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Economic analysis of different organic manures in sweet potato production under poplar-based agroforestry system

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ABSTRACT

Field study was conducted at the forest nursery and research center, School of Forestry and Environment, Sam Higginbottom Institute of Agriculture Technology and Sciences, Deemed University, Allahabad, UP on economic analysis of the use of different organic manures on sweet potato production under poplar based agroforestry system. The experiment was laid out in shade (under trees) condition with 7 treatments replicated thrice in randomized block design (RBD). The vine cuttings of sweet potato (20-25 cm) veriety Pusa Red were planted at 45 x 60 cm spacing. N, P_2O_5 and K_2O were applied in the form of farm yard manure (FYM), vermicompost and neem cake. The highest cost of cultivation was recorded in neem cake (Rs 72071.36) and gross return and net return (Rs 99204.00 and Rs 57299.00 respectively) in vermicompost. However benefit/cost ratio was maximum in FYM (1:1.02) under poplar trees.

Keyword: Organic manure; sweet potato; agroforestry; poplar

INTRODUCTION

Forest protection is required because of increased pace of deforestation. The main causes of deforestation in recent times have been increasing human population. Agroforestry is a land use system in which woody perennials are deliberately used on the same land management unit as agricultural crops. The cultivating trees and agricultural crops in intimate combination with one another is an ancient practice that farmers have used throughout the world. Increase in level of farm incomes is due to improved and sustained productivity (King 1968).

Poplar (*Populous deltoides*) is a fast-growing tall tree with a fairly straight and slim trunk rather open crown composed of a few large branches and attaining a height of 30 m and girth of 2 m. The branches are more or less angled or almost winged. Most of the poplar wood is used in the match and plywood industry (Chaturvedi 1993). The species is suitable

for making general purpose plywood, marine plywood and concrete shuttering plywood. It is also considered suitable for the manufacture of artificial limbs, sports goods and for structural uses as false ceiling, partition and almirah shelves etc. It has also been found suitable as line supports for overhead power and telecommunication lines. The white furniture made out of poplar wood is becoming popular in towns in Punjab (Tandon 1991).

Sweet potato (*Ipomea batata*) is a wonderful gift of nature. The sweet potato is a dicotyledonous plant that belongs to the family Convolvulaceae. Its large, starchy and sweet tuberous roots are important root vegetable (Edmond and Amerman 1971). The young leaves and shoots are sometimes eaten as green. Of the approximately 50 genera and more than 1000 species of Convolvulaceae (Abidin 2004) between 15 to 20 per cent of sweet potato harvest is converted by some Indian communities into pickles and snack chips. A part of the tuber harvest is used in India as cattle fodder.

MATERIAL and METHODS

The experiment was conducted in randomized block design having seven treatments and three replications at the School of Forestry and Environment, Sam Higginbottom Institute of Agriculture Technology and Sciences, Deemed University, Allahabad, UP which is located at 28.52^0 N latitude and 81.50^0 E longitudes 98 m above msl with favorable meteorological condition. The mean annual rainfall of the area is 1100 mm. Effect of different organic manures on sweet potato production was studied under seven year old poplar plantation growing at a distance of 9 × 3 m. The plantation consisted of 14 poplar trees G48 clones with an a average height of 13.30 m and average diameter of 0.112 m. The plantation offered partial light condition since the canopy was not fully closed due to more distance between rows of trees. The vine cuttings of sweet potato variety Pusa Red were planted at a spacing of 45 × 60 cm and given organic manure, farm yard manure (FYM) and neem cake. Crops were irrigated after planting with subsequent irrigations. N, P_2O_5 and K_2O were applied as organic manures in the form of farm yard manure (FYM), vermicompost and neem cake given as basal dressing. Weeding and hoeing were done as per requirement. The production parameters such as cost of cultivation (Rs/ha), gross return (Rs/ha), net return (Rs/ha) and benefit/cost ratio were calculated. The data was subjected to statistical analysis by ANOVA technique.

RESULTS and DISCUSSION

Table 1 depicts the variable cost and total cost of cultivation of different treatments in cultivation of sweet potato under poplar-based agroforestry system. The data in Table 2 show that the maximum cost of cultivation (Rs 72071.36) was observed in

Table 1. Variable cost and total cost of cultivation of different treatments in cultivation of sweet potato under poplar-based agroforestry system

Treatment		Unit	Qty	Rate/unit (Rs)	Cost (Rs/ha)
T_1	Seed material	kg	100.00	50.00	5000.00
	Fixed cost of crop + popular				24078.60
	Total				**29078.60**
T_2	FYM (20088.88 kg/ha)	ton	20.00	600.00	12053.33
	Seed material	kg	100.00	50.00	5000.00
	Fixed cost of crop + popular				24078.60
	Total				**41131.93**
T_3	Vermicompost (2602.22 kg/ha)	ton	2.60	5000.00	13011.10
	Seed material	kg	100.00	50.00	5000.00
	Fixed cost of crop + popular				24078.60
	Total				**42089.70**
T_4	Neem cake (50.22.22 kg/ha)	ton	5.02	8000.00	40177.76
	Seed material	kg	100.00	50.00	8000.00
	Fixed cost of crop + popular				24078.60
	Total				**72256.36**
T_5	50% FYM (10044.44 kg/ha	ton	10.04	600.00	6026.66
	50% Neem cake (2511.11 kg/ha)	ton	2.51	8000.00	20088.88
	Seed material	kg	100.00	50.00	500.00
	Fixed cost of crop + popular				24078.60
	Total				**50694.14**
T_6	50% FYM (10044.44 kg/ha	ton	10.04	600.00	6026.66
	50% Vermicompost (1301.11 kg/ha)	ton	1.30	5000.00	6505.55
	Seed material	kg	100.00	50.00	5000.00
	Fixed cost of crop + popular				24078.60
	Total				**41610.81**
T_7	50% Vermicompost (1301.11 kg/ha)	ton	1.30	5000.00	6505.55
	50% Neem cake (2511.11 kg/ha)	ton	2.51	8000.00	20088.88
	Seed material	kg			5000.00
	Fixed cost of crop + popular				24078.60
	Total				**55673.03**

Table 2. Economics of different treatments and benefit/cost ratio of cultivation of sweet potato under poplar-based agroforestry system

Treatment	Variable cost (Rs/ha)	Rental value of land (Rs/ha)	Total cost of cultivation (Rs/ha)	Gross return	Net return (Rs/ha)	Benefit/cost ratio
T_1 (control)	25893.60	3,000	28893.60	29568.00	674.40	1:1.02
T_2 (FYM)	37946.93	3,000	40946.93	93732.00	52785.07	1:2.29
T_3 (vermicompost)	38904.70	3,000	41904.70	99204.00	57299.30	1:2.37
T_4 (neem cake)	69071.36	3,000	72071.36	86076.00	14004.64	1:1.19
T_5 (50% FYM + 50% neem cake)	47509.14	3,000	50509.14	87024.00	36514.86	1:1.72
T_6 (50% FYM + 50% vermicompost)	38425.81	3,000	41425.81	88656.00	47230.19	1:2.14
T_7 (50% neem cake + 50% vermicompost)	52488.03	3,000	55488.03	82104.00	26615.97	1:1.48

T_4 (neem cake) followed by T_7 (vermicompost and neem cake) (Rs 55488.03) and the minimum (Rs 28893.60) in T_1 (control). The maximum gross return (Rs 99204.00) was noticed in T_3 (vermicompost) followed by T_2 (FYM) (Rs 88656.00) and the minimum (Rs 29568.00) in T_1 (control). The maximum net return (Rs 57299.30) was noticed in T_3 (vermicompost) followed by T_2 (FYM) (Rs 52785.07) and the minimum (Rs 674.00) in T_1 (control). The maximum benefit/cost ratio (1:1.02) was noticed in T_2 (FYM) followed by T_3 (vermicompost) (1:2.29) and the minimum (1:2.37) in T_1 (control). Thus the findings cleary suggest that agroforestry systems are always beneficial from monerty perspective than any other treeless landscape. The intercropping for the study was worked out and found that organic manure fetched more net income per hectare. The present investigations confirm the finding of Alloli et al (2011).

CONCLUSION

The present investigation suggests the possibility of cultivation of sweet potato under poplar trees. The treatment of vermicompost may be considered as an important alternative in agroforestry model with maximum net returns. Economic feasibility shows that the treatment of vermicompost resulted in maximum benefit/ cost ratio as compared to other treatments.

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