WORDS USED IN TALKING ABOUT COCOA PLANTING MATERIAL

By D.W. Kidd, formerly, National Crop Adviser (Cocoa), Lowlands Agricultural Experiment Station, Keravat, E.N.B.P. and A.E. Charles, Chief Agronomist, D.P.I., Konedobu

INTRODUCTION

For over 30 years, D.P.I. scientists at L.A.E.S. have been working to produce better planting material for cocoa growers. The work has included:

- Selection and testing of high yielding trees from cocoa already in Papua New Guinea.
- Introduction and testing of new kinds of cocoa from overseas.
- Making crosses between different trees.
- Testing plants for resistance to pests and disease.
- Trying different methods of growing cocoa vegetatively.

Since 1980, a plant breeder employed by the Cocoa Board has been working at Keravat, so this work to produce better planting material is going ahead faster now, and new kinds of cocoa will be produced in future.

Some special words are used when talking about cocoa planting material. This article explains some of these words. This should help you to understand the different kinds of planting material that cocoa growers can choose.

THE KIND OF COCOA TREES YOU GROW

When a grower plants cocoa, there are three things that affect how well his trees will grow and how much cocoa they will produce. They are:

1. The environment. This is the place where the cocoa is grown. The important things are the kind of soil (whether it is fertile or infertile, shallow or deep, wet or dry) and the climate (rainfall, sunshine, temperature, wind).
2. Management. This is what the cocoa grower does to look after his cocoa (planting shade, using a nursery, spacing the trees, weeding, controlling diseases and pests, pruning and so on).
3. The planting material is, of course, what he plants. This is discussed below. The genetic characteristics and growth type of the trees depends on the planting material a grower uses.

Genetic characteristics

These are features each generation passes on to its offspring (that is, what parents pass on to their children). For exam-

ple, Papua New Guinean parents pass on to their children features like brown skin and curly hair, while European parents pass on features like pale skin and straight hair.

Some characteristics of cocoa are determined entirely genetically and some partly genetically and partly by environment and management. For example, whether your cocoa trees have red or green immature pods is determined entirely genetically. However, whether your cocoa trees produce a lot of pods, or a few pods is determined partly genetically, but even more by the management you provide.

This may help you understand why it is important what planting material you choose. If the genetic characteristics of your planting material are bad, you will not get good production even if you plant in a very good environment and manage your trees very well. On the other hand, even the best planting material will not produce well if growing conditions are unfavourable or the management is bad.

Growth type

Cocoa trees have two types of growth - 'chupons' that grow straight up and 'fan branches' that grow in any direction (see the photographs on p. 117).

Seeds produce chupon growth. The kinds of vegetative planting material available in Papua New Guinea produce fan growth. The type of growth affects the shape of the tree and the type of management it needs.

PROPAGATION, REPRODUCTION, MULTIPLICATION

These three words all mean the way we make new plants, or produce planting material. For cocoa, there are two types - seed propagation and vegetative propagation.

Seed propagation

Cocoa seed is produced when male pollen fertilizes a female ovule. This is important for the genetic characteristics that the parents will pass to the progeny.

Usually children have some likeness to both their mother and their father, and also to their brothers and sisters, but they are all different. Cocoa is like this. Trees which grow from seed get genetic characteristics from both male and female parents, but are usually all different.

Unlike people, cocoa trees have both male and female parts. Sometimes, seeds result from self-pollination. Both male and female parents come from the same tree, so the offspring are more like the parents and more like each other, but they are often rather poor trees.

Cross pollination means that the pollen and flower come from different trees.

Open pollination means natural (or uncontrolled) pollination between flowers on the same cocoa tree. This is what normally happens on a cocoa block. The insects which cause most natural pollination on cocoa are very small flies.

Hand pollination is used to produce controlled crossing between different cocoa trees.

Self-compatible. A self-compatible cocoa tree is one that is able to self pollinate with pollen from its own flowers.

Self-incompatible. A self-in compatible cocoa tree can only set fruit if it is pollinated

Hand pollination of cocoa flowers. This method is used to supply some commercial seed.

with pollen from another clone. It is very important to know which clones have this characteristic, since a large block planted to a single incompatible clone would produce almost no fruit except around the edges of the block.

Hybrid. This word is used to describe the plants produced when two distinct types of parent plant are crossed. The production of hybrids is a widely used method of obtaining increased vigour and increased production. The best features of both parents can be combined.

Vegetative (clonal) propagation

The stems, branches and leaves of a cocoa tree are the 'vegetative' parts of the tree (the flowers, pods and seeds are the 'sexual' parts). Vegetative propagation means growing new plants from the vegetative parts of the parent plant. This method of propagation is very common in Papua New Guinea, as most of the important food plants (sweet potato, banana, taro, yam) are propagated vegetatively.

The important thing about vegetative propagation is that the new plants have exactly the same genetic characteristics as the plant they come from, and they also have the same growth type as the part of the plant they came from. Since all the cocoa plants produced vegetatively in Papua New Guinea are from fan branches they have the fan growth type.

Clone

We use this word to describe all the plants grown vegetatively from one original parent or its vegetative progeny. Hence all plants in a clone have the same genetic characteristics. Plants of the same clone can be identified by their leaf shape, fruit shape, size and colour. With clones, we can also know exactly the yield potential and disease resistance. Clones whose characteristics have been tested are essential for a breeding programme.

COCOA FROM DIFFERENT ORIGINS

Cocoa grows wild in the jungles of South America. It occurs over a very big area, in places thousands of kilometres apart. Trees in different places have different genetic characteristics. Different types of cocoa have been distributed around the world for commercial planting. The most important cocoa in Papua New Guinea has two main origins.

Trinitario cocoa:

This originated in the island of Trinidad and was brought to Papua New Guinea via Java and Samoa by the Germans in the early 1900's. It is very mixed cocoa with a very wide range of genetic characteristics. Much work has been done at Keravat, selecting and testing Trinitario cocoa. L.A.E.S. Trinitario cocoa clones have been the

basis of the breeding programme in Papua New Guinea. Each clone is identified by letters and numbers, e.g. KA2-101, or K21.

Upper Amazonian cocoa:

Between 1936 and 1942, seeds were collected from wild trees in the upper Amazon river basin in Ecuador and Brazil. Clones were selected from these trees grown in Trinidad. In the 1960's D.P.I. introduced seed produced by hand pollination between some of these clones. Then seeds were grown and tested at Keravat. Clones were selected from them and were given Papua New Guinea identification numbers (KEE...).

Upper Amazonian cocoa grows well in Papua New Guinea and produces large numbers of pods. However, both the pods and the beans are usually smaller than those used to set the standard for dry cocoa beans. As a result, none of these clones are recommended or distributed for commercial planting.

TYPES OF PLANTING MATERIAL USED IN PAPUA NEW GUINEA

Open pollinated Trinitario seed

This is the common cocoa that everybody has used in Papua New Guinea, since cocoa was first grown in the country.

Poly-clonal Trinitario seed

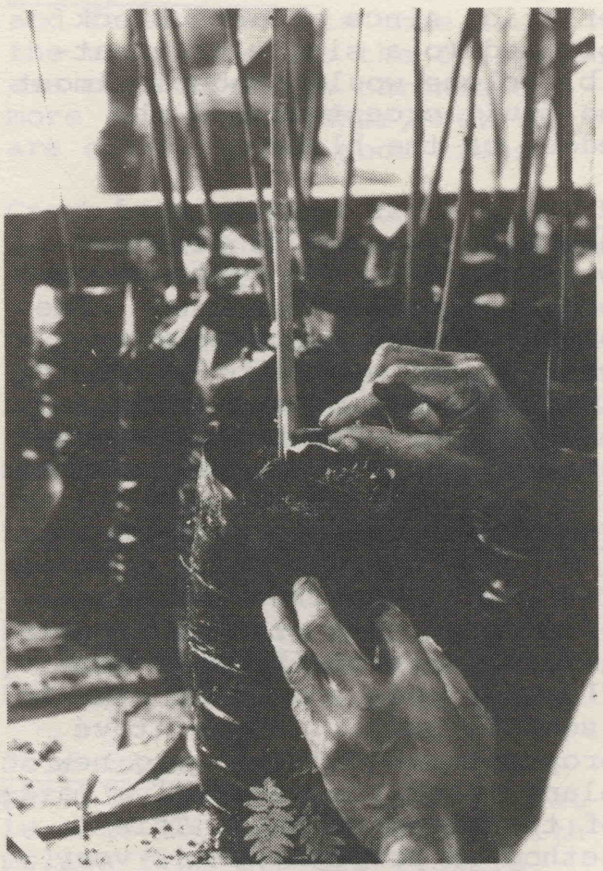
This is seed produced from plantings of selected clones. This is the 'Keravat seed' that was distributed for many years from L.A.E.S. Whenever possible the seed came from self-incompatible clones so that it was cross pollinated. Poly-clonal Trinitario seed is no longer distributed in Papua New Guinea, as better planting material is now available.

Trinitario cuttings (clonal)

Before budding techniques were perfected, clones were produced by taking stem cuttings and carefully growing them in a specially-built controlled environment propagator. This method was slow and costly. It also produced trees with weaker root systems. Cocoa cuttings are no longer used in Papua New Guinea.

Trinitario buddings (clonal)

These cocoa trees are grown from a bud taken from one of the recommended clones or cocoa selections. The bud is attached to the stem of an 'open pollinated Trinitario' seedling. The bud is encouraged to develop and is allowed to dominate. The seedling is cut back and finally the bud develops into a mature tree.



Budding rootstocks of seedling Trinitario cocoa with buds from Trinitario clones

Mature cocoa budding, showing the general shape of a tree growing from a bud (fan growth type).

A young hybrid cocoa tree with its first cocoa crop (chupon growth type)

P.N.G. Amazonian hybrid cocoa

These are hybrids produced by crossing tested Papua New Guinea Trinitario clones with tested Amazonian clones. The selection of these clones as parents is the result of over 20 years of testing at L.A.E.S., Keravat. Much more testing of clones and hybrids will be needed before the work is finished. As hybrid cocoa grows from seed, it has the chupon growth type and it has a range of genetic characteristics.

For further details about hybrid cocoa, see the articles in HARVEST, Volume 8, No. 1, pp. 6-12; and pp. 126-128 of this issue.

AN IMPORTANT WARNING

Hybrid seed for planting must ALWAYS be obtained from a certified source. Planting the seeds from hybrid cocoa growing on a plantation will NOT give a good stand of seedling hybrid cocoa. Details of the places where you can obtain hybrid seed for planting are given on pp. 123-125 of this issue.

If you have any questions please contact:

National Crop Adviser (Cocoa)
L.A.E.S., P.O. Keravat
East New Britain Province

Telephone: 926251