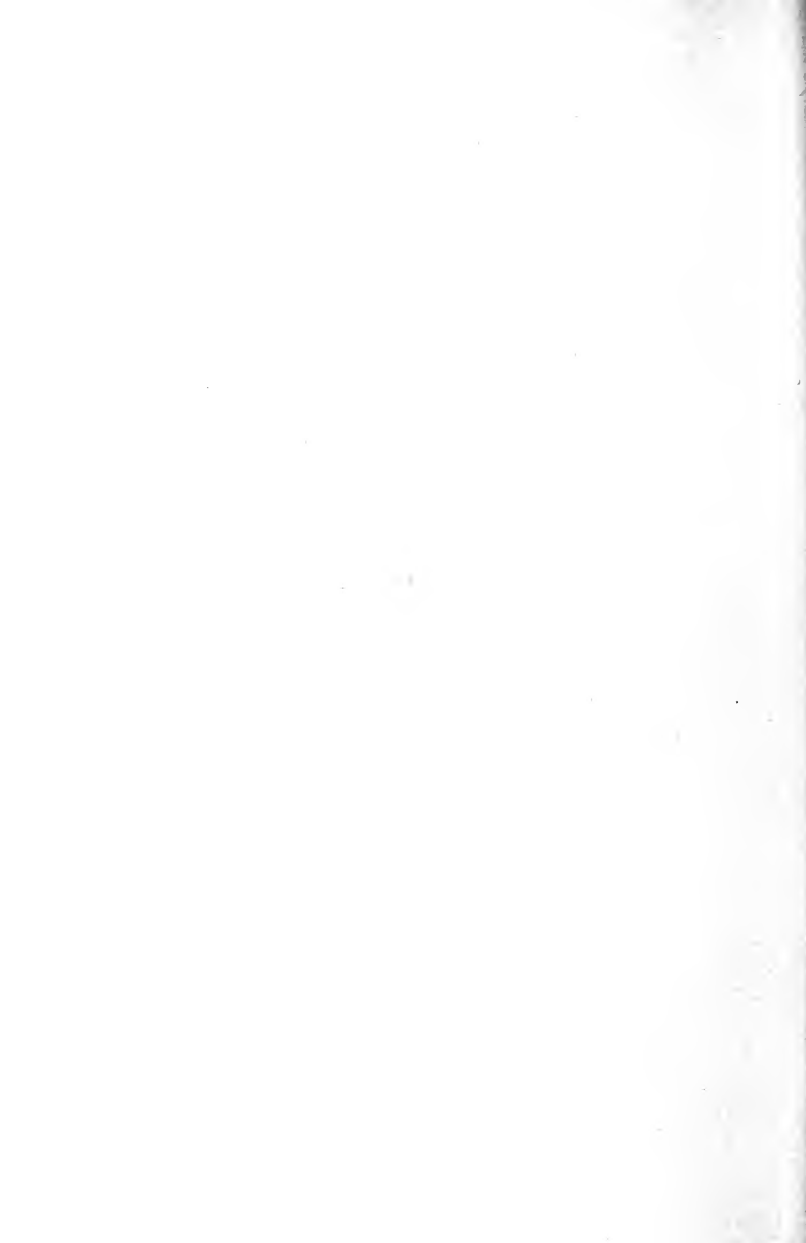


COMMERCIAL PAPAIA ORCHARD.





FIELD OF TARO FROM WHICH POI AND TARO FLOUR ARE MADE.



true. The varieties are commonly classified as "long," "half long" and "round." The "long," or Mexican type, is the best in flavor and is a hermaphrodite. The weight of the papaya fruit varies enormously; in some cases the fruits weigh as much as eighteen pounds. The tree, when properly cared for and fertilized, yields a heavy crop of fruit. There is an excellent local market for the varieties of best flavor. If attention were given to the shipping properties of the papaya, it would be an easy matter to develop a variety, which could be successfully distributed on the Coast. At present the average papaya will hold its texture for only about eight days after picking. On many of the ranches, and in gardens, papayas of poor flavor, and large size, are raised as pig feed.

FLOWERS.

The mainland visitor, on first coming to Hawaii, will perhaps be impressed by the relative scarcity of herbaceous flowers. Nearly all of our trees and shrubs bear ornamental or beautiful flowers and we have depended upon those for ornamentation, rather than upon delicate annuals and herbaceous perennials. Nevertheless, carnations, asters and violets are in bloom at all seasons of the year; and these constitute the chief herbaceous ornamental flowers which are grown on a commercial scale. Excellent roses could be produced here if it were not for the Japanese beetle and mealy-bugs. Until these are more effectively controlled by parasites, or otherwise, it will remain difficult to produce roses without having the leaves eaten off or distorted. There are innumerable shrubby or arboreal ornamentals, the mere list of which would be too long in this connection. Some of the most striking are poinciana, golden shower, hibiscus and poinsettia. There are a large number of native species of hibiscus, and these have been hybridized and otherwise manipulated, until we have 75 or more varieties, which produce an exceptionally beautiful flowering hedge.

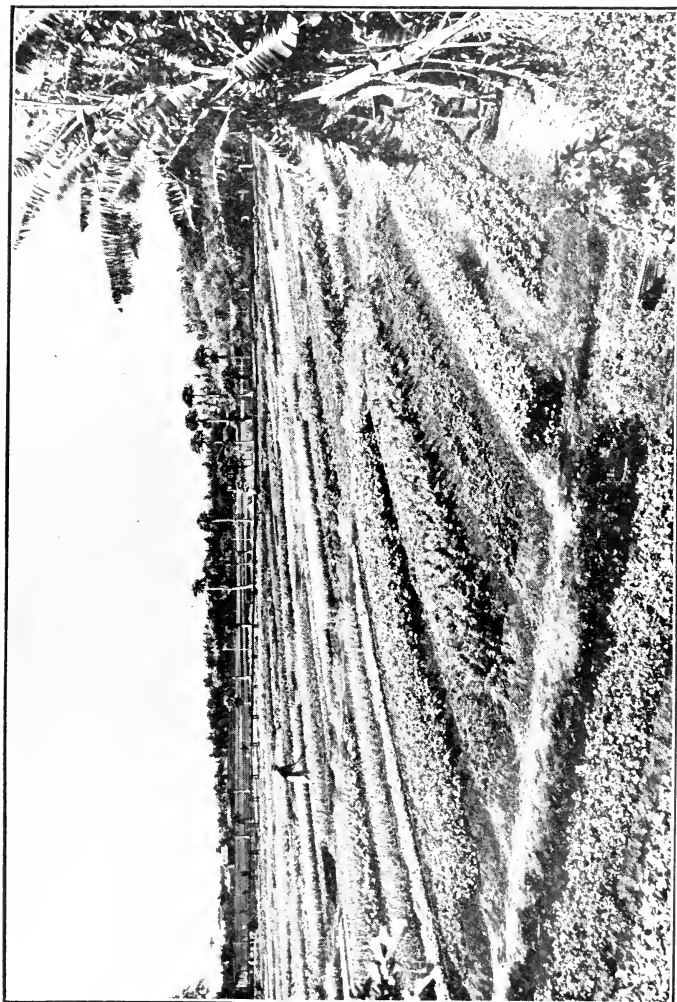
There is constant demand for seed, cuttings and young plants for ornamental purposes; and strangely enough, no commercial nursery has been established in the Territory. There should be such an institution; and for the right man, the opening is very promising from a business standpoint.

SWEET POTATOES AND OTHER VEGETABLES.

Sweet potatoes have always constituted one of the main food products of the native Hawaiians. A great variety of this vegetable has been produced, in respect of size, shape, color, characteristics of the leaf and habits of growth. The quality of the best varieties is excellent, and the local demand is constantly increasing. The local markets alone would consume three or four times the quantity of sweet potatoes now produced if attention were given to the problem of securing a uniform quality, shape and color of sweet potatoes; and a uniform supply for the market. This statement is based, not merely on a theoretical estimate, but upon the declarations of local dealers. In addition to sweet potatoes, we can produce all sorts of vegetables for home use and for the local market. In former days, Irish potatoes were raised here and shipped to California. An excellent quality of Irish potato can be produced on any of the islands at moderate altitudes. During the year 1908 Irish potatoes and onions were imported to the value of \$130,000. This material could be supplied by local small producers if attention were given to the matter. A large part of the market gardening now done in Hawaii is in the hands of Chinese, who are everywhere conspicuously successful and clever at this line of work. There is no reason, however, why market gardening should not be as profitable for white men and native Hawaiians. Even the production of taro could be profitably increased to a considerable extent. Requests for taro flour have recently been received from dealers on the mainland, and such products would find considerable sale if the markets were studied and carefully considered.

SILK.

Mulberry trees were introduced into Hawaii in 1837 and from time to time some interest has been awakened in silk raising. Mulberries thrive on all of our Islands and the quality of silk produced at the Hawaii Experiment Station has been pronounced satisfactory. Since a large part of our laboring population is composed of Asiatics and Portuguese, it would appear that we have a supply of cheap labor, in the women and children of these races, to raise the raw silk. The silk industry, however, has never assumed a commercial form. Doubtless if a reeling establishment were located here and a reasonable price were offered for cocoons, the silk industry could be encouraged in its development.



TRUCK GARDEN NEAR HONOLULU.



BEES.

The honey crop last year was nearly 1,000 tons, and the production of wax, about fifteen tons, with a total value of about \$65,000. The present investment in apiculture is about \$200,000, and there are 20,000 colonies of bees. In certain places the industry could be further developed, but for the most part, the rights for bee pasturage are already taken. Our honey plants are numerous and productive, and the honey flow, while not strictly continuous the year round, may best be stated as coming in two seasons. Algaroba, williwili, lantana, nasturtium, lehua, and many other flowering trees furnish honey together with a great variety of herbaceous plants.

FORAGE PLANTS.

In the agricultural diversification, which has been taking place in Hawaii for the past few years, too little attention has been given to forage plants, with the result that large quantities of hay and grain are annually imported at exceedingly high prices as compared with those on the mainland. We have excellent conditions, however, for growing all sorts of forage plants and an active movement is now taking place in that direction.

Alfalfa seems no more difficult to get started here than on the mainland. The plant does not grow as tall, and the yield per cutting is not as high as in the best alfalfa regions of the mainland; but the stems are fine and growth is very rapid. Where water is supplied for irrigation, or where the rainfall is sufficient without irrigation, from ten to thirteen crops per year may be cut. On one of the large dairy farms near Honolulu a cutting is made once per month the year round. On account of the fact that alfalfa can be had green every month, there is less necessity for making hay of this crop than on the mainland. A good quality of alfalfa hay, however, is cured in several localities.

Cow peas grow vigorously and furnish an abundant green forage and seed for cattle and hogs. This plant is particularly susceptible to the attacks of plant-lice as compared with other legumes. It serves, however, as a good cover crop in orchards, rubber and coffee plantations.

Jack beans produce an immense quantity of green forage, which has been found very effective in dairy

feeding. This plant is particularly immune to the attacks of plant-lice and other insects. The beans are not desirable feed when ripe, but if cut while the beans are still green, the whole plant furnishes good forage.

Soy beans are particularly adapted to our conditions on account of their vigorous growth and the active market demand. The local price for the beans for use in the manufacture of soy sauce is $3\frac{1}{2}$ cents per pound. At this rate, it has been found possible to obtain \$75.00 per acre for the crop of soy beans in our coffee plantations. The varieties used for stock feed are now being planted quite extensively as forage for hogs.

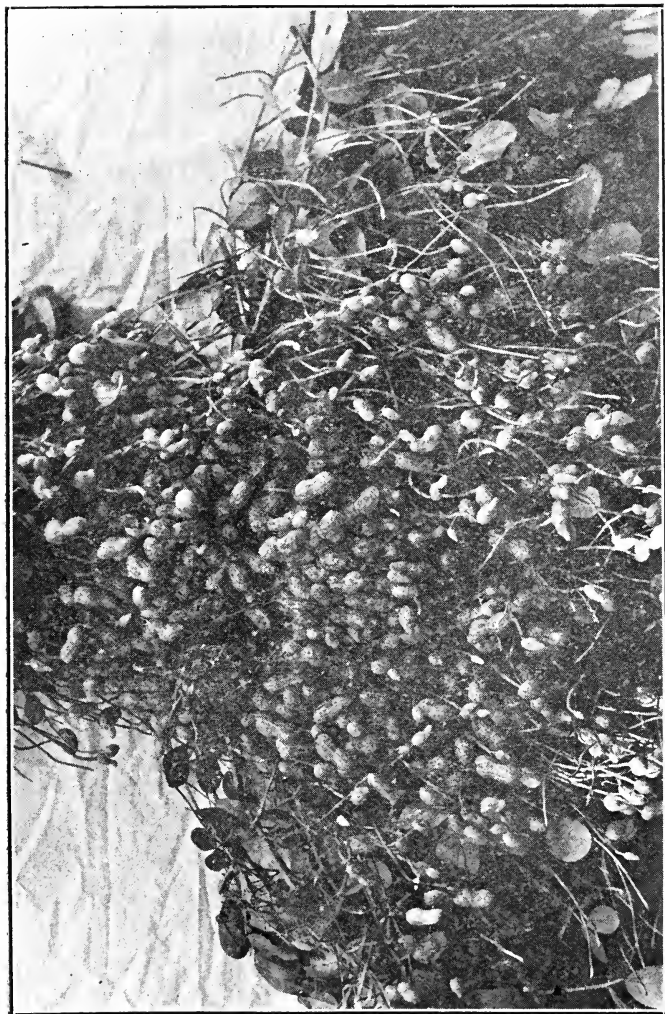
Sorghum is grown for green forage on most of the dairy farms and ranches. It ratoons readily, producing four or five crops per year, and does not need replanting for several years. Horses and other stock are fond of green sorghum, and it has the further advantage of being resistant to the attacks of cut-worms.

Wheat hay is the kind of hay most imported from California for local use. The added cost of freight makes it a rather expensive forage for our use. A number of experimental plantings of wheat for hay are being made this year. On one ranch two tons of wheat have been planted for this purpose. When it is remembered that in the early days, the Hawaiians furnished California with wheat, there seems little doubt of the success of this venture.

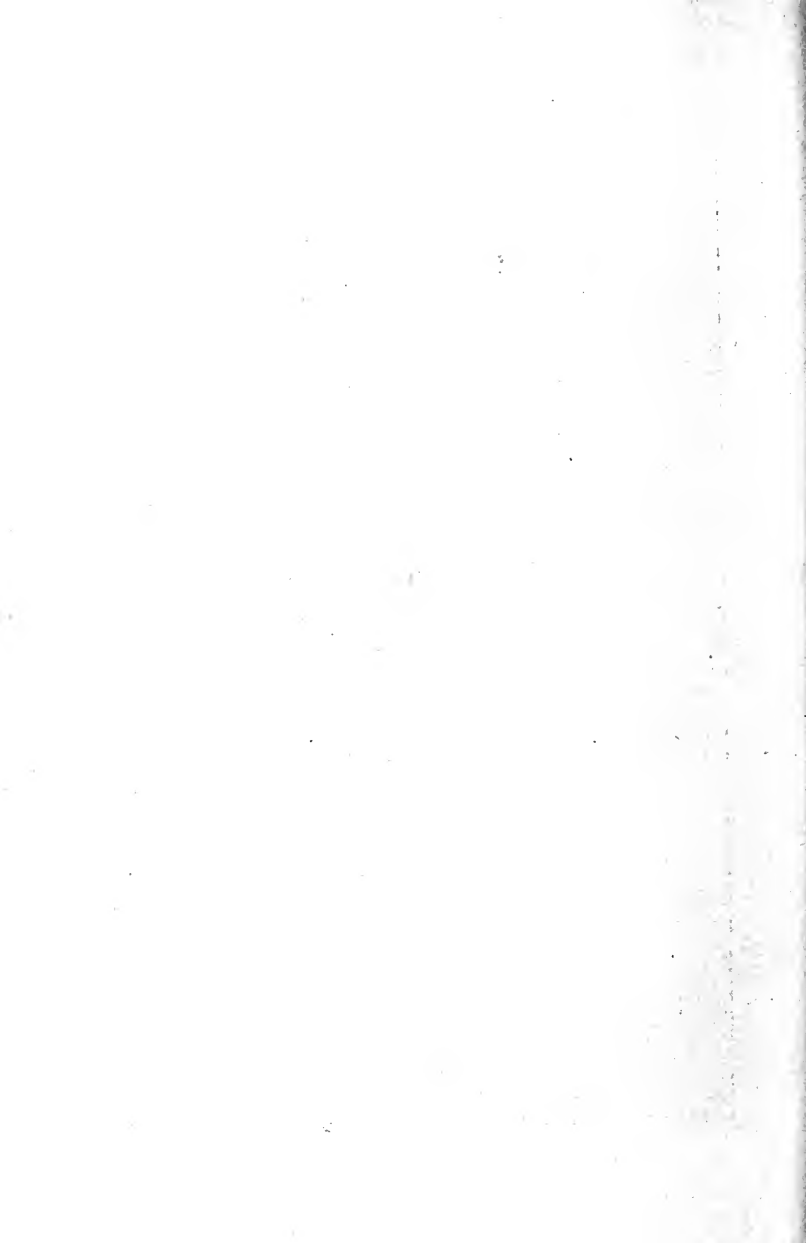
Rice hay has been grown in a number of localities, varying greatly in rainfall and altitude. Both Upland rice and salt marsh rice have been used for this purpose. A large crop of hay of excellent quality has been obtained and most stock seem to relish the hay. An abundance of bedding material is obtained from rice straw and rice chaff.

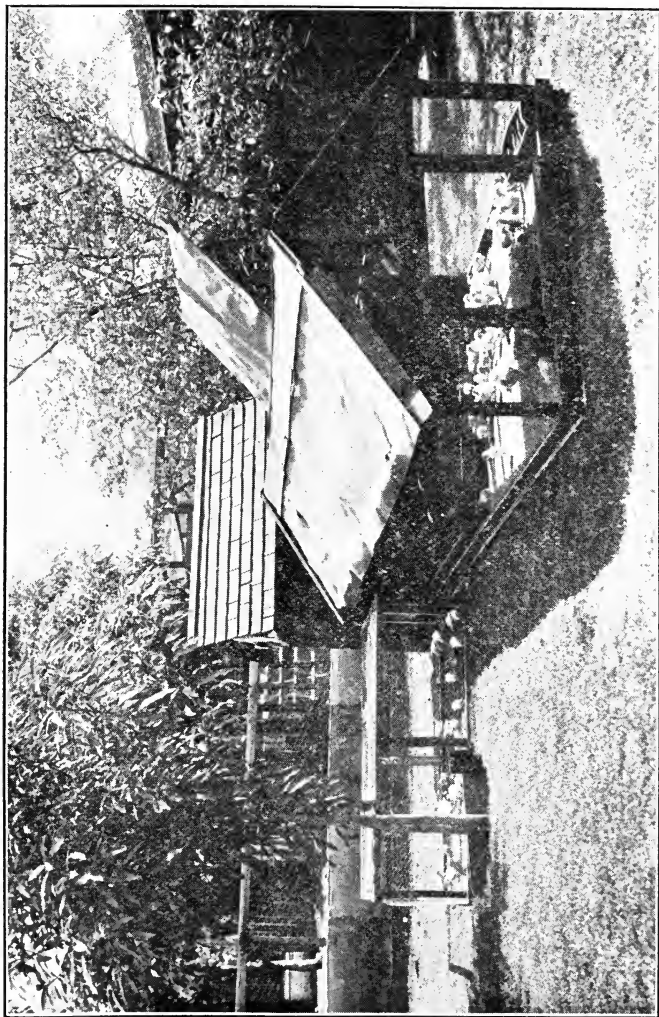
Rhodes grass, Guinea grass and Para grass have made a place for themselves in our dairy and cattle industry. Rhodes grass is particularly drouth resistant and produces a large crop of good quality in dry locations on ranches. Para grass requires more moisture, but grows rapidly and ratoons promptly. It is, therefore, much used as a dairy feed and as green forage for the family driving horse.

In the line of range grasses, a great variety of drouth resistant species from the mainland, Australia and Africa

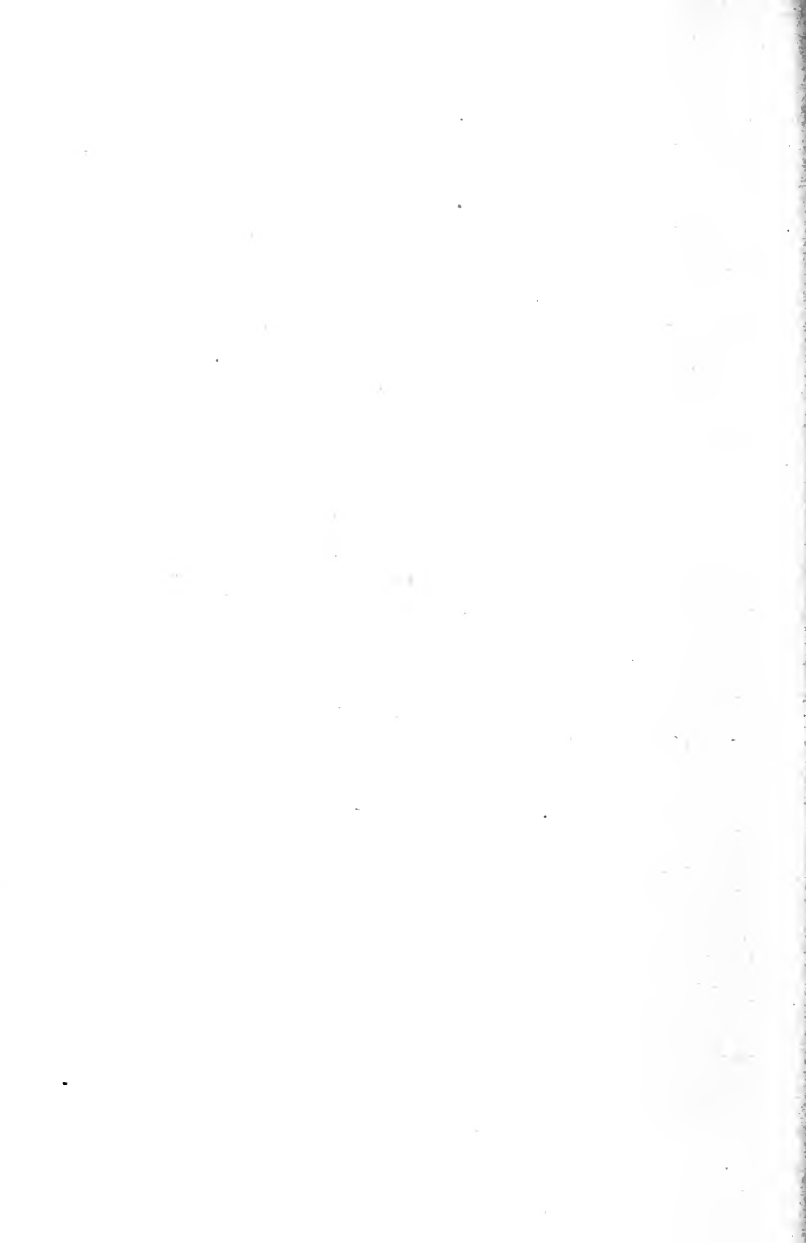


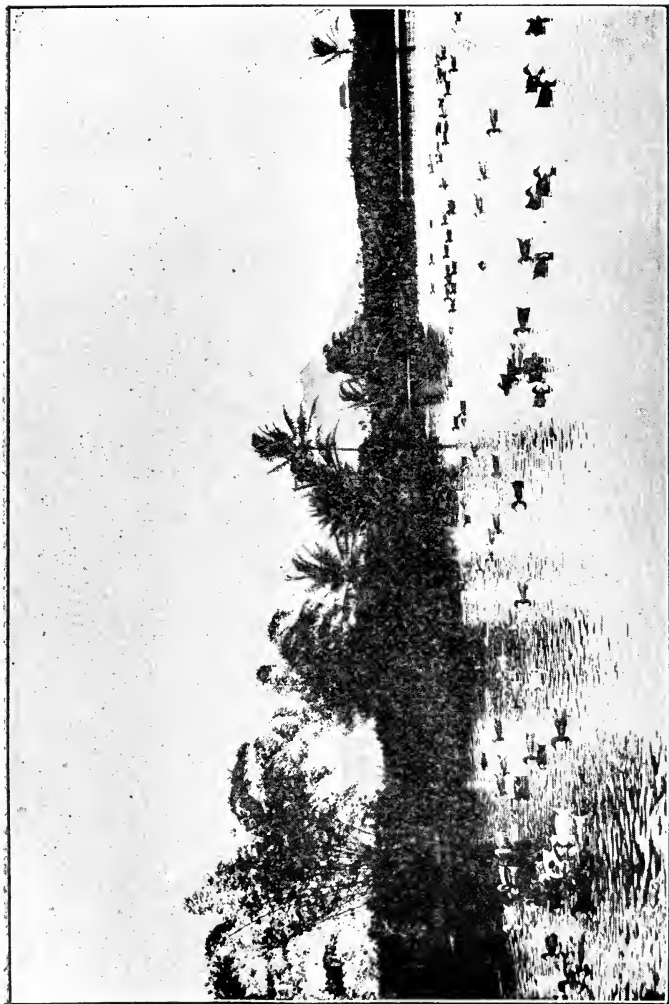
A PEANUT PLANT IN FRUIT.



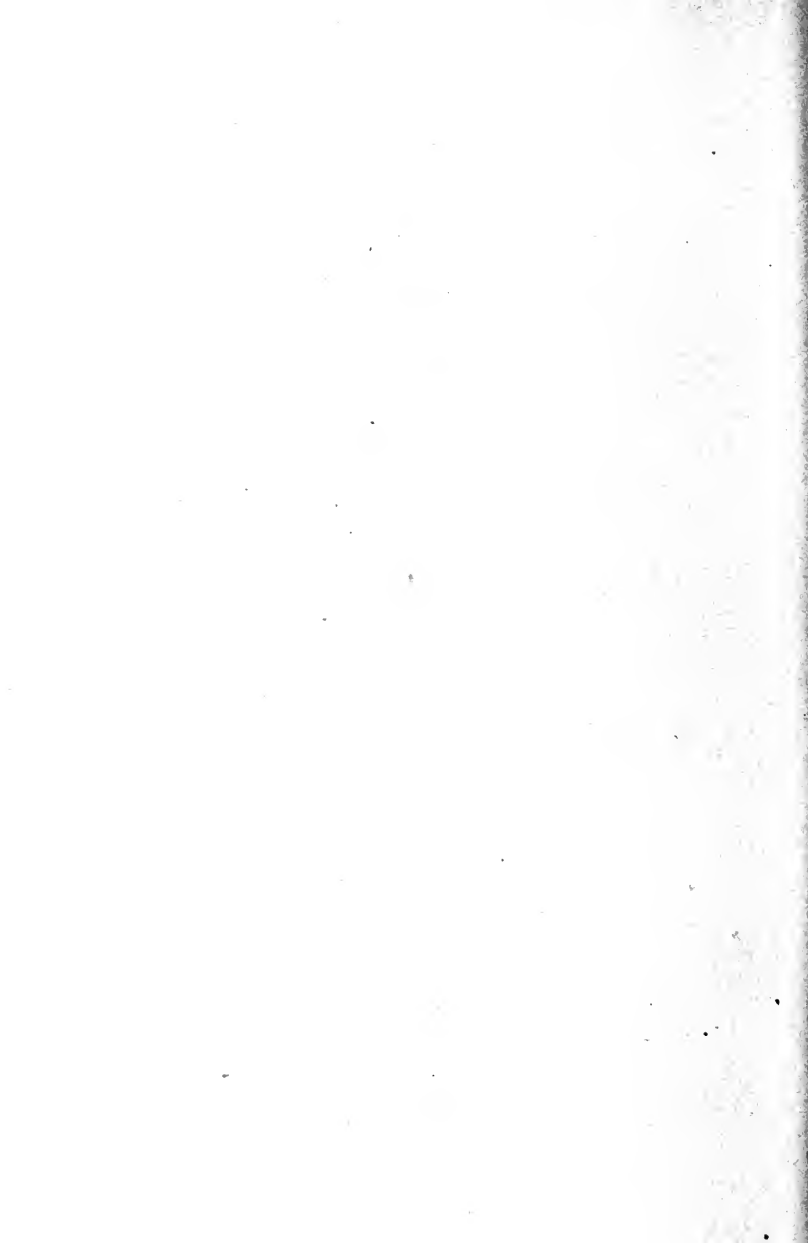


A HOME-MADE BROODER.





AN IDEAL POND FOR DUCK RAISING.



have been introduced. The grazing areas are gradually being improved by the distribution of desirable species of grass.

LIVE STOCK.

About 1,600,000 acres of land are used for grazing purposes. On the ranches, which control this land, there are 130,000 cattle, valued at \$1,699,999; 100,000 sheep, valued at \$126,000; in addition to horses, mules and hogs. The ranching business is almost entirely in the hands of American citizens. In the early days of ranching in Hawaii, cattle and sheep, as well as horses, were practically in a wild condition, ranging over the grazing lands, and also through the mountain forests. At present the best ranches are fenced and divided by cross-fences into large pastures for the better manipulation of the stock, and the control of the grazing areas. In order to increase the carrying capacity of the range, and to prevent losses which have occurred in the seasons of drought, it is necessary to increase, as greatly as possible, forage production on ranches by planting alfalfa, corn, sorghum, peas, cassava, and various other crops. An active movement in this direction is now taking place. In the following paragraphs a few details are given regarding the status of different lines of animal industry.

The annual consumption of beef in the Islands is about 14,000 carcasses and the demands for beef are increasing quite rapidly. Thus far the ranches have been able to produce all the beef that is required, and the increased demands for beef can be met by better management of ranches, particularly in producing larger quantities of cultivated forage. The chief breeds of cattle raised for beef are Devon, Hereford, Shorthorn and Holstein. On some of the ranches the Herefords are decidedly preferred on account of their ideal beef form and large size. In other localities, the Devons give better results on account of being more active on the range, and perhaps less susceptible to attacks of sore eyes. Shorthorns and Angus have given less satisfactory results than on the mainland. If the beef market showed more discrimination as to quality of beef, there would be less demand for Holstein beef, but, at present this breed gives a good account of itself on the range and produces a quality of beef which satisfies the ordinary consumer.

The greater number of sheep are located on six ranches, two of the smaller islands being practically given over

to the sheep industry. The breeds raised on these ranches are chiefly forms of Merino and Shropshire. The larger breeds, such as Cotswold and Lincoln, do not compare favorably as range sheep with the Merino and Shropshire under our conditions. Only a few of the sheep ranches are in a position to produce a better quality of wool than that obtained at present, and to this end importations of fine Merino breeding stock have been made. A recent shipment of Bulldog Merino was received from New Zealand. On large areas of our sheep ranges there are too many burrs, which get into the wool and lower its value. In such localities, it seems desirable to raise sheep for mutton rather than wool. For this purpose Shropshire, grade Merino and Tunis sheep offer much promise. All of our sheep are allowed to range without interference from herders. This kind of management gives far better results than can be obtained from the close herding system, such as is universally practiced on the large sheep ranches of the Western states. By alternating sheep and cattle in fenced pastures, containing 2,000 to 10,000 acres, there is one great advantage in the cleanliness of the range which is thus maintained. The grasses and plants, which are left standing by cattle, are eaten by the sheep so that the range is covered with a more uniform stand of grasses and no one weed or group of weeds is neglected to occupy the range to the exclusion of more desirable plants. There is room for the extension of the sheep industry, since about 500 carcasses of mutton are imported monthly to satisfy the market. The present wholesale price for dressed mutton is about ten cents a pound. Our wool exports in 1908 amounted to \$58,000, the wool being marketed in Boston at from twelve to twenty cents a pound.

The pork production of Hawaii is not nearly sufficient for home consumption. During the past year one firm alone in Honolulu imported 35,000 pounds of pork loins from the mainland. There is a constant demand for pork at ten cents a pound, live weight, a figure considerably above that obtained for pork on the mainland. The climate of the Islands is well adapted for raising hogs. They can be allowed to run at will on green pasture or on the range. There are hogs on all of the Islands, which have escaped from cultivation and find abundant forage in the hills and mountains. The necessary expenditure for buildings is very slight. By the use of local grain feeds, such as algaroba bean, corn, alfalfa, soy beans, etc.,

it is possible to produce pork at two or three cents per pound. The difficulties met with in hog raising here are no greater than on the mainland. There are outbreaks of hog cholera from time to time, but a careful system of quarantining imported breeding stock, and the confinement of hogs in fenced areas, will obviate most danger from this source. The Berkshire is to be recommended as probably the best breed for our conditions.

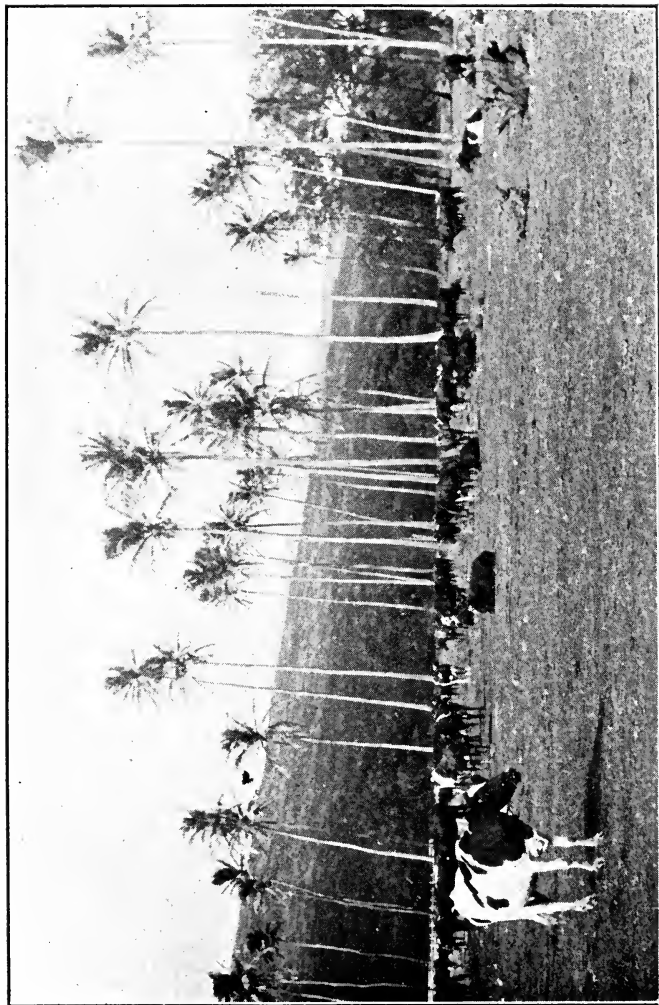
Dairying in Hawaii is carried on chiefly for the production of milk. Only small quantities of butter are made here, and no cheese. The present market price of milk is ten or twelve cents per quart. There is room for much improvement in the dairy industry and for considerable increase in the production of milk. About 45 dairies furnish milk to the city of Honolulu, part of these being well managed by intelligent dairymen, while others are in the hands of ignorant Portuguese, who understand little of the sanitary requirements of clean milk production. In some localities an excellent quality of butter is produced. A few of the outlying dairies in the mountain regions are managed according to modern ideas of sanitation and yield excellent returns. Perhaps the chief reason for the small profit, complained of in dairying, is to be found in the low milk yield of dairy cows. Almost no attention has been given to the selection of cows for large yield. The result of this neglect is that the average cow gives about one-half as much milk as the average cow on the mainland. It is obvious that a few enterprising dairymen, with good training in all of the technique of the business, could find room for the establishment of an industry with large profits in Hawaii.

There is a steady demand for horses for dray purposes in towns, and as draft and saddle animals on plantations. The local demand is nearly met by local production, but last year nearly 200 horses were imported. The quality of the draft and saddle horses could be improved. On the large ranches importations of the finest quality of breeding animals have recently been made; in fact, the great importance of fine, pure bred sires is quite well recognized. On one ranch we have six or eight Percheron stallions which would compare favorably with those of any locality. These stallions are at present being used for the production of heavy draft horses and also for the purpose of securing mares suitable for mule raising. There is room, however, for the further improvement of draft animals and a reasonable number of excellent draft ani-

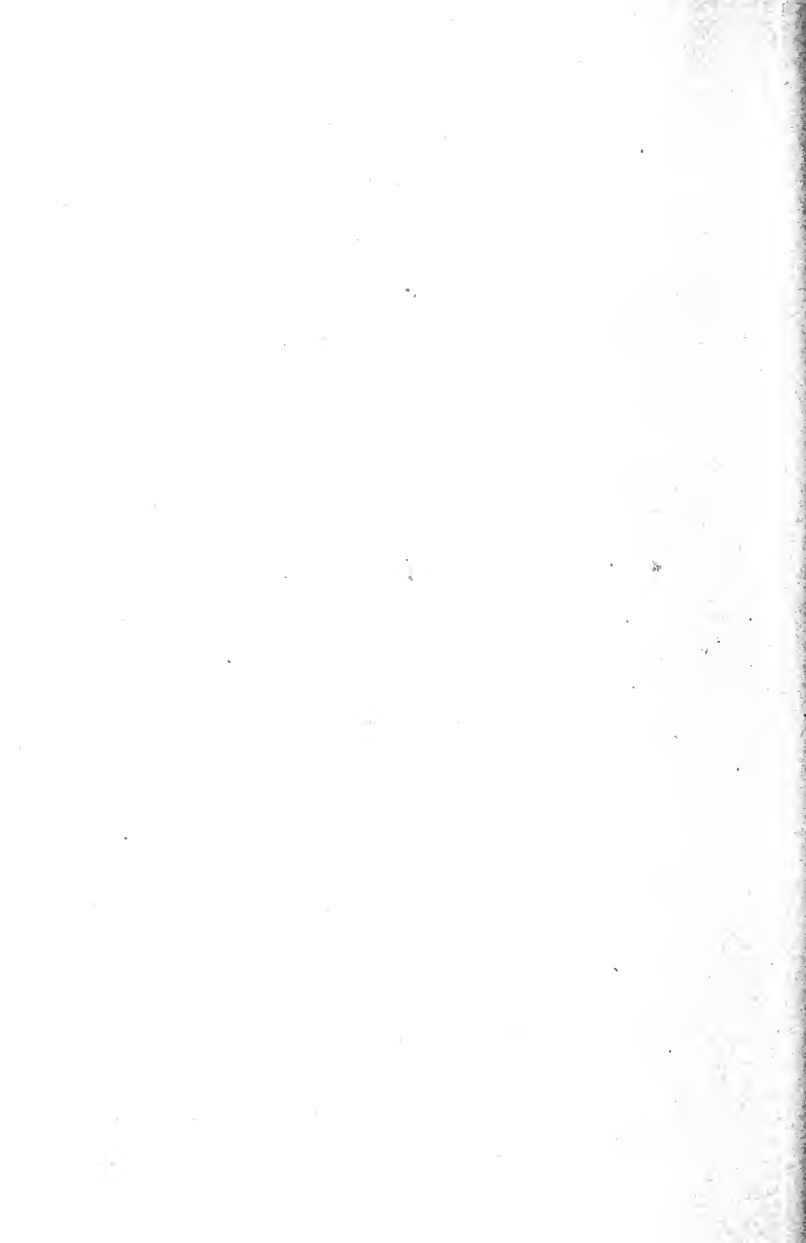
mals can always be marketed locally at remunerative prices. The demand for saddle horses is very active. There is an excellent opening for a skilled breeder to improve the type of saddle horses by the use of American Saddle stallions on native mares.

Mules are always in demand on plantations and the local production is insufficient to supply the market. During 1908, 750 mules were imported and sold at about \$250.00 per head. A few of the plantations are making preparation to raise mules for their own use, but there is a good opportunity for an expert breeder to produce mules for general work purposes about towns and on plantations. We have a great number of native Jacks, which are constantly used as pack animals, and some of the stallions have been used in mule production. It is easy to understand that the mules obtained in this way are under-sized and of undesirable color. Some unfortunate experience has been had in importing standard Jacks for breeding purposes. In several instances, the buyers have received very inferior animals. A considerable number of standard bred Jacks, if raised and acclimated in the Islands, could be sold to plantations for use in mule production.

Nearly all of the standard breeds of poultry are raised to some extent in the Territory. At the annual Poultry Show in Honolulu fine specimens of these breeds are exhibited and a poultry judge from the mainland is always invited to award prizes. The commercial production of poultry, however, is far below the requirements of local trade, and as a result, great quantities of poultry and eggs are constantly imported from the mainland. When it is remembered that the local price of eggs ranges from 40 to 60 cents a dozen, and that of ordinary fowls, from \$10.00 to \$15.00 a dozen, it is evident that there is money in poultry for the man who knows the business. There is a wide-spread belief that the diseases, and other troubles which the poultrymen meets, are more serious here than on the mainland. When we look into this matter, we find that sore head, or roup, and mungoose are the chief sources of trouble. The fowls can be protected against mungoose by the construction of cheap buildings and the use of mungoose-proof fencing. Moreover, sore head is no more serious here than in many parts of the mainland. The disease is apparently carried to some extent by mosquitoes, and fowls can be easily protected against mosquitoes by providing cheap, open roosting



LARGE DAIRY HERD IN A COCOANUT GROVE NEAR HONOLULU.



houses, screened with mosquito-wire. A number of men who are now following the business of poultry raising, are making good profits from it; and there is room for others. The raising of ducks is at present largely in the hands of Chinese, who control large areas of duck ponds near Honolulu. This line of poultry industry, could also be extended. Geese thrive excellently well and seem to be almost unmolested by diseases on most of the islands. Turkeys are subject to no more trouble than they have on the mainland; in fact, on many of the islands domestic turkeys have escaped and easily maintain themselves in a wild condition in the forests.

WHAT HAWAII OFFERS TO THE MAINLAND FARMER

The farmer whose experience has been had entirely in temperate climate, may wonder what he has to expect in a subtropical country like Hawaii. Such a man naturally hesitates to sever his connections with friends and with the familiar conditions under which he has lived from boyhood. The facing of new conditions in an unfamiliar country may seem a serious undertaking. We have conditions, however, which should appeal to a large number of American farmers. In the first place, he can raise in Hawaii all of the vegetables, most of the field crops, and some of the fruits with which he is familiar on the mainland. In addition to these crops, which constitute the agriculture of his experience, he can raise the innumerable tropical fruits which are found in Hawaii and many, or all, of the domestic animals.

Our climate should appeal to many as a welcome relief from the sudden and trying changes of temperature which characterize temperate regions. The heat is not too severe for the white farmer to do manual labor, and the joy of being able to live out of doors practically the year round is not to be lightly brushed aside. The crops with which the mainland farmer is familiar, mature in about the same time or more quickly with us than on the mainland. Tropical crops, however, are slow in maturing and those who intend to engage in the cultivation of rubber, sisal, Manila hemp, coffee, avocado or pineapples, should have sufficient means to tide them over the period during which he must wait for returns. Fortunately, in most of these crops, the soil will also sustain rapidly maturing crops between the rows of the slow maturing plants. The insect troubles, with which we

must contend in tropical climates, may seem very annoying at first, but as experience accumulates, they are no more insuperable than similar pests of temperate climates. An unusual amount of work has been done in the introduction and propagation of parasites with most striking results, and the hope is confidently entertained that all of our serious pests may be controlled in this manner with the assistance of artificial treatment. The agricultural problems of Hawaii differ from those on the mainland, but are no more difficult to the man who comes armed with intelligence and possessed of energy.

The Hawaii Experiment Station is maintained by Government funds, assisted by occasional Territorial appropriations. A staff of trained men are occupied in solving the problems which confront the farmer of Hawaii, and satisfactory progress along this line has been recorded. The sugar planters maintain an Experiment Station for the investigation of all problems relating to the sugar industry. The Territorial Bureau of Agriculture and Forestry has the supervision of official inspection work in preventing the introduction of insect and fungus pests and animal diseases; and in the control of the forests. The Territorial Conservation Commission is bending its energies to the conservation of our various resources, particularly water and the forests. The College of Hawaii has recently been established with functions and purposes similar to those of other Agricultural Colleges on the mainland. The American farmer, who may come to Hawaii, will find an unusual percentage of men well trained in technical lines, engaged in agricultural pursuits.

PUBLIC LANDS.

The control of the public lands of Hawaii is vested in the Territorial Government, subject to some general conditions imposed by Congress in the Organic Act under which the Territory is constituted. The Governor, through the Commissioner of Public Lands, has the power to lease and sell lands under various conditions of homesteading; and steps are now being taken to open up a number of tracts in lots of about forty acres to American settlers under easy conditions.

Although the law provides a number of systems by which the lands may be disposed of, the Governor has the option of making use of such form as he sees fit. At the present time a special form of agreement is being used

which has proved most satisfactory to everybody; makes the conditions extremely easy to the settler, and insures the Territory largely against speculators. Land opened under this agreement is sold at approximately twenty-five per cent. of its appraised value, and the payments may be extended over a period of twenty years, and without interest for the first ten years. A five per cent. payment of the purchase price is required on receiving right of entry, and two years later a second five per cent. is due. Thereafter five per cent. per year is required to be paid.

The homesteader cannot receive a patent in less than ten years, but at the end of that time may make all his payments, and receive a patent in fee simple.

Five years' residence upon the property is necessary to secure a title, but the settler may spread this over the first ten years if he desires, thus permitting him to get his land to producing an income before being required to actually live on it.

He is also required by his agreement to have at least ten per cent. of his arable land under cultivation within two years after date of sale, and ten per cent. additional each succeeding year until he shall have at least fifty per cent. under tillage. As much of the land in the Territory is interspersed with land not available for cultivation, the agreement requires that when a portion of a settler's land is of this character, he shall be required to plant it in trees—five trees per acre within the first two years, and five additional per acre each succeeding year until a total of twenty-five per acre have been planted.

Except in the length of time required for residence, and to obtain a patent, the conditions of the Hawaiian law is in every way easier for the bona fide settler than are the Federal Homestead Laws. The Land Commissioner, with the consent of the Governor, is empowered to extend time of payments, of cultivation, tree-planting, etc., when there is good reason why the settler has been unable to fulfill any of these conditions. The desire of the administration and of public sentiment in the Territory, to have the lands occupied by prosperous American citizens, insures the most liberal and helpful interest being taken in every person taking up land in good faith.

Another feature, which is not a part of the Federal laws, and which should appeal most strongly to the homeseeker, is the provision applying to forfeitures. If a settler for some reason fails to make good in his agreement, and thereby forfeits his holdings, the law provides

that upon the sale of the surrendered property, an appraisal shall be made on the permanent improvements, and this figure added as an upset price to the value when the land is resold. The first holder will receive the value of the improvements, and a proportion of any increase over the original selling price of the land, less such rentals and costs as he may owe. This provision of the law has made it possible for the settler to borrow money for developing his land, giving a lien on his building and other improvements. The Territorial Government recognizes this right, and has a form of mortgage acceptable to it in this connection.

For further information about the Territory of Hawaii and for illustrated folders, address

H. P. WOOD, Secretary,
Hawaii Promotion Committee,
Honolulu,
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