SWEET POTATO CAN BE GROWN UNDER SHADE BUT THE YIELD IS REDUCED

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INTRODUCTION

Sweet potato is the most important staple food crop in Papua New Guinea (PNG). It is increasing in importance in some lowland areas, especially where taro is severely affected by pests and diseases, and where the soil fertility is not adequate to obtain good yields of yams, taro or bananas.

On the Gazelle Peninsula of East New Britain Province there are large areas of old coconuts which produce low yields. Janet Cundell and her co-workers conducted a survey in 1988 to see if these and other low productivity areas had potential for agroforestry systems. They found that people were reluctant to cut down the old coconuts because the palms still provided useful products including copra for cash, husks for fuel, green coconuts for drinking, mature coconuts for cooking, and fronds for baskets. Planting cocoa under coconuts has been popular for cash cropping in the Gazelle area. However the world price for cocoa has dropped sharply since 1988, and this may affect the motivation of farmers to plant new cocoa in future. Many cash crop farmers in East New Britain now grow very little food, insufficient for their families' needs. One possible use for old coconut blocks is to intercrop the coconuts with food crops. This can be successful where the coconuts are widely spaced and sufficient light reaches the ground through the coconut canopy. It allows the farmer to be more self-sufficient, and he does not need to use so much of his cash income for purchasing imported foods.

One food crop known to grow well under shady conditions is kongkong taro (Chinese taro), but it is relatively slow to mature. At Vudal Agricultural College an experiment was conducted to see if sweet potato could be successfully grown under shade.

METHODS

Seven sweet potato cultivars were selected for the experiment. Four were cultivars which had been grown locally for some years; namely 'Kekori', 'Wanmun large', 'K9' and 'K131'. The other three were promising cultivars from other parts of PNG, named 'L11', 'L131' and 'Wanmun-Murua 1'. All the cultivars were grown on plots shaded by 50 percent sarlon shadecloth and on plots exposed to full sunlight. Four plots (replicates) of each cultivar and shade treatment were used. Each plot contained 24 single 25 cm terminal cuttings planted at a spacing of 25 cm on ridges which were 1 m apart. The experiment was planted on 15 April 1989 and harvested between 19 and 26 August 1989. Thus the crop was just over four months old at harvest. The planting site had been cropped with sweet potato in 1984 and then left to a grass fallow for four years.

At harvest, the number of surviving plants in each plot was counted. The vines were cut and weighed, and the tubers were dug by hand. The tubers were graded into marketable (over 100 g) and unmarketable (under 100 g). The number of tubers and their total weight were recorded for each grade on each plot.

RESULTS AND DISCUSSION

Mean values for plant survival (%), total yield (kg/sq. m), percentage of total yield that was marketable, number of tubers per plant, marketable tuber weight (g), and vine weight (kg/sq. m) are given in Table 1, for the seven sweet potato cultivars and two shade treatments. The percentage decrease (-) or increase (+) due to shading is also shown.

Shading had a marked effect on total yield. For the seven cultivars, yield was reduced by an average of 76 percent. However for three of the higher yielding cultivars ('Kekori', 'L11' and 'Wanmum large') the yield reduction was only 63-66 percent, whereas the yield reduction for the other four cultivars was in the range 78 to 100 percent. The three cultivars which had the least total yield reduction also had the least reduction in the number of tubers per plant (13-56 percent). Thus cultivars differ markedly in their shade tolerance, for tuber production. The ability of a cultivar to yield under shade appears to be closely related to its ability to yield in full sunlight (i.e. its overall adaptability to the environment), and to its ability to initiate tubers under shade. Overall, 57 percent of the yield reduction under shade was due to a reduction in the number of tubers per plant. The reduction in the percentage of yield that was marketable was only 32 percent.

The results for vine fresh weight at harvest showed that shading has very little overall effect on vine growth, compared to its effect on tuber production. Thus sweet potato may appear to grow well under shade even though the tuber yield is reduced. Similarly, shading had only a small effect on plant survival, and this is not likely to contribute to the cause of the yield reduction.

Studies of sweet potato grown under shade in the West Indies by L.B. Roberts-Nkrumah and his co-workers showed that sweet potato yield was only slightly affected by 20 percent shade; it was moderately affected by 55 percent shade, and severely affected by 80 percent shade. This provides a useful guide when selecting sites for growing sweet potato under shade.

CONCLUSIONS

1.Under certain conditions sweet potato can be successfully grown under shade.

2.When selecting shady sites for sweet potato planting, sites should be chosen that have an overall light reduction of less than 50 percent compared to full sunlight. (Ideally the site should have a light intensity of at least 75 percent of full sunlight).

3.When selecting cultivars to plant on shady sites, cultivars which are well adapted to the local environment (i.e. they produce high yields in full sunlight) and produce a large number of tubers per plant should be planted.

4.By following points 2 and 3 above, and by applying fertiliser according to the local soil fertility conditions, good yields of sweet potato can be obtained beneath open canopy stands of old coconut palms.

FURTHER READING

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Table 1. Plant survival (%), total yield (kg/sq. m), percentage of total yield that is marketable, number of tubers per plant, mean marketable tuber weight (g), and vine fresh weight at harvest (kg/sq. m) for seven sweet potato cultivars grown in full sunlight and under 50 percent shadecloth at Vudal Agricultural College. (Data are means of four replicates).

Cultivar	Plant survival %	Total yield kg/sq. m	Percentage marketable yield (1)	No. tubers per plant	Mean marketable tuber wt. g	Vine fresh wt. kg/sq. m
Full Sunlight						
Kekori	100	0.82	58	1.06	257	2.33
L11	100	0.68	68	1.09	249	3.33
K130	89	0.52	43	1.34	196	2.29
Wanmun large	99	0.47	62	1.33	204	2.00
K9	100	0.45	67	0.82	227	2.06
Wanmun Murua 1	94	0.45	36	0.82	223	2.60
L131	83	0.35	30	1.18	179	2.42
Mean	95	0.53	52	1.09	219	2.43
50% Shadecloth						
Kekori	96	0.30	43	0.92	195	2.92
L11	100	0.23	54	0.63	182	2.85
K130	82	0.08	56	0.43	133	2.23
Wanmun large	100	0.17	17	0.59	73	2.19
K9	98	0.06	26	0.23	58	2.50
Wanmun Murua 1	87	0.00	00	0.04	0	2.33
L131	76	0.07	50	0.41	119	2.02
Mean	90	0.13	35	0.46	109	2.43
Percentage reduction (-) or increase (+) due to shading						
Kekori	- 4	- 63	- 26	- 13	- 24	+ 25
L11	0	- 66	- 21	- 42	- 27	- 14
K130	- 8	- 85	+ 30	- 68	- 32	- 3
Wanmun large	+ 1	- 64	- 73	- 56	- 64	+ 10
K9	- 2	- 87	- 61	- 72	- 74	+ 21
Wanmun Murua1	- 15	-100	- 100	- 95	-100	- 10
K131	- 8	- 80	+ 67	- 65	- 34	- 17
Mean	- 5	- 76	- 32	- 57	- 51	0

1) Percentage of total yield that is marketable (tubers that weight more than 100 g).