METHODS FOR COMMERCIAL BANANA GROWING

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The Department of Primary Industry made a study of banana-growing methods at Lejo in the Northern Province. As a result of this study, the following methods for banana cultivation are recommended.

It should be remembered that this paper is largely based on experience gained in one place, at Lejo. There were also only three varieties tested in the trails. The three varties used were Dwarf Cavendish, Giant Cavendish and Tui, which is a tall robust type very similar to the Gros Michel grown overseas.

Climate and soils

Bananas grow everywhere in Papua New Guinea, from the lowlands to the highlands. They do not like places where there are frosts.

Bananas grow well on a wide range of soils, although very sandy, or hard clay soils are not preferred.

With heavy clay soils, root growth is retarded and water-logging can become a problem.

In very sandy soils bananas need a lot of water, and this can be a problem where there is a long dry season.

The soil should be slightly acid.

The banana roots are concentrated in the top 30 cm of soil, but a moist, open loamy soil allows roots to go deeper, thus ensuring a good anchoring system.

The amount of rainfall needed for bananas to grow is not very important, although on sandy soils where the rainwater quickly soaks away into the ground they will need more rain than in areas where the soil is heavier and the water stays in the ground longer.

Planting time

The time to plant depends on two factors, climate and market.

In dry areas, plants should be well rooted and actively growing before the dry season starts. It would therefore be advisable to plant during the wet season.

Another reason to plant at this time is to reduce the amount of leaf spot disease in the plant during the critical period when the bananas on the bunch are filling out.

Dry conditions are very effective in reducing leaf spot disease even when the plants are not being sprayed. As bananas can take up to 12 months from planting to harvest, the beginning of the wet season would therefore be the best time to plant.

However, bananas are required for the market throughout the year, so farmers will generally plant to suit the market, regardless of leaf spot disease problems.

Planting material

There are four different kinds of planting material. These are bullheads (or corms), bits, sword suckers and maiden suckers.

Bullhead

This is the underground part of the stem of a banana plant which has already borne a bunch. It is also called the corm.

The old trunk is cut down 20 to 30 cm above the ground, and the corm is dug out. This will be very heavy and hard to handle, and is not a popular form of planting material.

Bit

Instead of planting the whole bullhead, a section a bit only can be used (*Plate* 1). However, it must contain an eye or a bud before it can shoot.

The bit will grow readily under good moisture conditions. Its chief advantage is that it is easy to transport.

Sword sucker

Suckers are small plants growing up from the base of another plant. The sword sucker has narrow sword-like leaves (*Plate* 2).

Sometimes another kind of sucker known as a water shoot may be found. The water shoot is a similar size to the sword sucker, but it has broader leaves, a weak stem and a smaller corm. Water shoots are not good planting material (*Plate* 3).

Sword suckers are the most popular form of planting material as they can easily be cut

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Plate 1.—Bit showing a bud.

from the mother plant without disturbing the whole plant. They are also easy to transport.

Maiden sucker

These are simply suckers, which have grown past the sword sucker stage, but have not produced a bunch of fruit. If they are too big they are very hard to handle. Although they produce bunches early, these bunches will probably be small in size.

At Lejo, sword suckers were mostly used. These proved very satisfactory and produced good bunches. Bunches were ready for harvest 10 months after planting for Dwarf Cavendish, 12 months after planting for Giant Cavendish, and 13 months after planting for Tui. The period when they were grown included a very dry spell, and times may be shorter under better conditions

Treatment of planting pieces

When obtaining planting material one should treat for nematodes, and check for weevil borers, as follows.

Nematodes

Nematodes are tiny worms which cannot be seen without a microscope. They damage the roots and kill many plants

If possible planting material should come from a nematode-free area.

The planting material can be treated so as to kill any nematodes present. First of all, all roots and soil should be cleaned from the corm. The planting material can then be dipped in hot water at 53 °C (128 °F) for 20 minutes.

Alternatively, a mixture of nematicide and water can be used (e.g. 6.5 l DBCP per 100 l water).

Weevil borers

Weevil borers make tunnels through the corm. New planting material should be carefully inspected to make sure the weevils are not being introduced.

It is an advantage to have planting material of the same kind and size. If this can be achieved, the crop will be more uniform and bunches will be thrown at the same time.

Suckers and bits should be allowed to stand in the open under shade for at least 24 hours to allow the cut surfaces to dry. If this is not done, the corm may rot later.

Planting method

The land should be cleared, but not burnt.

It is important to dig holes at least 30 cm deep before planting. The hole should be of the dimensions 30 X 30 X 30 cm.

Plate 2.—Sword suckers.

Plate 3.—Water shoots.

If the soil is sandy the depth of the hole should be increased to 45 cm. This is to give the plants a better anchoring system and so decrease the chance of them being blown over.

After planting, some soil is then placed firmly on top of the corm but leaving a small hollow in the hole. As the corm swells the soil level will in fact rise with it.

Spacing

There is much variation depending on the variety and use of machinery. If machinery is to be used it is best to plant in rows.

North Queesland's recommendation for tall bananas (e.g. Gros Michel and Lacatan) are for rows 4 m apart and 1.5 m within the row. For shorter types (e.g. Dwarf Cavendish) a closer spacing such as 4 m by 1.2 m can be used. These high density plantings are said to have the advantages of weed control and good use of available land.

A popular system in the South Pacific is 3 to 4 m rows and 2 m within the row for short varieties, and 3 m square spacing for the tall varieties.

The spacings mentioned above should give good-sized bunches and yields. Closer plantings will most likely result in bunches of reduced size and quality, and could encourage leaf spot infection.

Removing suckers

Every month the bananas should be inspected and unwanted suckers removed. This can be done with a bush knife. The sucker is cut off at or below ground level, and the centre of the remaining portion is dug out with the point of the bush knife.

For densely spaced plants only two plants per stool is recommended, that is, the mother plant and one sucker.

The mother plant should be about 6 months old before a sucker is allowed to come through.

It is important, where machinery is being used, to allow suckers to come through only in such a way that the ratoon crop (crop from suckers) will still be in rows. Only suckers on the same side of the mother plant should therefore be kept.

For widely spaced plantings it will be possible to allow more suckers per stool. In some cases 3 or 4 suckers at different stages can be retained without reducing bunch weights.

By keeping suckers it is possible to maintain a plantation for a very long time.

The economic life of the plantation, however, will depend on a number of factors. Where machinery is used, it is important to keep bananas growing in rows. Usually 5 or 6 years is the normal life of a machine-operated plantation.

Hand-managed plantations can be left longer, even up to 20 years if yields can be maintained.

Weed control

Weeds, especially grasses, can severely reduce growth and production. It is therefore necessary to control weeds from the start.

As a newly planted area produces little competition, growth of weeds will be at its greatest. As the banana plants develop so does their power to compete with weeds.

Although slashing will decrease the competitive effect of the weeds, chemical weed control is more economical.

A popular practice in overseas countries is to use paraquat and dalapon. Paraquat is a contact herbicide. It kills all leaves or stems which it touches (but not underground stems or roots). Dalapon is more effective on perennial grasses which have underground stems and are not, therefore, completely controlled by paraquat.

Diuron is recommended soil-acting herbicide. It kills the weed seeds as they germinate. However, this chemical has produced toxicity symptoms (leaf yellowing) on a number of plants at Lejo. This has resulted in reduced growth and smaller bunches. It is suspected that some of the chemical leached into the root systems of the bananas following heavy rain.

Another means of controlling weeds is to use a low-growing cover-crop. Cover-crops do not seem to compete as strongly as grasses. They also do not get in the way like tall-growing weeds.

Cover-crops are usually legumes such as pueraria, which will add nitrogen to the soil. The nitrogen can then be taken up by the bananas.

The cover-crop will also prevent erosion.

At Lejo, the ground was already covered by *Momordica charantia,* and this weed seemed to be as effective a cover as pueraria. It was more effective than pueraria in controlling grasses.

Whatever cover-crop is used it must be cut back regularly from around the banana plants so that it will not cover them or get in the way of harvesting. The cuttings are used as a mulch. From such mulch and from natural leaf fall, covers improve the soil by continuous addition of organic matter.

Fertilizers

A block at Lejo was still producing good bunches without any fertilizer when it was four years old.

Fertilizers may improve yields, however.

Bananas are described as gross feeders and make large demands on soil nutrients, especially nitrogen and potassium. It has been found that the majority of these nutrients are taken up early in the life of the plant and fertilizers applied after 4 or 5 months from planting or sucker selection may not be taken up.

A suggested basic fertilizer programme is as follows:

Time of application	*Amount of fertilizer per plant*
As plants emerge or as selected ratoon suckers emerge	½ kg of NPK 6:5:25 plus 57 g of sulphur
4 or 5 weeks after first application	½ kg of NPK 6:5:25
4 or 5 weeks after second application	½ kg of NPK 12:4:16 plus 57 g of sulphur
4 or 5 weeks after third application	½ kg of NPK 12:4:16

In certain areas of Papua New Guinea there are soils that may also be deficient in other elements. Therefore other fertilizers may also have to be used to get maximum yields.

Although the programme indicated above should be applicable to most parts of Papua New Guinea it would be advisable to contact your Rural Development Officer to make sure of the fertilizer requirements for your particular area.

The actual timing of applications can be further apart during dry periods when growth will be much slower.

Where leaf spot is very severe, it may be wise to reduce fertilizer applications until the disease is brought under control.

Preserve organic matter

Another important factor is organic matter, that is, dead plant material in the soil, which gradually rots away and becomes part of the soil. The organic matter keeps the soil in good condition and stops the soil from becoming too acid

Stems of old bananas, etc., should be chopped up and dug into the soil, so that they can quickly rot into the soil.

Mulch should be placed on top of the soil if the soil is bare. This preserves the organic matter in the soil.

Fungicides

A spray programme, especially to control leaf diseases such as the Sigatoka complex and other fungal diseases of banana varieties such as Cavendish, is as follows.

In a motorized knapsack (mist blower) use—

100 g (4 oz) Benlate
4.5 l (1 gal) oil
7 l (1.5 gal) water
45 ml of X-45 (Lanes) emulsifier

This should be applied so that the operator covers ½ ha.

Aim the spray so that it goes above the plants, and falls down on them, and make sure that the youngest leaf especially is sprayed. It is best to apply the spray early in the morning before the wind blows. Spray every two weeks.

If you are growing Cavendish commercially, it is best to start spraying before the leaf spots appear.

Insecticides

Use of insecticides for insect control in bananas is not recommended.

Propping

Banana bunches can be very heavy. In a well-controlled plantation, weights of around 40 kg can be quite common. These weights cause a big strain on the banana stem and following heavy rain or wind the stems can bend or break in the middle or fall over from the base.

This is more likely to happen if the plants are tall. During heavy rains at Lejo many Tui bearing immature bunches were bent over when they had no prop to support them.

For this reason, it is advisable to use props after the bunches have emerged. The props can be a single pole with a forked end or two poles which cross under the bunch (*Plate* 4).

Plate 4.—Trees need to be propped with poles after the bunches have emerged.

Bunch covers

Bunch covers have become very popular overseas. The type of cover used at Lejo is a blue polyethylene sleeve which is tied around the bunch stalk and also tied around the base, with a small opening left so that that the water can run out (*Plate* 5).

The advantages of using bunch covers are—

- Decreased time for bunch maturity. Covered bunches at Lejo were ready to harvest 5 to 14 days earlier than uncovered bunches.
- Protection against fruit fly.
- Protection against other factors causing skin blemishes, such as sucking insects, leaves, fungicide residue, fungus, birds etc. This results in more attractive-looking fruit.
- Greater size of fruit has been reported overseas. However, results at Lejo showed only a small increase in bunch weight.
- Protection against chilling in cold climates. This was one of the main reasons why bunch covers were introduced into eastern Australia. It may be important in highland areas of Papua New Guinea.

Disadvantages are—

- Where the tree has fewer leaves due to leaf spot, sunburn of the bananas on the uppermost side of the bunch can be a problem. This can be prevented by enclosing the last emerged leaf (flag leaf) over the top of the bunch or by using tar paper or hessian placed inside the cover.
- Bunch covers used at Lejo definitely caused the skin to become softer. This can produce problems with transport.

Plate 5.—**Bunch cover tied over a bunch of bananas.**

- If the covers are removed and bunches left in the sun they can be affected with sunburn. It is therefore advisable not to remove covers in the field following harvest. If possible the bunches should be carried to an open shed or other form of shade and unwrapped. They should then be left there for 24 hours. This should harden the skin and increase its resistance to sunburn and bruising.
- Covers must be inspected at fairly regular intervals as insects (particularly long-horned grasshoppers) and field mice can eat their way through the cover. These pests were found to be troublesome at Lejo. Hand-collection of the grasshoppers will help to reduce this problem.

Other forms of covers besides blue polyethylene bags have been tried at Lejo. Hessian bags and old fertilizer bags were tried first but these were often of the wrong size.

Clear plastic is often used but this is even more likely to produce sunburn effects on the fruit.

In the highlands, bunches are often covered with trash (leaves etc.).

When to cover

The best time to apply the covers is after the bracts have hardened and can be removed. If covers are put on before removal of bracts, the bracts will rot and stain the fruit.

After the bell has fully developed it is cut off and the cover tied at the bottom.

Harvesting and marketing

Bananas can be sold at local markets in most centres.

Both "sweet" and "cooking" bananas can be sold to the government Fresh Food Markets which operate in Port Moresby, Lae, Kainantu, Goroka, Mount Hagen, Alotau, Popondetta and Wewak.

The government market will buy as many bananas as it is able to sell again to its customers. At present some markets are short of bananas.

At local markets, most of the bananas sold are ripe or nearly ripe. At the government markets bananas are mostly wanted in the green stage so they can be stored and perhaps transported to other markets.

More people will want to buy bananas from the government market if they can get first-quality fruit. If bunches are brought in overripe, bruised or full of fruit fly no-one will want to buy them.

Bananas for the government market should be picked when they are still green, but three-quarters full. The bunches should be kept cool after they have been cut, and not bumped around or stacked under bags of other produce.

The amount of bananas that can be sold at any one time is limited. You should ask your agricultural officer to advise you on how many bananas to plant.

Yields

Results from the trial at Lejo indicate that average bunches weighing 28 kg can be obtained at 3.5 X 3.5 m spacing with moderate leaf spot infection. This would be equivalent to a yield of 3 tonnes per hectare.

As two bunches per stool per year would be harvested, this would be quivalent to a yield of 6 tonnes per hectare per year.

Higher yields can be expected with closer spacing as indicated in present trials being conducted at Lejo.