# COMPARISON OF SINGLE AND PROGRESSIVE HARVESTING OF SWEET POTATO (*IPOMOEA BATATAS* (L) LAM.)

C.J. Rose*

## ABSTRACT

*Components of sweet potato yield were compared under single harvest and progressive harvest systems using two varieties. The crop was harvested at six months under the single harvest system. With progressive harvesting, large tubers were lifted at six months and the crop was completely harvested at nine months after planting.*

*For one variety, total tuber yield was significantly greater from progessive harvesting, but bulking rate was not significantly different for either variety. Progressive harvesting significantly increased the yield of pig tubers (those less than 100 g in weight), and the proportion of pig tubers in the total harvest also appeared to increase, although this was not significant. Top growth production was not affected by the harvest system.*

## INTRODUCTION

The practice of progressively harvesting the sweet potato crop is common among subsistence farmers (Mac Donald 1963). This technique of *mumutim* as it is termed in Neo-Melanesian, is widespread throughout the Highlands of Papua New Guinea. Mature tubers are hand dug for human consumption leaving smaller tubers undisturbed. When these later maturing tubers are big enough, they will be harvested in the same manner. Small tubers that are not so acceptable for human consumption are fed to pigs after the larger tubers have been taken and when top growth is becoming more mature. Subsequently, any remaining tubers will be eaten by foraging pigs when the land is prepared for the next crop. This small-size tuber component is important in the diet of village pigs.

Once harvested, the sweet potato tuber deteriorates very quickly (Gooding ,and Campbell 1964) and therefore progressive harvesting is a useful storage method and ensures a supply of fresh tubers (Kimber 1972). Some crops have been reported as being harvested over three years (Jamieson 1968), but in the Tari area where this experiment was carried out crops are harvested three or four times over a period of only eight months to a year. After nine months, the tubers are more liable to rot; this being influenced by variety, soil drainage and rainfall.

Since the sweet potato crop is the staple of both the human and pig populations in the Highlands, this trial was designed to assess by tuber size the amount of crop available for human and pig consumption under single and progressive harvest systems. A sweet potato crop was completely harvested at six months after planting and compared with another where only tubers over 100 g weight were harvested at six months and a complete harvest followed at nine months.

## EXPERIMENTAL METHODS

The trial was carried out at Piwa Agricultural Station near Tari in the Southern Highlands Province (1,620 m a.s.l.; 2,693 mm mean annual rainfall). The soil was free-draining, re-worked volcanic ash and had been left fallow for three months following two years of

* Rural Development Officer, Piwa Agricultural Station, Department of Primary Industry, Tari, Southern Highlands Province, Papua New Guinea.

*Table 1.* — Tuber and top growth yield from single and progressive harvests of two varieties of sweet potato

| VARIETY | HABARE | | MAME | |
|---|---|---|---|---|
| TREATMENT | Single Harvest | Progressive Harvest | Single Harvest | Progressive Harvest |
| TOTAL TUBERS | | | | |
| Yield (t/ha) | 10.7 | 16.2* | 12.0 | 15.9 |
| BULKING RATE (g/week/m²) | 40.9 | 40.6 | 45.5 | 40.0 |
| MARKETABLE TUBERS | | | | |
| Yield (t/ha) 1st harvest | 9.9 | 8.3 | 10.8 | 8.8 |
| Yield (t/ha) 2nd harvest | — | 5.0 | — | 4.0 |
| Bulking rate (g/week/m²) | 37.9 | 33.6 | 40.9 | 32.2 |
| PIG TUBERS | | | | |
| Yield (t/ha) | 0.8 | 2.8** | 1.2 | 3.1** |
| Bulking rate (g/week/m²) | 3.2 | 6.9** | 4.5 | 7.7** |
| % pig tubers of total weight | 9.8 | 15.6 | 10.9 | 16.0 |
| LEAF AND VINES (t/ha) | 20.6 | 20.1 | 11.0 | 9.4 |

** and * indicate a significant difference between treatments for each parameter within a variety at $P < 0.01$ and 0.05 respectively.

*Table 2.* — Mean tuber number per 25 m² and individual tuber weight (g) from single and progressive harvests of two varieties of sweet potato

| VARIETIES | HABARE | | | | MAME | | | |
|---|---|---|---|---|---|---|---|---|
| TREATMENT | Single | | Progressive | | Single | | Progressive | |
| No. and Wt. | No. | Wt. g | No. | Wt. g | No. | Wt. g | No. | Wt. g |
| MARKETABLE TUBERS | 115 | 213 | 140 | 235 | 170 | 152 | 178 | 199* |
| PIG TUBERS | 74 | 28 | 100 | 71*** | 107 | 27 | 158* | 49* |

*, **, and *** indiciate a significant difference between treatments of number and weight of tubers within each variety where $P < 0.05$, 0.01 and 0.001 respectively.

continuous cropping with sweet potato. It was rotary cultivated and spade mounded in preparation for planting.

Sixteen mounds each utilizing soil from 6.25 $m^2$ of ground were incorporated into a 100 $m^2$ block. Four mounds were randomly allocated to each of the four treatments. The treatments were a single harvest at six months and a twice harvested crop at six and nine months for each of two varieties. The two varieties used were Habare and Mame. Blocks were replicated seven times.

Disease-free planting material was collected from other plots on the station and used immediately. Apical cuttings of 40 cm in length with an average number of four nodes were planted in bunches of three at ten locations on each mound (equivalent to 48,000 cuttings per ha). The practices of the Huli people of Tari of planting the sweet potato cuttings at about thirty degrees to the horizontal and of bending (Kimber 1972) were used in this experiment.

The crop was weeded on the 46th, 99th and 153rd days after planting. Mounds that had been marked for a single harvesting were dug on the 184th day after planting. The tubers were separated into marketable (over 100 g weight) or pig (under 100 g weight) tubers, counted and weighed. Other mounds that had been marked for a second harvest were dug into at the base and then lifted up so that most of the tubers over 100 g weight were collected without disturbing the rest of the plant. The second harvest was taken 279 days after planting. Tuber classes were again separated, counted and weighed. Weight of leaf and vine was recorded at both harvests.

## RESULTS

Total tuber yield was significantly greater from progressive harvesting than from the single harvest for variety Habare, but there was little difference in growth rate (expressed as bulking rate), *(Table 1)*. An apparent trend, although not significant, was that marketable tubers harvested in the progressive treatment actually yielded less than those from the single harvest and this was the same for the bulking rate of marketable tubers. Pig tuber yield and bulking rate increased significantly in both varieties from progressive harvesting. Pig tubers appeared to constitute a greater proportion of total tubers in the progressive harvest, although this was not significant. Yield of leaf and vine was not affected by the treatments.

Mean tuber weight of marketable tubers of variety Mame, but not of variety Habare, was significantly greater in the progressively harvested treatment *(Table 2)*. However, the mean tuber weight of the pig tubers of both varieties was significantly greater in the progressively harvested treatment. The number of pig tubers of variety Mame increased significantly in the progressively harvested treatment.

## DISCUSSION

The removal of the larger tubers by progressively harvesting effectively removes a carbohydrate 'sink', so that although small tubers get bigger and have a higher bulking rate than in a once-harvested crop, they don't attain the larger marketable size. The method of progressive harvesting is however an important practice for increasing the yield of that portion of the crop suitable for feeding to pigs.

### ACKNOWLEDGEMENTS

My thanks to Allan Kimber and Michael Bourke for commenting on the script. Sinake Ninyu and Andrew Agasakwili helped with some technical aspects of the trial.

### REFERENCES

GOODING, H.J. and CAMPBELL, J.S. (1964). The improvement of sweet potato storage by cultural and chemical means. *Empire Journal of Experimental Agriculture*, 32:64-75.

JAMIESON, G.I. (1968). Observations on times of

maturity of sweet potato *(Ipomoea batatas)* (Lam.). *Papua New Guinea Agricultural Journal*, 20:15-24.

KIMBER, A.J. (1970). Some cultivation techniques affecting yield response in sweet potato. Tropical Root and Tuber Crops Tomorrow. *Proceedings of the Second International Symposium of tropical root and tuber crops*, 1:32-36.

KIMBER, A.J. (1972). The sweet potato in subsistence agriculture. *Papua New Guinea Agricultural Journal*, 23:80-95.

MACDONALD, A.S. (1963). Sweet potatoes with particular reference to the tropics. *Field Crop Abstracts*, 16:219-225.

(Accepted for publication August, 1979.)