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Performance Analysis and Economics of Leaf Litter Fall and Baby Corn Intercrop Under Poplar Based Agroforestry System

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ABSTRACT
Present study was conducted to estimate the effects of leaf litter fall decomposition and its impact on baby corn intercrop under poplar based agroforestry system, an experiment was carried out at SHUATS, Prayagraj, U.P., India during 2015- 2016 growth season. An experiment based on a Randomized Block Design with three replications was used. A total of ten treatments included eight levels with open field, traits including straw yield (q/ha), cob yield (q/ha), weight of leaf litter (gm.), were measured in maximum T_5, followed by T_9 and while minimum was recorded in control. As far as economic concern, maximum C: B ratio was found in T5 (1:3.07) with higher Net Return T_5 (`73,911/-). Therefore, a systematic baby corn cropping with sufficient management practices will be more beneficial for livelihood on a sustainable basis.
Keywords: *Baby corn, Leaf litter, Poplar, Yield, Economic, Net return, Cost benefit ratio*

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INTRODUCTION

Agroforestry, the intentional combination of trees with crops/livestock/fisheries on the same piece of land, is a verified practice which has the ability to increase both economic and ecological situations of rural areas. A more precise definition is offered by the International Centre for Research in Agroforestry which focuses on research "mitigating tropical deforestation, land depletion and rural poverty through improved agroforestry systems". According to World Agroforestry Centre, agroforestry is a collective name for land use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land management unit as agricultural crops and/or animals, either in some form of spatial or temporal sequence. In agroforestry systems, there are both ecological and economic interactions between the different components [4]**.** Growing of crops in the interspaces in poplar is described to be more economical and assure regular income from agroforestry system [1]**.** Since then several agroforestry models/technologies has been developed for different agro-climatic regions. Agroforestry systems can be considered as a better climate change mitigation option than ocean, and other terrestrial options, because agroforestry provides ecosystem services such as carbon sequestration, biodiversity conservation, water quality enhancement and land degradation [5, 9]**.** The establishment of agroforestry systems, however, is expensive in terms of labour and capital inputs, which may discourage their widespread adoption [2].

In India no cultivar has been exclusively breed for baby corn purpose. Prolific and early maturing cultivars have been mostly popularized as baby corn cultivar. In order to encourage uniformity in the material more emphasis is to be given towards development of

early maturing prolific hybrids. As baby corn with light yellow colour and regular row arrangements fetches better market price, at a time of breeding for baby corn attention must be kept in this direction, in recent past baby corn has gained popularity in regular vegetables markets in urban areas. However baby corn is being sold in domestic market, they are being sold without paper processing. This is principally due to lack of awareness among the farmers and due to non-existence of proper storage facilities and location of the farms far away from the market[6]**.**

MATERIALS AND METHODS

The experiment was carried out in the Department of Silviculture and Agroforestry, college of Forestry SHUATS, Allahabad, India during the growing season of 2015- 2016. Plantation of Poplar variety G-48 field was selected. The spacing of trees in the field was situated 9x3 m. and the baby corn Variety HIM 123 and DHM 107 was sown throughout the field. The same variety was also sown in an open field near the plantation to serve as control. Three replications of the following five treatment of litter removal frequency were allocated in the plots in randomized complete block design. The treatments were T_1 (Maize variety 1 in open field), T_2 (Maize variety 2 in open field), T_3 Once per week (leaf litter removal), T_4 Once per two week (leaf litter removal), T_5 Once per three week (leaf litter removal), T_6 No removal, T_7 Twice per week (leaf litter removal), T_8 Twice per two week (leaf litter removal), T_9 Twice per three week (leaf litter removal), T_{10} = No removal. Leaf litter was initially removed on 20 November, 2016.

Gross return (ha-1) = Linseed yield (q ha-1) x Price of yield (q-1)

Net return (ha-1) = Gross return (ha-1) - Cost of cultivation (ha-1)

$$\textbf{Benefit: Cost ratio} = \frac{\text{Net return (ha-1)}}{\text{Cost of cultivation (ha-1)}}$$

RESULTS

Economic:-

The economics regarding the cultivation of the crop calculated separately for different treatment on per hectare basis. The fixed cost of cultivation of crops, cost of seeds, etc. were calculated separately for determine the economics of cultivation. The revenue generated from seed yield was also calculated for determine the cost of cultivation was Rs. 24,036.00 under different manual practices influence in term of cost of cultivation of crops (fixed cost) per hectare, cost of seeds and cost benefit ratio of each treatment was calculated and is showed in table, 2, 3 and 4 respectively.

Cost of cultivation (Rs.h^1):

It was recorded that the highest cost of cultivation was noticed in T_5 with Rs. 62,399.01 followed by T_9 with 49,467.51 and lowest cost of cultivation is noticed in T_1, T_2, T_3, T_4 with Rs.24, 036.

Gross return (Rs.h^1):

It was recorded that the highest gross return was noticed in T_5 with Rs. 97,947 followed by T_9 with Rs. 93,840 and lowest gross return is noticed in control with Rs. 47,760

Net return (Rs.h^1):

It was recorded that the highest net return was noticed in T_5 with Rs. 73,911 followed by T_9 with 69,804 and lowest net return is noticed in control with Rs.-12,761.

Cost benefit ratio:

It was recorded that the highest cost benefit ratio was noticed in T_5 with 1:3.07 followed by T_9 with 1: 2.90 and lowest cost benefit ratio is noticed in control with 1:0.2. Supported by the findings observed by Khare *et al.,* [3]; Singh *et al.* [7] observed that wide planted and bund planted poplar and eucalyptus gives higher return over traditional rice-wheat system.

Table 1: Cost of cultivation (Fixed cost Rs. ha^{-1}) for baby corn (*Zea mays L.*) under poplar based agroforestry system

Sl. No.	Particulars	Unit	Qty.	Rate/Unit (Rs.)	Cost (Rs. / ha)
A.	**Land Preparation**				
1	Ploughing	Hours	3	400	1,200
2	Layout of the field	Labour	4	250	1,000
B.	**Seed**				
1	Cost of seeds	Kg.	4	150	600
2	Fungicide for seed treatment				400
C.	**Fertilizer application**				
1	Labour for seed sowing and fertilizer application	Labour	6	250	1,500
D.	**Irrigation**				
1	Tube well Charges	Irrigation	3	300	900
2	2 Labours per irrigation	Labour	6	250	1,500
E.	**Inter-culture**				
1	Thinning and Gap Filling	Labour	2	200	400
2	2Hand Weeding (2 labours/weeding)	Labour	4	250	1,000
F.	**Harvesting and Threshing**				
	Labour for harvesting	Labour	6	250	1,500
G.	**Rental value** of land	Months	4	600	2,400
	Sub - total				**12,400**
H.	**Interest on Fixed cost** @ 8.4% p.a.	Months	4		361
I.	**Supervision charges**	Months	4	2500	10,000
J.	**Land Revenue**				275
K.	**Family Labour** Charges - 4 Labours		4	250	1,000
		Total fixed cost (Rs. ha^{-1}) (A)			**24,036**

Table 2. Variable cost and total cost of cultivation for different treatments for baby corn (*Zea mays* L.) under poplar based agroforestry system

Treatment	Labour charges for removal of litter			Total variable cost (B)	Interest on variable cost for75 days (Rs.)	Cost (A)	Total cost (C)
	Qty.	Rate	Amt.				
	Labour ha^{-1}	Rs person^{-1}	Rs.	Rs ha^{-1}		Rs ha^{-1}	Rs ha^{-1}
T_0	0.00	0.00	0.00	0.00	0	24,036.00	24,036.00
T_1	0.00	0.00	0.00	0.00	0.00	24,036.00	24,036.00
T_2	100.00	250.00	25000.00	25000.00	431.51	24,036.00	49,467.51
T_3	50.00	250.00	12500.00	12500.00	215.75	24,036.00	36,751.75
T_4	30.00	250.00	7500.00	7500.00	129.45	24,036.00	31,665.45
T_5	0.00	0.00	0.00	0.00	0.00	24,036.00	24,036.00
T_6	150.00	250.00	37500.00	37500.00	863.01	24,036.00	62,399.01
T_7	90.00	250.00	22500.00	22500.00	431.51	24,036.00	46,967.51
T_8	60.00	250.00	15000.00	15000.00	258.90	24,036.00	39,294.90
T_9	0.00	0.00	0.00	0.00	0.00	24,036.00	24,036.00

Table 3: Economics of different treatments for baby corn (*Zea mays* L.) under Poplar based agroforestry system

Treatment	Cost of cultivation	Cob Yield	Sale Rate	Gross Return	Net Return	Cost : Benefit Ratio
	Rs. ha^{-1}	q ha^{-1}	Rs. q^{-1}	Rs. ha^{-1}	Rs. ha^{-1}	
T_0	24,036.00	12.62	4,000	50,480	26,444	1 :1.10
T_1	24,036.00	11.94	4,000	47,760	23,724	1 :0.99
T_2	49,467.51	20.52	4,000	82,080	32,612	1 :0.66
T_3	36,751.75	22.65	4,000	90,600	53,848	1 :1.47
T_4	31,665.45	23.38	4,000	93,507	61,841	1 :1.95
T_5	24,036.00	24.49	4,000	97,947	73,911	1 :3.07
T_6	62,399.01	18.79	4,000	75,160	12,761	1 :0.20
T_7	46,967.51	19.98	4,000	79,920	32,952	1 :0.70
T_8	39,294.90	21.57	4,000	86,293	46,998	1 :1.20
T_9	24,036.00	23.46	4,000	93,840	69,804	1 :2.90

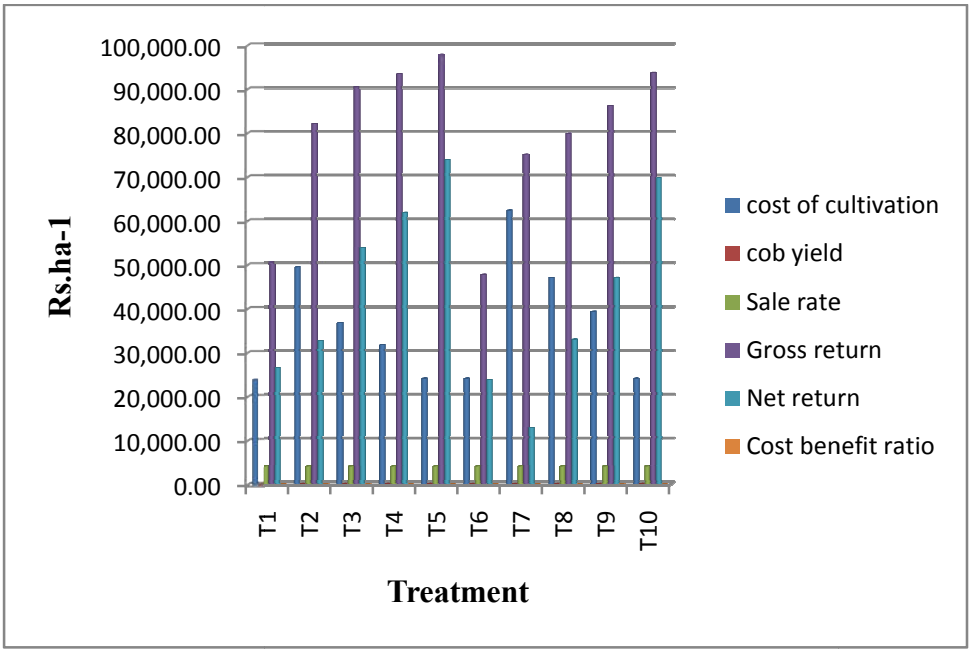

Figure1: - Economics of different treatments for baby corn (*Zea mays* L.) under Poplar based agroforestry system

DISCUSSION

The purpose of this paper is to examine result of the baby corn that existing in agroforestry practices, most with roots deep in the past, in order to try and identify the economic considerations that have caused farmers to adopt them. This is advocated by analysing the limited number of situations covered under the above studies. Nevertheless, the information outlined above, the main elements of which are summarized in above tables does suggest some of the main economic factors which encourage farmers to adopt tree/crop/livestock management as a major component of their overall farming system. In most of the situations, farmers lacked access to capital and consequently were unable to increase their land or labour resources by renting or purchasing. In many instances, farmer decisions were clearly also influenced by considerations of risk management.

Therefore under the local environmental conditions in which the study was conducted, It was recorded that the highest cost of cultivation was noticed in T_6 with Rs. 62,399.01 followed by T_2 with Rs. 49,467.51and lowest cost of cultivation is noticed in T_1, T_2, T_3, T_4 (control) with Rs. 24,036. It was recorded that the highest gross return was noticed in T_5 with Rs. 97,947 followed by T_9 with Rs. 93,840 and lowest gross return is noticed in control with Rs. 47,760. It was recorded that the highest net return was noticed in T_5 with Rs. 73,911 followed by T_9 with 69,804 and lowest net return is noticed in control with Rs.-12,761. It was recorded that the highest cost benefit ratio was noticed in T_5 with 1:3.07 followed by T_9 with 1: 2.90 and lowest cost benefit ratio is noticed in control with 1:0.2.

Supported by the findings observed by [3, 6, 7, 8]**.** observed that wide planted and bund planted poplar and eucalyptus gives higher return over traditional rice-wheat system. Moreover, this might be due to addition of nutrients which improved the physical, chemical and biological properties of soil and this leads to improve the root growth and development. So, Poplar hereby uptake all the nutrients and water from soil volume, in contrast the result of baby born shows good yield. Poplar based alley cropping system is much more beneficial than other. Owing to very little risks and high economical profits in Poplar cultivation, 1arge farmers and absentee land-lords prefer to put their lands under Poplar-based agroforestry rather than other agroforestry options.

CONCLUSION

The present study concluded that the experimental observations obtained during the investigation, highlights that treatment T_6 (18.79 q ha^{-1}) i.e. no removal of leaf litter variety HIM 123 found best treatment and T_6, T_5 was found statistically at par with T_9 with regard to its growth performance and yield attributes in and under poplar based agroforestry system. The said treatment, from the economic point of view also released highest benefit cost ratio. To arrive at final conclusion the investigation need to be conducted at multinational sites of the valley for sustaining productivity.

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