MECHANIZING SWEET POTATO PRODUCTION

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INTRODUCTION

Mechanizing sweet potato production means using machines to prepare the ground, plant the crop, and harvest the tubers.

Partial mechanization of sweet potato production has been tried by various people over the years. The aim of this article is to share some of the experience gained at a few properties in the Western Highlands where conditions have allowed various amounts of mechanization.

Mechanization is limited to places with large areas of flat land with a suitable type of soil. It is important to make sure that the land is suitable before starting a project.

Mechanization involves using a plough and then a disc harrow to prepare the land. Vines can be planted using a semi-mechanical planter. This means that some of the work has to be done by hand. Fertilizers and pesticides can be applied by machine. Finally, the tubers can be harvested using a mechanical digger.

All equipment tried up to now with sweet potato is designed and used for other crops and in fact could be easily designed and manufactured by existing Papua New Guinea based metal workshops. You will find descriptions of the machinery mentioned in this article in the Rural Development Series Handbook No. 14, 'Know Your Farm Machinery'.

The agronomy of sweet potato has been discussed in other articles in this issue. This article comments only on special points relating to mechanization.

VARIETY CHARACTERISTICS

Not all sweet potato varieties are suitable for mechanized production. Several characteristics are important in order to minimize damage (bruising, skin rubbing, cutting) by the mechanical digger. The following points should be noted:

- a variety should have many medium size tubers rather than a few large tubers. Very large tubers take longer to travel over the revolving (turning) elevator chains and so the risk of skin damage is greater.

- varieties that form their tubers near the surface are preferred. Deep rooted varieties are more likely to be cut by the blade of the digger.

- varieties that have short tubers are best. Long tubers are more likely to be broken by the digger or during collecting.

- the skin of some varieties is tougher than others and so resists harvest damage, e.g. Serenta has a stronger skin than Wan Mun.

- varieties where the tubers are bunched closely together and remain attached to the vine at digging are less likely to be damaged as they tend to ride gently over the chains whereas single tubers are more likely to roll and bounce and so be damaged.

In mechanical harvesting, all tubers are harvested in one single operation, with no selection for size. So, those varieties in which most tubers reach marketable size at about the same time are most suitable for mechanical harvesting. If the tubers mature over a long period, the larger tubers will be susceptible to rat and weevil attack while waiting for the other tubers to grow big enough. Also, varieties with different times to maturity should not be interplanted if it is planned to use mechanical digging.

LAND PREPARATION AND PLANTING

Soils of light medium texture with high organic matter content are most suitable. Lighter textured soils require fewer operations for adequate land preparation. Best results on any soil type can only be achieved by cultivating at the correct soil moisture content.

If conditions are just right, ploughing followed by two disc harrowings (1-2 months apart)

Forming large ridges using a disc ridger

would be enough preparation before ridging. Heavier soils will require use of spring tines or a rotary hoe before ridging. Some producers use the rotary hoe after ridging to break up clods in the top 5-10 cm of the ridge. This shallow hoeing produces a ridge into which it is very easy to plant.

We have found the use of large ridges (35 cm high with 170 cm centres) to be quite satisfactory for double row planting. With 55 cm between rows on each ridge and single cuttings placed 35 cm apart along the row we have a plant population of about 36 000 plants/ha. Planting material can be either 30 cm tip cuttings from existing fields or 25 cm sprouts from beds of selected roots. Overall it is much quicker to plant sprouts.

Planting sweet potato using a semi-mechanical planter

Semi-mechanised planting using an ordinary vegetable or tobacco transplanter is quite fast and successful. Cuttings for use in the transplanter should be picked 24 hours before planting to allow easier handling.

Fertilizer attachments for transplanters are available though we have not tried any yet. At present we apply the fertilizer by hand to the top of the ridge.

WEED CONTROL

It is important that the sweet potato crop is kept weed free. If this is not done the weed roots will 'mat' the soil and make separation of roots and soil difficult for the mechanical digger.

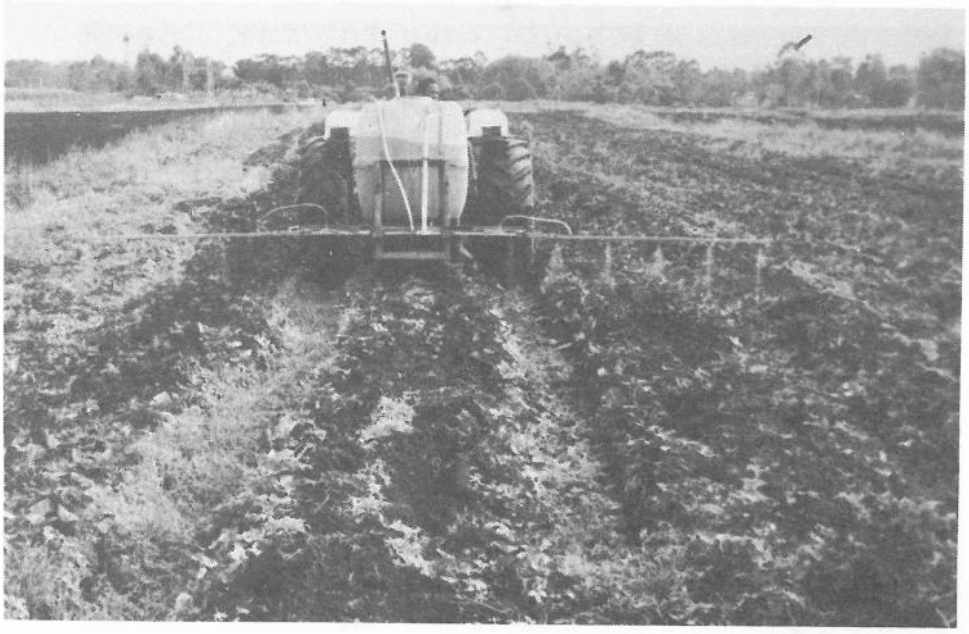
The main weed problem is soft annual weeds. All the perennial weeds should be controlled before or during land preparation. The very young annual weeds are controlled by a low rate of paraquat applied using a boom sprayer. Using a boom sprayer is faster than using knapsacks. Another advantage is that it is easier to achieve accurate application. Hence there is less risk of damaging the crop.

Depending on rainfall and weed population, the boom sprayer would be used once about 3-5 weeks after planting. After this, the running of vines between rows would prevent any further use of the boom sprayer The actual damage due to the tractor in this situation has not been assessed.

Overseas, some weed control is achieved by ridging in the early stages. This is not suitable with the system we use in the Western Highlands. However, it could be tried in areas with light soils which require extra ridging to maintain a large ridge after planting.

HARVESTING

There are two stages in mechanical harvesting. These are first, the removal of the vines, and second, digging out the tubers. All mechanical diggers



Weed control using a boom sprayer

A forage harvester is used to remove the vines before harvesting

Harvesting a sweet potato crop using a mechanical digger

require removal of the sweet potato vines before harvesting. At present we are using a flail type forage harvester (see photograph) which chops up the tops and distributes them over the field. The side benefits of the forage harvester are:

- faster decomposition (rotting) of vines.
- less regrowth and therefore fewer weed problems in the next crop.

Several types of mechanical diggers are used. The cheapest type is basically an adapted single furrow skeleton mold-board plough. This will give an acceptable though incomplete result on light soils.

Heavier soils require the more effective potato digger with revolving elevator chains. When operated correctly the damage caused by these diggers is comparable if not less than that caused by hand digging.

At Highlands Agricultural College, sweet potato correctly sorted and put into crates in the field is used over the next seven days. Very little of the crop is too damaged to use. With proper handling this mechanically dug sweet potato should last for much longer than one week. A big advantage of the potato digger is the completeness of the harvest. This reduces the regrowth weed problems in following crops.

CONCLUDING REMARKS

The contents of this article are the result of practical experience over several years at Highlands Agricultural College, Kuk Agricultural Research Station and several private growers. We invite comments from people with similar experience.

ACKNOWLEDGEMENTS

We acknowledge the contribution to this work by past and present staff of the Highlands Agricultural College and Kuk Agricultural Research Station.

FURTHER READING

Rural Development Series Handbook, No. 14 (1979). *Know your Farm Machinery*. D.P.I., Konedobu.

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