

THE PROBLEMS OF HAWAII¹

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Situated between 19° and 22° N. Lat. (the latitudes of Bombay and Rangoon) and between 155° and 160° W. Long., the Hawaii form a group of islands, lying north-west to south-east, right in the middle of the Pacific. Volcanic in origin, and with the tops entirely worn out, leaving only sand or atolls, the islands are typical of coral reef formation, and present an interesting flora which—with no factors to disturb right from the early geological times—are to be found nowhere else in the world.

The total area is about 6,000 square miles and the population 35,000. 2,000 miles away from San Francisco, the nearest point to the islands—and over 3,500 from Japan and Australia, the islands are yet in the trade routes of the world and therefore are in touch with the rest of humanity. The north easterly trade winds blowing for about eleven months in the year, bring in their wake a heavy rainfall, the mountain ranges in the islands—some of them over 10,000 feet above sea-level—causing a precipitation of over 300 inches in the year. On the leeward side of the mountains however, there is little rain—with but 10 inches or even less a year—so that the islands are partly desert, and partly rank with wild vegetation. The extreme steepness of slope, however, precludes the possibility of storing this large amount of water received during the rains, as the slope limits the capacity of any reservoirs that could be built.

As the islands were covered with wild uninhabited jungles, the early trade of the islanders was confined to forest produce chiefly sandalwood, of which a good many varieties flourish in the forests. With the advent of civilization, cattle were introduced, about the beginning of the nineteenth century, and cattle-rearing and export in hides and skins came to be important. This was not an unmixed blessing, for, with the introduction of cattle, followed the extinction of forests. As before mentioned, the flora without foraging animals to disturb them, formed a peculiar plant society with the roots of the trees in the sticky soil ecologically developing to be surface feeders, and a lot of moss and ferns associated with them. Grazing animals injured these roots, with the result that forests ceased to exist and in their place came wide grass lands. This inevitable disafforestation resulted in droughts since the moisture-holding capacity of the islands was considerably lessened. Thus the only source of revenue—namely forest produce—was spoilt by an overdose of cattle-rearing.

Then came the search for crops, and amongst these sugarcane was easily the most successful and profitable. The Chinese were the first to start the cultivation of this crop and even the manufacture of sugar and once the local demand was satisfied, it was possible to export large quantities to America chiefly. Trade flourished and one point worth noting in this connection is that the Hawaiians have no tariff to pay for their sugar, while in

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the U. S. A. a tariff, of 2 cents per pound of sugar is charged on other sugars.

Requiring good sunshine and facilities for drainage, the sugarcane is grown on the dry lands, and here the chief difficulty is water, as rainfall is the only source of supply. The canes grow for a period of 18, 24 and even 30 months and there are about 200,000 acres under crop. It requires about a ton of water to grow a pound of sugar, and it was only in 1918 that it was recognized that preservation of forests should be paid more attention to, if one wanted to escape periods of drought during the growth of the crop. Rigorous forest laws were introduced and steps were taken to rejuvenate the old forests, not only by reviving the old indigenous trees, but by importing foreign trees as well—amongst which may be mentioned the *Terminalia* Sp. from Assam. Since then, conditions have improved, and there is not so much drought now.

Another problem confronting the sugarcane cultivator is the depletion of soil. There is practically no rotation of crops, and the continuous growth of sugarcane for the last fifty years has removed much of the plant food. This led to the application of commercial fertilizers, very heavy doses (as probably obtain nowhere else in the world) being applied. One ton of fertilizers or 1,000 lbs. of sodium nitrate are very often applied. These fertilizers have to be obtained from distant places like Chile, the slaughter houses of America, and so on, and manuring is therefore very costly. As against this, there has been an increase in yield from four to nine tons per acre. There are, in fact, plantations giving an incredible yield of 18 tons of sugar per acre.

A leaf hopper pest of the cane which appeared in 1903 and which devastated large areas, had to be tackled. A parthenogenetic parasite was obtained from Australia, but even this did not do much benefit, as there were alternate periods of leaf hopper and parasite ascendancy and once the damage was done to the crop, it could not be rectified. Later, a parasitic red bug which was found in Australia, was let loose on the islands. This multiplied rapidly and sent the leaf hopper out of existence. This bug does no harm whatever to the cane and since its introduction, there has been no trouble from the hopper. Similarly, a borer found attacking the roots of cane, was got rid of by a parasitic wasp from Japan.

The hunt for a commercial crop in addition to sugarcane, led to the introduction of the pine-apple. This flourished very well on the island, soon a market for the commodity opened, and a great demand has arisen for the fruit. The chief difficulty is preserving and packing, (since San Francisco the nearest port is 2,000 miles away), and the keeping during transit. In addition there is only one variety, the kewpine grown, and as this is subject to diseases and fungus attacks during transit, the problem is to produce a disease-resistant variety. A Breeding Station has been opened and work on this has been started and a few varieties have been evolved.

It will be interesting to know that pine-apple on certain soils of the island showed a sickly yellow colouring and a chemical analysis indicated as high as 2 per cent. of Manganese dioxide in the soil. These plants were then sprayed with a 2 per cent. solution of iron salt periodically and the normal colour and growth of the plants were restored.