may be separated from the leafy portion and used as a substitute for asparagus.

The plant grows to perfection in Hawaii and should be cultivated extensively. Unfortunately, it is not well known and the market demand for it is limited, which causes gardeners to plant it but sparingly.

See also “Truck Crops.”

TALL OATGRASS Tall oatgrass (*Arrhenatherum elatius*) is of moderate importance on Lanai as a pasture grass.

TAMARIND The tamarind (*Tamarindus indica*), one of the most beautiful of ornamental trees, grows exceedingly well in Hawaii and may be found in many yards and gardens. Although it has been recommended from time to time as having commercial possibilities as a source of fuel wood and timber, it is considered throughout the Islands as nothing more than an ornamental.

The fruit of the tamarind tree is a somewhat fleshy pod, from which may be extracted a juice of an agreeably acid flavor. In Mexico this juice is much prized as a refreshing drink when greatly diluted with water and sweetened. In Hawaii, however, this use of the fruit seems not to have developed, and the pods simply waste away on the ground or are eaten by swine. In India the seeds are cooked and ground into meal, but the flavor is sometimes bitter.

TAN-BARK The bark of several kinds of trees has been used in Hawaii for securing the tannin necessary in curing and tanning leather. The three kinds used most commonly are koa, ohia and kukui (candle nut tree). Koa (*Acacia koa*) contains a good amount of tannin and has been used for over a century; it makes a rather dark colored leather. Ohia (*Metrosideros*) makes a relatively

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1The Planters Monthly Vol. XII, p. 531 (1893) gives directions for the “preserving” of tamarind pods, but there is no indication that it was a common use of this product.
light colored leather. Kukui (*Aleurites*) has the most tannin of any of these three and is therefore the strongest for tanning. Algaroba bark is said to have good tanning properties, also.

The sumach, or neneleau (*Rhus semialata sandwicensis*) was long ago found to be useful, especially in the tanning of fine kid skins. Thinking that there might be the basis of an industry in the furnishing of large quantities of this bark to the mainland trade, Mr. G. P. Judd in 1868 sent a keg of it to a Boston manufacturer for trial, the letter accompanying it saying that he supposed that it “may be the same as the Italian or Sicily sumach, used in woolen manufacture, also in tanning morocco skins.” Mr. Judd said that if the local sumach was good, “any quantity required” could be shipped. Nothing of commercial importance developed, although it was mentioned from time to time as a possible basis of an industry. Many years later (1918) a plan to develop an industry by growing sumach trees in plantation form was developed, but soon abandoned when it was discovered that a disease was destroying many of the wild sumach trees in the Hamakua forests, where they had in earlier times been abundant. It was feared that the disease would make commercial production unprofitable, if not impossible.

In 1905, an effort was made to demonstrate the possibilities of producing tan-bark on a commercial scale. This time it was not sumach bark, however, but the black wattle tree (*Acacia decurrens*), and the test was made by the Hawaii Experiment Station. A stand of these trees (6 acres) planted in 1890 was cut down and the bark stripped off, dried and sold for tanning purposes. The tannin content was good, and the returns from the bark together with the fuel wood sold were at the rate of $254.84 per acre. Director Jared Smith concluded “that wattle bark cultivation would prove a profitable industry in parts of Hawaii, as the trees grow as well in Hawaii as anywhere in the world.”

Another possibility in this line is the extraction of

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2Mentioned in 1853 as an established practice (see first item under “Ref.” at end of this article).
3In private files of Judd family.
4As in Planters Monthly Vol III, p. 592 (1884).
tannin from avocado seeds, which are known to be rich in this substance.

Tannin manufacture seems to be one of the many latent possibilities which Hawaii may develop when other and more attractive things have been exploited.


TANGERINE See "Mandarin Orange."

TANNIN See "Tan-bark."

TAPA The making of tapa, or kapa, is a Polynesian art many centuries old. Once important for its furnishing clothing material, it now is little more than a tourist attraction.

Tapa is a forest product, for it is made by removing the inner bark of various kinds of forest trees and beating it into a fibrous cloth-like article to be decorated with vegetable dyes applied in typical patterns.

Much of the tapa cloth offered for sale in Honolulu is imported from Samoa, but a movement is now under way to revive this old industry as a means of giving some Hawaiian families a means of livelihood.

For an excellent and authoritative account of the art of making this distinctively Polynesian product, see an article by the late Dr. W. T. Brigham, once Director of the Bishop Museum, in:

Ref.—Thrum's Annual for 1896, pp. 76-86, "Hawaiian Kapa Making."

TARO Taro (Colocasia esculenta) is probably the most ancient of Hawaiian agricultural crops. It is believed to have been brought here by the earliest Polynesian immigrants, forebears of the present Hawaiians, for it is the staff of life throughout Polynesia and would inevitably have been carried as food by voyaging parties.

The entire plant is capable of being used as food. The bulb-like root (corm) is cooked and eaten either as a vegetable or is mashed, kneaded and fermented to make poi; or it may be made into starch or flour. The leaves may be cooked and eaten as greens. The leaf stalks (petioles) and stems, when cooked, are succulent and tender like swiss chard or asparagus. The flowers are cooked to make
a dish that is especially delectable to Hawaiians. The skins and refuse left after cooking the corms are used as feed for pigs and poultry. Since the tops are usually in demand as planting material, they do not come into market for use as a food very abundantly.

Cultivation of the taro by the ancient Hawaiians was developed to an astonishingly high degree of efficiency, as attested by the fact that the relatively limited shore plain lands were made to yield enough of this staple to maintain a population of about 300,000 people in good health and vigor. They practiced selection in planting and thereby developed a large number of recognized and named varieties, each differing from the others in some essential characteristic. They handled the taro plant usually as an aquatic, growing it in small, diked basins which could be kept partially filled with ever-changing water by allowing a stream to flow through a series of such basins, each varying in area from a few hundred square feet to a quarter of an acre, according to the contour of the land. The early Hawaiians became skillful engineers in manipulating rivers and streams to bring them through their cleverly terraced taro lands. Their system of water rights, protecting the individual farmer in an exceedingly complicated network of irrigation canals and ditches, was so eminently fair and effective that it was incorporated bodily into the new set of laws established when the Islands were annexed to the United States.

Although this aquatic form of cultivation has always been used in Hawaii for most of the taro production, and certain varieties of the plant have become so accustomed to it that they will not grow well under any other conditions, there are varieties which do not require submergence and will thrive with only a moderate supply of irrigation water or rainfall. These are called "dryland" or "upland" varieties, in contrast to the usual designation "wetland" for the aquatic or semi-aquatic types. As a general rule, the dryland varieties are not used for poi making, but are cooked and eaten as vegetables.

The early Hawaiians, of course, had no commerce with the outside world. Later, after Captain Cook had opened this paradise to the world, its staple food, taro, did not

figure much in outside trade as did the sweet potato, pork and other articles of Hawaiian diet. Although foreigners of whatever race coming to these Islands to live learned to use and like taro, commerce never took it up. In a long list of exported products published in 1851, for example, taro does not appear.

During the nineteenth century, as the total population of Hawaiians diminished as a result of the impact with western civilization, the production of taro decreased rapidly, and what there was left of it began to be taken over by the Chinese. By the end of the century it was noted that about half of the production of taro was by Chinese farmers and that 80 per cent of the poi manufacturing was done by the Chinese. This trend has now gone further, to the point where practically all poi manufacturing is in the hands of Chinese, and Hawaiians constitute much less than half of the taro producers. At the present time, taro production for poi making purposes occupies only about 1500 acres of land, which is small in contrast to the total area which must have been devoted to this crop in the ancient days. Much of our present production is by Japanese farmers who grow not only the so-called Japanese taro, a dryland type with relatively small corms used as a vegetable, but in many cases are producing ordinary taro for the poi factories.

Taro requires ten to fifteen months to mature sufficiently for harvesting of the corms, and the yield is ordinarily six to ten tons of corms per acre, although under very good cultivation it may yield as much as fifteen tons. Worthy of note, too, is the fact that taro is considered much more valuable as a food than most of the starch crops mentioned above, and commands a sufficiently higher unit price in the market to make its cultivation profitable. The starch grains of taro are believed to be perhaps the most easily digestible of all known to commerce, while the combination of ingredients placed by nature in taro seems to be unusually nutritious and healthful.

Knowledge of this fact, now that there is a widespread interest in the diversification of agriculture in Hawaii, is causing some of our leaders to give careful consideration

to taro production as the possible basis of a very large industry, no longer to depend wholly on local consumption but to seek a world-wide market as a means of stabilizing conditions for the producer.

To this end, the Hawaii Experiment Station has recently undertaken a comprehensive and intensive program of research to accomplish the following objectives: (1) devise processes for transforming taro into forms of food with which the American public is familiar, as flour, breakfast foods, beverages, etc.; (2) develop the best possible cultivation techniques, including fertilization, especially for the varieties which do not require aquatic conditions, for there are much greater land areas available for the dryland varieties than for the more common wetland types; (3) find the best means of controlling several pests and diseases of taro which cause serious losses at the present time (sometimes destroying 50 to 75 percent of a field); (4) ascertain by the best scientific methods the true values of taro as a food. Effective cooperation in these investigations is being given by the Hawaiian Sugar Planters Association, the Queen’s Hospital, the Territorial Board of Health, and other agencies.

This is a large undertaking but promising results are already appearing in all the four subdivisions. It may be that taro will again take a conspicuous place among the crops of these Islands, for there are very extensive areas of land now unused which would seem to be suitable for the dryland type of culture, and there is a possibility that this crop might prove to be more profitable than some others now in cultivation and might displace them.


8For a report on these investigations and experiments see Haw. Exp. Sta. Annual Report 1936, pages 8, 10, 22, 33-37 (diseases), 54-58 (processing).

9Taro flour was manufactured here in the 1880’s; in 1887 some 4230 pounds of it were exported for trial in the United States, and another lot of 5100 pounds in 1891. No important results followed. Later, in the present century, two ventures were made in the same line, one calling the flour “taro-ina” and the other “taromano.” Neither was successful commercially.
TEA  The first introduction of the tea plant (*Thea sinensis*) into Hawaii was by W. H. Purvis in 1887, his seed having been obtained from Ceylon. His trial planting was near Kukuihaele, Island of Hawaii. The results were sufficiently encouraging so that in 1892 the Hawaiian Coffee and Tea Company planted about 5 acres in the Kona district, with the expectation of developing an extensive industry.

It was soon realized, however, that because wage rates here were higher than in India and other tea-producing countries competition was quite impossible. This initial effort was abandoned and no serious effort has been made subsequently to establish an industry on this commodity.

See also "Yerba mate."

Ref.—Thrum's Annual 1893:106; Planters Monthly XIII, pp. 342-344 (1894).

TESOTA BEAN  The tesota bean (*Olneya tesota*) is a leguminous tree, somewhat similar to the algaroba and koahaole in its preference for arid surroundings. Its nutritious pods and foliage are relished by cattle and afford a good source of feed in dry regions.

A trial introduction was made by C. S. Judd in 1922 but thus far it has not become an important feature here.


TI  Ti, or ki (*Cordyline terminalis*) is a native plant of Hawaii. Its leaves have long been used by the Hawaiians for wrapping food and other articles, and as a substitute for plates; also to cover food placed in underground ovens. The coolness of the leaves relieved headache and fever.\(^{10}\)

The root, which is really a greatly enlarged\(^{11}\) prolongation of the stem, has long been used as a source of alcohol in the making of a beverage called "okolehao." This has a recognized place in the alcoholic beverage trade, and since the repeal of the prohibition act some efforts have been made to revive a once thriving industry in the manufacture of this product from ti-root.

Investigations now under way at the laboratories of the H. S. P. A. Experiment Station indicate some very great

\(^{10}\)Thrum’s Annual 1923, p. 71.
\(^{11}\)Often weighing 30 to 40 pounds and sometimes much more.
possibilities in the extraction of levulose sugar from the root and stem of ti, as the inulin content is large.

TOBACCO Tobacco (*Nicotianum Tabaccum*) is a crop which is in very large demand and produced in many parts of the world. The United States, for example, has nearly 2 million acres devoted to tobacco production in an average year, this being scattered in twenty different states. The U. S. Department of Agriculture Yearbook (1935) shows some 46 countries engaged in the production of this crop, with about 4½ billion pounds estimated as the probable total crop of the world. By far the largest producer is the United States.

Hawaii is known to have some excellent locations and soils for this crop, and a good deal of money and effort has been spent to develop an industry here, but thus far there has been no lasting success. There is virtually no tobacco grown in this Territory on a commercial scale at the present time.

Probably the first planting of tobacco in these Islands was by Marin about 1812, and from this beginning it spread somewhat into general but very limited cultivation by Hawaiians.

With the forming of the Royal Hawaiian Agricultural Society in 1850 the idea began to be advanced with a good deal of determination that tobacco could be made a very important crop here. In 1854, A. Archer reports at length on commercial trials made by himself and others, all with poor or no success, due largely to lack of knowledge about both culture and curing of the crop. He concludes his report with the optimistic declaration of his belief that "tobacco will ultimately be one of the best paying crops raised here and nothing but time is required to enable us to compete successfully with Manila and Havana."

The Hawaii Experiment Station, when it was under the direction of Mr. Jared Smith, went extensively into experiments on tobacco production and curing, beginning in 1901. With financial assistance from several interested citizens, the Station tried this crop on a small experimental scale both in the Hamakua and the Kona districts of the

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Big Island, as well as elsewhere, with good results. It was believed from this preliminary experience that wrapper tobacco of the Sumatra type could be produced here which was fully the equal of the best in the world. Yields of 1000 to 2000 pounds per acre of good wrapper leaf were reported.\textsuperscript{13}

The experiments by the Station encouraged private enterprise to try the industry. In 1906 a commercial project was undertaken in Hamakua, with 15 acres as a trial farm. In 1908 a tract of over 200 acres in Kona was planted, with an investment of something over $25,000 in fields, implements, curing sheds, and labor.\textsuperscript{14} From this beginning the industry grew lustily for three years and seemed to be on the way to success.

In 1912 a very disastrous fire occurred, destroying a large curing shed and packing house and the tobacco stored therein; this happened to include not only the whole crop of that year of the pioneer company, but also the product of certain other newer producers which was stored there for curing and was destroyed with the rest. All together, there were about 100,000 pounds of tobacco lost in that fire, according to Mr. Jared Smith. This proved to be the beginning of the end, for the young industry never fully recovered from the disaster.

In the ensuing years, Jared Smith and others made repeated efforts to put this industry on its feet. Several new ventures were made, mostly in the Kona district, and a great deal of money was invested. In 1916 W. R. Castle took over the remnants of the original company and tried to rehabilitate it, but with no success. In 1919 he withdrew from all business activities, including his tobacco company, but declared his belief that tobacco production could be developed into a good industry here. Several smaller ventures by Smith meanwhile had met with enough success so that he was able to say,\textsuperscript{15} "After many reverses and false starts, by 1919 I had worked up a profitable local business, and was selling cigars" through a local wholesale house and also through a Seattle agency.

\textsuperscript{13}See Haw. Exp. Sta. Bul. 15.

\textsuperscript{14}Mr. J. G. Smith resigned the directorship of the Hawaii Experiment Station in 1908 to take charge of these operations in Kona.

\textsuperscript{15}Honolulu Advertiser, Nov. 13, 1934.
In 1920 Castle's old company was reorganized by others under a slightly different name and a crop was produced that year but none thereafter. Smith continued, however, until "the 1929 panic brought the end of dreams." Then he, also, withdrew and the Hawaiian tobacco industry was no more.

The following table of annual exports of tobacco from Hawaii shows the extent to which this industry was developed. The yearly crops did not fluctuate as greatly as the table would suggest, for it was the practice in some years to hold some or all of the crop in storage, to be marketed perhaps with the succeeding year’s crop:

<table>
<thead>
<tr>
<th>Year</th>
<th>Value of Exports</th>
<th>Year</th>
<th>Value of Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>$1,914</td>
<td>1917</td>
<td>1,205</td>
</tr>
<tr>
<td>1908</td>
<td>2,772</td>
<td>1918</td>
<td>25,910</td>
</tr>
<tr>
<td>1909</td>
<td>4,719</td>
<td>1919</td>
<td>12,647</td>
</tr>
<tr>
<td>1910</td>
<td>15,644</td>
<td>1920</td>
<td>8,802</td>
</tr>
<tr>
<td>1911</td>
<td>4,114</td>
<td>1921</td>
<td>1,438</td>
</tr>
<tr>
<td>1912</td>
<td>94,978</td>
<td>1922</td>
<td>3,097</td>
</tr>
<tr>
<td>1913</td>
<td>Destroyed by fire</td>
<td>1923</td>
<td>1,585</td>
</tr>
<tr>
<td>1914</td>
<td>1,277</td>
<td>1924</td>
<td>20,608</td>
</tr>
<tr>
<td>1915</td>
<td>26,832</td>
<td>1925</td>
<td>2,770</td>
</tr>
<tr>
<td>1916</td>
<td>4,420</td>
<td>1926</td>
<td>4,142</td>
</tr>
</tbody>
</table>


TOMATO The tomato (*Lycopersicum esculentum*), a member of the nightshade family of plants, is very widely cultivated for its juicy, edible fruits. A small-fruited variety grows wild in many parts of this Territory, from sea-level to 5000 feet elevation, apparently having established itself here several centuries ago, for the ancient Hawaiians used it both for food purposes and medicinally, as well. The fruit is nearly spherical and about a half inch in diameter; the vine is an annual, one to three feet high, and occurs commonly in pastures and abandoned fields. It is not to be confused with the popolo, a large, spiny
shrub which bears poisonous, tomato-like fruits an inch or so in diameter. This latter is another species (Solanum aculeatissimum), sometimes called "kikania" because of its spininess; it was introduced in the nineteenth century and now is widely distributed, growing wild as a common part of the foothill shrubbery.

The common (European) type of tomato was introduced soon after the coming of white people, Marin mentioning it in his diary about 1813; probably many had it in their home gardens. There were no very serious obstacles to contend with, other than the common blight and several kinds of noxious insects, until the melon fly gained admission to the Islands at about the beginning of the present century. This fly became a pest of major importance, causing the destruction of half or more of the tomato crop each year. Although the Hawaii Experiment Station began some tomato experiments in 1903, interest in this crop was at such a low ebb, chiefly because of the melon fly handicap, that no more attention was given to it until 1916, when the threatened food shortage during the World War altered the local situation.

Aside from the desirability of having a locally produced supply of tomatoes available in a time when the normal movement of ships might be interrupted, there was the fact that large quantities were being imported, both fresh and canned, amounting in value to about $100,000 per year, which might well be produced by our own farmers. The chief obstacle to this being the melon fly, efforts were begun in 1916 by the Experiment Station to cross the small, commercially valueless wild tomato with some of the imported varieties, for it was known to be immune to this insect pest and it was believed that an equally immune but commercially marketable type might be obtained as a hybrid. While the results were not wholly successful, several strains were developed which had good market possibilities and at the same time were more resistant to melon fly attacks than were the imported varieties. The best was a cross between the Earliana and the small native variety, in one year (1924) 7000 seedlings

16Kikania is applied more commonly to the cockle-bur and sometimes to the jimson weed (Datura stramonium).
or packets of seeds of this having been distributed to farmers and householders.

Interest grew rapidly in the production of tomatoes for market, attention shifting after several years from the locally produced hybrid to certain mainland varieties which, because of the globular shape of the fruit and absence of surface ridges, were found to be moderately resistant to the melon fly. As parasites increased their inroads on this pest its attacks on the tomato crop became less serious and growers increased their plantings. At the present time over 400 acres are devoted to this crop.

Attention is now being directed toward better marketing methods. Until recently there has been little or no effort made by producers to grade their tomatoes and to offer them in an attractive way to the consumers. This now is being done in some instances, with such good pecuniary results that others will probably do likewise.

In view of all these developments and because climatic and soil conditions here are so favorable for this crop, Dr. F. G. Krauss has stated as his belief that "tomato production in Hawaii offers as great an opportunity for the local market gardener and truck farmer as any vegetable crop. There is not only a heavy demand for local consumption throughout the year, but there are great possibilities for canning and for exporting fresh tomatoes," the latter depending, of course, on some modification being made in existing quarantine restrictions placed on many crops here (including the tomato) by the federal government because of the fruitflies. With such a modification permitting exportation, there would be a very large market open to local growers during the winter and early spring months when mainland consumers have to look to Mexico to supply their needs. There is a duty of three cents per pound on Mexican and other foreign tomatoes.


TREE FERN Several species of fern in Hawaii grow to large enough proportions to justify the name “tree fern.” The trunks of these “trees” have large cores which are an excellent source of starch (see “Starch”). The early Hawaiians discovered this and made practical use of it; in recent years an effort was made to develop an industry on it, but without success.

Pulu—These tree ferns produce an abundance of woolly silk at the growing point of the stalk, called by Hawaiians “pulu.” It was long ago discovered that pulu is good for stuffing pillows and mattresses, and a very thriving industry developed in the 1850’s and continued for nearly 30 years in shipping this material to California to be used in upholstery and mattress making. The best years were 1872-1875, when the annual shipments averaged a little better than a half million pounds, but in the subsequent years the industry diminished rapidly when California began producing cotton. An effort to establish an export business to Australia in the 70’s looked promising for a time, but did not develop successfully. While it lasted, this industry was financially profitable to Hawaii, for pulu commanded a good price, from ten to fifteen cents per pound, and yielded a revenue of $30,000 to $60,000 per year.

In spite of the large monetary returns the industry had its drawbacks, however, and many felt relieved when it passed out of existence. The work of collecting pulu for market was full of great hardship and sometimes tragedy, for it took many people far up into the rainy mountain forests for days and weeks at a time, thus breaking up families and causing sickness, which often resulted from the lack of adequate food and the perpetual wetness of the fern forests; in general, the human aspect of the industry was anything but satisfactory. It is one of those interesting and dramatic, though tragic, chapters in the history of Hawaii which are more easily told than ex-

19There are four species usually called tree ferns; three of them are closely related and are the largest, sometimes growing to heights of 30 or 40 feet: Cibotium menziesii, C. glaucum and C. chamiisi; the latter is commonly known by its Hawaiian name, “hapu.” Another, and smaller, species of tree fern is the Sadleria cyatheoides, called by Hawaiians “amau.”
I experienced. The sandalwood trade was another similar episode, on a larger scale.

See also "Fern Tips" and "Starch."

Ref.—Export figures in Thrum's Annual, 1878, p. 58; see also, 1929:77-82 for an excellent description of the industry.

TRUCK CROPS This is a general term frequently used in referring to a large miscellany of crops cultivated for food purposes, including not only those which are usually known as "vegetables," but also some fruits such as melons, tomatoes, etc.

The truck crops which are produced in Hawaii have been introduced from many parts of the world: from the South Sea Islands by the early Hawaiians, from America and Europe by the white people, and from Asia by the Orientals. This has resulted in there being here a wider range of these food crops than would be found in any other place of comparable size.

The semi-tropical climate of Hawaii is favorable to the production of a large number of truck crops, but there are a considerable number of others which seem to require temperate zone conditions and therefore are not easily produced here. Some of these latter can be and occasionally are produced here on a small scale but with relatively poor results as to quality; in the cost of production, also, we are usually at a disadvantage in such cases as compared with the areas which make a specialty of their cultivation on a large scale.

One sometimes hears it said that the vegetables produced in Hawaii are lacking in flavor or in nutriment because of the alleged lack of iron in the soil. For such a statement there is absolutely no justification. The soil is not lacking in iron, and there is abundant scientific as well as culinary evidence that Hawaiian-grown vegetables and fruits are as nutritious as those produced elsewhere. The flavor of fruits and vegetables sometimes varies from one locality to another, and a person accustomed to a certain flavor in a given kind of food may not find it exactly duplicated when he moves his place of residence; these differences in flavor do not, however, mean less nutritional value. As a matter of fact, the freshness of vegetables grown here should render them more nutritious than the
imported articles, and therefore superior and capable of commanding a slightly higher unit price. Unfortunately, the local product is usually in less demand and brings a somewhat lower price, probably because by better grading and packaging the imported vegetables and fruits present a better appearance. As soon as local producers learn the value of this and emulate the practices of their larger and more experienced competitors abroad it may be that the Hawaiian-grown product will stand on an equal footing in the matter of unit prices.

Directions for the planting and care of many of the truck crops producible here are given in some detail by Dr. F. G. Krauss in a bulletin \(^{21}\) which was published in 1932 as a practical help both to commercial producers and home gardeners. Another valuable guide, especially in the cooking of vegetables, is H. L. Chung's bulletin on Oriental vegetables. \(^{22}\)

The following classified list of truck crops includes only those which are or have been produced in Hawaii. Some information concerning each may be found by referring to it in its proper alphabetical position.

**Classified List of Truck Crops**

I.—Root, the Edible Portion:

- Arrowhead
- Arrowroot
- Beet
- Burdock (gobo)
- Carrot
- Daikon
- Dasheen (Japanese taro)
- Garlic
- Ginger
- Gobo (burdock)
- Horse-radish
- Japanese taro (dasheen)
- Kudzu
- Lotus-root
- Onion
- Oyster plant (salsify)
- Parsnip
- Potato
- Radish
- Salsify (oyster plant)
- Sweet Potato
- Taro, Japanese
- Turnip
- Water Chestnut
- Yam
- Yam Bean Root

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\(^{20}\) For a report on recent developments in marketing local truck crops see Haw. Exp. Sta. Annual Report 1936: 66-68.


II—Stem or Petiole, the Edible Portion:

Asparagus
Bamboo shoots
Bean sprouts
Butterbur
Celery

Fern Tips
Kohlrabi
Rhubarb
Taro shoots and stalks

III—Leaf (sometimes with stem), the Edible Portion:

Beet greens
Brussels sprouts
Cabbage
Chinese cabbage
Chives
Chrysanthemum
Collards
Coriander
Dandelion
Endive
Honewort
Kale
Leaf-mustard cabbage
Leek
Lettuce
Malabar nightshade

Matrimony vine
Mint
Mugwort
Mustard potherb
Parsley
Perilla
Radish greens
Rutabaga
Spinach
Swamp cabbage
Swiss chard
Taro tops
Turnip greens
Watercress
Water dropwort

IV—Flower, the Edible Portion:

Artichoke
Broccoli
Cauliflower
Ginger

V—Fruit, the Edible Portion:

Balsam pear
Cantaloupe
Chayote
Chinese melon
Cucumber
Egg plant
Gourd
Jesuit nut
Okra
Pepper
Pumpkin
Squash
Tomato
Watermelon

VI—Seeds, the Edible Portion:

Beans
Corn
Peas

TUNA  See “Cactus.”
TUNG OIL  See “Kukui.”

TURKEY  The turkey was first introduced into Hawaii early last century and became a minor feature of some of the big livestock ranches. Little care was given the birds, however, and they wandered off into the forests and became semi-wild. At certain times, as Thanksgiving and Christmas, some are brought in by means of a drive, or by shooting, and thus the local market has been supplied, but only to a limited extent, for much the larger part of the local demand has been met by importing cold storage turkeys.

In the past few years several poultrymen in Hawaii have begun to take up the raising of turkeys in a more organized manner. The chief obstacle thus far encountered is the disease factor and the consequently high rate of mortality, for the turkey in its young stages is more difficult to raise than chickens. Another difficulty is the mongoose, which makes serious inroads on eggs and young. It is believed, however, that this industry offers some interesting possibilities for Hawaii, in spite of these obstacles.

See also “Poultry.”

TURNIP  The turnip (Brassica rapa) is a member of the mustard family and is cultivated for its fleshy root. The leaves of young plants are sometimes used as greens.

Production in Hawaii is very limited, probably amounting to no more than an acre or two. Most of the local demand is filled by imports from the mainland, which amount to over 200,000 pounds per year. Locally produced turnips are apt to be fibrous and bitter when grown in the warm lowlands, and the mainland product is considered superior. Perhaps by selection and breeding a variety suitable for planting here could be developed.

The tops of young plants are used as greens, especially by the Chinese. Seedling plants eliminated in the process of thinning are tied in small bunches and offered in the market as turnip greens.

See also “Truck Crops.”
UBA CANE  Uba cane, a variety of sugar cane, is used to a moderate extent here for green fodder purposes, but is not equal to elephant grass in quality nor in quantity of yield per acre.

VANILLA  Until chemistry showed the world how to make it synthetically in laboratories and factories, vanilla was a promising crop for Hawaii. Now it is just an interesting relic of the past.

Vanilla extract for a long time was made from the pods of an orchid plant (*Vanilla planifolia*) which was abundant in tropical Mexico and most of the South Pacific islands. It was first brought to Hawaii in 1884 by John Kidwell and was tried by him on a small scale on Oahu. The results of this trial were so good that Col. Spalding offered to finance Kidwell in a larger commercial venture if he would move to Kauai, but Kidwell declined.

The possibilities in this potential industry attracted a good deal of attention in the latter part of the nineteenth century, for the pods were commanding a very high price ($15.00 per pound) in the world market and it was estimated that a grower could make anywhere from $500 to $5000 profit per acre. Hand pollination was required, which it was estimated would take eight persons to each acre.

Several undertook the cultivation of this new crop on a small scale, but there was very little progress toward establishing an industry.

In Kona, however, there was a fairly successful commercial venture in vanilla production by Capt. R. V. Woods, which prospered until chemistry changed the situation by greatly reducing the world price of this very expensive commodity. Some remnants of his vanilla plantation still exist, to recall the early days when there seemed to be promise of rich returns to the really good cultivator of this orchid crop.

VEGETABLE IVORY  Vegetable ivory is the trade
name applied to the ivory-like seed of a palm (*Coelococcus carolinensis*), of which there are a few specimens growing as ornamentals in gardens and estates. While it may have some commercial possibilities here they have not as yet been demonstrated.


**VEGETABLES** See “Truck Crops.”

**VELVET BEANS** The velvet bean (*Stizolobium spp.*) is a temperate zone soiling crop which has been tried in Hawaii with moderately promising results.


**VELVET GRASS** Velvet grass (*Holcus lanatus*) grows above the 2000 foot level and is usually considered good for pasturage.


**VETCH** Several varieties of vetch (*Vicia sativa*) have been tried a number of times in Hawaii for soiling and fodder purposes, but never with any promising results.


**VINEGAR** Vinegar is a by-product of the pineapple industry, made in considerable quantities from excess juice by the California Packing Corporation. Practically all demand for bulk vinegar within the Territory is supplied from this source.

**WAIAWI** See “Guava.”

** WALNUT** The walnut (*Juglans regia*) is a temperate zone tree which is grown sparingly in Hawaii at elevations of 4000 feet and higher, as on the slopes of Haleakala on Maui. There are a few fine trees on the Worth Aiken premises and the Von Tempsky’s, and doubtless some in other similar localities on the other islands, but the total planting is very small and of no commercial significance.

**WAMPEE** The wampee, or wampii (*Clausena wampi*) is one of the more uncommon citrus fruits and in Hawaii is used occasionally as an ornamental, never for commercial exploitation of its fruits, which somewhat resemble the orange in flavor.

WATER APPLE Several closely related species of *Eugenia*, introduced into Hawaii from the south Pacific tropics, produce fruits which somewhat resemble the mountain apple in structure and flavor. They are called “water apples” because of the watery texture of the pulp. They are uncommon in Hawaii, occurring in a few gardens. They are of little or no commercial importance.

WATER BUFFALO The water buffalo is an importation into Hawaii from Asia, present only in small numbers and used in the working of flooded rice fields where horses or mules would bog down. The cloven hoofs of this interesting draught animal enable it to plod its way, slowly but surely, even through the most sodden ground. With the waning of the rice industry in Hawaii, water buffaloes are much less in demand and the breeding of them is practically a thing of the past.

In one valley on Molokai the water buffalo was for a time living in the wild state. Having escaped many years ago, they multiplied and lived in the upper reaches of the well-watered valley. Hunters found them to be good game, because of a fierce disposition, and in time practically exterminated them.

WATER CHESTNUT The water chestnut (*Eleocharis tuberosus*) is an aquatic plant which produces an abundance of small, somewhat globular corms about an inch in diameter. These are much prized by the Chinese, who use them in the preparation of various dishes.

Production of the water chestnut in Hawaii is very limited, being only a specialty crop not often cultivated. A large part of the demand here, which is not extensive, is filled by imports from China, for it is considered that the foreign corms are sweeter and better flavored.

WATERCRESS Watercress (*Roripa nasturtium*) is a floating aquatic plant which thrives in fresh, running water but will grow in soil if sprinkled abundantly with water. Its foliage is somewhat succulent and has a peppery flavor, both of which characteristics make it desirable for use raw in salad dishes and sandwiches; it is often used, also, in the cooking of vegetable preparations.

Watercress occurs in the wild state in some places and
in others is in semi-cultivation. The latter areas all together probably are less than 50 acres, and are located mostly in the upper end of the well-watered valleys near Honolulu. The market demand is steady throughout the year, but never very great.

Care must be exercised in preparing watercress for eating raw, for it sometimes happens that it may be contaminated by liver fluke.


**WATER DROPWORT** Water dropwort (*Oenanthe stolonifera*) is an aquatic plant with fragrant foliage which is used by the Chinese and Japanese as a soup flavoring. In appearance the foliage somewhat resembles that of celery. Its cultivation in Hawaii is limited.


**WATERLEMON** See "Passion Fruit."

**WATERMELON** See "Melon."

**WATTLE** See "Tan-bark."

**WAX** Although a number of different kinds of plants are useful to commerce as sources of vegetable wax, in the case of only one in Hawaii has there been a serious effort at exploitation—sugar cane. In 1909 a quantity of the wax on the cane leaves was submitted to a manufacturing firm on the mainland specializing in wax products. It was hoped that an important industry might be developed here in the utilization of this obscure but possibly valuable by-product of the sugar plantations, for it was estimated that great quantities of the wax could be gathered.

The report from the laboratories blasted these hopes, however, for the wax of sugar cane was found to be of a decidedly inferior sort.¹ When used experimentally in the making of wax candles, it emitted a disagreeable odor, and had the further disadvantage of a very low melting point. The same defects made it useless for sealing wax, while for phonograph records it was not suitable. Even in the making of polishes it was not good because of too much greasiness.

¹For the full report see Planters Record Vol. II, pp. 373-381 (1910).
See also “Bayberry.” The beef cattle industry produces some tallow as a by-product.

**WHEAT** The first recorded planting of wheat (*Triticum aestivum*) in these Islands was about 1815 by that versatile immigrant Marin, who tried his hand at so many things. The results of his trial planting could not have been very notable, for during the subsequent twenty years the opinion prevailed “that neither the soil nor climate of the Sandwich Islands was adapted to the raising of cereal grains,” and none was to be seen growing. Surely there was incentive enough to try to raise wheat for the manufacture of flour, for imported flour in those days was more like concrete, after a long and wet voyage on a sailing schooner. The situation in those early years was picturesquely stated by J. S. Green when he said “there was often a scarcity of flour, and what reached us from the U. S. was barely tolerable, occasionally too poor for feeding swine. On opening a barrel stamped ‘Flour,’ a chisel and mallet were always put in requisition to prepare the way for sifting, and these even were so ineffectual oftentimes that a pickaxe or crow-bar seemed necessary for the work” of breaking up the solid cake. Usually it was musty and sometimes sour, and often riddled with bugs and worms. “In those days the demand for saleratus was imperious” to alleviate the indigestibility of their so-called flour. “I have little doubt,” declared the same commentator, “that the ill health of many of the early residents had its origin” in this imported flour.

Apparently, however, there had been a little growing of wheat since Marin’s trial planting, for in 1835 a Kula (Maui) Hawaiian showed a little box of threshed and cleaned product to Mr. Green and asked what it was. Green told him, and urged him to plant some of it, explaining its value as food. The Hawaiians had been using it as stuffing for pillows to sleep on!

Within a few years it began to be abundant enough to appear in the markets in barrel lots. It was costly, however, for there were no mills and the grain had to be rubbed out on rough lava stones and the chaff blown off

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with the mouth. With Irish potatoes selling even at so low a price as a dollar per barrel there was more profit for the farmer in that crop than in wheat, and the latter had hard going as an industry in those years. It was estimated that the cost of growing and threshing wheat was nearly $4.00 per bushel, before milling it into flour.

In 1848 a Mr. Edes introduced the cradle for more efficient harvesting of wheat, and there resulted a renewed interest in this crop. By 1852 there had developed the beginnings of a real industry, wheat growing, with nearly 140 acres devoted to it in the vicinity of Makawao, Maui. It was reported⁴ that if enough seed had been available the acreage planted would have been “400 or even 500 acres; probably 100 acres by the natives.” Most of the planting was by the white foreigners.

The following year more seed was available and some 1200 acres were planted on Maui, with small plantings on other islands. A power mill was erected in Honolulu and some 5000 barrels of flour manufactured in that year (part of 1853 and 1854), enough for home consumption needs. No longer was it necessary to break concrete blocks before one could eat his flour. The president of the Royal Hawaiian Agricultural Society, William Lee, gave vent to his feelings anent this when he declared fervently,⁵ “for the last three months I have made Makawao wheat my staple food and I hope never to eat another ounce of imported flour.”

Production flourished for a few years and became sufficiently extensive so that a few small export shipments were possible during the 1850’s. This situation did not continue long, however, for California began about that time to produce wheat on a large scale at a lower cost than it could be grown in Hawaii, while at the same time sugar cane was claiming more and more of the attention, land and capital of these Islands and crowding out such things as wheat. Thus, this industry had a comparatively brief day in Hawaii, for by the late 1860’s it was a thing of the past.

WHITE SAPOTA See “Sapota.”

The wi (*Spondias dulcis*) is a native of the Society Islands. The tree grows readily in Hawaii, being used chiefly as an ornamental. Its fruit is oval, 1 to 3 inches in diameter, smooth-skinned, with light yellow pulp which is good to eat when fully ripe, somewhat suggestive of the pineapple in flavor. There is a very limited amount of cultivation of this fruit for market, a recent crop survey showing scattered small plantings amounting to an acre or two all together.

Ref.—Wilder, "Fruits of Hawaii," p. 54.

Wilder grass (*Andropogon nodosus*) was first introduced into Hawaii by G. P. Wilder. It is still on trial and has not been generally disseminated.


Willow A species of willow (*Salix vitellina*) commonly used in the manufacture of furniture was introduced into Hawaii from Madeira in 1909 by Dr. L. R. Gaspar. It grew successfully in the vicinity of Honolulu, and some samples of furniture were made later from the canes. This experimental effort did not, however, lead to anything more extensive and this potential industry failed to materialize.

Wine See "Grapes."

Wool See "Sheep."

Yam Yam is a name variously used, frequently referring merely to a large sweet potato, but when strictly used it applies to the enlarged root of an oriental plant known botanically as *Dioscorea batatas*. The root is white-fleshed, usually somewhat cylindrical in shape, 6 to 18 inches in length and 2 to 6 inches in diameter.

In limited quantities this plant is grown here by Chinese gardeners, the total probably not amounting to more than 5 acres for the entire Territory.

Yam bean root The yam bean root (*Pachyrhizus*) is cultivated to a very limited extent in Chinese gardens in Hawaii and is sparingly offered for sale in the

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7Haw. Exp. Sta. Bul. 60, p. 55, 1929. Two other species, also, are called yam: *Dioscorea esculenta* and *Dioscorea alata*.  

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city markets. The root is shaped somewhat like a large turnip or beet, is straw-yellow on the outside and white-fleshed within, and is of sweetish flavor, with consistency somewhat like that of the Irish potato.

**YARD-LONG BEAN** The yard-long bean (*Vigna sesquipedalis*), so-called because of its excessively long pods, is related more closely to the cowpea than to the common string bean. It is an Asiatic bean, grown in Hawaii chiefly for the Chinese trade. Production is limited.

See also "String Bean."


**YERBA MATE** The yerba mate, a South American plant (*Ilex paraguayensis*), has in recent years attracted some interest in the United States in a commercial way. The leaves are used in the making of a kind of tea which is gaining favor as knowledge about it spreads.

The plant has been introduced for trial by the H.S.P.A. Experiment Station and flourishing specimens may be seen in its Manoa Valley grounds.