

FRUITS.

PINEAPPLE FOR CANNING.

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Pine-apples are found all over Fiji either wild along pathways in the scrub, or cultivated with more or less attention in native towns and gardens. They grow luxuriantly, both in the dry or the wet zone, where the rainfall ranges from 60 to 140 inches. Successful cultivation on commercial lines, however, requires attention to certain points briefly referred to in the following notes.

CLIMATE.

Experience has shown that a mean annual temperature of 75° F. in the cool months to 85° F. in the warmer months, with a narrow range between day and night temperatures and with an average monthly rainfall ranging from 2 to 20 inches, favour best the continuous growth of the plant. It can indeed endure heavier rain provided the ground is never water-logged. These are a shade above normal conditions in Fiji.

Good drainage is essential to healthy root growth and for that reason sloping land offers advantages not always found on flat land. Very fine pine-apples grow even on steep slopes, but gently undulating land easy to cultivate cheapens cost of production and is therefore preferable. Hawaiian experience has demonstrated that under the conditions obtaining there, an altitude of 500 to 800 feet favours disease-resistance as compared with pine-apples grown at low altitudes.

To guard against land scour during heavy tropical rains, storm-water drains running as far as possible across the declivity of the land should be provided to carry away the rush of surface water. In fact, in a climate like that of Fiji thorough drainage is an important preliminary work to the lay-out of a pine-apple plantation.

SOIL.

As the plant is intolerant of wet, retentive clay, a friable black or brown loam is the best, affording easy penetration of air into the soil round the roots and at the same time capable of absorbing and retaining moisture. Other soils, though, such as the grey or the red soils, of which there are several types, grow good pine-apples.

Certain soils have been found unsuitable, such as the black manganese soil of Hawaii or the lime-stone soils of Porto Rico, which cause iron starvation, characterised by a yellowing of the leaves and the development of undersized and acid fruit. A counteracting treatment consisting in spraying every few months a weak solution of sulphate of iron over the leaves is doing some good, but under Fijian conditions such a treatment is unnecessary for the reason that the trouble is non-existent.

Where the desirable physical conditions are absent they can often be created by deep cultivation, by the addition of coral sand or the ploughing in of a cover crop of Mauritius beans or of Cow peas a few months before planting.

The use of artificial fertilisers, which is a *sine qua non* of heavy cropping in other lands, is not practised yet on the virgin lands of Fiji, where, from all appearance, the weight of the fruit is often in excess of that considered the most economical for the requirements of the cannery.

CULTIVATION.

Where manuring is not yet required, the benefit of cultivation is not to be denied. The native method of preparing the land answers in small parcels of picked land, but it does not lend itself to extensive cultivation. In the hand of the native the *doko*, which is the name of the stout pointed stick he uses, does good work. It is driven some 9 inches into the soil, in a slanting way, and while the top end is pressed down the pointed part in the ground heaves it up and leaves it in a loose and friable condition. Where a bigger area has to be stirred up, the operation is repeated from different angles around the same spot. Finally the *doko* is driven straight into the centre of the loosened ground and with a rotary motion it leaves a circular hole of the depth and the size required, into which the seed or the plant is placed and then the ground is pressed and made firm around.

By this method, stumping of the bush land is not essential and ground too steep for ploughing can be cultivated. The subsequent work of weeding, however, is made more costly and, all conditions being equal, the advantage remains with the cultivated land when the crop comes to be harvested.

Where the land can be cleared with the fire stick, such as the rolling downs under tall reed grass of the dry zone or of the intermediate country between this and the forest land of the wet zone, very little stumping remains to be done. When cleared, the land can be ploughed and then harrowed and cross-harrowed. After resting four or five weeks most of the roots and vegetable matter have more or less rotted, the same operation is renewed and the land is left in a loose and friable condition for laying out the lines for planting. Land thus prepared will be less costly to keep clear of weeds and will hold moisture even during lengthy periods of dry weather.

The Smooth Leaf Cayenne is the kind canners in Hawaii have founded their great pine-apple canning industry on and it is the kind therefore required for the proposed canneries in Fiji. This kind is also locally called, though incorrectly, the "Queen Pine" and sometimes the "Giant Kew."

The leaves are long, broad and smooth or with very few spines towards the tip, they are dark green in colour; the flowers are purple; fruit large to very large, weighing from 3 to 12 lb., pyramidal or cylindrical, dark orange yellow when ripe, flesh pale yellow; rich, well flavoured, pips large and flat. Does not sucker so freely as other varieties. The main crop ripens in the warmer months: October-February, with another shorter season in the cooler months: July-August. It is largely grown in the Azores for supplying the English market during the winter and early spring months.

The kind of pine-apple most popular in Fiji for eating is at the present time the Ripley Queen. Unlike the Smooth Leaf Cayenne, it has spiney leaves, green with purplish longitudinal streaks running up the centre and becoming less distinct as the plants get older. This variety is smaller than the Smooth Leaf Cayenne, the flesh is of a light canary colour, juicy, sweet, and highly flavoured.

WHAT TO PLANT.

The pine-apple is seldom a seed carrier and this method of propagation is only used when new varieties are desired for testing "wilt"-resistant varieties. A pine-apple seedling takes several years to grow and mature its fruit, hence the quicker method is usually followed of propagation by means of suckers, gill sprouts, slips, and crowns.

Like the banana, the pineapple bears only once, the subsequent crops being carried by "suckers" which grow at the base of the mother plant, take root and bear fruit in the proper season. When clearing up the plantation after the fruiting season, the old plants are removed and if the suckers are too numerous they are thinned down to two. Some prefer to plant gill sprouts to suckers for the reason that suckers often carry fruit already in embryo when removed from the ground; this appearing before the sucker is properly established, often fails to come up to standard. This objection only applies to the first crop and not to the second crop from suckers grown *in situ*.

The "gill sprouts" are buds which shoot out from the stalk at the base of the leaves. Two, three, or more may grow on the one plant; they are pulled off if they are likely to interfere with the size of the fruit.

The "slips" are produced from buds on the fruit stalk, at the base of the fruit. They are smaller than the suckers and the gill sprouts, but are more abundant. If it is intended to use them for planting, all but two are rubbed off.

The "crown" is the cluster of short leaves on the top of the fruit; when required, they are collected at the cannery and may be used after the usual period of sun curing to dry up the flesh which would otherwise ferment in the ground and interfere with growth.

The "stumps" are occasionally used for planting and produce vigorous growth. It is the only portion of the pine-apple plant in which starch is found stored up. They may be planted in holes like sugar-cane sets. The time between planting and the ripening of the fruit varies with the strength of the plant. Strong suckers bear within twelve months. If transplanted like gill sprouts, the fruit may be cut in about fifteen to eighteen months. Slips generally take eighteen months, and crowns even longer.

Some preliminary preparation is required for healthy growth. Whether suckers, gill sprouts, slips or crowns are used, it is usual to expose the butt end to the sun for a few days to prevent bleeding and base rotting when they are put in the ground.

If mealy bugs are present at the base of the leaves it would be advisable to dip the butts into kerosene emulsion for a few minutes.

When plants are removed to the site of new plantation some distance away they are tied up into bundles of 25 or 30, all the tops pointing one way. They thus stand less risk of heating and fermenting than if packed in bags or in boxes.

At the time of drying the butts of the suckers in the sun and before planting, the small leaf scales at the base are pulled off to guard against what is known as ranglefoot. This enables the rootlets to strike out freely, as they sometimes twist round the base of the young plant and girdle it and choke its growth, when it becomes necessary to pull out the plant from the earth, cut the twisted roots and replant again.

Planting can be done at any time under island conditions, provided the ground is moist enough, but summer and autumn planting during the rainy season is best, as the plant growth starts then and is not checked during the winter.

SPACING.

The number of plants required for an acre usually ranges from 3,000 to 7,000 according to kinds and the lay-out of the ground. The experience gained is in favour of close planting; but provision must be made for the convenient working of the plantation: this consists mainly in maintaining it clean and in removing the crop which may be very heavy.

In Hawaii and in Queensland the double or the triple row system, with an interval of 6 feet between the rows, is preferred. The plants, about 5,000 to the acre, are set in alternate lines at intervals of 18 to 24 inches in the rows.

In Singapore the common plan is single rows five feet apart, with plants $2\frac{1}{2}$ feet in the rows and a 6 feet path at every 100 feet. About 3,000 suckers are required to plant up an acre.

In Florida close planting in beds 12 to 15 feet wide with a pathway around is the practice generally followed. The distances between the plants being 20 by 20 inches for the smaller varieties, up to 36 by 36 inches for the largest kinds. The plants are not always set out in squares; Smooth Cayenne, for instance, is often planted 20 by 30 inches apart.

This close planting fills the ground quicker, smothering the weeds, the plants support each other better and there is less sun scalding. On the other hand, a greater number of plants is required for a given area or land and horse cultivation becomes out of the question. The gathering of the fruit is more difficult, particularly the spiney leaf kinds, and the plantation requires systematic thinning out or else it becomes impenetrable.

CULTIVATION.

From the time of planting, clean weeding and the maintenance of a loose friable surface will help the plants along. When the spacing is wide enough to permit of horse cultivation, light scarifiers of the Planet Junior type will effect that work, with a little hand hoeing and hand weeding where the tools cannot be safely used. To obviate this weeding, locally made paper strips are used with advantage as a mulch in Hawaii, and tend in supressing weeds, conserving moisture and improving the size and quality of fruit suitable for canning. When ploughing is found necessary it should be to and not from the pines. In wet places more particularly, this will leave a shallow furrow which acting as a drain will save the roots of the plants rotting in water-logged land.

Weedicides have lately been used with advantage in Hawaii, both in cane fields or on pine-apple plantations, but in inexperienced hands this may prove harmful.

As soon as the pine-apples close together, the weeds are smothered out and the cultivation of the open spaces between the lines is all that need be done.

It is at this time that all superfluous gill sprouts and slips are removed, also old stumps which have already borne fruit. Only suckers growing out of the ground or ratoon suckers are left, not more than two to a plant, overcrowded beds produce mostly spindly suckers and low grade fruit.

At the same time any barren plants or suckers or crippled pines are pulled out and destroyed. A dark line showing on the underside of the leaf and running lengthwise generally indicates such undesirable suckers.

"Spiking" or pines with narrow leaves growing straight up, is an indication of weakened vitality and may be caused by insufficient cultivation, want of drainage or excessive acidity in the soil. Once the cause is corrected the effect disappears.

HARVEST.

The main crop in Fiji ripens in the summer from November to January, with a slight variation in the range of the season, according to locality and the time of planting.

The Smooth Cayenne besides has a short season in the winter: July-August. The summer crop is the main crop and the more regular, producing a better flavoured fruit.

For shipping, the fruit is picked when fully developed and partly coloured, but before it is fully ripe. For local sale it is allowed to remain on the plant a little longer, until quite ripe, but it must be cut before it is dead ripe and before the flesh is likely to lose its firm texture during the process of canning and develop a winey flavour.

Unlike the banana, the apple or the pear, the sugar content of the pineapple does not increase after removal from the parent plant. The source of that sugar emanates from the stored up starch in the stump portion of the plant, so that when that source is cut off the supply ceases.

A pineapple cut on the green side, for shipment, continues to colour up but its sugar remains at 5 or 6 per cent. as it was at the time of cutting. By the time it is cut and ripe enough for eating straight or for the cannery, the sugar content has doubled and with the rise in sugar the flavour also increases.

This fact was illustrated last year when this Department shipped in cold storage to the Dominion Cannery Ltd., Vancouver, a trial consignment of pineapples. They all carried well, but some cut on the green side and apparently ripe had not improved in sweetness and could not be compared for flavour with the rest cut at a more advanced stage of ripeness.

With the more general application of cold storage to the shipment of fruit, it will be possible to pick pineapples more fully ripe and supply distant markets with a sweeter fruit like that gathered for eating in the country of production.

Pineapples either for shipping or for canning should be cut from the plant an inch or two below the fruit and when ready for casing, a stump

an inch long should be left on the stalk or else the core rots after a few days and the fruit is wasted.

For canning, fruit fully ripe and of the proper size, $3\frac{1}{2}$ to 7 lb. cylindrical rather than conical, are placed in strong crates or lug boxes where they carry without bruising to the cannery where they are put through the process within 24 to 48 hours from the time of cutting.

For the fresh fruit trade, the number of pineapples is indicated on the case. The consignment shipped to Canada, mentioned above was packed, in the flat Azores case, 40 inches by 21 inches by 8 inches outside measurement with a centre board and open cleats for ventilation. The pineapples were packed in single layers twelve to sixteen in the case, the butt end pointing outwards; the temperature in the cool chamber was maintained at 50° to 55°F.

In Hawaii octagonal shaped crates are used, holding likewise about a dozen fruit each, the shape of the package ensuring ventilation all around.

The Smooth Leaf Cayenne is tender and difficult to pack. In Cuba, Florida, and Hawaii a large export trade has been worked up for the fancy trade, the fruit, weighing 8 to 10 pounds, being shipped in heavy paper cartons packed in crates and distributed to various parts of the United States.

YIELD OF FRUIT.

Soil, climate, cultivation, and freedom from pests and diseases influence the yield. One fruit per plant will be produced for the first crop. Odd plants are barren but they are few and they can be weeded out. Under ordinary conditions therefore 4,500 to 5,500 fruit may be produced per acre planted at distance shown in the double and the single row systems. About 3,000 if planted as explained in Singapore and 6,000 or more if planted in beds, Florida fashion; after the first year they should produce an average of about two fruits to each original plant. The pineapples may not all be marketable or many may be spoilt by sunscald, through the depredation of rats or for some reason or other. In Singapore 6 to 12 tons per acre are gathered, in Hawaii 8 to 20 short tons and more. In Florida quite as much. The weight per acre has not been ascertained in Fiji, but if 4,000 to 8,000 pines averaging 4 lb. each are picked, a crop of 7 to 14 long tons should be obtained without manuring as practised on old cultivated land.

Under the natural conditions obtaining in Fiji, admittedly favourable as they are, the length of time a pineapple crop takes before showing signs of declining has yet to be determined; without the stimulus of artificials, it is highly probable that three or four good crops may be expected, whereas with the right kind of fertilizers and with care and attention that time may be much extended before new fields freshly opened out replace the old ones. With home-grown suckers available for the labour of picking, the cost of a new plantation amounts to only half that of the initial plantation when suckers have to be bought. A renewal every few years or so is generally advisable to ensure a higher proportion of first class fruit.—Agricultural Circular, Fiji, Vol. V, No. 2.