A STUDY OF VARIOUS PLANTING METHODS ON TUBER YIELD OF SWEET POTATOES (*Ipomoea batatas* Poiret) IN PAPUA NEW GUINEA

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ABSTRACT

Traditional method of land preparation and planting of sweet potato in PNG was compared with a typical method used in Taiwan and the other Asian countries. The results were analysed to determine the performance of various techniques used within the two methods. The results of the trial are discussed and specific points of interests are highlighted. Recommendations are drawn from this to apply on the mission's extension farms in PNG and also as broad recommendations for traditional sweet potato growers in PNG.

INTRODUCTION

Sweet potato (kaukau) is one of the main staple food crops in PNG. The crop is widely grown throughout this country as an alternative subsistence and self-sufficiency staple crop. The gardens in which sweet potatoes are grown employ traditional methods of cultivation and are relatively small, basically to meet the needs of the gardener. Large scale modern farming with the use of mechanised technology is uncommon. Traditional method used by PNG farmers is basically a pile of soil mound up into a cone shape with bunches of sweet potato vines or creep planted at the peak of the mound. In using this method the farmer is less concerned about yield per unit area. This method differs from those used in many Asian countries where machinery is used to make ridges upon which single creep is planted at about 30 cm spacing between plantings. The ridges are normally 1.1 meter apart.

This study thus compares various planting methods on tuber yields. The best method is selected for recommendations to extension farmers of the R.O.C. mission.

MATERIALS AND METHOD

Experiment Location: R.O.C. Model farm at Bubia, Lae, Morobe Province.

Variety: Laloki 15 - The best local variety in PNG.

Date of Planting: October 27th, 1994.

Rate of Fertilizer application:

N	:	P_2O_5	:	K_2O
40	:	40	:	120

Kg/ha Twice one basal, the other 4 weeks later.

Experimental Design: Complete by Randomised Block Design (CRBD).
Three rows/block with one row at 15 m.
Block : 50 m
Replication: 4

Treatments: The following treatments were given with treatment A as control and data recorded for statistical analysis:

The figures in the following page show the results of the treatments corresponding to the descriptions given below.

(A) Mound - Three creeps planted as a bunch and hooked at the base.

(B) Mound - Single creep planted and hooked at the base.

(C) Ridge - Single creep planted vertically on the ridge.

(D) Ridge - Single creep planted at a slant on the ridge.

(E) Ridge - Three creeps planted as a bunch and hooked at the base

Plant Population:

(a) Ridges (Single)

i Between plants - 30 cm
ii Between ridges - 1.1 m
iii Population per ha - 30,303

As in A & B treatments.

(b) Mound

i Between plants - 90 cm
ii Between rows of hills - 1.1 m
iii Population per ha - 10,100

As in A & B treatments.

(c) Ridges (Single)

i Between plants - 60 cm
ii Between ridges - 1.1 m
iii Population per ha - 15,151

As in E treatment.

Management:

Typical management practices as employed in Taiwan in weed and pests control especially in the early stages of sweet potato development. Apart from the use of chemicals in the weeds and pest control there is little difference between the Taiwanese and PNG management practices for sweet potato.

Harvest Observation:

Each block was harvested and the tubers were counted and weighed for data to be used in the analysis.

RESULTS AND DISCUSSIONS

Effect on the Tuber Numbers: Table 1 shows that the various planting methods had large effects on tuber number. Treatment employing the use of ridges as in treatments C, D & E, was better than the traditional method of piling a mound as in treatments A & B. The number of tubers obtained in the ridge method was 40-50% more than the tubers obtained under the traditional mound method. The results indicate a significant difference of 1% between these two methods.

However, even within the ridge method there was some variation in the results obtained. Single creep planted on ridge at a slant (Treatment D) gave slightly higher number of tubers as compared to treatment C (Single creep planted vertically), but there was no significant difference between the two treatments. Treatment E, with three creeps planted on ridge with hooked base gave the poorest result of the three treatments under ridge method. The results shows a significant difference (>1%) from treatments C and D.

Within the traditional mound method, the results obtained show that in the single creep planted at a slant (Treatment B), the tuber number was slightly more than in the three creeps planted as a bunch with hooked base (Treatment A) but the difference between these two was about 4%, showing no significant difference.

Effect on the Tuber Weight: The result of the various planting methods on the tuber yield is shown in Table 1. The trend of the tuber yield (weight in kilogram) was similar to that of the tuber number analysis. The ridging methods of sweet potato cultivation as in treatments C, D & E produced higher total tuber weights than those employing the traditional mound method as in treatments A &

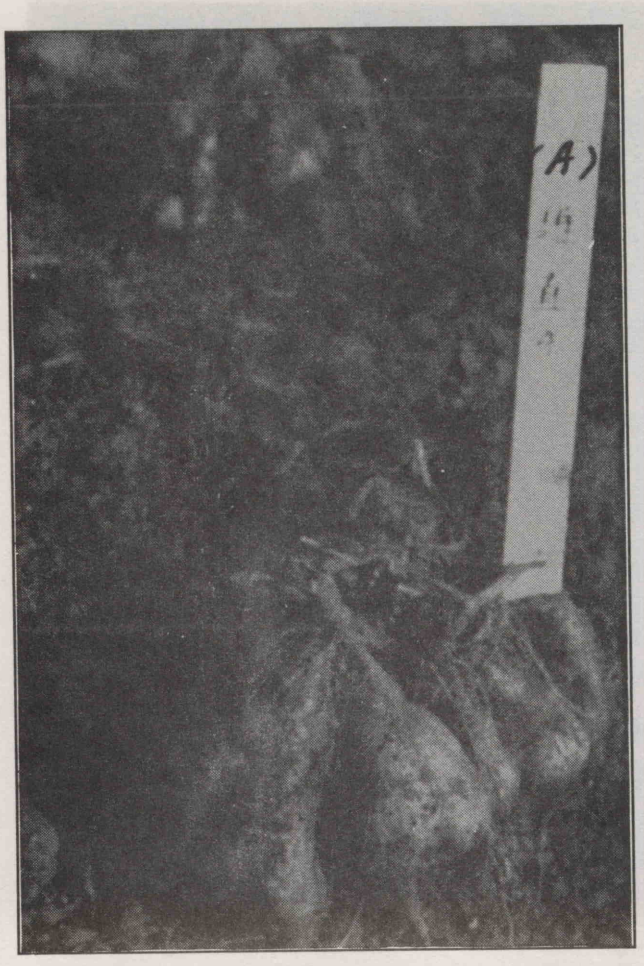

Figure 1.

Figure 2.

Figure 3.

Figure 1.
Result of treatment A, Sweet potato after harvest.

Figure 2.
Result of treatment B, Sweet potato after harvest.

Figure 3.
Result of treatment C, Sweet potato after harvest.

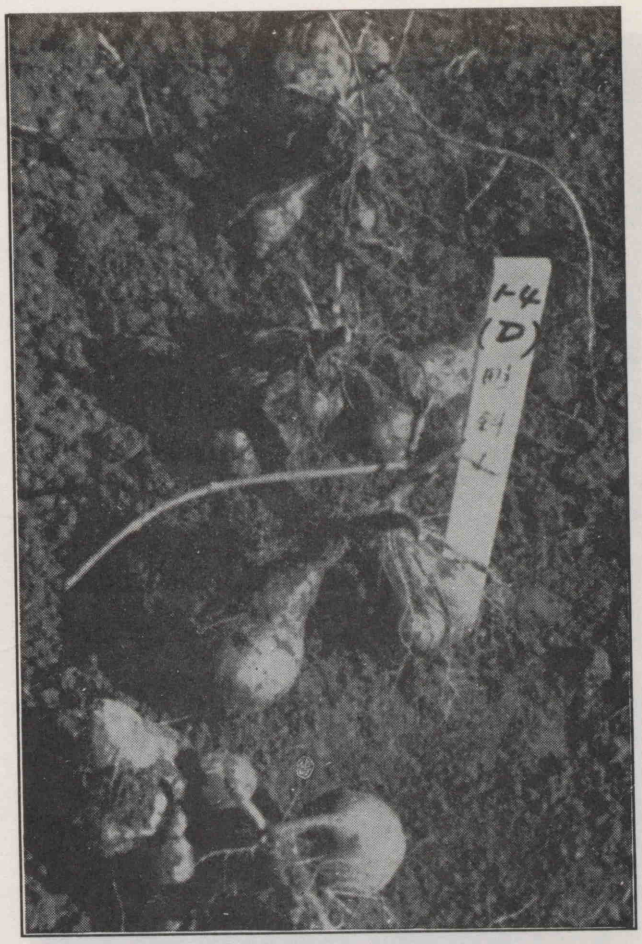

Figure 4.

Result of treatment D, Sweet potato after harvest.

Figure 5.

Result of treatment E, Sweet potato after harvest.

Table 1. RESULTS OF EXPERIMENT - Sweet Potato Planting Method Trial

TREATMENT	Plant Dens/ha	No.Tubers Yielded Tubers/ha	Ratio	Tuber Yield Kg/ha	Ratio	No.of Tubers per hole	Tuber Weight kg/hole	Average Weight(kg) PerTuber
A	9000	57200 *a*	100	20035 *a*	100	6.4	2.23	0.35
B	9000	59200 *a*	104	21875 *a*	109	6.6	2.43	0.37
C	29400	81700 *b*	143	24125 *b*	120	2.8	0.82	0.3
D	29400	87700 *c*	153	26575 *c*	133	3.0	0.9	0.3
E	15000	78650 *b*	138	23665 *b*	118	5.2	1.58	0.3

Figures followed by same letters are not significant at % level, according to Duncan's test.

B. The difference between the two methods was significant at 1%.

The best result obtained for the ridge method was from a single creep planted at a slant (Treatment D). The yield was higher than the traditional method (Treatment A) by 33%. Single creep planted vertically on ridge (Treatment C) was the second best. Results obtained in treatment C was higher than treatment A by 20%. Three creeps planted as a bunch with hooked base on ridge (Treatment E) gave the lowest yield among the three ridge methods, but still higher than treatment A by 18%. Treatments C & E show no significant difference.

The results obtained for the mound method show that the single creep planted at a slant on a mound (Treatment B) was slightly better than the traditional method of three creeps planted as a bunch with hooked base on a hill (Treatment A) by 90%. The difference between treatments A and B however, was not significant.

Based on the above results, it is shown that, the method employing the ridge method is better than to make a mound as reflected in both by tuber numbers and tuber weight per unit area of cultivation. It seems from this observations that planting density in the former (ridging) is three times higher than the latter (mounds).

In contrast, the tuber number and tuber size in each hole planted shows that the traditional method is better than the ridge method. This result may perhaps be due to the lesser planting density thus permitting better nutrient uptake per plant and also better aeration. In comparing three creeps and single creep plantings, it appears that the single creep planting is better than the three creeps planted as a bunch in both ridge and mound methods. The results obtained as tuber yields per unit area showed that, the two cultivation methods had marked differences. Results from planting using three creeps in bunches performed poorer than plantings of single creep. Also tuber number yield and tuber size per hole, the results show that single creep planted on a mound with hooked base is the best method (Treatment B).

The traditional method using more than three creeps planted as a bunch on a mound gives a better result in terms of tuber size, tuber number and yield per hole when compared to the other planting methods. The planting density per unit area is only one third of that under the ridging method. Therefore, the total yield per unit area is 30% less than the ridging method.

In relation to the present rural PNG farming methods and a scenario of small subsistence farmer slowly going into semi commercial, what should be the right method to adopt? Due consideration should be given also to sizes of local consumer markets and their product preferences. Generally also the average rural farmer lacks capital to acquire basic farm machinery for land preparation, and he still resorts to basic hand tools.

The ridging method at this point in time is not an appropriate method for many who still are contended with the "mound" method or the traditional way. The farmer employs this method with no real concern for yield per unit area. He had accepted the fact that the mound method gives him bigger size tubers per hole and more yield per hole. The PNG farmer's prime objective is for subsistence production and selling whatever excess left after home consumption. The traditional method is thus more appropriate in meeting this requirement.

According to the experimental results, single creep is better than three creeps planted as a bunch. For a large scale farming, single creep planting can save the number of sweet potato creeps to be planted and also obtaining higher yield per unit area. This method can be recommended for large scale production.

SUMMARY AND CONCLUSIONS

The objective of this experiment was to compare the traditional methods of sweet potato planting in PNG with methods used in other countries. The results were analysed and the promising planting technique is recommended for release to farmers. The results obtained from these experiments are as follows:

1. The total tuber yield obtained per unit area was higher by using the method of planting on ridges than on a pile of soil (mound).

2. The tuber size and yield per hill was higher using the traditional mound method than planting on ridge.

3. No matter whether the mound or ridge planting method was used, the use of single creep planting was better than multiple creep or bunch planting.

4. Single creep planting on ridge at a slant was better than single creep planted also on ridge but at a verticle angle. This method was also better than the traditional three creep planting on ridge, hooked at the base.

5. Within the PNG traditional method, planting single creep at a slant on mound was slightly better than planting three creep with hooked base on mound.

6. In short, the traditional method of sweet potato cultivation usually uses three creeps planted on mound with hook base and the tuber is bigger and yield per mound is higher than other methods. However, over a given area the mound method gives a smaller planting density, and thus the total yield on the whole is lower by about 30%. This traditional method can be used only where emphasis is on the size of tuber rather than yield per unit area. This method is suited mainly where machinery is not used to make ridges and also is suitable for small subsistence gardeners.