A high-yielding coconut palm raised by hand pollination. Age of palm 7 years.

PLANTING MATERIAL IN COCONUTS

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The subject for discussion this afternoon is "Planting Material in Coconuts". In any agricultural enterprise, two aspects are of vital importance *viz.* the quality of planting material used and the agronomic practices including management, that are necessary to get maximum efficiency. Both these factors must go hand in hand, otherwise maximum production per unit area is not possible.

In a perennial crop like coconuts, where the economic life span is over 60 years, the quality of planting material used initially to establish a plantation is of utmost importance. I propose to discuss only this aspect of the problem, and outline work carried out so far at the Coconut Research Institute Lunuwila to produce improved strains, and briefly state what is on for the future.

Variation in yield between palms

The yield records for over 20 years of a five acre block at Bandirippuwa are available. The mean yield per palm over that period was 60 nuts per year; and there were palms giving 15 nuts as well as 148 nuts per year.

7% of the palms gave less than 40 nuts a year and they contributed only 3% of the total crop;

70% of the palms gave 40 to 79 nuts a year and they contributed 65% of the total cost.

The remaining 23% gave over 80 nuts a year and contributed 32% of the crop.

Really our aim should be to reduce this variability and raise palms like that of the last group, i.e. palms giving over 80 nuts per year. How is this possible?

Mother palm selection

A programme of selection of seed parents and seedlings has been advocated. High-yielding palms with desirable agronomic characters are selected, seednuts collected from these palms are planted in a nursery, and selected seedlings are issued for planting. As a first step, this is quite a sound practice, and the improvement in crop that could be obtained by a rigid selection of seed in this manner is about 12 to 15 percent.

The selected palms have given over 90 nuts/40 lbs. copra a year. It does not follow that the offspring will be true to type and give the same yields more or less.

We have grown the unselected progenies of 9 high-yielding palms each giving over 40 lbs. copra a year. The yield of progenies has varied between 40 and 25 lbs. of copra a year. In other words some mother palms have given high yielding progenies, others only average or below average progenies. The reason for this is to be found in the genetic make up of the seed nut, arising particularly out of the behaviour of the flower of the coconut palm. There are two types of flowers on a coconut inflorescence—the male and the female. The female flowers are carried towards the base of the spikelets, (*i.e.* inflorescence branches), usually one or two, and numerous male flowers are carried above them nearly upto the end of the spikelet. In coconuts, the male flowers mature earlier than the female flowers, so that the latter has to look for pollen from palms in the neighbourhood. The honey bees in their search for nectar, collect pollen and also deposit them on receptive female flowers. Thereafter fertilization takes place *i.e.* the female and male gametes fuse, and development of nut proceeds further. If we consider nuts of one bunch, only the mother is common, and the father will vary from nut to nut. Thus progenies of all palms will not be true to type. This does not mean that selection of high-yielding mother palms is of little value. I have pointed out earlier that an overall improvement in yield of about 12 to 15 percent could be obtained by this method.

Controlled Pollination

We are not satisfied with a 12 percent improvement in crop. In order to get very high-yielding material, controlled pollination, where both male and female parents are known has to be resorted to. In this process we enclose the entire inflorescence in a bag after removing all the male flowers, and when the female flowers are receptive, pollen from known palms are introduced to them.

We have embarked on an intensive programme of hand pollination and many lines of investigation are in progress. The main objective being to breed an *early bearing*, high-yielding palm, if possible with a short stem. We started this work in 1949 and have already made considerable progress.

Earlier I mentioned that *some* (not all) high-yielding mother palms give high-yielding progenies, inspite of the fact that seed nuts are open pollinated. We call them "pre-potent" palms—as they could transmit the character

high-yield to offspring they are comparable to stud bulls in animal breeding work. Selected palms crossed with pollen from these "pre-potents" are expected to give an increase of crop of about 25 to 30 percent.

A 'Pollen Bank' has been developed from pollen collected from these 'pre-potent' palms, and its facilities are available to the Industry. Already there are 6 private estates that are carrying out their own programme of controlled pollination work to raise high-yielding planting material for underplanting. The Institute helps them by training personnel and supplying them with pollen periodically.

Hybrids between Varieties

You are aware that there are a number of varieties and forms of coconuts and most of them are not useful for commercial purposes. But there are some forms that betray useful characters, *e.g.* early bearing and short habit, which are useful for breeding purposes. We have carried out experiments to find out how far a productive strain could be synthesised by using these varieties. These experiments have been a success and a strain that is early bearing and high-yielding has been developed. The mean flowering period of these palms is $3\frac{1}{2}$ years when grown in a new clearing, and $4\frac{1}{2}$ years as an under-plantation. The yield of 11 to 14 years old palms (experimental) has been 150 nuts/75 lbs. copra per palm/year. There are some palms amongst this experimental material that have given over 100 lbs. copra/year.

If there were methods of vegetative propagation as in Tea, Rubber and other crops, high-yielding clones could be established from the material that we have today. But unfortunately, coconuts could be multiplied only by seed and that brings in plenty of difficulties.

We require 2,000,000 seednuts a year and it is impossible to raise this quantity by hand-pollination. We have to resort to the use of Isolated Seed Gardens for production of quality seed on a large scale. The first Seed Garden has been established in the Ambakalle Forest Reserve, near Chilaw, and 125 acres have been planted already.

During the short time at my disposal, I have outlined the lines of investigation and progress of research to raise quality planting material.