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CARIBBEAN FOOD CROPS SOCIETY

PROCEEDINGS



**ELEVENTH ANNUAL
MEETING**

**ATTEMPTS AT MECHANICAL HARVESTING OF ROOT CROPS
IN BARBADOS**

by

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SUMMARY

A locally constructed harvesting aid and an imported digger-elevator were used for harvesting Sweet Potatoes. The harvesting aid was also used in yams and work so far indicates a saving in harvesting costs of up to \$48.00 per acre. So far, the mechanical diggers have not damaged more tubers than hand digging methods. Further work is planned.

ATTEMPTS AT MECHANICAL HARVESTING OF ROOT CROPS IN BARBADOS

Traditionally, harvesting of root crops in Barbados has been carried out by hand labour. In the case of potatoes one individual has been able to unearth the tuber using a normal garden fork. However, in the case of yams which go somewhat deeper, two individuals are often required. One of these digs and undermines the yam with the fork, while the other pulls on the vines and helps to lift the yam free from the soil. In either case the job is cumbersome, it requires tremendous physical effort, is very time consuming and is also labour intensive. Superimposed on these short comings is the rapidly increasing labour shortage with which agriculture is faced.

In an effort to offset some of the above difficulties investigations into partial mechanical harvesting methods have been made. To date a locally constructed harvesting aid and a power-operated elevator digger which was imported from England have been tried.

THE LOCALLY CONSTRUCTED HARVESTING AID

Background Information

The first harvesting aid was built in Bridgetown in October 1970 by Jim Suttie, Technical Engineer attached to the British Development Division, and shipped to St. Vincent for use in arrowroot. It consisted of a trailing V-blade (with separating rods at the rear.) which was welded to the points of two subsoiler units mounted on an MF 100 tool carrier. In St. Vincent it was used as a first stage implement for under-cutting and loosening the arrowroot. Here it did a satisfactory job until its use was superceded by the Johnson elevator digger which is currently being used. In St. Vincent, the subsoiler blade was also used with some measure of success for lifting bunch-type peanuts.

Following the work in St. Vincent, the Ministry of Agriculture in Barbados in November 1971, procured a Ransomes C83 tool carrier,

with two sub-soiler units, which was modified with the aim of assisting the land harvesting of yams.

The modifications consisted of placing the units 102 cm (40") apart, and joining them by a straight blade, 102 cm (40") x 20.3 cm (8") made of 1 cm (3/8") thick steel. On the trailing edge of blade five (5) 2.5 cm (1") diameter rods were welded 16.5 cm (6½") apart and protruding 38.1 (15") to assist in separation of soil from the tubers.

The blade was subsequently used in carrots, yams and sweet potatoes.

Harvesting of Carrots

With carrots the blade has worked well. The carrots were topped using a rotary slasher before using the blade for under cutting and loosening the tubers. It was later found however, that the carrots could be better handled and bundled with the tops intact. Topping prior to loosening was therefore abandoned.

Harvesting of Yams

The blade was first tried (in January 1972) in yams which had all the vines intact. Though some measure of success in undercutting and loosening was achieved, the whole operation was marred by constant fouling of the implement and tractor by the vines. This led to the decision to do a harvesting trial in yams which had the vines removed prior to digging. The vines were cut off manually leaving about 20.3 cm (8") to serve as a marker. In these vine-free yams lifting and loosening were satisfactory. However, separation of the soil and tubers on the separating rods at the back of the blade left much to be desired. The yams therefore tended to be reburied in soil after dropping on to the ground.

This year, in an effort to improve separation of the soil from the tubers, the five rigid 2.54 cm (1") diameter separating rods on the

trailing edge of the blade were replaced by five lengths of old, flat car springs. The idea here was to introduce some degree of vibration as the yams and soil travelled over the springs and so achieve more efficient separation.

Where lifting was done in very dry, light soil, separation was definitely improved. However, where the soil was heavy and contained moisture, it tended to adhere to the flat surface of the springs. This resulted in a build up of soil on the front of the springs producing a bulldozing effect.

An interesting observation was that when used in yams, the originally straight blade gradually developed a gentle curve in its centre. When this first happened it was thought necessary to have a stronger blade, so the bent blade was replaced by another straight blade made of 1.27 cm (1") rather than 0.95 cm (3/8") thick steel. Like the first blade this second blade also bent in its centre. It was later found however that in yams the bent blade worked better than the straight blade.

Harvesting of Sweet Potatoes

As far as sweet potatoes are concerned, the story was much the same as that for yams. One noticeable difference however was the relative ease with which the blade undermined and lifted the potatoes. This could probably be attributed to the shallower depth of rooting of the crop. With potatoes separation of the soil from the tubers remained a major problem.

The Johnson Elevator Digger

In October of last year, in an effort to get around the soil separation problem, it was decided to purchase a Johnson elevator digger for use in yams in January of this year. The implement however did not arrive in the island until late March, by which time no yams were available for harvesting trials. So far therefore it has only been used in sweet potatoes.

The implement is a power-operated digger similar to that used in arrowroot in St. Vincent. It carries an undercutting blade and shaker chains that elevate the tubers and sift out most of the soil, dropping the tubers and remaining debris (i.e. vines, clods, occasional stones etc.) from the rear of the conveyor on to the ground. The tubers are then picked up by hand and bagged. The cutting blade is operated just below the tuber zone and delivers the tubers on to the rod-chain type conveyor. The elevator chain is agitated by oval-shaped idler sprockets.

The machine was originally tried in potatoes which had all the top growth intact. The longer vines however tended to choke the elevator, so that manual slashing of the vines prior to digging and lifting the tubers had to be done. Some 450 kilos (1000 lbs.) of potatoes were dug with the machine in less than half an hour. Separation of soil from the tubers was very good as the soil moisture content was minimal at the time. The undermining and lifting of the tubers by the machine was also very good. A check behind the machine revealed that less than five per cent of the tubers were left in the ground.

Mechanical damage of the tubers has been estimated to be in the region of four to six per cent. Most of this damage has been due to cutting of some of the tubers by the pair of coulton disks at the front of the implement. However complete removal of the disks, along with the use of narrower ridges for planting, should lead to less incidence of tuber damage.

CONCLUSION

So far no statistically tested trials have been carried out using either the subsoiler blade or the Johnson elevator digger. However, preliminary work in yams with the blade indicates a saving of three cents/hole, in comparison to hand digger and loosening. With yams planted on ridges 168 cm (5ft. 6") wide, and spaced at 152 cms (5ft.) within the row, this represents a saving of approximately \$48.00 per acre.

Effective mechanical digging and lifting of yams and sweet potatoes can only be achieved if the vegetative growth of the crops is removed prior to digging.

Mechanical harvesting of yams and sweet potatoes could be better handled with the existing machinery, if pure stands of the crops were planted on considerably smaller ridges than the 168 cm (5ft. 6") ridges presently in use.

Pure stands of the crops are also essential as neither the subsoiler blade nor the Johnson elevator digger works well in a mixed stand.

FURTHER WORK

Further work with both the blade and the Johnson digger has been planned for next year's crop.