LANZON  The lanzon (*Lansium domesticum*) is a fruit tree occurring in the Philippine Islands and introduced for trial in Hawaii some twenty years ago by J. E. Higgins. The fruit resembles the loquat in appearance, except that it is smooth on the outer surface, lacking the fine hairiness characteristic of the loquat; in flavor it is suggestive of the grapefruit.

The early trials were not successful but new plantings are now being made in Kona by the Experiment Station. Ref.—Haw. For. Agr. 1922:269-270; Haw. Exp. Sta. Annual Report 1936:95.

LAUHALA  See “Hala.”

LEAF-MUSTARD CABBAGE. This Chinese plant (*Brassica juncea*) is a species of cabbage but does not form a head. It is cooked and eaten either in the very immature stage when little more than a seedling or when it is about half grown to maturity. In the latter form it resembles Chinese cabbage in many respects. It is occasionally found in truck gardens but total production is much less than of Chinese cabbage.

See “Chinese Cabbage,” also “Truck Crops.”

LEATHER  Although good tan-bark, lime and other ingredients necessary for transforming animal skins into leather were at hand, the Hawaiians had not discovered and developed the art prior to the coming of western civilization in 1779. It should be noted, of course, that they would have had only dog and pig skins to tan if they had developed the art. Early in the nineteenth century, however, the manufacture of leather began on a small scale, but not extensively enough to make importations unnecessary. Toward the middle of the century the Royal Hawaiian Agricultural Society¹ appointed a committee to investigate the possibilities and costs of establishing a leather manufacturing industry here to make use of the abundance of hides which were available. The report of the committee indicated that the opportunity was good, but the requisite determination on the part of the local population was lacking. It was pointed out that over $100,000 worth of leather goods were imported each year and that leather

¹Trans. Royal Haw’n Agr. Soc. 1853, p. 86.
fully equal in quality to anything made elsewhere was being made here, but the stimulus was not enough to set an industry in motion. One of the obstacles noted at that time (1853) was the cost of obtaining tan-bark. The local chieftains were charging heavily for permission to gather the bark in the forests and the cost of the labor of gathering it was relatively high, making it more expensive to tan leather here than to import it.

In 1905 the Metropolitan Meat Co. established a tannery in Honolulu (Kalihi) and brought an expert from Boston to operate it. A good plant was built and a diligent effort put forth to secure at least the local trade in leather with such additional business as could be secured in the Orient and on the mainland. It developed, however, that the costs of tanning here were higher than had been expected and it seemed impossible to meet mainland prices. In 1909 the tannery was closed.

At present there is practically no manufacture of leather in the islands except on a small scale at some of the cattle ranches where a home supply is desired for miscellaneous purposes.

See also "Tan-bark."


LEEK The leek (Allium porrum) is a close relative of the onion and is used in the same manner as "green onions." Many truck gardens near Honolulu and Hilo produce limited quantities of this vegetable. In crop surveying it usually passes as a variety of onion.

See "Onion" also "Truck Crops."

LEMON The common lemon of commerce (Citrus Limonia) seems to be better adapted to sub-tropical situations such as in Southern California than to the warmer tropics. In Hawaii there have been a number of efforts made on a limited scale to grow lemons on a commercial basis but with no great success. Production is usually light and the acidity of the fruit is lower as compared with regions where this fruit is at its best. The total area

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2A few trees of Eureka and Villa Franca lemons grown at the Hawaii Experiment Station grounds were reported in 1916 (Annual Report, p. 19) to be bearing "heavily." Mr. Jared Smith states that in 1901 he saw heavily bearing trees in the Olala coffee homestead area.
devoted to lemon production in this Territory is less than five acres. For Hawaii there is a better prospect of success in the commercial growing of limes.

A variety of “rough” lemon grows well here and is occasionally found in gardens but its fruits are not as desirable as the common lemon for the juice is bitter. Seedling trees of this variety are sometimes used as budding or grafting stocks for propagating orange and other kinds of citrus trees for commercial planting.

See “Citrus Fruits” also “Limes.”


LETTUCE Lettuce (*Lactuca sativa*) has for many centuries supplied the need for leafy food in many countries but in early Hawaii this need was filled by the taro leaf and lettuce was unknown until the foreigners brought it at about the beginning of the nineteenth century. At first grown only in home gardens it later became the basis of a small industry for supplying local needs. For many years only the leafy types, such as the mignonette, were grown for it was believed that the heading types would not do well in these tropical surroundings.

When modern transportation facilities began to be available head lettuce together with other kinds of vegetables, was imported from California to satisfy the demands of Americans and Europeans resident here. The Orientals preferred the open leafy types, and to a considerable extent the Occidentals used this type, also, so that small truck gardens continued to flourish in areas near a city or town.

In the early 1920’s some Japanese gardeners in the vicinity of Kilauea Volcano, at an elevation of about 3,000 feet, began experimenting with head lettuce and succeeded in growing a very excellent product, quite equal to anything that came from California. The Agricultural Extension Service took note of this and stimulated the expansion of the incipient industry. In the course of the next several years it spread to the Waimea district of the same island and to the Kula district of Maui, the total area planted never amounting to over 50 acres, however. Excellent lettuce is raised here when weather conditions are favorable; in these areas mentioned the farmers have to depend on rainfall, as irrigation water is not available.
In 1925 the Hawaii Experiment Station began a project to develop by hybridization and selection a variety of lettuce that would grow well and form a firm head in lowland areas. This was carried on for five years with practically no success even though a thousand or more crosses were made. The plan was finally given up.

In some cooler upland areas where there is adequate rainfall or available irrigation water it should be possible to develop a profitable industry in the growing of head lettuce for the Honolulu market and for other towns in the Territory. How extensive this might become is difficult to estimate; probably it could not be developed beyond a few hundred acres of planting.

For detailed information on cultural practices, varieties, marketing, etc., consult the extension bulletin mentioned below, published by the University in 1932.


LEVULOSE See “Dahlia,” “Jerusalem Artichoke,” “Ti.”

LILIKOI See “Passion Fruit.”

LIMA BEAN The lima bean (Phaseolus lunatus), sometimes called “butter bean,” is the largest of the cultivated beans. The plant is of two types, bushy and climbing vine, the large flat pods being produced in abundance under proper cultivation.

A recent crop survey (1936) shows an aggregate of about 50 acres devoted to the production of lima beans for the local market, nearly all of which acreage is on Oahu, scattered in small units in many truck gardens. In addition to this production there are considerably larger amounts of dried lima beans imported from the mainland.

See also “Beans” and “Truck Crops.”


LIMES The acid lime (Citrus aurantifolia) is a tropical species and thrives very well in Hawaii, much better than the lemon. Its fruits are more acid than the lemon, very juicy, and possess an aroma and flavor more pleasant than that of the lemon. In spite of this, however, the quantity of imported lemons consumed far surpasses the
amount of limes produced here, the total acreage of the latter being less than ten acres, according to a recent (1936) crop survey.

There are several varieties of limes here, the commonest being the Kusaie, introduced many years ago from the South Pacific. Another, the Mexican lime, was introduced in 1920 by D. L. Crawford and is found occasionally in Kona. Either of these varieties would be suitable for planting on a large scale, if it should be considered possible to market the crop as a substitute for imported lemons.

See also “Citrus Fruits.”
Ref.—Haw. Exp. Sta. Bul. 77:44 (uses); see also Planters Monthly XII, 286 (1893).

LINSEED OIL  See “Flax.”

LITCHI  The litchi\(^3\) (*Litchi chinensis*), well known in Hawaii as a delicious and somewhat rare fruit, is beginning now to be cultivated on a much larger scale and may become an important factor in the diversification of industry here.

It was brought to these islands in 1873 from southern China,\(^4\) where it has been cultivated for many centuries. In spite of very high prices paid for the fruit (50 to 75 cents per pound) its production has always been limited in Hawaii, probably because of the difficulty of propagation. While it grows readily from seeds, the seedlings are usually valueless and vegetative propagation has to be resorted to. The Chinese method of doing this has been by a process known as “air-layering.” A branch while still attached to the tree has a bit of bark removed and is then encased in a ball of earth which is kept continually moist. In the course of a few months roots develop in this soil and the branch is then detached from the tree and planted.

After its first introduction here some attempts were made to establish its cultivation on an orchard basis, but several large lots of young trees imported from China died on the way or soon after arrival, causing the abandonment of the plans for commercial exploitation of this fruit.

The litchi was among the first fruit trees to be planted by the Hawaii Experiment Station shortly after its estab-

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\(^3\)Pronounced lye-chee.

lishment in 1901. The initial plantings produced abundant crops of fruit at least as early as 1914, and attempts were then made to propagate the trees by budding and grafting. The grafts made at that time failed to take when made on litchi stocks but did take when placed on stocks of the longan, a closely related species. A few years later, however, in a wind storm these grafts were blown off at the point of union, due apparently to some inherent weakness in the union. About 1931 the Station succeeded in developing a technique whereby it is possible to graft small seedlings of the litchi with scions from mature litchi trees. There has been insufficient time, however, to demonstrate the bearing qualities of these recently grafted seedlings.

The fruit is most commonly known in the dried form, called “litchi nut,” but in the fresh state or canned in juice it is even more delicious. Some of the canned product from China enters the American market and meets a good response, as a novelty. This is encouraging certain individuals here to try to develop a litchi canning industry on modern American lines, for it is believed that the conditions in Hawaii are ideal for this. The climate and soil are suitable, and there seems little doubt but that there is an extensive market for the product. The problem now is how and where to obtain enough young trees for planting.


LIVESTOCK Industries of various degrees of importance to Hawaii have developed around the following members of the animal kingdom, loosely grouped together as “livestock”:

- Beef cattle
- Bees
- Dairy cattle
- Goats
- Horses
- Mules
- Poultry (chickens, ducks, geese, turkeys, etc.)
- Rabbits
- Sheep
LONGAN  The longan (*Euphoria longana*) is a Chinese fruit, sometimes called dragon’s eyes, which is closely related to the litchi (which see) and is only rarely grown in Hawaii.


LOQUAT  The loquat (*Eriobotrya japonica*), sometimes called Japanese plum, was introduced into Hawaii many years ago from the Orient. An early record mentions a single tree of this fruit at Hanalei, Kauai. Homeesteaders in the Hamakua section of Hawaii have grown this fruit tree to a limited extent for many years.

Although the fruit is of pleasant flavor and offers some possibilities for commercial exploitation as a source of excellent juice, the loquat is not extensively grown in Hawaii as a fruit tree. A recent crop survey (1936) shows a few scattered plantings to a total of about 4 acres. As an ornamental it occurs not uncommonly in gardens, and as a forest tree it is used at the lower and intermediate elevations; it is propagated there by scattering the large seeds in the mountain forest areas, but only a relatively small number succeed in establishing themselves, as a result of which this tree is not of common occurrence in our forests.

The fruit is subject to attack by the Mediterranean fruitfly, but its structure—a quarter-inch layer of pulp over a large seed—makes it easier of protection by the fruitfly parasites, as compared with the larger fruits like the guava or grapefruit in which the fruitfly worms may be out of the reach of the parasite wasps.

LOTUS ROOT  The lotus (*Nelumbo nucifera*) is an aquatic plant indigenous in southern China and India. Introduced into Hawaii many years ago by the Chinese, it is in semi-cultivation here, but not extensively.

The edible portion of the plant is the root, which resembles a chain of link-sausages in appearance, the “links” being 3 to 6 inches long and 2 to 3 inches in diameter, connected by a short petiole to adjoining units. A cross-section of the root shows a number of large canals extending in straight lines longitudinally through each link. As the roots are sliced in preparation for being eaten, these canals give the lotus a very distinctive appearance.

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5Trans. Royal Haw’n Agr. Soc. 1853, p. 94.
The commercial demand for lotus root is mostly from the Chinese, but other people are using it more and more. Some 50 acres in this Territory are devoted to the production of this crop, with some imports coming from China to add to the local supply.

LUNGAN See “Longan.”

MACADAMIA NUT The macadamia nut (Macadamia ternifolia) is a novelty in the American market but seems to offer much promise of becoming an important item in the list of commercial nuts.
This nut grows on a large and handsome tree which is indigenous in Australia and is valuable for its hard wood as well as the harvest of edible nuts. The first introduction of this tree into Hawaii seems to have been in 1892 when R. A. Jordan brought some seeds from Australia, some of which were planted at his Nuuanu Valley home, and some on the slopes of Tantalus by the Bureau of Agriculture of the Hawaiian Government. Some of these trees are still standing. A closely related, but commercially inferior, species (the gympie nut) was introduced about ten years earlier and established in Hamakua.
The trees started as seedlings in 1892 were slow in coming into bearing, perhaps because they were too crowded; in 1908 they began to bear and by 1910 the yield was large enough to attract some interest as a possible new agricultural crop for Hawaii. But it was several years before commercial operations were begun, and then only on a small scale in several parts of the Territory, two areas on Oahu and several on Hawaii.
In 1915 the Hawaii Experiment Station began giving some attention to the problems incidental to the production of this new nut crop. A thousand young seedling trees were distributed in 1918, mostly in Kona where it was believed that conditions were ideal for such an industry, and a brief circular of information was issued summarizing the existing knowledge concerning cultural.

1The Hawaii Experiment Station's lands included the area on which the Bureau of Agriculture of the Hawaiian Government had planted macadamia nut trees in 1892, and it was from these trees that the Station obtained its propagating materials.
practices, processing the nuts, etc. A successful method of grafting the macadamia tree was developed later by the Station.

By 1927 the interest in the crop had grown to the point where the Territorial Legislature was willing to exempt all commercial macadamia nut plantings from taxation for five years as a means of helping an infant industry to get a firm footing. In 1929 an excellent bulletin (No. 59) was issued by the Experiment Station on macadamia nut culture.

Meanwhile the commercial plantations were encountering serious difficulties and not obtaining the profitable returns for which they had hoped. A large percentage of the seedlings turned out to be of the "rough-shell" variety which produces a relatively smaller and less oily kernel than the "smooth-shell," and the expense of converting them by grafting seemed too large to contemplate in the depression years. Also, the cost of cracking the nuts, roasting and grading the kernels and marketing the final product proved disturbingly large because of inadequate machinery and the smallness of the total crop. As a result, the retail price of the nuts has been so high that they could not be thought of as competing directly with the more widely established types of market nuts.

A new stimulus came, however, in 1935 when Congress ruled that a portion of the sugar processing tax receipts must be devoted to the diversification of agriculture in Hawaii. The macadamia nut industry has been receiving some of the benefits of this, by the enlarged program of research and experimentation thus made possible.

Recent investigations by the Hawaii Experiment Station have included an examination of over 1,500 individual trees by an expert horticulturist and the selection of some forty-one which are superior in that they have a combination of several desirable characteristics. Chief among these characteristics is thinness of shell of the nut, which is important in two respects: (1) the kernel is rela-

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2 At that time there were ten plantations of from 1 to 100 acres each, total area of all being about 300 acres, on four islands—Hawaii, Maui, Oahu, and Kauai.

3 The range of variation can be best expressed in the percentage of the weight of the kernel in relation to weight of the nut, which varies from 18 to 42 per cent.
tively larger, and (2) the cracking of the nut is easier and less expensive. It may be possible to develop a variety with shell thin enough to be cracked as easily as that of the almond or hazel nut. Another characteristic of much importance is richness of oil content. Large kernels are not always rich in oil, a fact which must be taken into consideration in the development of a superior type of tree. Propagation of many new trees derived from these selected individuals is now under way to ascertain whether or not the desirable characteristics are constant. If so, the desired type of tree will ultimately emerge and may displace present plantings which are very diverse.

After twenty years of effort at establishing an industry on this nut, several points have become clear:

(1) Hawaii has climatic and soil conditions favorable for its production.
(2) There seems to be a potential market demand sufficient to warrant developing a large industry, provided total costs can be reduced to make competition with walnuts and pecans possible.
(3) A suitable type of nut and tree must be developed by further experience, and then vegetative methods of propagation must be used instead of planting seedling trees, in order that the desired type may be had in all plantations. There must be some approach to standardization in this matter through cooperation of all concerned.
(4) The machinery for cracking and processing the nuts will go through a good deal of evolutional improvement before the industry is on a sound foundation.

A survey in 1936 indicated that the total acreage planted to macadamia nuts was about 375, with some of the plantings only a year or two old. There is much interest in this crop and it seems destined to fill a much larger place than it now occupies.

MAHOGANY  The lumber trade knows several different kinds of mahogany wood, all having in common the characteristics of being very hard, being capable of taking a good polish and being attractively grained. Until recent years the koa was known commercially as “Hawaiian mahogany”; this name is now illegal, however, as a result of efforts of the true mahogany producers to prevent its use for other woods, even when accompanied by a qualifying word, as “Hawaiian.”

The true mahogany (*Swietenia mahogani*) is a tropical American tree. It was introduced into Hawaii for experimental planting some years ago and seems to be doing well. The row of trees down the center of Kalakaua Avenue in Honolulu (Waikiki) is of this species, and there is a stand of over 2 acres in Makiki Valley. It is a slow growing tree, valuable chiefly for lumber, and probably not as good for Hawaii as some other kinds of forest trees.


MALABAR CHESTNUT  The malabar chestnut (*Pachira aquatica*) is sometimes used for food purposes but is not considered highly edible. It is a South American plant and was introduced into Kauai some years ago where a very small amount is now cultivated.

MALABAR NIGHTSHADE  Malabar nightshade (*Basella rubra*) is a vine with somewhat succulent foliage which is cut and folded into neat bundles for market. It is used by the Chinese and Japanese in the preparation of certain meat dishes. Its production is not common nor extensive.


MALINA  Malina fiber, called also silk grass, is somewhat similar to sisal but not as strong and not suitable for cordage. It is made from the leaves of a plant (*Furcraea gigantea*) which is thought to have been brought to Hawaii from the Philippine Islands many years ago. This plant is very hardy and although no longer cultivated nor used for fiber making, it may be seen in many dry and barren areas growing wild and apparently thriving. It resembles the agave from which sisal is made.
and is commonly mistaken for it; its leaves are less rigid and lack the terminal spine characteristic of the sisal.

There is in malina fiber at best only a moderately good possibility for commercial development in Hawaii, dependent on very cheap land being used and cultivation and manufacturing costs being kept at a low figure. If clearing costs were not too high some of the large areas on the leeward (dry) side of all our islands might be used profitably for production of malina and sisal. Malina fiber has possibilities for paper manufacture.


MAMMEE APPLE The mammee apple (Mammea americana) is a tropical fruit tree introduced into Hawaii from the West Indies and used only as an ornamental. In the American tropics the fruit is eaten abundantly, but in Hawaii it is a rarity known to but few people.

The fruit is about the size of a large apple, russet colored on the outside, with a thick, tough rind enclosing a mass of yellow, not very juicy, pulp which is quite edible.

There is no commercial exploitation of this fruit in Hawaii.

MANDARIN ORANGE The Mandarin, King orange, or tangerine (Citrus nobilis) is a species of orange which thrives well in Hawaii. Its fruit is distinguished from the common orange by the loose bagginess of the skin; the flavor is excellent. It is planted here occasionally in gardens, partly for ornamental purposes and incidentally to furnish a supply of fruits for the household.

See also "Orange."

MANDRAKE See "Guava," also "Waiawi."

MANGO The mango (Mangifera indica), one of the most delicious of all fruits, probably originated in southern Asia but is now common in practically all tropical countries. The tree does not readily adapt itself to the cool climate of the temperate zone and the fruit has been considered too perishable to be shipped long distances to northern cities; for these reasons the mango has never
become well known to the millions of people living outside the tropics.

There is no authentic record of the first introduction of the mango into Hawaii, but Pope believes that Don Francisco Marin is to be credited with having given this luscious fruit its first start here sometime between 1800 and 1820, probably bringing the seed from Mexico. The descendants of Marin's first trees are now scattered all over the Territory and are generally known as the Hawaiian variety, inferior in most respects to some of the varieties more recently introduced. Very susceptible to the fruit fly, this variety is responsible in large measure for the firmness of grip which this insect pest maintains upon the horticulture of these Islands.

In 1885 Joseph Marsden brought in some superior varieties from the West Indies and at various later times others have added still more from India and elsewhere.

A catalog of the many varieties growing in Hawaii is included by Pope in his recent bulletin (No. 58 of the Hawaii Station) dealing with this tropical fruit. These varieties are grouped into six "races," the Hawaiian, West Indian, Alphonse, Sandersha, Mulgoba and Cambodiana. Classification is based chiefly on the characteristics of the fruit—its shape, size, color, odor, fibrousness, flavor, shape of seed, etc. There is a wide range of variation in most of these, causing some to be rated as relatively inferior and others very delectable.

In spite of the fact that the mango has been in Hawaii for over a hundred years and has been well thought of as an edible fruit, it never has achieved for itself a place of any importance in the economic scheme of things here. A recent agricultural survey indicates that the scattered plantings of this fruit, if concentrated into orchard form, would not cover more than perhaps fifty or a hundred acres. This does not take into account thousands of trees of the inferior Hawaiian type growing wild and neglected, and considered of no practical use, except by small boys to whom any mango is a mango, regardless of variety or state of maturity. One of the most valuable of all the plantings is an area of about five acres in the Moanalua

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5By the Agricultural Extension Service of the University, 1936.
Gardens (Honolulu) where S. M. Damon concentrated many of his importations of the world's leading varieties.\textsuperscript{6}

One could suggest several reasons for the failure of this excellent fruit to become the basis of an important industry here. There are serious difficulties incidental to its successful marketing on the mainland, chief among which is the fact that it is almost unknown to the masses of American people and would require an extensive and costly campaign of advertising to establish it well. Also, there are difficulties in shipment; in the fresh state, the perishable nature of the fruit discouraged early efforts, and since 1914 there has been a quarantine prohibition against such shipment because of the fruitfly. Canning the fruit will obviate these difficulties, but the shape and texture of the fruit make it hard to handle for canning. Notwithstanding this difficulty a small canning industry is developing in the Philippines; also, one producer on Maui is growing ten acres of mango trees for the purpose of canning the fruit.

In Queensland, Australia, there is some drying of mangoes for commerce.

It seems quite likely that a profitable industry could be developed here on the mango, if certain superior varieties were used and suitable machinery developed for canning the fruit. There is a limited production in California and Florida and this has made the country sufficiently aware of this tropical fruit to open the way to an extensive market with less advertising than would have been required a decade or two ago.

For detailed information about the propagation and culture of the mango and the control of injurious insects and diseases, the reader is referred to Dr. Pope's bulletin. Ref.—Haw. Exp. Sta. Bul. 58, "Mango Culture In Hawaii," by W. T. Pope (1929); Bul. 77:48-54 (uses and recipes); Annual Reports 1902:321; 1904:380; 1905:62; 1906:33; 1908:45; 1909:

\textsuperscript{6}Hon. S. M. Damon, who developed his Moanalua estate into a great park and botanical garden, introduced a large number of fruit trees and shrubs from many parts of the world. In 1900 and later he brought here for trial several varieties of Mango: Piri, Alphonse, Cambodiana, Mulgoba and some Philippine varieties; five acres of his estate are devoted to mango culture. Other horticultural importations included several avocado varieties, figs, red banana from Jamaica, grapefruit, grapes and many ornamentals.

Closely associated with Mr. Damon in much of this work was Mr. Donald McIntyre, who is known widely as an expert horticulturist.

For a full account of the Moanalua work, see Thrum's Annual 1914, pp. 75-84.
MANGOSTEEN  The mangosteen (*Garcinia mangostana*) is a tropical tree which seems to find Hawaii a little too cool. A few trees are growing here but with indifferent success. As the fruit is exceptionally delicious an effort was made by the Hawaii Experiment Station in 1910 to develop a more hardy form by grafting the mangosteen upon a closely related species which thrives well in these Islands, *Garcinia xanthochymus*, but without success.


MANILA HEMP  The fiber of a species of banana plant (*Musa textilis*) is known to commerce as manila hemp or abaca, and is used extensively in the manufacture of rope and twine. The United States imports about 40,000 tons per year, mostly from the Philippine Islands. With the increasing use of steel cables, American imports of this article have been diminishing, for the records of a quarter century ago show that 80,000 to 90,000 tons per year came in from the Philippines in an average year.

As this fiber plant requires a tropical habitat and has some considerable economic value, it was long ago (1866) introduced into Hawaii for trial. Experimental plantings were made in Iao Valley on Maui and in Kona (by T. C. White) and in some other places also, but nothing of importance came of these efforts. In 1875 some samples of fiber from the Maui plants were sent to the United States but no commercial development followed. Fiber of good quality was made from the Kona plantings, but only on a small laboratory scale.

The Hawaii Experiment Station in 1903 reported that these plantings were still growing in Iao Valley and other locations, stating that they occurred only in moun-
tain valleys, for the plant requires abundant rainfall and good drainage and will not prosper in wet, swampy soils. The Station made something of an effort to place this before the people of Hawaii as a potential industry for these Islands, publishing a brief bulletin and a number of press releases on the subject. These efforts, however, were fruitless, as was the pioneering work of those who first introduced the plant here, for no industry has thus far developed.

Banana—While there is a possibility of Philippine independence giving a new stimulus to the thought of developing a Hawaiian industry in abaca production, it is not highly probable, for the returns are not as attractive as for certain other crops. The average yield could be said to be anywhere from 350 to 1,000 pounds per acre per year, depending on the richness of the soil and the amount of rainfall. It is possible, however, that an industry might be developed in the extraction of fiber from the commercial banana plant, which is closely related to the abaca as hemp species and is known to have a good quality of fiber. As a by-product of a fruit industry such an enterprise should have a better chance for success.

See “Banana.”


MANIOC  See “Cassava.”

MATRIMONY VINE Matrimony vine (*Lycium chinense*) is an Asiatic plant occasionally grown in truck gardens of Hawaii for its leaves, which are used by Orientals in the preparation of certain meat dishes.


MATTING SEDGES AND RUSHES In 1906 the U. S. Department of Agriculture obtained seeds of several species of matting sedges and rushes in the Orient for trial in America. Two of the species, *Cyperus tegetiformis* from China and *Juncus effusus* from Japan, seemed to require semi-tropical conditions and accordingly the seeds were sent to the Hawaii Experiment Station (then under federal control) for trial. Test plant-
ings were made in several localities, as in the swampy area near Kailua (Oahu).

Two years later the Station reported that the Chinese sedge was thriving well, yielding at the rate of nearly ten tons per acre. "The greatest difficulty in the way of making this crop a financial success," the Station Director declared, "consists in the fact that each reed must be split" before being used in the making of matting. The labor cost of this seemed to present an insuperable barrier to commercial success.

The Japanese rush seemed to be of much slower growth and less promising from a commercial point of view.

According to J. M. Westgate, Director of the Station from 1914 to 1935, nothing of economic importance ever developed from these early experiments, and both botanical immigrants joined the limbo of forgotten crops. One of them, the Japanese rush (*Juncus effusus*), has become sparingly naturalized here, occurring here and there in swampy areas, but seemingly being of no commercial value.


**MEADOW RICE GRASS** Meadow rice grass (*Microlaena stipoides*) is found chiefly in Kona where it is proving to be a good range grass.


**MELONS** Watermelons (*Citrullus vulgaris*) and probably muskmelons also, were introduced into Hawaii by Marin, to whom we are indebted for many horticultural innovations. A member of Captain Cook's discovery crew listed the various food crops found in these Islands in 1778-79 and melons were not among them. In a subsequent inventory, fourteen years later, melons were in the list. Don Marin came to Hawaii first in 1791, and in his journal of 1813 he made a record of many kinds of fruits and vegetables which he had "at sundry times" planted since his arrival; among them he mentions "melons," without indicating the kind.

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8According to Prof. Harold St. John of the University of Hawaii, who reports (unpublished) that it has been collected on the Islands of Hawaii and Molokai.

The watermelon seems to have found a congenial home in these Islands, for it became a common article of garden cultivation in certain localities where the soil was suitable for it, and entered into trade which developed with the whaling ships in the nineteenth century. The Royal Hawaiian Agricultural Society in listing the exports from the Islands in 1850-51 includes an item of 7,756 melons.\(^{10}\)

Although never assuming important proportions in comparison with the major crops of the Islands, the cultivation of watermelons and muskmelons continued through the century on a scale large enough to fill local needs and to supply ships stopping here. This, however, came to an abrupt end early in the current century when the melon fly (close relative of the Mediterranean fruitfly) gained entrance to Hawaii and proceeded to work havoc with all kinds of melons, squashes, cucumbers, tomatoes and some other crops, causing the U. S. Department of Agriculture in 1913 to lay down a rigid quarantine against the sending of any of these items to the mainland states.

The fact that practically every melon grown became infested with the maggots of this fruitfly discouraged producers and for many years this once flourishing crop disappeared from Hawaiian agriculture almost wholly—but not quite completely, for a few determined farmers went to the trouble of keeping a paper covering over each individual melon from its infancy until ready to pluck, as a means of protecting it from the melon fly, and in this way were able to offer a few in the market at very high prices. The technique of this practice has improved in the past few years and meanwhile the melon fly has diminished greatly in its abundance so that the culture of watermelons and cantaloupes is returning to a place of some economic importance, and locally produced melons are being offered in our markets at much lower prices than prevailed a decade or two ago.

A recent census of crops shows over 800 acres planted to watermelons in 1936, with a small additional acreage (about 50 acres) producing cantaloupes. With further inroads on the melon fly pest being made by the intro-

duction of additional parasites, melon production may expand still further and become one of the more important of our minor industries.

Other kinds of melons cultivated in Hawaii include the following:

Chinese Preserving Melon (*Benincasa cerifera*)—a very large melon, 30 to 40 pounds, used very commonly as a cooked vegetable by the Chinese and others. In the mature stage it is diced and cooked with meats and other dishes, while in the immature stage it is used as a squash, or sometimes boiled whole and stuffed. As a confection this melon is excellent when cut in strips and heavily impregnated with sugar.


**MEXICAN GRASS** Mexican grass (*Ixophorus unisetus*) is a comparatively recent introduction (1922) and is valuable chiefly for soiling purposes, as it will not withstand ordinary grazing.


**MILLET** Millet (*Chaeotchoa italica*), valuable in some cooler regions as a livestock feed, has been given a trial here, with indications that it is not as good as sudan grass under Hawaiian conditions.


**MINT** Mint (*Mentha spicata*) is found in limited quantities in many truck gardens and in some home gardens, as well. In total acreage, however, this plant could scarcely be considered as being of much economic importance. Its leaves are fragrant and used in the compounding of beverages and sometimes for garnishing meat dishes.

**MOLASSES** Cane molasses is a by-product of the sugar industry, about 450 pounds resulting from the manufacture of each ton of raw sugar, under Hawaiian conditions. Since Hawaii produces about a million tons of raw sugar per year, the total output of molasses is about 225,000 tons.

This important and abundant by-product is used in
several ways, and investigations are under way to still further extend its usefulness. Much of it is burned as fuel in the mills by spraying it upon bagasse as the latter is fed into the furnaces; the resulting ash makes good potash fertilizer. Some is applied directly to the soil as fertilizer for its beneficial effects in increasing the activity of soil bacteria. Some is made into alcohol for fuel or other industrial purposes, with yeast as a by-product. Some is fed to plantation animals, for the feed value of molasses has been recognized for a very long time.

A large part of the annual output of molasses is shipped out to be used as a component of mixed feeds manufactured on the mainland. This seems to be uneconomical from the viewpoint of the Territory, for it is sold at only a few dollars a ton and comes back in mixed feeds for livestock at five or six times that figure. Since Hawaii is importing large quantities of these feeds for its dairy cattle, poultry and other livestock, it would seem logical to utilize more of our molasses here and thus perhaps reduce a little the cost of producing our milk, eggs, pork, etc. The F. L. Waldron Company, in Honolulu, is now beginning to enter this field. A feed mixing plant has been erected capable of turning out 40 tons in an eight-hour day. Molasses is a component part of most of the feeds manufactured in this plant, constituting perhaps on an average about 15 per cent of the various mixtures.

As a result of seven years of continuous experimentation upon the University dairy herd the Hawaii Experiment Station declares that cane molasses may safely be substituted for 25 per cent of the concentrates normally fed to dairy cows, if properly supplemented with high protein feeds. This would effect a material saving in the cost of milk production, the amount depending on prevailing costs of other feeds and of molasses.

It is declared, further, that the use of cane molasses in the manner suggested does not cause any significant reduction in reproductive efficiency of dairy cows, nor any increase in abortions.

11For an excellent discussion of the economics of this, and a report on the utilization of molasses as a by-product, see Planters Record Vol. IX, 621-626 (1913); also other references cited in the general Index of 1915 (pp. 170-172) and in later volumes.
As a feed for hogs it has been shown by long continued tests at the University Farm that cane molasses may profitably be fed to swine in amounts up to 20 per cent of the total ration. This causes an increase in the daily gains in weight, at an appreciably reduced cost per unit. Hogs eat the molasses mixture readily and no bad physiological effects have been observed.

In the poultry yard, also, cane molasses is valuable as a feed, but to a more limited degree. In mixing the mash for chicks and young pullets and cockerels, molasses may be used in amounts not exceeding 7 per cent of the mash, according to tests at the University Farm. For laying hens it is not advisable to use molasses, but for fattening broilers it is good even in amounts as high as 15 per cent of the total ration.


MOLASSES GRASS Molasses grass (Melinis minutiflora) spreads by runners and forms a mat. After cattle acquire a taste for it they relish it and fatten well on it. It is widely disseminated.


MONSTERA The monstera (Monstera deliciosa) is a clinging vine with very large leaves, frequently seen growing on the trunks of large trees. It is a relative of the taro plant and produces flowers of similar odd structure. The fruit is a long spike with many berries adhering to it, these being succulent and edible, suggestive of both the pineapple and banana in flavor. There is no commercial exploitation of this fruit in Hawaii.


MOUNTAIN APPLE The mountain apple or Ohia ai (Eugenia malaccensis) grows wild in moist, shady portions of the coastal river valleys of all the Islands, to an elevation of about 1,800 feet. The fruits are of a
beautiful reddish color on the outside and white within, and are borne on very short stems attached to the trunk and main branches. Although much relished by mountain hikers for its cool, refreshing effects, this fruit is not considered to have any great commercial value; it is sold in season by numerous roadside vendors, and occasionally is offered in the city markets.


MUGWORT Mugwort (Artemisia vulgaris) is a perennial shrub which grows readily in the drier portions of these Islands. Its grayish green leaves are fragrant with an odor suggestive of sage and are used by the Japanese in flavoring and coloring festival rice cakes. Production is very limited, as is the market demand, also.


MULBERRY Although the mulberry tree (Morus nigra) produces a fruit which is sometimes used in making jam and preserves, it is far better known for its association with the silk industry. For many centuries silk worms have been raised on mulberry leaves as their sole food, and in silk producing countries the culture of the mulberry has long been an important art.

Silk culture was first tried in Hawaii in 1836 (see “Silk”) and the mulberry was introduced at the same time to serve as feed for the worms. Although its cultivation increased rapidly for a few years, it soon dwindled with the realization that the infant silk industry was not destined to become large. Today the mulberry occurs only here and there in single plantings or small clusters. It is of no commercial significance.

If there should be a renewal of effort to establish a silk industry here, the mulberry tree would probably come into some importance, unless perhaps another food plant should be discovered to be superior for silk worms. Lettuce has been used successfully in some countries for this purpose.

MULES12 Mules have been used extensively in agricultural work in Hawaii and many are produced on the

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12This statement was prepared by Prof. L. A. Henke.
bigger ranches, notably the Parker Ranch. A large number have also been imported and some are still being imported but to a much lesser degree at the present time. Tractors have replaced mule power to quite an extent but the decline in the mule population has been less marked than that of horses, as is shown in the following U. S. Census figures:

**Horses and Mules in Hawaii**

<table>
<thead>
<tr>
<th></th>
<th>1900</th>
<th>1910</th>
<th>1920</th>
<th>1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horses</td>
<td>12,982</td>
<td>15,856</td>
<td>24,307</td>
<td>15,797</td>
</tr>
<tr>
<td>Mules</td>
<td>6,506</td>
<td>7,956</td>
<td>10,542</td>
<td>8,998</td>
</tr>
</tbody>
</table>

Importation of horses and mules to Hawaii has declined greatly in recent years as shown below:

**Importation of Horses and Mules to Hawaii**

<table>
<thead>
<tr>
<th>Inclusive years</th>
<th>Horses</th>
<th>Mules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1921-25</td>
<td>366</td>
<td>1,747</td>
</tr>
<tr>
<td>1926-30</td>
<td>497</td>
<td>1,221</td>
</tr>
<tr>
<td>1931-35</td>
<td>147</td>
<td>124</td>
</tr>
</tbody>
</table>

**Mungo Bean** See “Bean.”

**Mushrooms** Mushroom culture has been tried in Hawaii on a small scale by several people, but never with enough success to encourage continuation or expansion. Information on cultural practices is available but seldom used.

See also “Pepeiao akua.”


**Muskmelon** See “Melons.”

**Mustard** A species of mustard (*Sinapis chinensis*) is used by the Japanese as a potherb or greens, always in the seedling stage when the plant is small and tender. The leaves have a pleasant flavor and should have a much wider market demand than now is the case. Production is very limited.

See also “Leaf Mustard.”


**Napier Grass** See “Elephant Grass.”

**Naseberry** See “Sapodilla.”

**Natal Plum** See “Carissa.”

**Nut Grass Control** Nut grass (*Cyperus*
rotundus) is a small sedge which may grow sufficiently abundantly in moist soils to constitute a serious handicap to cultivated crops. It spreads by small tubers on underground stems and from seeds, also. Its normal habit of growth is to a height of three to nine inches, with the numerous upright stalks crowded together into a dense mat.

The growth above ground may easily be killed by an application of arsenite of soda spray, or other weed poisons, but within a few weeks the underground tubers have sent up a new jungle of growth, apparently none the worse for the poison attack. Repeated applications of poison, before the nut grass flowers and seeds, will eventually wear out the vitality of the tubers and after several years control can thus be effected, but at great expense.

Frequent discing and stirring reduces this grass pest materially but does not eradicate it. Tubers brought to the surface and exposed long enough to the drying effects of sun and wind lose their power of growth.

Small patches of soil can be freed from nut grass by steaming or by application of chloropicrin.

Covering infested areas with mulching paper sometimes is an effective control measure.


NUTMEG A few nutmeg trees (Myristica fragrans) are to be found in gardens in Hawaii. This source of commercial spice was never developed into an industry here, although it has been urged more than once.

Ref.—Planters Monthly XI, 69-72 (1892); XVII, 85-88, 308-309 (1898); Haw. For. Agr. 1906:305.

NUTS Plants producing commercially valuable nuts known in Hawaii and discussed in this review are the following:

Betel nut
Cacao
Cashew nut
Coconut
Jesuit nut
Kamani
Kukui
Macadamia
Malabar chestnut
Peanut
Vegetable Ivory
Walnut
Water-chestnut

OATGRASS  See “Tall Oatgrass.”

OHELO  The ohelo berry (Vaccinium reticulatum), related to the common cranberry, is a native of Hawaii and was one of the few kinds of fruits which were available to the ancient Hawaiians. It grows most abundantly in the vicinity of Kilauea Volcano, and does not thrive well at the lower elevations.

Ohelo berries are used in the making of jams, jellies and pastries, for which there is a limited demand commercially. It is possible that this might be extended enough to justify a larger production under cultivation, but there are other fruits which are more promising for commercial exploitation.

OHIA  A conspicuous feature of all Hawaiian forests is the ohia tree (Metrosideros collina polymorpha) which is used for fence posts by ranchmen and as a source of lumber. The wood is hard and beautifully grained and therefore useful for flooring and similar purposes. For information concerning this, refer to Hawaiian Forester and Agriculturist, Vol. VII (1910), pp. 118-126.

See also “Forest Products,” and “Tan-bark.”

OHIA AI  See “Mountain Apple.”

OKOLEHAO  See “Alcohol,” also “Ti.”

OKRA  Okra (Hibiscus esculentus) is a sub-tropical plant and thrives well in Hawaii. Its seed pods are somewhat fleshy and when immature are used sometimes in soup. As the demand is very limited, production is on a very small scale, the aggregate of many small plantings probably being less than 5 acres.

OLIVE  The olive (Olea europaea) is a temperate zone fruit tree which was introduced into Hawaii during the nineteenth century but has not found it as congenial a situation as in Italy or Spain or Southern Cali-
fornia. A commercial planting of several acres was made in Kalihi Valley (Honolulu) in the 1880's but abandoned after several years when the trees failed to bear well. There are some trees growing in Honolulu as ornamentals but they seldom develop fruits.

In the cooler uplands, especially where it is not very rainy, the results are better. In 1895 some olive trees were planted at Puuwaawaa, Island of Hawaii, at an elevation of 3,500 feet by E. P. Low. Although given no special care, they began fruiting in 5 years and produced good crops of excellent fruit.

Although this would indicate some possibilities for an olive industry in high and semi-arid localities, no serious efforts have been made to develop it.


OLONA  Olona (Touchardia latifolia) is a native plant of Hawaii and the source of an unusually tough and strong fiber which has long been used by the Hawaiians for fish nets, canoe lashings, house framing and other purposes. Unfortunately, the ease with which one can obtain certain fibers introduced by western civilization has pushed this superior kind into the discard and it is seldom seen or used now.

The olona plant is said to be easy to propagate by certain recognized techniques. The source of the fiber is a thin intermediate layer in the bark, both an outer and an inner layer having to be stripped off to expose the part desired.

A committee of the Royal Hawaiian Agricultural Society\(^1\) reported in 1854 that, "if the olona is well cleaned, and could it be separated into its distinct fibers by machinery, and then manufactured into strands, and these strands laid into rope. it would exceed in strength any foreign cordage ever brought here."

During the reign of King Kalakaua olona fiber was exported to Switzerland where it was useful in mountain climbing because of its great strength and imperviousness to moisture.\(^2\)

An excellent account of the early production methods

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\(^1\)Transactions, Vol. II, No. 1, pp. 142-144 (1854).

and uses of this native fiber is contained in an article by S. M. Kamakau in Thrum's Annual 1919, pp. 69-74.

ONION The onion (*Allium cepa*), with its relatives, garlic and leek, is produced only to a limited extent in Hawaii, although the demand is relatively large and very steady. Krauss, in his bulletin on vegetable production in Hawaii urges an expansion of local production, stating that "next to potatoes, cured onions are the vegetable crop most extensively imported into Hawaii. The 1930 imports amounted to 4,731,187 pounds valued at $177,419. There seems to be no good reason why the truck farmers of Hawaii should not grow most of the onions consumed in Hawaii, and, possibly, export some stocks to the mainland during off seasons there. A decade or two ago, very choice Bermuda onions were grown on windward Oahu, on Maui, and in several other districts of the Territory, but heavy importations from Australia finally caused this infant industry to languish and die.

"Onion growing is an intensive culture and only the skilled truck farmer, favorably located in respect to soil and climate, should attempt to grow onions extensively. No attempt should be made to produce onions in excessively rainy districts, because of the weed factor and the difficulty of ripening the bulbs."

A recent crop survey (1936) indicates that local production of bulb onions occupies about 115 acres, with an additional 30 acres devoted to green onions and leeks. The Bermuda is practically the only variety of bulb onion produced here, and its cultivation is mostly in the sandy loam areas on windward Oahu.

Green onions are in steady demand throughout the year. Perhaps the chief consumers are the Oriental people here, but the demand is by no means wholly from that source. Practically all commercial truck gardens near Honolulu and other centers of population in Hawaii devote some area to the production of green onions, and many homes do likewise.

For detailed information on planting, cultivation, harvesting and marketing this crop, whether for bulb pro-

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duction or greens, consult the Krauss bulletin referred to above.

ORANGE The common orange (*Citrus aurantium*) was brought to Hawaii in 1792 by Vancouver. He stopped at Tahiti before arriving in Hawaii and brought away from there some young trees and quantities of seed of a sweet and delicious orange which was prevalent there. This became well established and was known as the Polynesian orange. Some years later Mr. Greenwell introduced a variety from Monserrat, British West Indies, which became known as the Kona orange. Although scores of varieties have been brought in subsequently from many countries, this latter still seems to be the best, for local conditions.

In the early part of the nineteenth century Vancouver's orange became well established and rather widely planted, but not in orchards so much as in back-yard clusters of trees.

Exports of this and the Kona variety to California began about 1840 and for about 30 years there was a fairly brisk business in marketing oranges in the Golden State. According to early records⁴ this export business reached a yearly total of about 143,000 oranges in 1854.

With the passage of the gold rush years in California that state turned to agriculture, and in the southern portion there developed a citrus fruit industry which not only supplied that and neighboring states, but shipped its fruit out over the entire United States. By the end of the century the tables were turned and Hawaii was importing oranges from California.

In 1905 the Hawaii Experiment Station began asking why these Islands should not produce their own oranges. In the preceding year imports of citrus fruits had amounted to $60,000, and it seemed that farmers here might just as well have that business.

Accordingly, Horticulturist J. E. Higgins gathered as many kinds of citrus fruit varieties as he could readily assemble and planted a small experimental orchard. Also, he compiled a bulletin by drawing upon various sources of information and this was sent out to awaken popular

⁴Trans. Royal Haw'n Agr. Soc. 1851, p. 87.
interest in this one-time flourishing industry. That little experimental orchard is still growing at the foot of Punchbowl, with a score or two of different varieties of oranges, mandarins, lemons, limes, grapefruit, etc. It has been a good source of bud wood for the propagation of thousands of young trees which are scattered all over the Territory.

It was found, however, that many kinds of insect and fungus enemies were lying in wait for the citrus fruit grower and if he did not wage expensive warfare against them they took most of his crop. It was much easier to buy California oranges and lemons.

Then in 1910 the dread Mediterranean fruitfly was discovered here, probably having been accidently brought in from Australia a few years before that. California put a strict quarantine against shipping not only oranges but most other fruits from Hawaii into her ports, and in 1913 a federal quarantine was enacted, effective in all American ports.

This quarantine, in itself, need not have seriously affected the Hawaiian citrus fruit industry which was just then struggling feebly to be reborn, for no one really expected that our farmers would do any more than supply local needs, and the quarantine would not affect local trade. But the fruitfly became exceedingly abundant and created a strong reaction against the local oranges, for the pest had the very bad habit of propagating its maggots inside ripening oranges and other fruits and the average consumer did not like to find the fruits thus occupied. Consequently, he preferred California oranges, even if they did cost a little more, and what little business had seemed to be starting here quickly languished.

The introduction of parasites gradually brought the fruitfly under partial control and hopes began to revive for a small orange industry. This was especially true in the Kona district of Hawaii, for it happened that coffee berries were a favorite host fruit of the fruitfly and the parasites were able to reach nearly all the maggots in coffee, while at least half of those in oranges and other large fruits escaped. In the coffee region, therefore, the effectiveness of the parasites was much greater than elsewhere, and orange growers there found their fruit only...
rarely infested in the late 1920's, whereas a decade earlier few fruits had escaped the ravages of the fruitfly.

The Experiment Station then renewed its efforts, though on a comparatively small scale, to push orange culture into something of an industry. Many hundreds of young budded trees of approved varieties were distributed free, for trial, and a second bulletin was published (in 1934) to tell the public how to care for these trees, and what varieties to select. The old Kona variety was said to be the best among the oranges; the California navel orange does not seem to do well here.

In 1931 a new attack against the fruitfly was begun here by the U. S. Department of Agriculture. Following its successful battle in eradicating the same pest in Florida, the federal department transferred its activities here and is now engaged in discovering means of treating fruit which may harbor the pest so that it can be shipped to American markets without endangering fruit industries on the mainland. While it is not likely that any considerable exportation of oranges will result from this work, it is possible that some other kinds of citrus fruit might be produced for export, as limes or some other that is less susceptible to injury by the fruitfly.

Hawaii does not have ideal conditions for the production of oranges on a commercial scale. The climate is a little more tropical than it ought to be for the ideal situation, and the general conditions of climate and terrain are too favorable to insect pests. Without a winter season to check them the insects keep on multiplying throughout the entire year and become enormously abundant, and the mountainous nature of most of our fruit-producing lands makes it extremely difficult and expensive to apply the necessary insecticides. We fall, therefore, into the easier way of relying on parasites to control the pests, but they seldom do as thorough a job as we really need for commercial success.

Then, too, oranges in our tropical conditions do not take on the uniformity of color that the California oranges do, and this makes them seem less desirable to most consumers who judge a fruit first by its appearance. In flavor, our Hawaiian (Kona) oranges are sweeter than California oranges but they lack the acid tartness which
people like and so are usually rated as inferior to the imported product in flavor. This would militate against the development of any large commercial industry in citrus fruits.

It is possible, however, that it would be well worth while to increase the plantings of orange trees in back yards and home gardens. They grow so easily that any householder with sufficient space could have a few trees for supplying home needs. Even if the fruits so produced were not of the best appearance, they would taste better because they grew at home. Likewise, a lime tree would supply home needs for lemons for a large part of each year, and a mandarin or Kona orange tree or two would save the expense of buying at the market.

See also “Chinese Orange,” “Mandarin Orange” and “Citrus Fruits.”


**ORCHARD GRASS** Orchard grass (*Dactylis glomerata*) is suitable only for the higher elevations, above 4,000 feet, where it is valuable for pasturage.


**OSTRICH** Ostrich farming offered attractive possibilities in the latter part of the nineteenth century, when the demand for plumes was at its height. A small farm was established near Honolulu by Charles M. Cooke in the 1890’s, with some 15 or 20 birds. Later, the activities were transferred to Kauai, but the project was not continued long.

More recently, within the last few years, Paul Fagan undertook to establish ostrich farming on Molokai, but no results of commercial importance followed.

**OYSTER PLANT** See “Salsify.”

**PANICUM GRASS** Panicum grass (*Panicum purpurascens*), called also para grass, was introduced in

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\(^1\)Information furnished by Mr. Richard A. Cooke.

\(^2\)Sometimes referred to as *Panicum barbinode*. 

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