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Analysis of monetary input output in *Dalbergia sissoo* Roxb. based agroforestry system under different pruning and nutrient management

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Abstract

A field investigation was carried out at the Agroforestry Research Farm, Department of Forestry, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, in Jabalpur, Madhya Pradesh. The aim of this study was to find out the economical viable treatment during two Rabi season consecutive years of 2022-23 and 2024. An experiment was laid out in a split plot design with three replications of two systems: Pruning level (0, 25, 50 and 75% intensity) and open system (no tree only flower). Seven sub plot treatment 6 IMN (T_1 - Green manuring with dhaincha, T_2 - Green manuring +*Trichoderma*, T_3 - Enriched vermicompost @ 2th-1(VAM + *Trichoderma* + *Azospirilium*), T_4 - Vermicompost without enriched@ 2t ha-1, T_5 -Green manuring+ Enriched vermicompost @2 t-1, T_6 - Green manuring +Vermicompost without enriched @ 2 t ha-1 and T_7 control (RDF). Higher net monetary return was recorded under 75% pruning + T_5 Green manuring+ Enriched vermicompost @2 t-1 (Rs 221261/ ha) followed by open condition (Rs217720/ha), 50% pruning (Rs 209215/ ha) and 25% pruning (Rs 200932/ha) and lowest in no pruning + Green manuring with dhaincha (Rs 147150/ha).

Keywords: *D. sissoo*, agroforestry, pruning, INM, B:C ratio, gross monetary return, net monetary return

1. Introduction

Farmers all around India make more money thanks to Agroforestry. It is cultivated on land that is used for forestry or pure agriculture in Nepal and Bhutan. Numerous research conducted in Bangladesh, Myanmar, Malaysia, Pakistan, and Afghanistan in various regions of India indicate that, in tropical to sub-tropical Africa. There is scope to agroforestry is more profitable than only agriculture or enhance the economics of sissoo based agroforestry forestry (Chaturvedi, 1981; Lahiri, 1983; Mathur *et al.*, systems by judicious manipulation of canopy so that 1984; Chandra, 1986 and Patel, 1988) [1, 2, 3, 4, 5]. Pruning of the tree component is a powerful approach to regulate this competition (Frank and Eduardo, 2003) [6]. Rainfed locations are where sissoo-based agroforestry systems are most successful. From the Indus to Assam in India, the sub-Himalayan tract and outer Himalayan valley are home to *Dalbergia sissoo Roxb*., also known as sissoo. Its rapid growth, high wood value, and inherent resilience have made it a popular choice for afforestation and reforestation projects across India. Marigold (*Tagetes erecta)*, a loose flower from the Asteraceae family, is commonly used in India to make garlands for religious and social activities. It is cheap but having high medicinal value and growing it is profitable.

2. Materials and Methods

2.1 About the Experiment

A field experiment was carried out under *Dalbergia sissoo* with marigold agroforestry model and open system at Research Farm, Department of Forestry, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh. The experimental site is positioned at an elevation of 391 meters above sea level. It is situated at a latitude of 23^0 C 12' 50" north and a longitude of 79^0 C 57' 56" east in the Kymore Plateau and Satpura Hills, agroclimatic zones of Madhya Pradesh. The climate is characterized by scorching, arid summers with an average maximum temperature of 46°C and frigid, arid winters with an average minimum temperature of 4°C. Jabalpur experiences an average annual rainfall of 1350 mm. The majority of rain received during mid-June to the end of September. The remaining months, particularly from December to February, receive just 75 mm of rainfall due to the influence of westerly winds. The region is renowned for its elevated relative humidity levels, ranging from 80 to 90%, 60 to 75% and 20 to 23% during the rainy, summer and winter, respectively.

The experiment was arranged in a split- plot design, with three replications under (Agroforestry system and open system) as the main factors. Seven sub treatment where 6 INM (T_1 - Green manuring with dhaincha, T_2 - Green manuring +*Trichoderma*, T_3 - Enriched vermicompost @ 2th-1(VAM + *Trichoderma* + *Azospirilium*), T_4 - Vermicompost without enriched@ 2t ha-1, T_5 -Green manuring+ Enriched vermicompost @2 t-1, T_6 - Green manuring +Vermicompost without enriched @ 2 t ha-1 and T_7 control (RDF) were taken under study during the *Rabi* seasons in the years 2022-23 and 2023-24. The objective of study was to find out the superior economical viable in

Dalbergia sissoo with marigold under INM treatments. The economics of different treatments was worked out in terms of cost of cultivation, gross monetary return (GMR), net monetary return (NMR) and benefit: cost ratio (B:C ratio) to ascertain economic viability of treatments. The cost of cultivation for each treatment was determined on the basis of different inputs used for raising the crop under different treatments on hectare area basis. The value obtained from the produce gained under each treatment computed on the basis of existing market price of the produce. Net monetary return per hectare under each treatment was determined by subtracting the cost of cultivation of a particular treatment. To obtained the benefit obtained from different treatments for each rupee of expenditure incurred, B:C ratio of each treatment was calculated as below,

$$\text{B:C ratio} = \frac{\text{Profit (Rs ha}^{-1})}{\text{Cost of cultivation (Rs ha}^{-1})}$$

Results and Discussion

The data pertaining to different economic aspects are presented in Table 1.

Cost of cultivation

The cost of cultivation (Table 1) remains unchanged under without pruning and open condition. The pruning at 25% posses higher cost of cultivation than without but lower to 50% and 75%. However integrated nutrient also increases the cost of cultivation. The highest cost of cultivation Rs 76000/ha was recorded under P_3 T_5 closely followed by P_2 T_5 and P_1 T_5 while the lowest was RS 61800/ ha under P_0T_1 and P_4 T_1

Gross monetary return

The gross monetary return (Table 1) Rs 297621/ ha was obtained under P_3 T_5 closely followed by Rs 292520/ha under P_4 T_5 whereas the lower return of Rs 208950/ ha was obtained under P_0T_1.

Net monetary return with B:C ratio

Similarly net monetary return of Rs 221261/ha was recorded from P_3 T_5 followed by Rs 217720/ha under P_4T_5 while the treatment combination P_3 T_5 fetched B C ratio of 3.1 means treatment P_3 T_2, P_4T_1, and P_4T_2 are equally good to gave highest return per rupee investment.

Table 1: Gross monetary return (Rs ha^{-1}), Cost of cultivation (Rs ha^{-1}), Net monetary return (Rs ha^{-1}) Benefit cost ratio (BCR).

Treatment (pooled)	Total cost of cultivation (Rs/ha)	Total return (Rs/ha)			Net monetary return (Rs/ha)			B:C		
		Y1	Y2	Pooled	Y1	Y2	Pooled	Y1	Y2	Pooled
P_0T_1	61800	213300	204600	208950	151500	142800	147150	2.5	2.3	2.4
P_0T_2	63300	220500	213800	217150	157200	150500	153850	2.5	2.4	2.4
P_0T_3	73000	230580	228400	229490	157580	155400	156490	2.2	2.1	2.1
P_0T_4	70000	227340	225800	226570	157340	155800	156570	2.2	2.2	2.2
P_0T_5	74800	250380	250200	250290	175580	175400	175490	2.3	2.3	2.3
P_0T_6	71800	231300	227000	229150	159500	155200	157350	2.2	2.2	2.2
P_0T_7	67000	229680	232000	230840	162680	165000	163840	2.4	2.5	2.4
P_1T_1	62600	225615	220741	223178	163015	158141	160578	2.6	2.5	2.6
P_1T_2	64100	237113	232326	234719	173013	168226	170619	2.7	2.6	2.7
P_1T_3	73800	253195	257756	255476	179395	183956	181676	2.4	2.5	2.5
P_1T_4	70800	248962	245482	247222	178162	174682	176422	2.5	2.5	2.5
P_1T_5	75600	277549	275515	276532	201949	199915	200932	2.7	2.6	2.7
P_1T_6	72600	252291	258363	255327	179691	185763	182727	2.5	2.6	2.5
P_1T_7	67800	248581	242158	245370	180781	174358	177570	2.7	2.6	2.6
P_2T_1	62800	237193	230685	233939	174393	167885	171139	2.8	2.7	2.7
P_2T_2	64300	247050	243528	245289	182750	179228	180989	2.8	2.8	2.8
P_2T_3	74000	266298	272037	269168	192298	198037	195168	2.6	2.7	2.6
P_2T_4	71000	254006	260835	257420	183006	189835	186420	2.6	2.7	2.6
P_2T_5	75800	280778	289253	285015	204978	213453	209215	2.7	2.8	2.8
P_2T_6	72800	261795	259288	260542	188995	186488	187742	2.6	2.6	2.6
P_2T_7	68000	253519	251819	252669	185519	183819	184669	2.7	2.7	2.7
P_3T_1	63000	245820	246120	245970	182820	183120	182970	2.9	2.9	2.9
P_3T_2	64500	257881	271443	264662	193381	206943	200162	3.0	3.2	3.1
P_3T_3	74200	283130	275819	279474	208930	201619	205274	2.8	2.7	2.8
P_3T_4	71200	260515	270440	265478	189315	199240	194278	2.7	2.8	2.7
P_3T_5	76000	289902	304619	297261	213902	228619	221261	2.8	3.0	2.9
P_3T_6	73000	271622	264592	268107	198622	191592	195107	2.7	2.6	2.7
P_3T_7	68200	258725	253368	256046	190525	185168	187846	2.8	2.7	2.8
P_4T_1	61800	257220	245200	251210	195420	183400	189410	3.2	3.0	3.1
P_4T_2	63300	264420	255000	259710	201120	191700	196410	3.2	3.0	3.1
P_4T_3	73000	273420	281800	277610	200420	208800	204610	2.7	2.9	2.8
P_4T_4	70000	264780	267800	266290	194780	197800	196290	2.8	2.8	2.8
P_4T_5	74800	287640	297400	292520	212840	222600	217720	2.8	3.0	2.9
P_4T_6	71800	262620	277000	269810	190820	205200	198010	2.7	2.9	2.8
P_4T_7	67000	257220	263800	260510	190220	196800	193510	2.8	2.9	2.9

Conclusion

The sissoo-marigold based agroforestry system was found more economically profitable under 75% as compared to sole marigold under open condition.

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