part ONE
Before we discuss each of Hawaii's diversified agricultural industries, it might be well to orient ourselves with regard to the land, people, and institutions insofar as they affect these industries. The Island reader, although familiar with many of the facts, may want to refresh his memory. However, the reader in the mainland United States or abroad will need to study the first chapters more carefully for a better understanding of the entire book.

Physical Characteristics of the Islands

The Hawaiian Islands lie near the center of the North Pacific Ocean. San Francisco, the mainland port nearest to Honolulu is 2,100 nautical miles away; Los Angeles and Vancouver are slightly farther. The distance from Honolulu to Yokohama is 3,400 miles; to Auckland, New Zealand, 3,800; to Sydney, Australia, 4,400; to the Panama Canal, 4,700; and to Manila, 4,800.

The eight main islands, a group about 375 miles long, are located entirely within the tropics. The total land area of these eight islands is 6,406 square miles, divided as follows: Hawaii, 4,021; Maui, 728; Oahu, 589; Kauai, 551; Molokai, 259; Lanai, 141; Niilau, 72; and Kahoo-lawe, 45.

The Islands are great volcanic mountains rising from the ocean floor. The two highest peaks, Mauna Kea and Mauna Loa, both located on Hawaii, are close to 14,000 feet above sea level. Haleakala on Maui is 10,000 feet. The mountains on the other islands are lower, ranging from about 5,000 feet on Kauai and Molokai, and 4,000 feet on Oahu, to 1,300 feet on Niilau. One-fourth of the Islands is estimated to lie below 650 feet elevation, one-half below 1,950 feet, and three-fourths below 4,500 feet. About 90 percent of the population lives below 650 feet.

Large parts of the interior of most islands consist of rugged, mountainous terrain dissected by numerous deep gullies. Between the mountains of some islands are plains or plateaus, with flat areas stretching along the coast. These plateaus, plains, and the lower mountain slopes,
although a comparatively small part of the total area, are the most im-
portant agricultural lands in the Islands.

The climate of Hawaii is mild and the temperature changes little from
day to day and between summer and winter. The northeasterly trade
winds, blowing most of the time from cool ocean currents, keep tem-
peratures generally below those in similar latitudes elsewhere. Because of
these prevailing winds the people of Hawaii refer to the windward and
leeward sides of an island.

As an illustration of the evenness of temperatures, in downtown
Honolulu, on the leeward side of Oahu, the mean monthly temperature
for August, the warmest month, is 78° F, and for January, the coldest
month, 71° F. The average daily range of temperature is 9° F, or slightly
more than the difference between the average summer and winter tem-
perature. It has never been warmer than 88° F or cooler than 56° F in
Honolulu. There is a decrease of about one degree for each 300-feet
rise in elevation. Frost and snow very rarely occur below 4,000 feet, but
in winter are common above 6,000 feet.

Rainfall varies remarkably within short distances, due mainly to topo-
graphic influences. For example, the normal annual rainfall for 5,000-
feet-high Mount Waialeale on Kauai is more than 500 inches, compared
to less than 20 inches at sea level about 15 miles to the leeward.

The maximum rainfall occurs at approximately 3,000 feet on the
windward side of the highest mountains on Hawaii and Maui and near
the crest of the lower mountains on all the islands. The lowlands on the
windward side receive moderate and at some places heavy rainfall. On
the upper reaches of the highest mountains, precipitation is scant. The
lower leeward slopes and plains are, with few exceptions, arid or semi-
arid. The latter districts get much of their precipitation during the in-
frequent southerly or Kona storms. Rainfall in dry areas is greatest in
winter. In wet areas there are three maximum rainfall periods, namely,
March-April, August, and November-December.

Annual and monthly variations in rainfall are great in all parts of the
Islands. For example, the precipitation at Honolulu totalled 11 inches
in 1926, nearly 44 inches in 1927, and 15 inches in 1928. Precipitation
in any one month may also vary greatly from one year to the next.
Places with an annual rainfall average of 100 inches or more may at
times have a dry month with one inch or less. Conversely, dry sections
with an annual average of 20 to 30 inches may record 20 or more inches
during a single wet month. For some stations on Oahu with over 30
years of rainfall records, each month has ranked first in rainfall during
at least one year.

Occasional strong winds may damage trees, crops, and buildings. In
some districts with strong prevailing winds, some type of windbreak is
necessary for successful crop production.
The climate is such that crops can be grown the year around in present agricultural areas. At times farmers harvest as many as four or five vegetable crops a year from the same field. However, the mild, moist climate is also favorable for insect pests and plant diseases. Control measures are possible in many cases, but involve higher costs than paid by competing farmers on the West Coast.

Hawaii soils in dry and hot areas are usually neutral or alkaline in reaction. They contain little organic matter and nitrogen but have a high content of available minerals. Soils formed under heavy precipitation in the cool sections of the Islands contain much organic matter and nitrogen, which, however, may soon become exhausted by steady cropping. In wet locations soils are low in available minerals, which have been leached out by rains. Most soils in Hawaii are porous, which allows for rapid drainage, good aeration, and easy development of roots. Earth particles eroding from the mountains have accumulated on some of the lower slopes, plateaus, and plains, forming fertile and deep soils.

Systems of irrigation, which are valued at over 45 million dollars, bring water many miles to once arid lands. Additional water resources are available, but their development would require considerable investment.

Utilization of Agricultural Land

The total area of the Islands amounts to 4,100,000 acres. (See Table A1.) Of this, about 1,210,000 acres, or 29.5 percent, were territorial forest reserves in 1951. These reserves have been created primarily to prevent runoff and soil loss following rain.

The armed forces occupied 58,000 acres, or 1.4 percent of the total, in 1951. Some 213,000 acres, or 5.2 percent, were used for national parks. Waste land, cities, towns, camp sites, roads, and land not otherwise specified, except agricultural land, accounted for 912,000 acres, or 22.2 percent.

About 1,706,000 acres, or 41.6 percent of all land in the Islands, were used for agricultural purposes. (See Table A2.) Pasture land amounted to 1,397,000 acres and land in crops to 309,000 acres. Of the total cropland, 295,000 acres were in sugar and pineapples. Diversified crops other than flowers occupied 14,000 acres, or slightly less than 5 percent of all cropland. About 5,600 acres were used for vegetables and taro, 3,500 acres for coffee, 1,900 acres for tree fruits, 2,200 acres for macadamia nuts, and 800 acres for miscellaneous field crops. No exact data were available for the land area on which flowers and foliage were produced. It was estimated that about 600 acres were used for this purpose.

According to the United States Census of 1950, about 117,000 acres
Diversified Agriculture of Hawaii

were irrigated in that year. Sugar was grown on all except a small portion of the irrigated land. The remainder was devoted mainly to taro, rice, vegetables, and fruits.

The island of Hawaii, largest and most southerly of the group, is made up of four mountains, Mauna Kea in the northeast, Mauna Loa in the south, Hualalai in the northwest, and the Kohala mountains at the northern end.

Land Utilization in Hawaii in 1951

The land area of the island is 2,573,000 acres, of which 716,000 acres were territorial forest reserves and 196,000 acres were national parks in 1951. Approximately 560,000 acres were occupied by cities, camp sites, roads, military establishments and wasteland, mainly lava flows.

The total cultivated land amounted to 109,000 acres, or 4 percent of the total land area. Of this, 101,000 acres were devoted to sugar cane, and the rest to minor agricultural crops. About 990,000 acres, or more than one third of the total land area of the island, were used for grazing.

The Kau district, covering the broad southern slopes of Mauna Loa, is traversed by many lava flows of various ages. The soil cover is thin in many places and consists chiefly of volcanic ash. The amount of annual and monthly rainfall is highly irregular. Annual rainfall ranges from less than 20 inches near the coast to over 100 inches at 3,500 feet elevation. The best agricultural land between 500 and 2,000 feet was used by two sugar plantations in 1951.

The Puna district, to the southeast of Mauna Loa, has a high annual rainfall averaging from 80 to 200 inches in the various agricultural areas. The soil is generally shallow with frequent rock outcroppings. Some sugar is produced in the lower windward districts. Near Kilauea Volcano, at an altitude of 4,000 feet, there is a cool-climate vegetable district. Farmers in the vicinity of the road from the Volcano to Hilo and near the southeastern tip of the island also produce vegetables and fruits. Extensive macadamia nut orchards are being developed in the area.

The Hilo and Hamakua districts on the windward side of Mauna Kea, with few exceptions, get from about 80 to more than 200 inches of rain
per year. The mountain slope is cut by many precipitous ravines, but lands in between are arable and productive. Sugar cane is grown in a nearly continuous belt along the coast from south of Hilo to the cliffs of Waipio valley in the north. Some truck crop farms are scattered throughout the districts. In Waipio valley, accessible by land only over a mule trail, taro is the principal crop. Bearing macadamia nut orchards are largely limited to the northern portion of Hamakua, but plantings have been made recently in other parts of these districts. The Hilo area is the center of flower growing and poultry and swine raising on the island.

Sugar is the main crop on the lower windward slopes of the Kohala mountains on the northern tip of the island. A few farms produce field corn, vegetables, and macadamia nuts. In the important cool-vegetable district of Kamuela, on the plateau between the Kohala mountains and Mauna Kea, farmers produce temperate zone crops such as lettuce, cabbage, and celery.

The Kona district on the western slopes of Hualalai and Mauna Loa is the only area in the Islands with more summer than winter rainfall. Kona's annual precipitation in the major agricultural areas, at elevations of about 800 to 2,200 feet, is high for a leeward district. It ranges from 50 to 100 inches per year. Coffee, grown on about 3,500 acres, is the major product of the district. This crop is favored by an excellent climate, freedom from storms during most periods of the year, and by well-drained though shallow soil. Kona is now the main district where taro is grown without irrigation. Other crops produced commercially are avocados, bananas, and other fruits, macadamia nuts, and vegetables. Cattle are grazed on the upper slopes of the mountains of the island, above the areas used for crop production, as well as in lowlands located mostly on the leeward side. The carrying capacities of ranges vary widely. The island has some of the poorest pasture lands of the territory. Most of these are located in dry and arid areas or in semi-waste lands covered by partly decomposed lava flows; others are in districts with excessive rainfall. On the other hand, several of the best ranges in the Islands can be found on the northern slopes of Mauna Kea, the leeward slopes of the Kohala mountains, and in Kona. A portion of the arid saddle land between Mauna Kea and Mauna Loa is used for sheep grazing.

The island of Maui, to the north of Hawaii, is 466,000 acres. In 1951, 177,000 acres were forest reserves and parks and 81,000 acres were used for other nonagricultural purposes or were waste land. Close to 54,000 acres, or 12 percent of the total area of the island, were under cultivation.

On the northeastern side of the extinct volcano of Haleakala, the topography is too rough and the soils are too poor for most crops. At present wetland taro grown on the Wailua and Keanae coastal flats is the only cultivated crop of commercial importance produced here.
Precipitation in the Wailuku plain between Haleakala and the West Maui mountains is low, but soils there are of high quality. About 29,500 acres of sugar cane were grown there under irrigation in 1951. Pineapples are produced above the sugar plantations on the northwestern slopes of Haleakala.

The largest vegetable-growing area on the island is located on the Kula slope, stretching along the western and northwestern side of Haleakala at elevations of from 500 to more than 3,000 feet. Cabbage, tomatoes, and onions are the major crops, but many other vegetables also do well in the deep, fertile soils of these districts.

On the arid leeward side of the West Maui mountains is another irrigated area of sugar cane of about 9,500 acres. Pineapples are grown in the zone of somewhat greater rainfall on the northwestern tip of the island.

Vegetable and taro farmers are located on both the windward and leeward coasts of West Maui and near the larger towns of the Wailuku plain. Some fruit is grown near Lahaina and in the Kula area, and macadamia nuts are grown near Haiku. A little less than one-third of the island, ranging from the dry leeward coastal areas to the wet windward slopes of Haleakala, is used as cattle pasture.

The island of Kahoolawe, formerly a cattle range, is now uninhabited, unused, and severely wind-eroded. In 1951 all crop land on the island of Lanai, about 15,000 acres, was in pineapples.

Of Molokai's total area of 166,000 acres, a mountainous windward area of 47,000 acres was territorial forest reserve in 1951. Pineapples on about 17,000 acres were the island's major crop. They were being grown on plateaus in the central and western parts of the island.

Only about 300 acres were in minor agricultural crops, primarily corn, taro, vegetables, and mangoes. These crops were grown mostly on the Hoolehua plateau in the center of the island, on the lower leeward slopes, and in small valleys. Lack of irrigation water in the arable areas was the primary reason for the low acreage of minor agricultural crops. Cattle ranches occupied 93,000 acres.

Only about 90,000 of Oahu's 377,000 acres were used for agriculture in 1951. Forest reserves included 120,000 acres, mostly the higher portions of the mountains.

On the leeward side of the island in and around Honolulu are located many of Oahu's poultry and swine enterprises, nearly one-half of its dairies, and many flower farms and vegetable market gardens.

A fertile plateau, gently sloping toward the ocean at both ends, extends through the middle of the island, flanked by the Waianae and Koolau mountain ranges. Some 32,000 acres of sugar cane were grown by irrigation on its lower portions in 1951. On its higher part, where rainfall is slightly greater, about 22,000 acres were in pineapples.
Vegetables and some fruit were produced under irrigation in the dry Waianae district on the leeward side of the Waianae mountains.

In the windward district of Koolauloa were another 4,000 acres of sugar cane, nearly all of them irrigated. In 1951 over 400 acres of wetland taro were under cultivation in the lower areas of the many valleys on the windward side of the Koolau mountains. Other crops grown in this section were vegetables, about 400 acres of papayas, and 700 acres of bananas. The latter were raised primarily in the upper, wind-protected portions of the valleys.

About 30,000 acres were used for pasture. Oahu was the only island on which less land was used for grazing than for cultivated crops. The pastures on the slopes of the Waianae range were used mainly for beef cattle. Dairies operated on the grazing lands in the southeastern part of the island.

Practically the whole island of Niihau, consisting of 46,000 acres, was used for beef and sheep grazing.

On Kauai the territorial forest reserve covering the mountainous interior amounted to almost half of the island’s 350,000 acres. About 53,000 acres were cultivated.

Sugar cane was grown on about 46,000 acres, from Kilauea in the north with few interruptions around the island to Mana in the west. All but approximately 5,000 acres of sugar-cane land on the island were under irrigation. About 7,000 acres of pineapples were produced in several areas, from the vicinity of Anahola in the northeast to Kalaeheo in the south.

Approximately 170 acres each of taro and rice were grown from Hanalei valley in the north to Waimea and Hanapepe valleys in the southwest. About 250 acres were planted to vegetables on farms scattered from Hanalei to Waimea, with the largest acreage in the vicinity of Kapaa and Wailua. Approximately 260 acres of macadamia nut trees were growing in the southern portion of the island. Cattle ranchers used about 90,000 acres for grazing.

**Land Tenure**

The present land tenure pattern in Hawaii is to a great extent the result of the land division in the 1840's called the *Great Mahele*, the development of large-scale agricultural enterprises, and the largely unsuccessful policy of homesteading a part of the public domain. In 1948 public land amounted to about 1,760,000 acres, or 43 percent of all land in the Islands, and private land to approximately 2,360,000 acres, or 57 percent. Of the government-owned land, 227,000 acres were used by federal agencies, 1,356,000 acres were territorial, 4,000 acres county, and 169,000 acres Hawaiian Homes Commission land. The latter was
set aside by the Hawaiian Homes Commission Act of 1920 for homesteading by people of Hawaiian ancestry.

Plantations and individual farmers owned about half of the cropland which they farmed in 1945. They leased the rest. Similarly, ranchers owned approximately half of their grazing lands. (See Table A3.)

Much of the territorial public land is poor, according to a statement by the territorial Commissioner of Public Lands during the 1946 congressional hearings on statehood for Hawaii. Cropland is usually much more valuable than pasture land. Of all leased agricultural lands, most of the cropland was leased from private owners and the greater part of the pasture land was leased from the Territory. About 167,000 acres of cropland were leased in 1945, of which 24 percent was public land and 76 percent was privately owned.

Of the 680,000 acres of leased grazing land, 75 percent was public land and 25 percent was privately owned.

On all islands most of the land not owned by the government is held by a relatively few corporations, trusts, and individuals. In 1951 the largest private landholder, the Bernice P. Bishop Estate, owned 370,000 acres, or 15 percent, of all private holdings in the Islands. The inventory of this estate listed 30,000 acres of farm land and 218,000 acres of grazing land. In the same year, the ten largest private property owners accounted for about 50 percent of the private land. In 1948 about 69 percent of all private land in the Islands belonged to the 50 largest owners.

At present agricultural land available for fee simple purchase in the Islands is scarce while the demand for it is great. High land prices are the result. For example, in 1952 pasture land on the outside islands with a carrying and fattening capacity of one head of cattle per five acres cost $40 to $80 or more per acre. Small parcels for diversified crops on Oahu sold for as high as $2,000 or more per acre.

The natural scarcity of all agricultural land in Hawaii is one reason for its short supply on the market. Another is the policy of many large landholders not to give up their holdings.

In view of the large amount of leased agricultural land, good leasing practices are essential. The Committee on Pasture Land Leases, appointed by the Commissioner of Public Lands in 1948, stated that "land leasing practices in . . . Hawaii . . . are neither productive nor progressive as judged by similar practices in England and its Commonwealths and in the Scandinavian countries."

A revision of the length and form of some agricultural leases appears
necessary. The leases of public land are in written form and are, with some exceptions, for sufficiently long terms. Public leases are for 15 years for cropland and 21 years for pasture land.

Private leases for large areas, particularly for lands used for grazing, sugar cane, and pineapples, are also adequate in length and form in most cases. The most common length of large private grazing leases is about 20 years, and up to 30 years for undeveloped grazing tracts. Sugar leases for large areas run frequently for 20 years or more. Pineapple lands are leased for the length of one or more growing cycles of a pineapple planting, with many leases of 8 to 10 years.

Small farmers in the diversified agricultural industries often have to be content with oral leases for one year or less. That holds true even for crops like taro that require more than one year to mature. Five- and 10-year leases for vegetable land are not frequent. Land for long-term tree crops such as coffee and avocados is rarely leased for more than 15 years. There is, therefore, need for long-term written contracts for these farmers.

In most cases lessees of both private and public agricultural lands do not get any credit for the improvements they make on the leased property. Neither can they remove these improvements when their contracts expire. The above-mentioned Committee on Pasture Land Leases recommended that the outgoing lessee should receive a cash payment for the undepreciated value of his investment in permanent buildings, water developments, and permanent heavy fencing on the land at the end of his tenure. The committee pointed out that these proposals would "stimulate the physical improvement of the property, . . . guard against the rapid depreciation of buildings and fences as the lease nears its expiration and . . . keep the area in high production at all times."

Even though the committee did not mention it, credit should also be given for temporary buildings and improvements, service roads, fertilizer which has been applied but not completely used up, and for clearing the land of noxious pests and weeds.

The committee suggested that lessees be required to follow modern methods of soil conservation and "to participate in the programs for land conservation . . . within any Soil Conservation District created in the area concerned." In present lease contracts, stipulations regarding soil conservation, if included at all, are usually vague and ineffective.

In some industries, for example sugar and coffee, the amount of rent to be paid is frequently tied to the price level for the commodity produced. The use of such an "escalator clause" appears desirable in other agricultural industries in which the annual rentals are now fixed for the whole period of the lease. This is especially true in those branches of agriculture in which rent is an important item of cost, such as cattle ranching.
Until recently, many leases of agricultural land, both public and private, were for so large an area that bidding by all but a few large operators was discouraged. The committee proposed the subdivision of certain large public pasture leases into smaller ones ranging mostly from about 200 to 600 acres. The Commissioner of Public Lands followed some of these suggestions, giving the smaller ranchers a chance to compete for these land resources.

The ownership of water rights in Hawaii presents a complex pattern which appears to be unique in the United States. Surface water is held in fee simple title by individuals, trusts, and by the territorial government. Like land, the control of water resources is highly concentrated. On the larger islands, except for a few public water departments and some other owners, irrigation water is controlled by sugar plantations or private water companies closely connected with sugar-growing interests. Irrigation water developments in Hawaii have almost all been made with private capital. In contrast, many irrigation projects in the western United States are federal projects.

Agricultural Planning

Before World War II a Territorial Planning Board was charged with the duty of preparing a master plan for the physical development of the Islands. This agency was discontinued during the war. The 1949 territorial legislature created the Farm Advisory Board, which is less broad in scope than the prewar agency. The board is to study the maximum utilization of the public and private lands of the Islands and to make recommendations regarding the further development of lands suitable for farming. The members of the board were appointed early in 1952, but no money had been appropriated for their use by the 1951 legislature. The optimum development of diversified agriculture will require careful and extensive planning on both a local and territory-wide basis. The new Farm Advisory Board should become the focal point for this work and have the close cooperation of all public and private agencies concerned.

Population

The population of the Islands is estimated to have been about 300,000 at the time of Captain James Cook's arrival in 1778. (See Table A6.) As a result of their long isolation from the rest of the world, the natives had little resistance to the diseases that white men brought with them. By 1872 the population was only 57,000, of whom about 50,000 were native Hawaiians. The remainder were mainly Americans, British, and Chinese.
As the expanding sugar industry created a demand for labor, plantations imported large numbers of workers. Up to 1878 most contract labor came from China. Beginning in that year Portuguese were imported in increasing numbers, and after 1885 Japanese were brought in. Most of the agricultural laborers since 1908 have come from the Philippines. Since 1931 immigration from the Orient has been negligible. One exception was the year 1945, in which 6,000 Filipino men and some dependents were brought in because of scarcity of plantation laborers.

**Civilian Population in Hawaii, 1778, 1872, 1940, and 1952**

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1778</td>
<td>300,000</td>
</tr>
<tr>
<td>1872</td>
<td>56,897</td>
</tr>
<tr>
<td>1940</td>
<td>397,405</td>
</tr>
<tr>
<td>1952</td>
<td>465,325</td>
</tr>
</tbody>
</table>

Smaller groups of immigrants had come from many other countries, such as Korea, Puerto Rico, Spain, and Germany. In addition, there was a slow but steady immigration from the mainland United States, which increased greatly just before and during World War II.

Of Hawaii's 500,000 residents, including military personnel, in 1950, about 185,000 were of Japanese extraction, 74,000 of part-Hawaiian, 115,000 of Caucasian, 61,000 of Filipino, 32,000 of Chinese, and 21,000 mainly of Korean and Puerto Rican extraction. Less than 13,000 were full-blooded Hawaiians. (See Table A7.) In 1952 approximately 14 percent of the population, or 65,000 people, were aliens, mostly Japanese and Filipinos.

The population of the Islands rose from the low point of 57,000 in 1872 to 154,000 in 1900, nearly 370,000 in 1930, and a peak of 491,000 in July 1948. (See Table A6.) As a result of depressed economic conditions and later the effects of the Korean War, emigration exceeded immigration by 65,000 during the following four years. However, with an annual excess of more than 11,000 births over deaths in the Islands during the last five years, another population increase can be expected.

The population increase during the past half-century was greatest on Oahu, particularly in the city of Honolulu. From some 20,000 in 1890, Honolulu's population rose to 138,000 in 1930 and to 233,000 by 1952.*

* Figure for 1930 includes military personnel stationed in Honolulu. Figure for 1952 includes civilians only.
In contrast, the population on the outlying islands declined by 16 percent between 1930 and 1952. (See Table A8.)

Other urban areas which have developed are of minor importance compared to Honolulu. The second largest city in the Islands, Hilo, on the island of Hawaii, had a population of 26,000 in 1952. A preliminary report of the 1950 U.S. Census lists only five other cities in the Islands with more than 6,000 population: Wahiawa, Kailua-Lanikai, and Waipahu on Oahu, and Wailuku and Kahului on Maui. The largest towns on the islands of Kauai, Lanai, and Molokai were, in the order named, Lihue with about 4,000, Lanai City with about 3,000, and Kau-nakakai with about 1,000.

In 1952 the population of Oahu was 326,000, or 70 percent of the total for the Islands. Hawaii ranked second with 64,000, followed by Maui with 38,000, and Kauai with 29,000. Only 8,000, or less than 2 percent of the total population, lived on Molokai, Lanai, and Niihau. The population density averaged 73 people per square mile in the territory as a whole, 553 on Oahu, and 24 on the outlying islands. (See Table A8.)

The numerical importance of the several races represented in Hawaii varies greatly from one agricultural industry to the other. It depends upon the time of their arrival in the Islands and their experience and traditions in their countries of origin.

According to a sample survey in 1947, about one-half of all adult men employed on the sugar plantations and nearly three-fourths of those working on the pineapple plantations were Filipinos. They now constitute most of the hired labor force of Kona's coffee industry, and some work as laborers in the dairy and cattle industries. They are also beginning to establish themselves as small sugar growers and as coffee and vegetable tenant farmers.

After the Filipinos, the Japanese are the largest racial group among plantation workers. Most of the small-scale growers and the great majority of small farmers in the minor agricultural industries are of Japanese ancestry. They produce nearly all the coffee, vegetables, rice, and fruits other than pineapples, much of the taro, flowers and honey, and some macadamia nuts. Farmers of Japanese or Okinawan ancestry dominate the poultry and swine industries. They are of lesser importance in the dairy industry, and are seldom beef cattle ranchers.

Caucasians hold most of the higher managerial positions on plantations. They also own and manage a major proportion of the large enterprises in the diversified agricultural industries, particularly in cattle raising, dairying, and macadamia nut growing. The Portuguese are mainly ranchers or dairymen; they rarely produce crops as a major enterprise.

Some Hawaiians and part-Hawaiians, who make up the largest portion
of subsistence farmers, produce crops for sale, particularly taro, and some work on ranches. Chinese, who once constituted the largest group of plantation workers and farmers, particularly rice growers, have with few exceptions left agriculture.

REFERENCES


Hawaii (Kingdom). Board of Education. Census of the Hawaiian Islands: 1832; 1836; 1853; 1860; 1866; 1872; 1878; 1884; 1890; 1896. Honolulu.


Honolulu Advertiser. (See June 15, 23, 1946.)


Wadsworth, Harold A., Colin G. Lennox, and Frank G. Serrao. “A Partial Report From the Advisory Committee on Pasture Land Leases Appointed by the Commissioner of Public Lands, June 14, 1948 . . .” Univ. of Hawaii, College of Agriculture, files. 2 parts, typed. (See part 1, pp. 1, 7, 11, 22; App. E.)
chapter 2 INFLUENCING FACTORS

Research and Education

Agricultural research and education in Hawaii compare well with similar activities on the mainland. The experiment station of the Hawaiian Sugar Planters' Association and the Pineapple Research Institute, both privately financed, concentrate nearly all of their research on the two major agricultural industries. However, some of their research results are applicable to other agricultural fields.

Most of the research for the diversified agricultural industries is being done by the University of Hawaii Agricultural Experiment Station. Diseases and pests of plants and animals are studied and methods developed for their control. Improved crop varieties and livestock strains are introduced and new agricultural methods are adapted to the requirements of the Islands. Problems of human nutrition, food processing, and marketing are investigated.

Research on fruit flies, a major agricultural problem of Hawaii, is handled cooperatively by the U.S. Bureau of Entomology and Plant Quarantine, the territorial Board of Agriculture and Forestry, the Hawaiian Sugar Planters' Experiment Station, the Pineapple Research Institute, and the Hawaii and California Agricultural Experiment Stations.

The Board of Agriculture and Forestry, in addition to its fruit fly work, is engaged in other agricultural research, mainly in the marketing field. However, it is primarily a regulatory agency.

In 1949 the territorial legislature created the Industrial Research Advisory Council to sponsor and finance studies which contribute to the development of the Hawaiian economy. Most of its research projects to date have been in the field of diversified agriculture.

The Federal-Hawaii Cooperative Agricultural Extension Service was established in 1928 as an integral part of the University of Hawaii. Together with other educational agencies, it has played a prominent part in the progress which Hawaii's agricultural population has made during the past two decades. The Agricultural Extension Service acquaints farmers with new developments and demonstrates better practices in crop and livestock production, pasture management, and soil
conservation. In its home demonstration clubs it trains women to make better homes for their families and to become more useful members of their communities. It publishes agricultural statistics, price reports, and production forecasts. It makes studies of efficiency and costs of farm production and demonstrates good marketing methods. Its 4-H clubs train farm youth in agriculture, homemaking, leadership, and citizenship.

Hawaii's public school system is outstanding in that children living in rural districts have the same educational opportunities as city children. Since 1937 the age limit of compulsory school attendance has been 16 years. In 1948, 30 percent of all public school pupils were attending high school. The corresponding figure for the continental United States in 1948 was 23 percent.

Hawaii's public schools are administered as one educational unit by the territorial Department of Public Instruction. Training opportunities for all boys are provided in vocational agriculture and shop, including classroom instruction and field practice. Evening classes in agricultural subjects are held for interested adults. The Future Farmers of America, a nation-wide agricultural youth organization, is sponsored by the DPI. In cooperation with the U.S. Veterans Administration, it also provides special agricultural training for veterans of World War II.

The University of Hawaii offers undergraduate and graduate courses leading to bachelor's and master's degrees in agriculture and Ph.D. degrees in soil science, entomology, and genetics.

Before World War II a large proportion of farmers in Hawaii were aliens, many of them educated and trained in farming in foreign countries. The older generation largely adhered to their accustomed agricultural practices and progress was relatively slow.

This situation has fundamentally changed in postwar Hawaii. Many of the present farmers were born in the Islands and have gone through the public school system. As soldiers during the war, a good many saw mainland or foreign agriculture at close range. They also gained experience in handling motorized equipment in the armed forces. Even on farms where the father still works, the son now often decides how the farm is to be run. As a result, production and marketing practices have greatly improved during recent years. Today the farmers in Hawaii closely cooperate with research and educational institutions and are quick to make use of new agricultural developments.

Farmer Organizations

Since World War II, Hawaii’s farmers have become increasingly aware of the value of farmer organizations. Two farmer federations have been created: the Territorial Young Farmers Association, sponsored by the DPI, and the Hawaii Farm Bureau Federation, which is close to the Agricultural Extension Service. In addition, farmers in several diversified
industries have formed associations, for example, the territory-wide Hawaii Poultrymen's Council, the Hawaiian Dairy Farmers Association, and the cattlemen's associations on several islands.

These associations have economic, educational, and political aims which are similar to those of corresponding farmer organizations on the mainland. They are used to promote activities and legislation designed to help their industry. Meetings give the members an opportunity to get together socially and to learn about changes in their field.

An increased development of cooperatives in the diversified agricultural industries was brought about by World War II and continued in the postwar period. About twenty active farmers' cooperatives were registered in Hawaii early in 1953. Of these, only two had existed before the war. They served the producers of fruits, vegetables, flowers, eggs, poultry, and livestock. Although most of them marketed farm products and bought supplies for their members, marketing was the more important side of their business. Approximately 15 percent of all farmers in the Islands belonged to one or more farmer cooperatives.

Hawaii's farmers before World War II were little used to cooperative action. The development of cooperatives during the war was stimulated by the necessity for united action in assembling shipments, making equitable distribution, and purchasing supplies. After the war the majority of co-op members decided to continue and expand their cooperative marketing and purchasing activities. Fruit and vegetable growers in particular saw the need for orderly marketing. They feared a cutthroat struggle for the Honolulu market among growers on the various islands and mainland shippers. However, an attempt to form a central cooperative organization with the local island cooperatives as members, failed.

The territorial cooperative law, until 1949, was not conducive to cooperative development. For example, it hindered the formation of a central cooperative organization of fruit and vegetable locals because it contained no provision for unequal voting rights by member locals. Furthermore, the territorial attorney general had ruled "that a cooperative was not exempt from the general excise tax if it had accumulated a surplus, nor to the extent to which it traded with non-members."

In 1949 an amended territorial cooperative law was passed which was closely patterned after the Uniform Agricultural Cooperative Association Act used on the mainland. By remedying the major defects of the old territorial statute, the new law opened the way for an increased development of agricultural cooperatives for production, financing, purchasing, and marketing.

Labor

Most farms in the diversified agricultural industries of Hawaii use farm family labor almost exclusively. If outsiders are hired on the small
vegetable, fruit, swine, or poultry farms, they may or may not receive housing. In 1952 on Oahu their cash wages ranged mostly from $5.00 to $7.00 per eight-hour day.

In the coffee-producing area of Kona, seasonal laborers are hired during the harvest, which normally is at its peak from October to January. Many of these workers are unmarried Filipinos. Coffee-growers give these workers a place to live and some occasional jobs during the off-season to hold them on the farms until the following harvest season.

Before World War II the prospect of a change from plantation life induced Filipino laborers from sugar plantations to come to Kona for the coffee-picking season. Now, with plantation jobs less plentiful, they fear giving up a permanent position for a temporary one. The pay for coffee picking has so far been too low and the season too short to attract many persons from the cities, even the unemployed. Children's work is so important in Kona that school vacations are shifted to coincide with part of the coffee-picking season.

Wage scales in Hawaii increased greatly for all types of work during and after World War II. Farm employers in the diversified agricultural industries were compelled to raise their wage rates in order to hold their labor supply. For example, the rate paid for picking a bag of coffee during the peak of the season rose from $0.65 in 1939, to $1.65 in 1945, and to $3.00 in the 1952-53 season. A worker does well when he picks three bags a day. Even in remote Hanalei valley on Kauai, daily cash wages paid by taro-growers amounted to $5.00 or more in 1951 compared to $1.75 to $2.50 a day in 1942.

Most of the hired labor in the diversified agricultural industries is used on the large cattle ranches and dairy farms, where union labor is not common. Ranches in many cases still continue the perquisite system now abandoned by the plantations. These perquisites may include some or all of the following: housing, medical care, farm products for family use, and laundry service. In 1952 cash payments to ranch labor, excluding perquisites, usually varied from $125 to $200 per month, with salaries in more responsible positions up to $300 per month. Monthly earnings for workers on Oahu dairy farms ranged from $200 to $300, including housing.

**Transportation**

Nearly all the freight between Hawaii and the United States mainland is transported by ships. The number of overseas vessels using the port
of Honolulu during the fiscal year ending June 1951 was 941. Formerly, most of the freight from the mainland destined for delivery on islands other than Oahu was unloaded in Honolulu and trans-shipped by inter-island carriers. However, as each major island now has at least one good overseas shipping port, more and more freight is going directly to and from Hilo on Hawaii, Kahului on Maui, and Port Allen and Nawiliwili on Kauai.

By far the largest portion of the freight moving between the United States mainland and the Islands is carried by vessels of the Matson Navigation Company. The remainder is shared mainly by the Isthmian Steamship Company, the American Pioneer, American President, Waterman, and Pacific Transport Lines, and occasionally by barges. Matson's freighters leave for Hawaii weekly from both Los Angeles and San Francisco, and approximately bi-weekly from Seattle, Tacoma, and Portland. A joint service by Matson and Isthmian provides for weekly to 10-day sailings from the North Atlantic seaboard with regular calls at Gulf ports. Past, modern C-3 type freighters sail from Honolulu to California and Pacific Northwest ports in five and a half days and to North Atlantic ports in about 18 days.

Matson’s C-3 freighters on the Hawaii-California run average approximately 56,000 cubic feet of refrigerated space each, and the vessels to the Pacific Northwest about 41,000 cubic feet. The passenger liner Lurline, operating on the Honolulu-California run, has 51,000 cubic feet of refrigerated space. The entire Matson fleet now has about three times as much refrigerated space as in prewar days. The cold-storage space on the C-3 freighters is subdivided into 20 refrigerated compartments of various sizes so that cargo can be segregated according to temperature requirements, type of product, and destination.

Incoming overseas freight of Island ports, excluding petroleum products shipped by tankers, was approximately the same as outgoing freight in 1951, with each amounting to about two million tons. This made full loads possible on both the incoming and outgoing trips, which is a basic requirement for low tariff rates. Water freight rates on most agricultural products between the West Coast and the Islands were from about $16.70 to $17.50 per revenue ton of non-refrigerated cargo and 3.2 cents per pound of refrigerated cargo early in 1953.

Honolulu is a regular port of call for some freighters traveling from the mainland to Japan, China, and elsewhere in the Orient. Some steamers sailing from North America to New Zealand and Australia also stop at Honolulu.

Air shipment of agricultural products between Hawaii and the mainland is largely restricted to high-value and low-weight perishables such as flowers, foliage, and day-old chicks. Honolulu airport is a stopover for transpacific flights from North America to New Zealand, Australia,
and the Orient. However, airfreight of agricultural commodities to and from foreign countries other than Canada is insignificant.

Scheduled barges now transport most of the interisland freight. Before World War II, when four steamers served the interisland trade, passenger service provided a sizeable portion of steamship revenue. Nearly all travel between the islands is now by air. In 1952 the only remaining ship which carried freight regularly between Honolulu and the island of Hawaii discontinued operation.

In addition to the previously mentioned major overseas shipping ports, the Islands have a number of minor harbors, piers, and landings. The more important among the latter for diversified agricultural products are the ports at Kawaihae in South Kohala and Kailua in Kona on the island of Hawaii, and the pier at Kaunakakai on Molokai. With the improvement of highways, the tendency has been more and more to ship through one or two main ports on each island.

Interisland rates in 1952 were $6.00 per revenue ton between Honolulu and Kahului, Nawiliwili, and Port Allen; $6.50 between Honolulu and Hilo; and $7.00 between Honolulu and Kawaihae, Mahukona, and Kailua, Hawaii. Some refrigerated space was available on interisland ships and barges at 1.5 cents per pound. The longest scheduled sailings between the outside islands and Honolulu take about 24 hours.

Air shipment of diversified agricultural products is more important in Hawaii than in the continental United States where trucks provide a flexible and fast way of transporting perishable commodities over short distances. With good airports on all major islands, the airplane takes the place of the truck in Hawaii, at least for high-priced, perishable agricultural products. For example, 16 percent of all fruits and vegetables transported from the outside islands to Honolulu were sent by air in 1952.

Airfreight rates for shipments of half a ton or more in February 1953 were 2.5 cents per pound from the island of Hawaii to Honolulu and 2 cents per pound from all other islands.

The surfaced highways connecting farm districts with cities, harbors,
and airports are generally adequate. However, unsurfaced side roads to some farms or groups of farms may occasionally become impassable for cars and trucks during heavy rains. The two small railroads in the Islands, the Oahu Railway and the Kahului Railroad on Maui, are of little importance to the diversified agricultural industries.

**Agricultural Credit**

The diversified agricultural industries in Hawaii suffer from a lack of sufficient credit. Commercial banks are an important source of credit for large-scale agricultural enterprises, particularly sugar and pineapple plantations. They also furnish production credit for small independent cane producers. However, they give few loans to small producers of diversified agricultural products. Such loans are mainly restricted to installment loans of up to three years duration to dairy, beef cattle, and poultry farms. Cattle loans are usually secured by a chattel mortgage on the livestock. Loans by commercial banks to producers of vegetables and tree fruits are rare.

Lenders are reluctant to make farm loans under the G.I. Bill of Rights. Since the beginning of the loan guarantee program in 1946, only one veteran got such a loan up to early in 1952, although many made inquiries. In contrast to some mainland areas, insurance companies make no mortgage loans in Hawaii to farmers producing diversified agricultural commodities.

Wholesale and retail dealers played a major role in financing farmers in the past. In his book *Paradox in Hawaii*, D. L. Crawford showed how this type of credit became a heavy burden to the farmer during the thirties in the coffeegrowing district of Kona. He wrote: "The store sells food and necessary goods on credit, taking in coffee when the harvest is done. If there is not sufficient crop to pay off the debt, the balance is carried forward to the next year. So it piles up, to be finally cleared off in some good year which comes perhaps once or twice in a decade. Meanwhile there is a high interest rate adding to the burden and the man is helpless because the debtor is always at the mercy of his creditor.

"To make matters still worse, the storekeeper has a good deal of authority in fixing the price which he will allow on the debtor's coffee when it is finally harvested." Upon delivery, the coffee "has not been graded and its ultimate value can only be guessed at. It is human nature that the storekeeper, who has waited long for his money, will scale the price down to a point where he feels that he is well protected against loss."

At present, dealer credit is of less importance to farmers than before World War II. Many farmers paid off their debts to merchants during the prosperous World War II and the first postwar years. Coffee buyers
still advance credit at times. Some produce wholesalers give production loans, and feed dealers often deliver feed on credit. Machinery and equipment can be bought on time payment plans. In addition, many farmers carry accounts with farm supply and grocery stores.

The main sources of capital to the small farmer are his own savings and those of his family and friends. Oriental families, particularly Japanese, are closely knit. Because of this and the lack of other sources of credit, the farmer of Oriental ancestry turns to his family first when in need of capital.

The Kona Community Federal Credit Union, organized a few years ago, has satisfied the minor production and consumption credit needs of many farmers in the district. Recently a credit union was formed on Molokai which may become of importance in serving farmers producing diversified agricultural products.

Share cropping, a common practice of agricultural financing on the mainland in the South, is not extensively used in the Islands. However, some land, particularly on Oahu, has recently been leased to fruit and vegetable growers on a share basis.

Among governmental credit organizations, the Farmers Home Administration is by far the most important. The FHA was the successor in 1946 to the Farm Security Administration (FSA). It makes four types of loans, farm ownership, operating, farm housing, and disaster loans. Farm ownership loans are repayable in forty years, operating loans in from one to seven years, and farm housing loans in from five to thirty-three years. Disaster loans can be either short-term or long-term loans, depending on the purpose, with a maximum of twenty years. Operating loans were first made in Hawaii in 1938, ownership loans in 1939, housing loans in 1950, and disaster loans in 1951. In the beginning the FSA restricted itself to the island of Hawaii, but in 1940 it began operations on other islands as well.

Nearly all ownership loans are of the "tenant purchase" type. With a loan of this type, the FHA buys the land and finances the establishment of the farm as well. There have been very few "development loans," where the farmer already owns the land and needs capital for its development or the enlargement of the farm.

By March 1, 1952, about 345 Island farmers had received 2.1 million dollars in ownership loans. As of the same date, 839 operating loans amounting to over 1.1 million dollars had been made. In addition 78 housing loans amounting to $640,000 and 55 disaster loans for a total of $78,000 had been approved.*

* These figures do not include $95,000 worth of emergency crop and feed loans. The first of these loans had been made by the Farm Credit Administration in the early 1930's. The program had been taken over by the FSA and had been discontinued in 1946.
The record of the FSA and FHA program in Hawaii so far has been good. Up to March 1952 no financial losses occurred among the ownership, housing, and disaster loans. Losses in operating loans totalled only $200. Of a total of 2.0 million dollars in ownership loans, 1.1 million dollars of principal was repaid by March 31, 1951. By that date 143 of the 285 ownership borrowers had completely repaid their loans.

Observers attribute the success of the FSA and FHA in Hawaii primarily to the careful selection of borrowers and the supervised loan program. Loans other than housing loans are granted only after a farm and home plan has been made by the farmer in cooperation with the FHA. Trained agriculturists of the FHA supervise the carrying out of these plans and help with advice if needed.

The record of FHA borrowers in Hawaii is better than on the mainland. On March 31, 1951, Island ownership borrowers had repaid 55 percent of their loans, compared to a 48 percent average for the mainland. Extra repayments of principal, in addition to required minimum payments, were about 50 percent higher in the Islands than the mainland average. In making these comparisons, it must be remembered, however, that operations of the FSA on the mainland began several years earlier than in Hawaii. These early years, largely falling into a period of agricultural economic depression, are included in the above mainland figures.

Furthermore, to become a client of the FHA a farmer must show that he cannot obtain credit from a bank or other lending agency at a reasonable rate of interest and on terms to meet his needs. As possibilities of getting farm credit are much scarcer in Hawaii than on the mainland, most Island clients of the FHA can be expected to belong to a better class of farmers than in the continental United States. A sample survey of 52 FHA-financed farms in the Islands indicated that the FHA farmers were, in general, better-than-average farmers.

FHA farm ownership loans in Hawaii are at present limited to $18,000 per farm, with loans exceeding $12,000 requiring regional or national office approval. Operating loans are limited to $7,000 per loan. The ownership loan ceiling confines the farm ownership financing of the FHA largely to agricultural industries requiring relatively little capital. For example, ownership loans to full-time beef cattle ranchers and dairymen have been rare.

Several other FHA requirements limit the type and number of clients applying for loans in the Islands. For loans other than disaster loans, farmers must be American citizens. Except for a farm housing loan, a borrower has to devote a major portion of his time to his farm, and receive a major portion of his income from it. To receive these loans, farmers must have security of farm tenure. Despite these limitations, eligible applicants for housing and operating loans have far exceeded the funds available to the FHA during the last few years.
The only major territorial agricultural credit agency, the Farm Loan Board of the Territory of Hawaii, which was created in 1919, has not been successful. Up to 1941 a total of about $330,000 had been loaned by the agency. In that year delinquent loans and interest payments amounting to $243,000 were reduced to $134,000 under the terms of the so-called Reamortization Act. No new farm loans have been made directly by the board since 1942; outstanding farm loans amounted to $15,000 in 1952.

The failure of this lending institution appears to have been caused by poor administration and by some of the stipulations in the law under which it was established. The upper limit for loans was $5,000. Loans granted for the purchase of land had to be repaid within ten years, development loans within five years. Experience has shown that this loan ceiling was too low and the repayment periods too short. The restriction of all loans to fee simple property greatly limited the number of potential borrowers. The lack of a supervised loan program and poor selection of borrowers were other causes for the failure of the board.

Since 1949 the board has made available to the FHA its revolving fund of about half a million dollars. By March 1952 the FHA had used about $230,000 of this in its insured mortgage farm ownership program.

The Hawaiian Homes Commission can make loans up to $12,000 to its agricultural homesteaders. Only persons with at least 50 percent Hawaiian blood are eligible for the program of this agency. Few of these homesteaders have so far been successful as commercial farmers.

The fact that the agricultural borrowers of the Hawaiian Homes Commission and the Farm Loan Board have failed to prosper is sometimes cited as evidence that diversified agricultural industries and small farming cannot be successful in Hawaii. In view of the satisfactory record of the great majority of FHA farmers producing diversified agricultural products, such a conclusion does not appear to be warranted.

Private lending institutions might well be able to enlarge their volume of loans to diversified farmers and their marketing agencies. Lately the two principal commercial banks in the Islands have shown an increasing interest in the financial needs of non-plantation agriculture. More credit would become available to Island farmers if they would keep better farm records. At the present time many agricultural producers are unable to furnish financial statements that are satisfactory to lending institutions. Marketing agencies could encourage the granting of credit to farmers by using mainland-type practices such as crop or livestock product assignments, which protect the interests of creditors. Landowners could greatly aid farmers in getting loans by selling them land or by granting them longer and more secure leases.

The agricultural credit situation in Hawaii could probably be improved greatly by extending to Hawaii the operations of the lending
agencies organized in the Farm Credit Administration. Farmers on the mainland form credit cooperatives, the so-called National Farm Loan Associations. These obtain long-term credit from the Federal Land Banks, which are part of the Farm Credit Administration. For the purpose of getting short-term production loans from the FCA, mainland farmers establish cooperative Production Credit Associations. The Bank of Cooperatives, also a part of the FCA system, extends credit to mainland farmer cooperatives.

In 1951 two representatives of the FCA investigated the possibility of establishing a Production Credit Association in Hawaii. They recommended against such an undertaking at that time. However, they indicated that a PCA might operate successfully within a few years with continued improvement in Island agriculture and with further growth of farmer cooperatives. Several agricultural leaders in Hawaii feel that the volume of business among farmers would justify a PCA immediately.

Island farmers are being paid for part of the costs of certain conservation practices by the U.S. Production and Marketing Administration. The maximum annual payment under this agricultural conservation program to any one farmer or rancher is limited to $2,500 in 1953. It is the policy of PMA to approve only those practices which are most conducive to better soil conservation and increased agricultural production.

Laws, Regulations, and Taxes

Island farmers operate within an extensive system of laws and governmental regulations. Regulating authorities include federal, territorial, county, and district agencies.

In 1903 the Territory started a plant and animal inspection and quarantine service to protect its crop and livestock industries. At present territorial and federal services cooperate in the enforcement of quarantine regulations on shipments to and from Hawaii.* Certain plants and animals moving in interisland trade are also inspected by the territorial agency. Despite the quarantine, several serious plant pests and livestock diseases have been introduced in recent years, such as the Oriental fruit fly and the Newcastle disease of poultry.

Many progressive acts and ordinances passed during the last few years have enhanced the development of the diversified agricultural industries. A marketing act passed in 1945 greatly improved the marketing of farm produce. It provides for the adoption of grades for fresh fruits and vegetables and a territorial inspection service for agricultural products. On its authority the Board of Agriculture and Forestry has

* These agencies are the Division of Foreign Plant Quarantine of the Bureau of Entomology and Plant Quarantine, USDA, and the Division of Entomology, Territorial Board of Agriculture and Forestry.
promulgated regulations governing grading, packing, standard containers, and labeling.

The portion of the marketing act which regulated dealers in farm produce was expanded by the 1949 and 1951 territorial legislatures. In 1949 legislation was passed providing for the establishment of grades and compulsory inspection service for fruits, vegetables, and nuts that are exported. Laws now in effect controlling the quality of seeds, economic poisons, and mixed feeds protect the farmer as a buyer. Agricultural production is safeguarded by legislation such as the law controlling the use of 2,4-D and similar plant hormone preparations.

The mild climate of Hawaii makes strict sanitary regulations necessary. Some of these ordinances, such as those regarding adequate rodent and fly control for livestock and poultry, require expensive procedures.

Meat slaughtered for sale is inspected for evidence of disease by territorial authorities in the same manner as under federal regulations. (One slaughterhouse is federally inspected.)

The territorial legislature in 1947 passed a law providing for the creation of Soil Conservation Districts to protect the land against wastage and erosion and to conserve water. By the middle of 1953, twelve districts had been established on the islands of Hawaii, Oahu, Kauai, Maui, and Molokai. Both the U.S. Soil Conservation Service and the Agricultural Extension Service assist in the formation of the districts and cooperate with the district directors in their operation.

Hawaii has a wage-and-hour law more inclusive than that of many states—extending even to agricultural labor. However, this law does not apply to agricultural enterprises employing less than 20 persons. The Hawaii Employment Relations Act, a "little Wagner Act," gives the right of organization and collective bargaining to agricultural workers in enterprises employing eight or more persons except those engaged directly in the milking or feeding of dairy cows. The child labor law regulates the conditions under which minors work, but children working on farms of their parents or guardians are exempt from most of the provisions of this act.

Most taxes which are levied on Island farmers are similar to those paid by farmers on the mainland, such as real property tax, fuel tax, federal net income tax, and territorial net income tax. Because of low net incomes, only a fraction of the family farmers in the diversified agricultural industries pay net income taxes. In a sample of 52 small farmers in 1947, 11 paid federal and 9 territorial net income taxes. The average payment per sample farm was $28.00 federal and $4.00 territorial net income tax.*

* This sample included only small family farms employing very little hired labor. A sample including a representative share of the larger diversified farms would have shown higher average income tax payments per farm.
In contrast to farmers in most mainland states, farmers in Hawaii have to pay a territorial gross income (general excise) tax. The rate is 1.5 percent of gross receipts from sales by agricultural producers to dealers. Wholesalers pay a 1 percent and retailers a 2.5 percent tax on their gross receipts. Farmers who sell directly to consumers pay a tax of 2.5 percent.

The gross income tax is among the heaviest tax burdens on farmers in Hawaii, except for those with high incomes. In contrast to net income taxes, its rate stays the same regardless of the amount sold. At present tax rates, general excise tax payments of the above-mentioned sample farmers would have averaged 2.2 percent of their total farm costs including interest.*

The effect of the tax is similar to that of a retail sales tax; both tend to reduce the volume of sales. In some states, such as California, food is exempt from retail sales taxes. This exemption gives food products a relative advantage over other commodities in these states. Hawaii's farmers and food dealers do not have this tax advantage, because they are taxed the same as other businessmen.

The general excise tax puts Island food producers at a disadvantage in competing with mainland growers. For example, a wholesaler importing farm products from California buys from farmers not subject to a gross income tax. Island farmers selling to the same wholesaler have to pay a 1.5 percent gross income tax. In the case of agricultural exports from Hawaii, the general excise tax is a cost which growers in most competing areas do not have.

Another effect of the territorial gross income tax is to increase the prices of goods purchased. The amount by which prices are raised by the tax depends largely on the degree to which it can be shifted by

* Actual gross income tax payments of these farmers constituted a smaller percentage of their farm costs because the rate on sales by agricultural producers to dealers was 0.25 percent for the first six months of 1947. The rate was raised to the present level of 1.5 percent on July 1, 1947.
wholesalers and retailers to consumers. For products with nation-wide fixed sales prices, dealers may have to absorb the tax, with no price rise to consumers. However, producers and dealers usually base their mark-up on their cost, including the tax. Most agricultural products are sold at least three times—by the producer, a wholesaler, and a retailer. In these cases, the price rise to the consumer above what he would have had to pay without the tax is estimated at about 5 percent.

REFERENCES
Elliott, Ralph C. "Territorial Cooperative Law Needs Revision," The Island Co-op Digest, I (October 1946). (See p. 3.)
———Farm Loan Board. Report . . . for the Period from January 1, 1941 to December 31, 1942. Honolulu: 1943. 22 pp. (See pp. 5, 11.)
———Territorial Planning Board. An Historic Inventory of the . . . Resources of the Territory . . . Honolulu: 1939. 322 pp. (See pp. 197, 202.)
chapter 3  HAWAI I AGRICULTURE  TO 1900

Prediscovery Hawaii

Before the coming of the white men, the Hawaiians had been economically self-sufficient for many centuries. They practiced an intensive form of agriculture which sustained an estimated population of 300,000 at the time of Captain Cook’s discovery in 1778.

Their main staff of life was poi, prepared from the cooked corm of the taro plant. Most of the wetland taro was grown partially under water in rich bottom lands and on irrigated terraces. Wetland taro patches were level beds, perhaps 20 to 50 feet square, surrounded by earthen dikes. The so-called dryland taro was produced without irrigation in some of the moist upland areas. Sweet potatoes were also cultivated but were less exacting in their water requirements.

Other food crops were grown, such as breadfruit, bananas, plantain, coconuts, sugar cane, awa root, and gourds, although nothing much was done by the natives except to plant them. The paper mulberry tree, from which the Hawaiians made their cloth, or tapa, was cultivated along with these food plants.

Hawaiians developed much skill in the growing of some crops. They brought irrigation water to their taro fields from streams which were often far away. It required ingenious engineering to make these irrigation systems function effectively. An efficient system was developed for the distribution of water, and the adjustment of disputes.

The Hawaiians learned how to conserve and build up the fertility of the soil. They developed simple hand implements for tillage, such as a wooden spade of simple design. They had practically no iron or other malleable metals and no work animals.

Fish was the most important source of protein in the diet of the Hawaiians. Of primary importance among animals raised for meat were breeds of short-legged and large-bodied dogs. These were kept in yards, fed on vegetables and refuse, and eaten at an early age. A small, razorback type of hog was also commonly raised. Its flesh was preserved by boning it, rubbing it well with salt, and drying it. Chickens were the only other livestock.
All land belonged to the king, who distributed it to his principal chiefs on a feudal basis. They in turn allotted the land to lesser chiefs, who subdivided it among the common people.

The functional agricultural unit was the individual tenant's holding, or *kuleana*. In the uplands, *kuleanas* were from about seven to nine acres in size. Each tenant cultivated two or three acres during a given year, then would let this land lie fallow for two or three years. *Kuleanas* used for wetland taro in the fertile bottom lands were smaller.

The tenants could be ejected at will by their chiefs. However, in contrast to European feudalism in the Middle Ages, the farmers were not serfs. They could leave one chief if his burdens proved too heavy, and seek a *kuleana* from another. The commoners retained only one-third of the fruits of their labor for their own use. The remaining two-thirds were paid in one form of tax or another to the various orders of chiefs and priests.

Considerable commerce existed between islands and between different areas on the same island. For example, on the island of Hawaii the people of Kona bartered dried fish for vegetable produce from the fertile Hama-kua coast. The inhabitants of Niihau, a rather dry island, sent yams to the island of Kauai in exchange for wood to build their canoes.

Before Cook's visit, exchange had developed to the point that regular market fairs were held on the island of Hawaii where peddlers from all parts of the island came together to barter their products. Market inspectors were at hand to assure orderly trading and to arbitrate disputes. The natives possessed no medium of exchange or money. No legal protection was given to lenders; apparently willingness to lend implied willingness to bear the risk of the debtor's default.

Farming, like all other activities in ancient Hawaii, was tightly regulated by a strict religious ritual. Under this so-called *kapu* system, much extra labor was required and violators were severely punished.

**Discovery to Middle of 19th Century**

As foreign vessels began to visit the Islands the number of imported cultivated plants and domesticated animals increased rapidly. It is known that Captain Cook introduced melons, pumpkins, and onions. The orange was brought to Hawaii in 1792, the grape in 1796, the Irish potato about 1820, and the mango tree in 1824. By 1825, cabbages, Indian corn, limes, and pineapples were exchanged at the regular market then functioning in Honolulu. A great number of other fruits and vegetables from both temperate and tropical zones have since been introduced from all parts of the world. There probably exists now a wider range of cultivated crops in Hawaii than in any other place of comparable size.
New species of animals were imported at a rapid rate. Captain Cook brought goats, which roamed wild in the mountains and have since become forest pests. Cattle and sheep were brought to Hawaii in 1793 and horses in 1803. By about 1825 turkeys, ducks, donkeys, mules, and European varieties of chickens, pigs, and dogs had been introduced.

As a result of the king's strict kapu on cattle, the interior plains and mountains were full of them by 1830. Removal of the kapu started ranching and the hunting of the wild cattle on horseback on Hawaii and the other islands. Government and king jointly owned the wild, unmarked herds and sold or leased slaughtering rights to private parties. The wild cattle amounted to 25,000 head in 1846. Though meat and tallow were sold, wild cattle were hunted primarily for their hides and eventually became very scarce. Ranching developed into a highly profitable enterprise in the middle of the nineteenth century.

During the 1840's the interests of cattlemen frequently collided with those of farmers. The cattle destroyed the hala trees and vegetable patches of the Hawaiians, who were not in the habit of fencing their land. In at least two areas, in Waimea on Hawaii and in Kahuku on Oahu, farmers were actually driven away from their homes by the depredations of cattle. Laws were passed against trespassing cattle but not enforced. As time went on the evil was mitigated by fence building.

Provisioning of ships gave the first foreign stimulus to Hawaiian agriculture. Ships stopping at the Islands during the four decades following discovery were mainly engaged in fur and sandalwood trade between the Pacific Northwest, China, and Hawaii. Beginning about 1820 whaling ships made the Islands their principal field base of operations and stayed in port for weeks and months in the spring and fall. Whaling in the Pacific reached a peak between 1840 and 1860, and rapidly declined thereafter.

At first the foodstuffs which the natives had to offer for sale to the sailors were limited to pigs, poultry, yams, and a few fruits and vegetables. During the latter part of the whaling period the most important provisions bought by the whalers were beef, sweet potatoes, and Irish potatoes. Also bought were chickens, turkeys, hogs, pumpkins, melons, onions, yams, coconuts, limes, oranges, bananas, pineapples, molasses, sugar, and coffee. As late as 1844 most of the trade was barter. Near the ports the natives learned to use money, but in the outlying districts it was not yet generally the medium of exchange.

Agricultural exports had been insignificant before the 1830's. Beginning in that decade, modest exports of sugar, molasses, cattle hides, and tallow appeared rather regularly in the export statistics. In the 1840's coffee became another permanent export item.

The California gold rush brought a brief but spectacular boom to Hawaii's agriculture. Production of Irish and sweet potatoes was stim-
ulated more than that of any other crop. Some Irish potatoes had been exported in 1847, but the strong demand and high prices began in the fall of 1849. Exports rose from 900 barrels in 1849 to 52,000 in 1850 and 43,000 in 1851. By the fall of 1851, the boom was over. Total shipments of Irish potatoes amounted to only 8,200 barrels in 1852 and had practically ceased by 1855. Competition from the Oregon country had pushed Hawaii out of the California market. In addition, the Californians began to raise potatoes themselves. To make things worse, the potatoes from Hawaii had acquired a bad reputation on the West Coast since Island growers had shipped many potatoes of inferior quality to San Francisco.

Exports of some other agricultural products also reached a peak early in the 1850's but continued at a modest level for a number of years more. Shipments of sweet potatoes, for example, rose from only a few barrels in 1848 to 56,700 in 1851. Though they declined to 6,100 barrels in 1852, nearly 2,000 barrels were shipped as late as 1859. Banana exports began in 1851, reached 1,700 bunches in 1853, and then continued at lower levels during the following years. Cattle ranchers sent 25 tons of fresh and salted beef to California in 1853 and were still exporting nearly that much in 1860. Other agricultural products exported to California during the gold rush were chickens, turkeys, swine, dried pork, cattle, mules, eggs, onions, pumpkins, melons, cabbage, yams, oranges, pineapples, coconuts, coffee, sugar, molasses, flour, and hay.

With the exception of beef and some sugar and coffee, most of the agricultural crops during the gold rush period were produced on kuleanas. Active steps were taken by the government to encourage family farming. For example, most of the potatoes exported were grown in Kula on the slopes of Haleakala, Maui. Public land there was subdivided into lots of from one to ten acres and offered for sale to the natives at $3.00 per acre.

Agricultural techniques had not changed greatly by the middle of the nineteenth century. Ax and knife were now used generally by the natives, but no heavier or specialized tools. S. E. Bishop reports that in his youth in Kona he never saw a plow, scythe, sickle, or as far as he remembered, a metal spade or shovel.

In the late 1830's some carts and oxen came into use in the less backward communities. Horses became more common, and animals were used in the grinding of sugar.

American missionaries, the first of whom arrived in 1820, were a major influence in spreading Western methods of agriculture. Among other things, they taught the natives how to yoke oxen, to plow and harrow, and to fertilize their crops.
Great Mahele and Aftermath

During the fifth decade of the 19th century, the landholding system changed from a feudal to an alodial basis in the so-called *Great Mahele*. The king divided the land among himself, the government, the chiefs, and the common people. The king’s own property, or “crown land,” amounted to approximately 984,000 acres, the government land to 1,495,000 acres, the chiefs’ to 1,619,000 acres, and the common people’s to 28,600 acres.

Not all native tenant farmers applied for the title to a *kuleana*. Some felt that the cost of acquiring a title exceeded its value. Others believed that the *kuleanas* offered to them were too small to sustain their families. During the land division, some surveyors included in a *kuleana* only the land actually under cultivation. In many areas, such as in the uplands, a *kuleana* had to be three times as large as the area actually cultivated.

It must also be realized that the farms given to the common people consisted primarily of irrigated taro lands in the valleys. These lands were regarded as by far the most valuable at that time.

Many *kuleanas* passed rapidly out of the hands of the commoners into the possession of non-Hawaiian operators of sugar and rice plantations and cattle ranchers. The natives were slow in grasping the full significance of land titles. Returns from lease or sale of their land were high and life in the port towns tempting.

Large portions of the areas granted to the king, the government, and the chiefs were mountainous, arid, or forest lands. With the increasing importance of crops other than taro, the growth of livestock industries, and the development of irrigation, many of these latter lands became of great agricultural value.

Much of the land of the chiefs and the government also passed into the hands of white people by sale, lease, or marriage. In 1856 only 209 of the 15,514 land claims registered with the government had belonged to foreigners or their descendants. By 1896, 57 percent of the taxable land was in their hands. Title to all government and crown land was conveyed to the United States by the Treaty of Annexation.
Sugar Industry Until Annexation

Up to 1835 few foreigners were engaged in farming. Uncertain land tenure, lack of near markets, and the possibility of making money more easily by trading with the whalers kept them out of agriculture. However, during the next 25 years they began to turn their attention to this field. Their change of attitude was brought about primarily by three developments: (1) the change in the landholding system, (2) the rapidly increasing export market on the West Coast of the United States, and (3) the decline of the whaling trade.

Among the many crops they tried, sugar was destined to become Hawaii's major industry. It has been reported that as early as 1802 attempts were made to produce sugar commercially in the Islands. The first permanent plantation, the forerunner of the present system of corporation agriculture, was established on a large leasehold at Koloa, Kauai, in 1835. Other sugar producers and mills soon began operating, and the first sugar exports were reported in 1837.

For the next 20 years the young industry struggled against heavy odds. It was handicapped by the lack of or uncertainty of markets, low prices, labor scarcity, and drought. Other factors were the planters' lack of experience, equipment, and capital. Until the Great Mahele many difficulties arose from the feudal land system.

By 1857 the surviving plantations were primarily those which were large and centralized, combining the growing and processing of sugar cane in one enterprise. They had proved better suited to the Hawaiian conditions of that time than a system of central mills to which sugar cane is brought by individual cultivators. Mill machinery and cultivation practices steadily improved. In 1872 it was stated that "no country can boast of finer mills or plantations."

Up to 1856 sugar was produced without irrigation. When irrigating of sugar proved profitable in that year, a large number of small-scale irrigation projects were undertaken.

With the increasing complexity of sugar production, many planters had little time left for marketing, purchasing, and financial matters. Therefore, they affiliated with Honolulu merchants who handled on a commission basis all their business except the growing and milling of sugar cane. From such a modest beginning some of these merchants, who were called factors, grew to their present dominating position in the sugar industry.

Boom prices during the Civil War in the United States furnished a major stimulus to Hawaii's sugar industry. Sugar exports expanded from 572 to 8,865 tons during the war and continued to increase thereafter. The Treaty of Reciprocity between the United States and Hawaii, concluded in 1875, provided for free entry of Hawaiian sugar and molasses
into the United States. The sugar industry became "as profitable as gold mines were only hoped to be" and it expanded rapidly. About 20,000 additional acres were brought under cultivation in six years, and old sugar land was farmed more intensively. Twenty plantations were in operation in 1875; five years later there were 63.

Large-scale irrigation developments were undertaken under the stimulus of the treaty. The first of these, the Hamakua Ditch, was 17 miles long and able to deliver 40 million gallons of water daily to the fertile sunny plains near Paia, Maui. Later on, still larger ditches were built. The Spreckels Ditch was 30 miles long and the Koolau Ditch had a capacity of 80 million gallons daily. In addition, subterranean water resources were developed by large-scale pumping.

Sugar planters and factors loosely organized in 1882 in the Planters' Labor and Supply Company, which founded a sugar experiment station early in 1895. Later that year the more strongly integrated Hawaiian Sugar Planters' Association superseded the first organization and took over the newly established experiment station.

The successful development of the sugar industry following the conclusion of the Treaty of Reciprocity of 1875 is best shown by the increase in sugar production. It rose from 12,500 tons in 1875 to 229,400 tons in 1898, when the Islands were annexed by the United States. Sugar had become king in Hawaii.

Coffee Industry Until 1900

Coffee was first grown in Hawaii in 1817 on the island of Oahu. The first large coffee plantations were established in the late 1830's and early 1840's on Kauai; others followed on Maui and near Hilo and in Kona on Hawaii. The Kona district was found to be especially well suited to its growth. Some coffee was consumed locally and a good deal sold to the visiting whalers. Exports began in 1845. For a short period coffee became the second largest agricultural industry in the Islands, and some believed it was destined to become the major industry of Hawaii.

Coffee planters soon ran into trouble, however. Coffee and sugar began to compete for land and labor during and after the California gold rush. Land rents went up; many coffeegrowers could not pay high enough wages and lost their workers to the sugar planters; a destructive
plant blight struck the industry. The sharp rise in sugar prices during the Civil War in the United States was the final blow to coffee plantations. In many cases, coffee planters uprooted their trees and planted sugar instead.

However, coffee growing continued in small units on a family basis. Most of the producers were natives who lived some distances from cane fields. They were not greatly attracted by employment on sugar plantations because of their training and habits. They planted either coffee slips or seed and let the trees grow without attention until it was time to pick the berries. Husks were removed by primitive methods, often resulting in coffee with an unclean appearance or poor flavor, which reduced its price.

With tariff protection of the local market, home consumption in the early 1870's was estimated at about 200,000 pounds. Exports fluctuated greatly; they amounted to 415,000 pounds in 1870 and to only 39,000 pounds two years later. Most exports went to Pacific ports of the United States and some to British Columbia and Germany.

The Reciprocity Treaty of 1875 harmed Island coffee growers. It removed the Hawaiian tariff on coffee imports from the United States, and American shippers flooded the Hawaiian market with cheap grades. In the 1880's coffee exports declined to their lowest level since they were first listed in the export statistics.

About 1887 the world market for coffee began to rise substantially. Prospects for the crop seemed excellent and large sums of money were spent to develop new coffee plantations in the Islands. Exports increased rapidly and in 1899 amounted to 825,000 pounds.

**Rice Industry Until 1900**

Rice growing became an important Island industry in the early 1860's. A ready market for rice had existed for some time; in the 1850's $10,000 to $12,000 worth was imported annually from China. The number of Chinese immigrants, who were large rice consumers, rapidly increased both in the Islands and in California.

In 1860 an experimental planting in Hawaii proved successful. Agricultural resources suitable for rice growing were available and unused. With the decline in the native population, the demand for poi had also declined, and many taro patches had been abandoned. The existing
earthen banks and irrigation channels could quickly be made ready for growing rice. To help the industry get on its feet, a protective tariff was imposed of 1 cent a pound for rice in the husk and 1.5 cents for cleaned rice. A speculative rice fever began, and the cultivation of the crop spread quickly. However, after the first enthusiasm natives and Caucasians found the returns from rice growing disappointing. They leased their lands to the Chinese, who completely took over the industry.

Rice exports increased rapidly from about 670,000 pounds hulled in 1862 to 1,960,000 pounds in 1875. The industry was greatly stimulated by the Reciprocity Treaty of 1875, under which rice was admitted free of charge to the United States. Chinese growers extended plantings to all remaining unused taro lands and then reclaimed swamp and marsh land. During the peak of the rice era, they brought previously unirrigated land under cultivation and irrigated it from newly dug wells.

In 1880 the home market was made more secure by an increase in import duties to 1.5 cents a pound on paddy and 2.5 cents on hulled rice. In 1887 rice exports reached a peak of 13,680,000 pounds and then gradually declined. In 1899 production amounted to 33,440,000 pounds valued at $1,560,000. At that time, slightly more than 9,000 acres were used for rice. The major portion of this acreage was on Oahu (with two-thirds of the output) and on Kauai.

There were three types of rice producers: (1) independent family farmers, (2) cooperative groups, and (3) plantations. The great majority of farmers raised from one to five acres each. To finance their operations the small growers commonly borrowed from grocery stores. Such loans ordinarily were not secured by a lien on the crop or even a note but were made merely on the basis of confidence.

There were two types of group farming, the fun kung and the hop pun. In the fun kung system the owner or lessee of the real estate furnished the land, agricultural equipment, and work animals. The laborers bound themselves by contract to the plantation and supplied their own rations. At the end of the season, the capitalist and the workers divided the crop, or the money from the sale of it, on the basis of their mutual contract or agreement. In the case of the hop pun, or small partnership, two or three farmers jointly leased a piece of land, raised a crop, and divided the proceeds.

Companies were formed by both Chinese and Americans to promote and finance rice plantations. Some of these finance companies were also rice dealers or millers. The largest company, Sing Chong, had 4,000 acres under cultivation and at its peak produced half the Oahu output. Most of the large plantations ranged from 100 to 300 acres. They were usually operated for the companies by a salaried manager.

Most of the rice growers did not own the land they cultivated. In 1900 cash tenants operated 393 of the 504 rice farming units, share
tenants 40, and managers 24. Only 33 operators owned their farms in full and 14 were part owners.

The Chinese produced rice in Hawaii by the same methods their forefathers had used for centuries in their homeland. They introduced water buffalos with which to prepare the soil. Horses were used for threshing. Most other work was done by hand. Permanent plantation

Land Tenure of Rice Growers in 1900

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workers received about $12.00 a month besides housing and board. At planting and harvesting times extra laborers were recruited from the major towns.

On the windward side of the Islands one rice crop was raised per year, yielding an average of 3,000 pounds per acre. Two crops a year were grown on the leeward side, totalling about 5,000 pounds per acre.

Miscellaneous Crops Until 1900

Bananas were the only fruits regularly exported throughout the second half of the nineteenth century. The Hawaii-grown Cavendish bananas became popular in California, particularly among the Chinese. Annual shipments increased to more than 10,000 bunches in 1875 and more than 60,000 bunches in 1885. By 1889 exports exceeded 100,000 bunches and, with some fluctuations, remained at about that figure until annexation.

Orange exports from Hawaii to California began about 1840 on a limited scale and continued for about 30 years. By the end of the century the tables were turned, however, and Hawaii was importing oranges from California. Other crops, such as potatoes and cabbage, suffered the same fate. During the gold rush period Hawaii shipped these produce items to California, but later California began sending them to Hawaii. As a consequence, commercial production of some crops in Hawaii was negligible for many years. However, the variety of fruits and vegetables grown for home use in many Island backyards greatly increased during the second half of the nineteenth century.
Other potential export crops were tried, but none proved permanently successful. The earliest efforts to grow cotton in Hawaii date back to the first years of the nineteenth century. Production on a commercial scale began with the outbreak of the American Civil War when northern cotton consumers, cut off from their normal suppliers in the South, turned to the Islands as a possible source of the fiber. Exports expanded from 600 pounds in 1862 to a maximum of 22,300 pounds in 1866. Shipments to the mainland declined after that date and ceased entirely in 1875. The postwar competition of the southern states and the increasing opportunities in sugar were too much for the Hawaiian cotton grower.

A serious effort to produce silk on Kauai between 1836 and 1844 was a failure. Drought, wind, and insects damaged the mulberry trees, the leaves of which were used to feed the silkworms. When the project turned out to be less profitable than sugar and coffee, it was abandoned.

A little wheat was raised in the Islands before 1840. By 1852 about 140 acres were grown near Makawao, Maui, and some 1,200 acres the next year in the same locality. A power mill was erected in Honolulu and about 5,000 barrels of flour were manufactured. For a few years production was sufficient to fill domestic requirements and to make a few small export shipments.

However, Hawaii growers could not compete with California farmers who began at that time to produce low-cost wheat on a large scale. In the spring of 1857 sales were made at $11.00 and $13.00 a barrel in San Francisco, compared to $17.00 in Honolulu. With a profitable sugar industry competing for capital and labor, commercial wheat growing passed completely out of the picture in the late 1860's.

Among staples grown for home consumption, taro production decreased with the decline in native population. However, *pō* remained the mainstay in the diet of the Hawaiians, who did not easily substitute other foods for it. Whenever the supply of taro dwindled—such as in 1861, the first year of commercial rice production—prices rose to bring production quickly back into line with demand. Growing of the taro crop gradually passed out of the hands of the Hawaiians and was taken over by the Chinese. By the end of the century, the Chinese raised half of the taro and milled 80 percent of the *pō*.

Corn was not valued as food by the Hawaiians. In the 1850's plantings in the cooler uplands were successful. About 1900 several thousand
acres were grown for feed in the Kula district of Maui and the upper portions of the Parker Ranch on Hawaii.

Livestock Industries from 1850 to 1900

Cattle ranching steadily expanded during the second half of the nineteenth century. In 1846, out of a total of 35,000 head of cattle in the Islands, about 10,000 were estimated to have been domesticated. U.S. Census returns in 1900 gave the number of cattle one year old or over as 103,000. Modern English breeds, which were brought to Hawaii about 1850, had largely replaced the original longhorns by 1900.

The Great Mahele provided a sound foundation for the development of large-scale ranching. Caucasians as well as Hawaiians—including the nobility and even the king—were in the ranching business. Beef cattle were raised on both private and government land. Numerous small ranches were absorbed by larger ones through lease or sale, and in many instances several small ranches were combined under single ownership. By the time of annexation, many of the present large ranches were already in existence.

As late as 1875 hides and tallow were reported to have been of greater value than beef. The number of hides exported rose from 6,000 in 1836 to an annual average of 21,000 in the period 1870–80. Around 1900 exports reached 30,000 hides per year. At first they were largely sent to South America. When California became an important population center, most hides were shipped there.

Dairies developed much more slowly than beef cattle ranches. Cow's milk was a new food for the Hawaiians and most Orientals, and both races were slow in adopting it as a regular article of diet. The demand for milk and other dairy products came largely from Caucasians. Dairy cattle were introduced into Hawaii about the middle of the nineteenth century. One commercial dairy was reported in operation in Honolulu in 1869 and five by 1880.

Previous to annexation, when beef prices were low, some of the large ranches found it profitable to keep dairy cows. They made butter and shipped it to Honolulu. In 1900 there were about 4,000 cows two years old and over in Hawaii which were kept primarily for milk production.

In the 1850's the Royal Hawaiian Agricultural Society pointed out the great potentialities of the Islands for wool production. Sheep ranches were soon established on the Waimea plains of Hawaii and on Molokai,
Lanai, and Niihau. In 1875 wool exports reached 565,000 pounds valued at $70,000. The sheep industry apparently reached its peak in 1884, with 122,000 head of sheep in the Islands, and from then on it gradually declined. About 100,000 sheep were reported in Hawaii in 1900.

The raising of horses and mules became an important enterprise on many ranches. Mules were the favored draft animals on the plantations, particularly in the latter part of the nineteenth century. Horses were used for work with cattle and by overseers in getting about the sugar plantations.

Horse racing became popular in the Islands about 1870. Hawaiian breeders produced excellent race horses and polo horses, some of which were exported to the United States. In 1900 there were 13,000 horses and 6,500 mules in the Islands.

Swine raising, mostly on small farms, was a minor industry during the last half of the century. About 1855 some new breeding stock was imported. A few beef cattle ranches and sugar plantations took up swine raising as a side enterprise about the time of annexation. By 1900 the total swine population numbered only 8,000.

Turkeys were raised in a semi-wild state on some of the big livestock ranches late in the last century. However, production was insufficient to satisfy the demand of the Island market.

Before 1900 chickens were kept only in backyard flocks; no commercial egg producers operated in Hawaii. At times the local stock was improved by imported American and European breeds. However, chickens in Hawaii were still poor egg producers in 1900. According to the U.S. Census for that year, 32,000 chickens produced only 155,000 dozen eggs.

The first swarm of bees was brought to the Islands in 1857. Until 1895 beekeeping was carried on as a household activity. In that year the first commercial venture in the production of honey and beeswax for export was begun. In 1899 the honey industry was still small. The U.S. Census reported only 1,400 bee colonies for that year.

Transportation and Wages, Mid-century to 1900

The few Hawaiian agricultural exports in the first half of the nineteenth century were usually carried as additional cargo by whalers or other ships visiting the Islands. With the growth of agricultural exports, particularly of sugar, a line of clipper barks began operation between San Francisco and Honolulu in the 1850's. Permanent steamer service between the two ports was established in 1867. Soon thereafter sugar interests started their own shipping lines, which by 1901 included about 15 sailing ships. Most Hawaiian agricultural export commodities of that period were not highly perishable. Therefore, sailing ships, though
slower than steamers, were the most economical means of transport to the Pacific Coast.

With the development of specialized agricultural industries, inter-island and intercoastal trade expanded and improved. Freighting of sugar from the outer islands to Honolulu and of fertilizer and general merchandise from Honolulu to the outer islands represented a large part of total interisland tonnage. Rice was shipped from distant places on Oahu to Honolulu. Sailing vessels, averaging 60 tons, had largely replaced canoes by 1850. In 1860 a 400-ton steamer began interisland operation on a permanent basis.

The mountainous interior of each island discouraged road building for a long time. A passable cart road existed in 1853 on the leeward side of Oahu, but there were only horse trails between Honolulu and the windward sides of the island. A carriage road had been built around Oahu by 1875, but the other islands had just a few short stretches of road at that date. However, the increased economic development following the passage of the Reciprocity Treaty brought rapid improvement in overland transportation. New roads were constructed and narrow-gauge railways were soon in operation on Oahu, Maui, and Hawaii.

By 1850 money had been generally accepted as a medium of exchange and a measure of value. Nevertheless, barter continued, with imported merchandise exchanging for beef, pork, poultry, poi, vegetables, and the like. The first permanent bank was established in 1858, and another was opened in 1885.

Agricultural wage levels rose steadily. In the late 1840's the average wage was 15.5 cents a day; in addition, the employer supplied the workers with grass houses, taro patches, and an outlay of 6 to 10 cents per working day for food. By 1856 total labor costs, including food, were about 33 cents a day, or $9.00 a month. This wage compared favorably with the cost of keeping slaves in the South at that time. It was estimated that a slave cost 37.5 cents a day, plus depreciation and interest on the invested capital.

In 1863 wages of $8.00 to $10.00 per month excluding food were considered reasonable. By 1890, under the stimulus of the Reciprocity Treaty, contract labor received from $15.60 to $19.50 per month. Wages for free labor ranged from $17.50 to $22.25. In addition, the employer in both cases had to pay board and quarters, and importation costs in the case of contract workers.
REFERENCES

Bice, Charles M. *Poultry Production in Hawaii.* Honolulu: Privately printed, 1947. 246 pp. (See p. 2.)


——— *Paradox in Hawaii.* Boston: The Stratford Company, 1933. 262 pp. (See pp. 4–5, 8–9, 137–138.)


Hawaii (Terr.). Territorial Planning Board. *An Historic Inventory of the . . . Resources of the Territory . . .* Honolulu: 1939. 322 pp. (See p. 94.)


Sugar Industry, Annexation to Present

The annexation of the Islands by the United States in 1898 assured the Hawaiian sugar industry of access to a large protected market. Many new sugar plantations were established. Firms that could secure additional land and water rapidly expanded as much as possible.

The harvested sugar cane area increased from 60,300 acres in 1899 to 90,300 acres in 1903. (Harvested acreage in Hawaii is lower than the total acreage in sugar cane; it takes sugar cane from 18 to 24 months to mature.) In the same period, annual sugar production rose from 283,000 tons to 458,000 tons. In 1917 production reached a high of 654,000 tons, and in 1918 the total area in sugar cane was at the all-time peak of 277,000 acres.

Production fell off during the last year of World War I and the years immediately following because of a shortage of ships, fuel, fertilizer, and labor. During the 1920's and early 1930's sugar plantations found it once more profitable in terms of labor, fertilizer, and irrigation, to intensify cultivation and to extend acreage to areas less suited to sugar growing. By 1933, at the then prevailing wage rates and production costs, the intensive and extensive margins for sugar production were reached. In that year raw sugar output amounted to 1,064,000 tons. Although the total acreage in cane was slightly below the record levels of World War I, the area harvested was at the all-time high of 145,000 acres.

The rise in wages between 1933 and 1940, the wartime labor and equipment shortage, the further sharp rise in wages since 1944, and the increase in other production costs have forced the industry to make many changes. The plantations are combating higher labor costs with more mechanization, laborsaving practices, and efforts to increase yields per acre. Fields which cannot be worked with mechanized equipment have largely been abandoned. More scientific and efficient agricultural methods have been developed and the handling of sugar in bulk rather than in sacks has become more and more common.
Overhead costs per ton of sugar have been reduced by increasing the size of plantations and by merging adjoining companies. Small isolated plantations have been liquidated. The number of sugar plantations decreased from 42 in 1932 to 28 in 1952. In the latter year, the area planted to sugar cane per plantation averaged 7,900 acres, ranging from 600 to 25,000 acres. The total area in cane amounted to 222,000 acres.

In 1952 approximately 1,500 small sugar growers had under cultivation about 24,000 acres, or about 11 percent of the total sugar cane acreage. All but 12 of these family-sized farms were located on the island of Hawaii. (See Table A5.)

The small sugar growers have two types of agreements with the plantations: as adherent planters or as independent growers. Under the adherent planter arrangement, plantations have the right to make many basic decisions in the operation of the small cane farms, such as the timing of planting and harvesting. They also furnish fertilizer, weed killers, seed cane, and other supplies at a charge approximating cost, and finance the farming operations of the adherent planters. The planters usually care for the crop from planting until harvesting.

In 1951 the plantations offered the small growers so-called independent grower contracts which give the small growers greater independence in the management of their farms. In most instances, they are being financed by commercial banks. Early in 1953 almost 80 percent of the small sugar planters were operating under the new arrangement. This constitutes the first break in the long trend of centralization and integration in the Hawaiian sugar industry.

As an aftermath of World War II and a crippling strike in the industry, raw sugar production dropped to 680,000 tons in 1946. With improved cane varieties, more economical growing and harvesting methods, and better labor relations, the 1952 crop reached 1,020,000 tons.

A substantial decline of sugar prices would force a reduction in the Hawaiian output, unless accompanied by a corresponding decrease in
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cost. Hawaiian sugar growers are concerned about the future level of sugar prices in view of the recent expansion of world sugar production. They hope, however, that the U.S. sugar quota system would continue to mitigate the effects on domestic growers of declining world sugar prices. It is one of the primary purposes of federal sugar policy to insure reasonable returns to domestic producers.

Hawaiian sugar cane growers, like other domestic cane and beet producers, receive so-called “conditional payments” from the U.S. Production and Marketing Administration. These subsidies have averaged about $9.50 per ton of sugar, or $9,600,000 per year for all Island cane farmers in 1951 and 1952. The future level of these payments will also affect the amount of Hawaii’s sugar output.

Under the assumption that sugar prices and federal subsidies remain at present levels, the leaders of the Hawaiian sugar industry expect to raise production within a year or two to about 1.1 million tons of raw sugar. In the 1951 amendment of the Sugar Act of 1948, Hawaii’s quota for the continental United States was continued at 1,052,000 tons of raw sugar. An additional quantity of refined sugar is annually allowed to Island producers for sale in Hawaii, amounting to 42,000 tons in 1952.

Development of Pineapple Industry

Pineapple growing and canning became Hawaii’s second major industry within a few decades after the turn of the century. The young pineapple industry was at first opposed by most of the sugar planters in the Islands. They feared that pineapple growers would compete for their land and labor supplies and that this competition would raise the cost of production to more than sugar could afford.

However, pineapple growers generally use land not suitable for sugar cane production. Growing of cane is confined to lowland areas which can be irrigated or in which rainfall is high. Pineapple plantations frequently use semi-arid lands for which no irrigation water is now available. The labor requirements of the pineapple industry did not make serious inroads on sugar labor or greatly affect the wage level of sugar workers.

Although the pineapple had been a familiar fruit in Hawaii for many years, its commercial possibilities were only recognized in the 1880’s when new varieties were introduced. Among them was the “Smooth Cayenne,” which is now grown almost exclusively.

In the 1890’s fresh fruit was exported occasionally, and a small cannery operated for a few years. In 1900 homesteaders on the Wahiawa plateau of Oahu began raising the new crop. At first they shipped fresh fruit to San Francisco despite heavy spoilage losses. When one of the homesteaders built a cannery, practically the whole crop was canned and fresh shipments nearly ceased.
Soon a small plantation was under way. The territorial legislature tried to encourage small-scale production by exempting from real and personal property taxes the first 40 acres of pineapples per farm. Nevertheless, large-scale production of pineapple soon became dominant. In 1909 the two largest corporations each accounted for more than 1,000 acres out of a total of 5,400 acres in pineapples.

The area owned or leased for growing the fruit increased to 47,000 acres by 1920. Of this total, 33,000 acres were on Oahu, 6,000 each on Hawaii and Maui, and 2,000 on Kauai. By 1937 pineapple growing had been tried in many new districts and a substantial shift in the importance of production areas had occurred. Plantations had been established on Lanai and Molokai, and acreage on Maui and Kauai had been increased. Plantings had been cut to less than half the 1920 acreage on Oahu and had been completely discontinued on the island of Hawaii. Despite these changes, total acreage had increased little since 1920.

By 1952 the area in pineapples had increased to 73,500 acres. Production had been expanded on all islands that raised the fruit in 1937. (See Table A2.) Further expansion of planted acreage is not expected at this time.*

A minor portion of the 1952 pineapple crop was raised on about 110 small, non-plantation farms, most of which had contracts with canneries. The others sold their fresh fruit in Island and West Coast markets. Mainland shipments of fresh pineapples amounted to almost 1,300 tons in 1952 and are expanding.

Canned pineapples were generally unknown to the average consumer the world over at the turn of the century. Demand for the canned fruit expanded less rapidly than the supply. In February 1909 the Hawaiian...
industry found itself with about three-fourths of its entire output of the previous year on hand. The growers organized and broke the marketing bottleneck by launching an extensive advertising campaign.

The first million-case pack was shipped in 1912. Production continued to grow and reached a pre-World War II peak of 22.3 million cases in the crop year ending May 31, 1940. The canned pack declined during the war to about 18.1 million cases in the crop year 1944-45. In the postwar period it rose to the record volume of 26.1 million cases in the crop year 1950-51. Largely because of a strike on one plantation, the sale declined to 23.6 million cases in the crop year 1951-52.

The value of the pineapple output has greatly fluctuated from year to year. Insect pests and plant diseases have made repeated inroads, and climatic factors, particularly variable rainfall, affect quantity and quality of production at times. Market forces have been the major cause of the industry's instability in recent years. Price fluctuations of competing canned fruits and juices, such as canned peaches and grapefruit juice, and lately of concentrated frozen orange juice, are important. Another reason for unstable marketings is the fact that pineapples are a luxury food item. Sales, therefore, are severely reduced by declines of consumer purchasing power during business recessions.

The depression of the 1930's hit the industry particularly hard. It forced the competing growers into a territory-wide organization, the Pineapple Producers Cooperative Association. In the ensuing arrangement all firms agreed to limit production under a quota system and to sell their pineapple pack through a marketing committee. With improved market conditions during World War II, the agreement was allowed to lapse and it has not been renewed since.

After years of research a satisfactory canned pineapple juice was developed. Quantity shipments began in 1934, and pineapple juice has since become highly popular. In 1945 it even exceeded the quantity, though not the value, of canned pineapple fruit. In the postwar period several frozen pineapple products have been developed. Fresh frozen pineapple chunks have been shipped to the mainland for several years. In 1952 a new product, frozen pineapple juice concentrate, reached the market.

Processors utilize practically all parts of the fruit. Some of the by-products are pineapple pulp and bran, citric acid, alcohol, sugar syrup, and natural sugar.

Many complex production and processing problems had to be overcome during the short history of the industry. In 1913 a device for the peeling and coring of pineapples, the Ginaca machine, was patented. Insect pests and plant diseases, such as the mealy bug and wilt, were brought under control by extensive scientific work. In 1916 researchers found that spraying with solutions of iron sulfate prevented the chlo-
rosis of pineapple plants. This discovery made possible the production of pineapples on lands well adapted to the crop but where the soils were high in manganese, such as in parts of the Wahiawa plateau on Oahu.

In recent years plantation engineers have highly mechanized pineapple production. Powerful crawler tractors pull heavy-duty plows across the fields. Large spraying rigs have almost completely replaced hand spraying. Harvesting machines equipped with conveyor belts extending over several plant rows have reduced picking labor and improved crop quality. Double-bin truck trailers transport the fruit from the field to the canneries.

Most of the Island pineapple pack is being consumed within the United States; only a small portion is exported. Hawaii now produces about 85 percent of the mainland consumption of canned pineapple products. The Island industry may expect more competition on the mainland, mainly from the Philippines, Cuba, Mexico, and Puerto Rico.

**Connection Between Major and Diversified Agricultural Industries**

Some of the 28 sugar and 14 pineapple plantations now operating in Hawaii engage in one or more diversified agricultural enterprises. Several sugar plantations hold large tracts which they use for beef cattle. Others operate dairies, and at least one raises swine.

Occasionally, plantations produce crops other than sugar and pineapples. For example, the Honokaa Sugar Company had in 1952 the second largest macadamia nut orchard in the Islands, with about 500 acres. Baldwin Packers, Ltd., a pineapple corporation, had in 1951 a mango orchard of about 80 acres, 50 acres of watermelons, and approximately 1,000 litchi trees. During World War II sugar and pineapple companies produced several thousand acres of vegetables and field crops. After the war all plantations except Baldwin Packers gave up the growing of these crops.

Some of the factors, the business agents of the sugar companies, engage directly in a few agricultural enterprises other than sugar and pineapple production. For example, Theo. H. Davies and Co., Ltd., operate a cattle ranch on the Hamakua slopes of Mauna Kea on Hawaii; Castle and Cooke, Ltd., have ventured into the growing of macadamia nuts.

The small farmers who contract to grow sugar cane or pineapples usually devote most of their cultivable acreage to these crops. Both products assure the growers of a comparatively safe though sometimes modest income per acre. However, some of these farmers also raise diversified products. In some areas they use the space between the rows
of recently planted or harvested cane to raise such vegetable crops as cucumbers or tomatoes.

Sugar and pineapple plantation workers grow vegetables in their backyards or in community gardens. They also keep some poultry and livestock. Most of this diversified production is for family subsistence and little reaches the market.

Sugar and several by-products of sugar and pineapple processing are of importance to diversified agriculture. Sugar is used in the canning of fruits and juices, in the preparation of jams, jellies, and fruit and nut candies.

Much of the livestock and poultry feed used in Hawaii has to be imported. Blackstrap molasses, a sugar by-product, is a valuable carbohydrate feed for beef and dairy cattle and hogs. Mixtures of low-grade sugar and the pith of bagasse, a by-product of sugar milling, show great promise as an emergency source of carbohydrates for poultry. Investigations are now being conducted to determine the practical limitations of this new feedstuff. Another potential livestock feed being tested is a mixture of molasses and bagasse pith. Efforts are now being made in a pilot plant at the Oahu Sugar Company to develop a process of separating the pith and fiber of bagasse economically on a large scale. The fiber may be used to manufacture paper products.

Some of the by-products of pineapple canning are highly valued by livestock producers, especially dairymen. The skin and core of pineapples, the so-called pineapple pulp, is sometimes fed to cattle unprocessed or as ensilage. More frequently, the pulp is dried before feeding.

Many subsidiary enterprises serve both the major and diversified agricultural industries. Among these are firms which import insecticides, fungicides, agricultural machinery, and packaging material. Iron works, can factories, and fertilizer mixing plants manufacture goods used in agricultural production. Finally there are the firms engaged in transportation, marketing, and the rendering of various services. The existence side by side of sugar, pineapple, and diversified agricultural industries in Hawaii provides a sufficiently large volume of business for these subsidiary enterprises to provide good service at reasonable cost.

Some agricultural research is equally useful to both major and diversified industries. Climatic and soil investigations are cases in point. A study of the utilization of agricultural wastes and by-products such as molasses or pineapple pulp has been valuable to both major and diversified agricultural industries. Practices developed in the major industries can frequently be applied or adapted to diversified agriculture or vice versa.

Training and experience given to workers in one sector of Hawaii's agriculture may frequently be useful in the development of other agri-
cultural industries. For example, mechanization in the sugar and pineapple fields began well before the outbreak of World War II. During and since the war, agricultural machinery has increasingly come into use in diversified agriculture. Experience with mechanical equipment in former plantation jobs now is useful to many newly established independent farmers.

Diversified Agriculture, 1900 to Present

The industries constituting the diversified agriculture of Hawaii have shown great divergence in their development since 1900. Among field crops, rice declined from more than 9,000 acres in the first decade of this century to a mere 160 crop acres in 1952. The competition of low-cost, mechanized rice growers in California has been the major reason for the decline of this Island industry. In 1952 only about 1 percent of the rice consumed in Hawaii was locally grown.

Field corn plantings rose from 3,200 acres in 1900 to about 10,000 acres in 1920, a year of high corn prices. The area planted to this crop rapidly declined after that and was down to 360 acres in 1952. Local growers now supply only a small fraction of Island requirements.

Taro patches decreased from 1,300 acres in 1900 to about 770 in 1930 because of plant diseases and the competition of cheaper starchy foods. At the beginning of 1953 the area in taro amounted to 840 acres. Potato plantings were enlarged to 1,600 acres as part of a drive for greater self-sufficiency during World War II; by 1952 they had declined to 120 acres.

Fresh vegetable growing has expanded with Hawaii's rapidly increasing population. The harvested area, excluding taro and potatoes, rose from about 1,200 acres in 1910 to 4,700 acres in 1952. About 35 percent of Hawaii's fresh vegetable market supplies for civilians was imported in the latter year.

The size of coffee plantings and production has fluctuated with the price. The area decreased from 14,000 acres in 1898 to 3,700 acres in 1910. During the 1920's it increased to about 6,000 acres, but subsequently declined to the 1952 level of 3,500 acres. Most of the crop is exported to the mainland.

Major tree fruit plantings expanded from 1,100 acres in 1910 to 2,000 acres in 1952. Banana and papaya orchards made up almost 80 percent of all fruit plantings in the latter year. Avocados and mangos accounted for most of the remainder. About 61 percent of the fresh fruit bought by Hawaii's civilian population was imported in 1952.

Two young agricultural industries, macadamia nuts and flowers, show great promise. Sizeable macadamia orchards were first planted commercially in 1922. As in any new industry, macadamia nut growers
had to overcome many production difficulties. During the last few years trees of good varieties have been highly profitable and the acreage is expanding rapidly. In February 1953 about 2,400 acres were planted to macadamia nuts.

Large-scale floricultural exports became possible with special air freight rates in the years since World War II. Vanda orchids, anthuriums, and tropical foliage are some of the major products of this industry. Between 1946 and 1951 the number of floral packages shipped annually to the mainland increased more than eightfold.

Many other crops have been tried in Hawaii since 1900. Most of them were abandoned as economically unsound. Among these were rubber and sisal, the producers of which could not compete with the cheap labor of the Orient and other areas. Tobacco was tried for many years but never became commercially successful. Other crops, such as cotton, cassava, and grapes, are grown only on a few acres.

Most livestock industries have been greatly expanded since 1900. Beef cattle increased from about 96,000 head in 1900 to 147,000 in 1952 as a result of better herd and pasture management and higher beef prices. The swine population increased from 8,000 head in 1900 to 32,000 in 1940 and to 84,000 early in 1953. Sheep decreased steadily in number from 102,000 in 1900 to 14,000 in 1952. Hawaii imported about one third of its fresh, chilled, and frozen civilian meat supplies other than poultry in 1952.

The raising of horses, mules, and donkeys expanded during the first two decades of this century. In 1920 there were almost 16,000 horses and 9,500 mules and donkeys on Hawaii’s farms. With the coming of the tractor and automobile, the number of draft, pack, and riding animals sharply declined. By 1950 only 1,900 mules and donkeys were left. Horses are still being raised for use on cattle ranches; their number amounted to 7,600 in 1950.

Island milk production increased from about 2 million quarts in 1900
to 37 million in 1952. In spite of this expansion, fresh milk consumption
in Hawaii is low compared with mainland standards. Practically all
processed dairy products are being imported.

The total number of chickens more than three and four months old,
respectively, rose from about 30,000 in 1900 to more than 470,000 in
1950. Island poultrymen produced 5.3 million dozen eggs and nearly
800,000 meat birds in 1952. Despite this increase in poultry flocks, 31
percent of the supplies of shell eggs and 55 percent of the poultry meat,
excluding turkeys, consumed in Hawaii was imported in 1952.

Honey exports gradually expanded to reach an average annual export
volume of 1.5 million pounds in the 1920's. Output declined after that
because of bee diseases and low prices. Honey production in 1951 was
about 900,000 pounds, most of which was exported to the mainland.

A few commercial rabbit producers are operating in the Islands. Other
livestock and poultry raised during the last fifty years, such as goats,
ducks, pigeons, geese, and turkeys, are not now of major commercial
importance.

Significant 1952 Statistics

The 1952 wholesale value of agricultural marketings in Hawaii was
estimated at about 278 million dollars. (See Table A4.) Of this total,

Number of Commercial Agricultural Enterprises in 1952

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number</th>
</tr>
</thead>
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<tr>
<td>Sugar &amp; Pineapple</td>
<td>1,660</td>
</tr>
<tr>
<td>Livestock &amp; Poultry</td>
<td>1,480</td>
</tr>
<tr>
<td>Diversified Crops &amp; Flowers</td>
<td>3,580</td>
</tr>
</tbody>
</table>

the value of products of the sugar and pineapple industries, including
Sugar Act payments to sugar cane producers, accounted for 238.9
million dollars.

The output of diversified agriculture was estimated at 39.2 million
dollars, or 14 percent of all agricultural production. Livestock products
alone amounted to 25.8 million dollars. Cattle products accounted for
9.3 million dollars, milk for 7.3 million, poultry products for 5.1 million,
and pork for 4.0 million. Marketings of sheep and bee products together
were about $130,000.
The wholesale value of diversified crops and flowers was estimated at 13.5 million dollars. Of this, fresh vegetables and taro accounted for 5.1 million dollars, flowers for 3.0 million, coffee for 3.9 million, fruits and macadamia nuts for 1.3 million. Rice and corn together were worth $160,000.

About 5,200 full-time or part-time farmers operated in Hawaii in 1952. (See Table A5.) Approximately 3,600 of these were diversified farmers, flower growers, or ranchers, and the remainder raised sugar cane and pineapples. Of a total of 3,580 diversified crop and flower enterprises, vegetables, rice, and taro were raised on 1,800, coffee on 710, flowers on 630, and fruits and nuts, on 440. About 1,480 farms or ranches had commercial livestock enterprises. Hogs were raised on 590 farms and poultry on 380. There were 400 cattle ranches, 3 sheep ranches, 76 dairies, and 25 apiaries.

REFERENCES


——— *Paradox in Hawaii*. Boston: The Stratford Company, 1933. 262 pp. (See pp. 88–89.)


——— *HSPA Weekly Sugar Briefs*. (See Jan. 16, Feb. 6, 1953.)


U. S. Bureau of Foreign and Domestic Commerce. *Monthly Summary of Foreign Commerce of the United States.* (See December 1941, p. 47.)

