Uganda Journal of Agricultural Sciences, 2000, 5:13-15
ISSN 1026-0919

Towards sustainable seed production of centro in Uganda

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Abstract

A study was conducted to determine whether cassava could provide the necessary support to increase seed yields of centro (*Centrosema pubescens*). The effect of centro on cassava tuber yield and the cost of production of centro seed under three production methods, i.e. unstaked, staked and supported by cassava, were determined. Results showed that centro twining on cassava yielded more seed than the unstaked one. It was slightly but significantly ($P<0.05$) less than that of staked centro. Centro did not affect cassava tuber yield. Production costs of 1 kg of seed were Shs 1200, 2000 and 3700 for centro supported by cassava, unstaked and staked, respectively. It was concluded that centro seed could be easily and economically produced on a sustainable basis by small-scale farmers growing cassava in Uganda.

Key words: *Cassava, cropping system, net* return, seed price

Introduction

Centro (*Centrosema pubescens*) is one of the recommended forage legumes in Uganda. It is not widely used to improve native pastures due to lack of seed. Although some farmers have opportunistically produced limited quantities of seed, there is a lack of appropriate technology that could lead to self sufficiency in forage seed production on small scale farms. Centro is a twining legume of which seed yield has been improved by provision of some form of support (Ferguson 1979; Akinola & Agishi 1989). However, wooden supports are costly and often returns realised from increased seed yields do not offset the costs involved (Castillo & Siota 1978). Cassava (*Manihot esculenta*) is widely grown by small-scale farmers who produce over 90% of Uganda's agricultural output. The tuberous roots of cassava are the second most important staple food of those farmers. It is propagated by stem cuttings which develop 1-4 shoots/plant. The erect growth habits of cassava shoots could allow its stems to provide necessary support to increase seed yields of centro.
A study was therefore undertaken to determine whether a cassava centro crop system could provide both food and forage seed. Production costs/kg of seed were determined when centro was unstaked, staked or twining on cassava. The effect of centro on cassava tuber yield was also determined.

Materials and methods

The experiment was conducted at Namulonge Agricultural and Animal Production Research Institute (10° 32°N, 32° 35'E), 1150 m asl. The soils are ferralitic sandy clay loams which are low in phosphorus (4 ppm P) with a pH of 5.4-6.0. It has bimodal rainfall with a mean of 1100 mm.

Single superphosphate at a rate equivalent to 250 kg/ha was incorporated into a fine firm seedbed.

Plots measuring 6m x 6m and separated by 1 m were marked out in a complete randomised block design. Cassava was planted at a spacing of 1m x1m. A one-primary shoot system was used for cassava to minimise future shading of the legume. After 4.5 months 2-m stakes were fixed at same spacing in plots as per treatment. Two-month-old centro seedlings were then transplanted next to the cassava plants, stakes and in the unstaked plots at similar spacing. A record was made of dates of first flowering. The number of pods/seedbed was taken by counting mature green pods on 5 seedheads from each of 5 randomly selected plants. Mature brown pods were hand picked at fortnightly intervals. 20 pods/plot were randomly picked at every harvest to assess number of seeds/pod. 100-seed weight was taken at the end of harvesting. Harvesting was stopped when there was no more seed to be harvested from the unstaked and staked crops. Cassava was harvested when 14 months old and stems left upright to support the legome. Costs and returns were based on costs of labour and prices of goods at the time of the experiment.

Results

Unstaked and staked centro started flowering 5 months after transplanting while that growing with cassava flowered 7 months after transplanting. The cassava-centro crop system had consistently high seed yield parameters except total seed yield (Table 1). Unstaked centro produced 14 harvests and stopped giving any seed during the dry season. The staked crop produced 18 harvests and the cassava-centro crop system produced 15 harvests. Total cassava tuber yield was not significantly different between treatments (Table 2). Centro seed production was cheapest in the cassava-centro crop system and most expensive with the staked crop (Table 3).

Table 1. Seed yield parameters of centro under three support systems

Seed yield parameters	Unstaked Centro	Centro staked at 2m	Cassava/ Centro	SEM
No of pods/seedhead	1.9a	2.6b	4.0c	± 0.2
No. of seed/pod	12.71	15.7b	17.1c	± 0.5
100-seed wt (g)	2.59	2.8b	3.02b	± 0.1
Seed yield (kg/ha)	215a	520c	425b	± 9.2

Means in the same rows with different letters are significantly different (P<0.05)

Table 2. Cassava tuber yield (t/ha) when grown alone or with centro

Tuber yield parameter	Cassava alone	Cassava-CentroSEM	
umarketable tubers	40.0a	37.7a	± 1.9
Unmarketable tubers	3.4a	5.1a	±0.3
Total tuber yield	43.4a	42.8a	± 2.1
Total dry matter yield	19.3a	19.2a	±0.7

Means in the same rows with different letters are significantly different (P<0.05)

Table 3. Costs and returns (Shs '000)/ha of centro seed and cassava tuber production under three production methods

Item	Unstaked centro	Staked centro	Cassava/ centro	Cassava alone	SEM
Land preparations	57a	57a	57a	57a	±8.0
Planting & fertilising	38a	38a	57b	51b	±9.1
Weeding	32a	26a	32a	19b	±8.2
Construction of stakes	-	1464	-	-	NA
Centro seed harvesting	302b	338a	287b	-	±11.5
Cassava tuber harvesting	-	-	77a	26b	±10.0
Total cost	430b	1924a	510b	153a	±210.0
Gross return	1503c	3640b	4300a	1403c	±238
Net return	1073c	1717b	3786a	1250c	±135
Cost of production/kg of centro seed	2.0	3.7	1.2	-	±0.3

Means in the same row with different letters are significantly different (P<0.05)

Discussion

The later flowering of centro growing with cassava compared with the unstaked and staked crops may partly be due to shading of the legume by the cassava leaf canopy. Shade normally reduces the growth rate of tropical forage legumes (Humphreys & Riveros 1986). It is evident from Table 2 that the cassava-centro crop system produced more pods/seedheads and seed/pod. The possible explanation for this observation partly lies in the fact that cassava stems provided necessary support to centro. The cassava-centro system may also bave resulted in factors favouring high seed yield parameters. Moreover, the shading effect of the cassava leaf canopy on centro may have some beneficial effect on the legume at sometime, particularly during the dry and high irradiation periods.

Despite high seed yield parameters, the cassava-centro crop system had less total seed yield than the staked crop. This is probably due to the fact that seed picking for the trial stopped prematurely for the cassava-centro system. A higher yield would have been realised if all the seed had been harvested. Cross staking gives more seed than erect staking (Akinola &Agishi 1989). Branches of cassava simulated cross staking.

Economic analysis showed that the cassava-centro crop system gave the highest net return. Returns from the sale of cassava and centro seed contributed to this high value. Despite increased seed yields as a result of staking, cost of the stakes was very high. Low seed yield of unstaked centro and the relatively low cassava prices lowered the net returns of the other two farming systems.

Conclusion

There is great potential of producing centro seed on smallholdings in Uganda. The use of cassava to produce forage seed would be a viable and attractive proposition to farmers owing to its potential for sustainability. It requires little extra technological input and has a high net return. If adopted, such a system would not only provide forage seed but would also improve farmers' incomes. Subsequent crops might also benefit from the nitrogen fixed by legumes.

Acknowledgements

We gratefully acknowledge the financial assistance of the African Feed Resources Network and National Agricultural Research Organisation, Uganda.

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