PINEAPPLE INDUSTRY IN HAWAII

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THE credit of producing from 80 to 85 per cent of the world's output of pineapples, a popular canned fruit, goes to the Territory of Hawaii, commonly known as the Hawaiian Islands, an archipelago of the United States far out in the Pacific. The large area well suited to the production of the crop constitutes the most important factor associated with the carrying on of that industry in the islands.

It has been stated that Hawaii is the pineapple's paradise, for there it thrives best and attains that sweetness and lusciousness of flavor not present in pineapples grown in other lands.

The pineapple (Ananas comosus) belongs to the same family (Bromeliaceae) as the Spanish moss (Tillandsia usneoides), common on the coast of the United States in the Gulf of Mexico. It is something between a mesophyte and a xerophyte, adapted to climatic conditions of great variation except those involving low temperatures. In the Hawaiian Islands it grows at sea level, at an altitude of 3,000 feet, in soils with much potash, in soils with little potash, in semi-arid areas without irrigation, and in areas with a rainfall of 60 inches.

Pineapples grow best in light, well-drained, loamy soils, and in this respect they are specially favored in Hawaii. Red or chocolate-colored soils, neutral or slightly acid (pH 6.0–6.5), are preferred to those that are dark and strongly acid. The chemical content of some soils otherwise suited to their production offered a problem that has been successfully solved during the development of the industry.

Nearly all the pineapples in the islands...
are raised on plateau-like lands at elevations between approximately 500 feet and 1,700 feet. On Oahu much of the crop is raised between 500 feet and 1,000 feet above sea level. On Molokai all the pineapple land lies above the 500-foot contour. On Lanai pineapples are raised only between 1,000 feet and 1,700 feet.

EARLY HISTORY

The history of the pineapple industry in the Hawaiian Islands is an account of pioneers in a new field of agricultural endeavor, who brought the business to its present status largely by processes of trial and error. During the course of adjustment to the natural environment of the islands it has been necessary to find out by practice fertilizer requirements, soil preferences, the reaction of the plant to rainfall, drainage, winds, and sunshine, all of which have to do with the agricultural aspects of the industry. In addition, methods of handling the fruit in the canneries have been worked out, the length of time required to sterilize it, and the temperature that must be maintained in the cookers. Finally, the industry is one in which competing companies have been forced into a cooperative system.

Doubt exists regarding the circumstances associated with the introduction of pineapples to the Hawaiian Islands. Whalers probably introduced them in the beginning of the nineteenth century. A Spaniard, Don Marin, also—it is stated—had a part in their coming and propagation. The plants first introduced were allowed to grow as best they could, and gradually propagated themselves in favored localities where they thrived in a half-wild condition.

About 1880 a few white settlers in the islands thought that the fruit might be raised successfully and marketed at a profit. Accordingly they devoted some of their agricultural efforts to its production. About 1885 several varieties of pineapples were imported in order to ascertain those best adapted to the environment. Among those introduced was Smooth Cayenne, which became the standard and the one now raised almost exclusively.

The first company of importance established for the production of pineapples organized in 1891. The lands used were near Pearl Harbor. Other companies sprang up shortly afterwards, some of which had lands near Pearl Harbor and others in the exceptionally propitious district of Wahiawa, about twenty miles northwest of Honolulu.

During the early and middle nineties the industry was carried on with indifferent success. A high duty levied on fruits imported into the United States prevented the development of a profitable market there, and the high cost of transportation elsewhere and the likelihood of spoiling precluded serious attempts at their disposal in other countries. How-
ever, on the occasion of the annexation of the Hawaiian Islands to the United States, the business of raising pineapples received considerable impetus. The duty, of course, no longer remained in force. It was anticipated that success would attend the efforts of those engaging in the industry.

**Expansion**

In 1900 enterprising pineapple farmers took up homesteads at Wahiawa. Among them was James Dole, a man to whose efforts and initiative the development of the industry is largely due. He recognized first the various factors militating against canning the product, especially the lack of uniformity in size and flavor. Dole realized in an effective way that if the industry was to be developed profitably on a large scale, it would have to be done on the basis of canning the fruit for wide distribution on the American mainland. In 1901 he organized the Hawaiian Pineapple Company to produce and ship fresh and canned pineapples to the States. In 1903 he erected a small cannery at Wahiawa. In 1906 the company abandoned the cannery at Wahiawa for a larger and better equipped plant at Iwilei in Honolulu. There labor was more easily available and facilities for shipping the product were immediately at hand.

In 1907 provision had been made for the disposal of the entire crop of the Hawaiian Islands even before its maturity. The market seemed to be almost unlimited,—although some believed that there was a faint possibility of overstocking it.

About that time the disposal of a greatly increased output on the mainland of the United States did become a problem, and the planters encountered their first serious situation brought about by overproduction. The problem, in large measure really a question of underconsumption on the part of the public, was solved most efficaciously by a vigorous advertising campaign carried on through the large national weeklies and by grocery-store window display.

Near the end of the first decade of the twentieth century, the tendency of the industry was to double each year the output of the year preceding. Everything led to the supposition that that tendency could not fail to continue—the proportion, perhaps, increasing even more.

Land apparently suitable for raising the fruit seemed plentiful. Scarcely any competition for the same land existed between pineapple planters and sugar cane planters. Some areas newly devoted to pineapples were hitherto used for raising cattle. Thousands of acres of pasture were still available for the more profitable use of pineapple culture.

About 1911, in another period of overproduction, the market failed to absorb the output and the industry received a temporary setback. To relieve the situation, members of canning companies together subscribed $75,000 for a great advertising campaign. This resulted in a fast movement of goods from the warehouses and their absorption by newly cultivated markets.

The second decade of the twentieth century was a period during which outstanding improvements in canning machinery were made and mechanization of the industry proceeded very rapidly, both in factory and field,—all of which progress increased the output. In 1912 the number of cases of canned pineapples first exceeded a million.

Between 1911 and 1913 Henry Ginaca, employed by the Hawaiian Pineapple Company, evolved and perfected the “Ginaca” machine that peels the fruit and removes its core, preparatory to slicing and cooking. One Ginaca ma-
chine operated at high speed removes the outsides of pineapples, cuts off the tops and bottoms and cores the fruit at such a rate that it requires less than five minutes to prepare a ton of fruit for canning.

In 1915 the market was again over-supplied. As a result of failure to dispose of their crops, many small Japanese growers and a good many white homesteaders became bankrupt. Large producers survived, and the experience served to put the industry on a more conservative basis than it had been before.

Towards the end of the decade an expansion took place into areas previously regarded as unsuited to the production of the crop. Experiments showed that pineapple plants could not assimilate iron through their roots if manganese, in considerable quantity, were present in the soil. Manganese soils were, therefore, ruled out of production. A chemist in the local experiment station of the United States Department of Agriculture discovered that the plants could assimilate a solution of iron sulphate sprayed on the leaves. In 1918 growers generally made use of this spray treatment, and by such solution of the problem production was made possible in the interdicted areas.

As the industry developed and expanded, pineapple growers and canners realized that on the mainland a relationship existed between the demand for pineapples and the quantity of other fruits produced and canned in the United States, especially peaches. The market absorbed approximately the same amount or only a slightly greater amount of all fruit each successive year. If the consumption of one variety was stimulated, the market for others experienced a corresponding decline. The increase in population, however, created a growing demand and insured a gradually expanding market that they hoped would be filled by pineapples alone.

The post-war period of the Hawaiian pineapple industry saw further and further expansion. The market was a seller's market; the limit of ability to produce the product limited its output. The enterprise then assumed sufficient importance to attract large investments
The Industry Since 1920

During the third decade of the twentieth century the discovery and use of "mulching paper" resulted in greatly improved methods of cultivating the crop. In 1921 the first experiments with paper mulch were carried out on pineapple plantations. Three years later the mulch was in general use. The "tarred paper" inhibited the growth of weeds and eliminated the necessity of the first year's cultivation between the lines of a bed. Its use created an enormous saving in field labor and a substantial reduction in the cost of production.

In 1922 an experiment station was established at Wahiawa, and in 1924 a research association was organized under the direction of the University of Hawaii. Specialists in various lines of research carried on experiments in connection with the solution of problems arising in the field and in the canneries. They sought parasites for pests, analyzed soils, introduced pineapples from other countries and crossed them with local varieties in an effort to produce better strains. They carried on work in many directions to further the progress of the industry.

Carefully planned advertising stimulated the demand for the canned product. During one campaign cooperative advertising expended a quarter of a million dollars to acquaint the consuming public from the Pacific coast of the United States to the eastern seaboard, through the medium of periodicals and newspapers, with the merits of the delicacy.

Although there was cooperation in research work and in advertising, keen competition existed for land to raise the fruit, and great rivalry arose in selling the canned product. In 1928 there were in the Hawaiian Islands thirteen pineapple companies and eleven canneries. Since it remained a seller's market, companies vied with each other in the area of land used, and the number of cases that could be canned and sold. Some companies had better sales organizations than others and, therefore, had an advantage in disposing of their product.

As well as the companies who engaged in the production of the fruit on pineapple plantations, many small farmers also specialized in this branch of agriculture. They sold their product to the canneries of the companies with some of whom they had contracts for the delivery of their crops, or they cooperated in building and operating canneries of their own. Some farmed leased land, favorable for production, the rental of which soared to a height corresponding to the competition for the land. Others scratched the slopes of gulches and the surface of other waste areas from which they had cleared the brush. There they planted pineapples, hoping to market their crops.

For several years, about the middle of the third decade of the twentieth century, the industry remained on a plateau of high production. Near the end of

Figure 4.—Summer pineapple harvest. Trucks transport the fruit piled along the numerous roads, to the cannery or to boats that carry it from islands that have no cannery to the canning factories on other islands.
that decade three circumstances made possible and were largely responsible for a huge increase. First, it was found that pineapples flourished in semi-arid areas; consequently, growers utilized thousands of acres of such land for that crop. Second, the farmers discovered and practised a multiple system of planting. The increased number of plants per acre, made possible under the new system, produced a larger yield than single planting. However, the average weight of the fruit was lower than that under former methods used. Third, experiments successfully solved a problem of wilt caused by infestation by mealy bugs. Their presence was associated with the presence of ants. Sprays successfully combatted bugs that had gained entrance to the fields, and ant “fences” warded off the insects from some areas.

The great expansion took place largely on the islands of Maui and Lanai. Growers invested about six million dollars in transforming most of the used portion of Lanai into a pineapple plantation. They instituted and developed a port at Kaumalapau on the southwestern side of the island on a small, exposed harbor. Large sums were spent on dredging, on the construction of a breakwater, and on a concrete wharf. An asphalt macadam road with an average grade of six per cent extended from the port to the interior of the island. To keep the grade at the required level, fifty-two turns were made in the first four and a half miles.

To accommodate the laborers the growers laid out a town eight miles from the port. That town, Lanai City, is today a model pineapple plantation settlement. Neat houses stand picturesquely among Norfolk Island pines and California cypresses. Laborers’ quarters of different sizes for families and single men all carry electricity and running water. A motion picture theater; ice, cold-storage and electric light plants; a hospital, bank, post office, stores; a machine shop, garages, warehouses, offices of the company, a church, a police force and fire department,—all constitute complete units within the town itself, built for the benefit of the laborers.

Cultivation

Methods of cultivation on Lanai are representative of those on other islands in the group. Planters thoroughly prepare the fields by repeated plowing and diskimg until they establish a deep, mellow seed bed, leaving roads 300 feet apart in the fields. Thereupon they lay on the ground mulching paper, usually a 36-inch asphalt-saturated paper, through which they set in rows crowns from the tops of the fruits, slips borne on the fruit stem, or shoots arising lower down on the main stalk of the plant.

Planting usually takes place in the early fall, and produces the first yield the second summer, following a period of eighteen to twenty months of growth. Shoots spring from the main stalk of the plant, two of which are generally allowed to remain. They produce fruits the following summer. Thus the plant crop yields one fruit for harvest, and the
ratatoon crop two. A second ratatoon crop is harvested one year after the first ratatoon, or the fourth year after planting. During the growth of a crop a large amount of fertilizer, mainly nitrous, is applied to the soil.

**TRANSPORT AND CANNING**

Trucks loaded with four tiers of skips carry fruit harvested on Lanai to Kaumalapau for shipment to the cannery. Great cranes lift at a time a truck load weighing about nine tons, into a barge, which, when full, is towed by a tug sixty miles to the port of Honolulu. There, reversing the process at Kaumalapau, cranes lift the skips to railway cars that transport them to the cannery.

In the cannery the fruits, segregated according to size, pass through the specially made shelling and coring machines. From these, long belts convey them past women and girls who deftly cut any deep eyes that may not have been taken out by the machines. The fruit then goes through a slicing machine and is packed in cans according to grade. Broken pieces, diverted on side-tracks, are collected for canning as crushed or grated pineapple, to be used for pies and jams. Small, wooden trays in trucks carry the cans of the perfect product to the syruping machines. Automatic machinery supplies each can with the requisite amount of syrup and a conveyor then carries the cans to the steam cooker that sterilizes them before being capped. After passing through a second cooking machine, the cans are set out in a cooling room. When cool, a lacquering machine applies a special preparation for the preservation of the tin. They are then stacked in a warehouse to await a shipping order, labelled, and finally sent for consumption to all parts of the world.

**LABOR**

Growers recruit part of the labor for the production of pineapples in Hawaii from the Philippine Islands, requiring a larger proportion during the summer harvest, June to September, than at other times of the year. Eighty-five per cent of the annual crop of pineapples ripen, are picked, sorted, delivered to the canneries, and canned at that time. Those months constitute the “off-season” on sugar-cane plantations and both industries use in common a small proportion of the total labor supply necessary to carry them on. Labor for the canneries, operated at capacity only during the summer, is enlisted from housewives and daughters, school boys and school girls, who earn pin money and school expenses at that time.

The months from February to May constitute the slack season on pineapple plantations, and at the beginning of that period growers lay off many laborers. In years past, during those months, they have found employment on sugar-cane plantations, coffee farms, or in other fields of work, or have migrated to the mainland of the United States.

**PRODUCTION**

The establishment and development of the industry on Lanai and its expansion...
on other islands resulted in an increase in production from 9,211,376 cases of canned fruit in 1929 to 12,672,296 cases in 1930. During the three decades from the beginning of the twentieth century, the acreage devoted to pineapples has increased from a few hundred to more than seventy-eight thousand.

The yield amounted to about sixty tons each five-year cycle, the usual cycle for a plant crop of pineapples in the Hawaiian Islands. That constitutes, at present, a representative yield. Pineapples from ratoon crops are smaller than those from plant crops. For the three crops in each cycle the proportion may run thirty, fifteen, fifteen. Some companies, however, take the largest yield from the first ratoon.

It was stated in 1931 that the pineapple industry had been developed to a point where it had virtually everything that a business of that magnitude could hope for. It had plenty of land; its canneries wanted for nothing in the way of modern equipment; it had utilized scientific measures to produce the finest type of fruit remarkably free from pests and disease. Methods of tilling the soil for that particular crop embodied the best agricultural practices.

It was unfortunate that the huge increase in production should have come just at a time when the ability of the American public to buy was considerably lower than it had been a year previously. A great economic depression had reached the United States and business stagnation prevailed. Furthermore, foreign markets for pineapples were substantially curtailed. A tariff wall arose around Germany, and depreciation of the pound sterling caused a slump in sales in Great Britain. The pineapple industry in the islands received a staggering blow. As a result of the decreased market, millions of cases of canned fruit remained unsold in the warehouses, and thousands of acres of ripe fruit remained unharvested in the fields. Thousands of acres of land leased for planting remained uncultivated.

The great boom in the pineapple industry had encouraged the officers of the largest company to expand their business to such a degree that, when the depression came with its unparalleled price declines, they experienced heavy operating losses, their working capital was depleted and they accumulated large bank loans. The financial problems facing the company demanded complete reorganization. The assets were transferred to a new corporation that undertook the indebtedness and obligations of the existing company.

The depression convinced the pineapple companies that they must cooperate in the output of their product so as to protect their own interests and those of their stockholders. Negotiations to stabilize the industry and secure joint operation, carried on during the summer of 1932, culminated satisfactorily. Seven companies signed articles of incorporation of the "Pineapple Producers Co-operative Association, Ltd." They entered into an agreement to (1) limit
production to the needs of the market, (2) sell the combined pack through a marketing committee, and (3) pool their advertising.

They decided to restrict the output of 1932 to less than 5,000,000 cases as compared with a total of 12,672,296 cases packed in 1931, and to restrict that for the crop year ending May 31, 1933, to 5,295,851 cases. They also agreed that determination of the size of the 1933–1934 crop would depend on the carry-over of each grower in the cooperative system on May 31, 1933.

Thousands of acres of land that grew pineapples before the depression, now lie fallow and will be replanted if, and when, the need arises. They are areas where the natural environment is well suited to the production of the fruit. Estimates place enough good land available for pineapples in the Hawaiian Islands to yield a pack of 20,000,000 cases of canned pineapples a year. (A typical case of pineapples holds twenty-four cans, each of which contains about one and one-half pounds of fruit, and about one-half pound of syrup.)

Nation-wide advertising of canned pineapple, inaugurated through displays in popular magazines, trade journals, and newspapers, formed part of a comprehensive educational program of the newly formed Pineapple Producers Co-operative Association, Ltd. It involved a current appropriation of approximately $1,000,000 for advertising and sales promotion that stimulated the market to absorb the output planned for 1932 and—it is hoped—that for 1933 also.

The pineapple co-operative association does what government administrators in Washington hope all other primary industries will be able to do in the near future. Its members have adopted a code of ethics and fair dealing, and established standards and definitions,—all this voluntarily and because it appeared to be the best thing to do in order to restore orderly production and distribution of canned pineapples.