

THE MACADAMIA NUT INDUSTRY IN HAWAII

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(Based on an address given by W. B. Storey at the California Avocado Society annual meeting, June 6, 1953).

The macadamia nut has become an important orchard crop in Hawaii since its introduction from Australia about sixty years ago. It ranks second in importance among all tree crops, exceeded in value only by coffee. There are several reasons for this. The finished vacuum packed product is one of the best confectionary nuts in flavor and texture, it may be exported from the Islands, it commands a fairly high price, and it finds ready consumer acceptance on both Hawaii and mainland markets.

The macadamia is native to the coastal rain forest areas of southern Queensland and northern New South Wales in Australia. It is known variously in that country as "Australian nut," "macadamia nut," "bush nut," and "bopple nut."

Two different types of macadamia nut trees are found in Hawaii. Both are considered to belong to the same species, *M. ternifolia*, but only one, the "smooth-shell" or *integrifolia* type, is grown commercially. All clonal varieties in Hawaii are of the smooth-shell type. The other type, commonly referred to as "rough-shell" macadamia, has largely been eliminated from orchards, or else top-worked to smooth-shell varieties.

Several distinguishing characters separate the rough-shell type from the smooth-shell type and identification is not difficult. Leaf, seed, and flower characteristics useful in identifying the two types are listed in Table 1. In Australia these same types are recognized as are several intermediate types. Wills⁴ describes four different forms of *M. ternifolia*.

Table 1. Contrasting characteristics of *M. ternifolia* and *M. ternifolia*, variety *integrifolia*.

	<i>M. ternifolia</i> (rough-shell type)	<i>M. ternifolia</i> (smooth-shell type) Bot. var. <i>integrifolia</i>
Nuts	Usually lopsided or spindle shaped	Round or almost round
Mature leaves	Commonly four leaves at a node, but sometimes three; young seedlings have two; leaves usually larger and longer than variety <i>integrifolia</i> ; leaf stems very short or almost absent; leaf edges spiny; leaves up to 18 inches in length.	Three leaves to a node, except for young seedlings, which have two; leaves usually shorter than <i>M. ternifolia</i> , ranging from 4 to 10 inches in length; leaf stems usually about 1 inch long; leaf edges much less spiny than <i>M. ternifolia</i> or without spines.
Young leaves	Pink or reddish in color	Pale green or yellow
Flower color	Pink	Creamy white

Strangely enough the macadamia nut has not achieved as much popularity and commercial importance in its native country as it has in Hawaii. According to Ross³, only a few hundred acres of macadamia trees, all of seedling origin, have been planted in Australia. However, the propagation of clonal varieties is being encouraged and several good types have recently been selected and propagated as varieties. Some of the production in that country is still said to come from scattered macadamia trees found growing wild in the bush.

The macadamia nuts in Hawaii are produced largely in commercial orchard plantings. Production at present is almost entirely from seedling trees fifteen or more years of age. However, macadamia acreage has tripled during the past ten year period and young orchards now coming into production are almost entirely of good clonal varieties.

Macadamia orchard plantings have increased steadily since the first orchard plantings were made approximately thirty years ago. It is interesting to note that according to Crawford², interest in the crop had grown to a point where the Territorial Legislature in 1927 was willing to exempt land planted to macadamia trees from taxation for five years to aid the new industry.

Commercial production is centered largely in the Hamakua Coast and Kona sections of the Island of Hawaii where about seventy percent of the nuts produced in the Territory are grown. The largest producing orchards are those of the Honokaa Sugar Company, which maintains an orchard of approximately 500 acres on the Hamakua Coast. (Fig. 1).



Fig. 1. *Twenty-year-seedling Macadamia orchard on the island of Hawaii.*
(*Photograph by P. O. Christensen.*)

The remaining thirty percent of the production is distributed among the Islands of Kauai, Oahu, and Maui. The total acreage, production, and wholesale value of macadamia nuts produced in the Territory of Hawaii are shown in Table 2. There has been a rather slow but consistent increase in acreage up to 1953. The increase in acreages of non-bearing trees between 1948 and 1952 may be attributed largely to the installation of the Keaau Orchard by Castle and Cooke, Ltd., near Hilo, Hawaii. Over 500 acres of young trees have already been planted, and the figure is expected to reach 1000 in the next few years.

Table 2. Production, acreage and wholesale value of Macadamia nuts produced in Hawaii, 1943-1952.

Year	Total		Production Unshelled Nuts Tons	Wholesale Value Unshelled Nuts Dollars
	Bearing and Non-bearing Trees Acres	Non-bearing Trees Acres		
1943	667	—*	190	38,000
1944	696	—*	277	77,000
1945	770	—*	279	79,000
1946	806	—*	315	95,000
1947	1,030	—*	340	117,000
1948	1,232	424	350	119,000
1949	1,402	594	340	115,000
1950	1,767	959	378	128,000
1951	2,197	1,334	425	144,000
1952	2,349	1,486	483	165,000

*No estimate available for these years.

The seedling trees found in orchards now in production vary widely in productivity, and the nuts produced vary in size, shape, thickness of shell, quality and percent kernel. However, all new orchards set out since 1938 have been almost entirely planted to grafted trees of good varieties. Good clonal varieties are conservatively estimated to be capable of at least doubling and perhaps tripling the yield of unshelled nuts per tree. In addition, the varieties being planted produce an average of about 35 percent kernel compared to about 25 percent kernel from the seedling trees now in production. It is evident that a substantial increase in production may be anticipated as the orchards of grafted trees set out since 1938 begin to bear.

Although the macadamia tree produces best on deep, well-drained soils with well-distributed rainfall in excess of 60 inches per year, it is a relatively hardy and drought tolerant tree once it has become well established. In Hawaii macadamias are grown successfully from near sea level to about 2,500 feet elevation and under rainfall conditions varying from 40 inches to over 200 inches per year. Irrigation has not been practiced to any great extent in macadamia orchards in Hawaii.

Macadamia trees are susceptible to wind damage because the wood is relatively hard and easy to split. The trees are not especially strong rooted and are sometimes uprooted by high winds. These facts are becoming well appreciated among growers in Hawaii as a result of experience. Well planned windbreaks are now considered essential for orchards located on exposed, windy sites. Macadamia trees, in common with most other fruit trees, do not grow well on poorly drained or extremely shallow soils and should not be « planted on them.

At the present time new plantings are being made almost entirely with good grafted trees. The varieties planted result from a program of selection and testing begun in 1936 at the Hawaii Agricultural Experiment Station. This program carried out by Hawaii Agricultural Experiment Station Horticulturists has involved the examination and testing of about 65,000 seedling trees over a 19-year period. Seven macadamia varieties have been named as a result of the testing and selection program. A dozen or more promising clonal selections are presently undergoing extensive field and laboratory tests to determine their ultimate value.

Four varieties are being recommended for planting in Hawaii at present. Names of these varieties, described in Hawaii Agricultural Experiment Station Circular 36², are Keauhou, Wailua, Kakea, and Ikaiki. They are rather similar in nut characteristics, but differ somewhat in adaptation to various elevations and local climatic conditions on different islands. All of the four recommended varieties are of the smooth-shell type and possess good resistance to anthracnose.

Macadamia nut production now seems firmly established as an important minor industry in Hawaii. Furthermore, it shows signs of continued expansion. There are two large factories and several small ones in operation which crack the nuts, roast the kernels, and put up the finished product vacuum packed in jars for sale in the retail market. At present, these factories are turning out about 250,000 pounds of vacuum packed nuts a year. So far, less than 20 percent of the production is exported, the remaining 80 percent being sold entirely through retail outlets in the Islands. In view of the popularity of the nut in the Islands, it is felt that the mainland United States offers an almost

unlimited market, particularly if the retail price can be brought down to a level competitive with other confectionary nuts, and with adequate advertising and sales promotion.

LITERATURE CITED

1. Crawford, D. L. Hawaii crop parade. Advertiser Publishing Company, Honolulu. 305 pages. 1937.
2. Hamilton, R. A., W. B. Storey, and E .T. Fukunaga. Two new macadamia varieties and an appraisal of the H.A.E.S. named varieties. Hawaii Agr. Exp. Sta. Cir. 36. 1952.
3. Ross, A. A. Nut crops. Queensland Agr. Jour. 75(1) -.21-29. 1952.
4. Wills, J. M. The Queensland nut. Queensland Agr. Jour. 52(2): 163-178. 1939.