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Economics of mixed cropping in juvenile oil palm orchard

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Abstract

Oil Palm is major source of vegetable oil with an average oil yield level of 4 to 6 tonnes per hectare compared to any other vegetable oil yielding crop. As it is planted on wider spacing there is a scope for raising intercrops in oil palm plantations during juvenile phase. The attempt was made to suggest suitable, compatible and profitable intercrops in juvenile oil palm garden at College of Horticulture, Mulde during the year 2014 to 2017. Banana, Pineapple and Elephant foot yam were taken as intercrops. Three years study revealed that from banana farmers Rs. 55,833 ha⁻¹, Elephant foot yam Rs. 61,950 and Rs. 27,500 from pineapple could be obtained. Yield of oil palm in intercrops was 10.53t ha⁻¹ while it was only 7.64 t ha⁻¹ in without intercrops. The net returns were Rs. 89,549 year⁻¹ in intercropping with B: C ratio of 1.83 and it was negative (Rs.10,021 year⁻¹) in sole crop. Thus, study suggested that growing Banana, Pineapple and Elephant foot yam as a mixed crop up to 4 years is profitable under South Konkan region of Maharashtra.

Keywords: mixed cropping, banana, pineapple, elephant foot yam, oil palm

Introduction

Oil Palm is familiar as the major source of vegetable oil with an average oil yield level of 4 to 6 tonnes per hectare (Vasanth kumar, 2005) [7]. Oil Palm has economic life of 35 years. It is planted at a wider space of 9 m X 9 m X 9 m in a triangular system. It occupies only 5-15 % area during the juvenile phase of the garden (Suresh and Rethinam, 2001) [6]. However, 60 to 65 % of the area remains vacant in mature oil palm gardens. Active root system of adult palms under good management is mainly concentrated within a radius of 0.5 to 3m laterally from the bole and 10-40 cm depth vertically (Suresh *et al.*, 2003) [5]. This provides scope for effective utilization of horizontal and vertical space for growing other crops as intercrop or mixed crop, thus providing additional employment opportunities and income for small and marginal farm families during the initial three years of oil palm cultivation (Reddy and Prasad, 2011) [3]. The main objectives of intercropping are effective utilization of space left. Reddy *et al.*, (2004) [4] suggested intercropping in oil palm during juvenile phase without any adverse effect on growth of oil palm and also suggested that intercrops added lot of biomass which can be utilized in further growth period of oil palm.

As it is a perennial crop, there is possibilities for raising intercrops in oil palm plantations during the initial 3-4 years. Similarly, economic condition and size of land holding of Indian farmer, increased cost of production and FFB price fluctuation are forcing them to go for intercropping in grown up oil palm garden. Hence growing of other crops in the interspaced of oil palm is practiced only in India. Reddi *et al.*, (2015) [2] obtained higher net return.

In Maharashtra area under oil palm is increasing through Govt. Schemes hence, attempt was made to suggest suitable intercrops in juvenile oil palm garden. Experimental palms of two years old under AICRP on Palms (Oil palm) project at College of Horticulture, Mulde were selected as experimental unit for mixed cropping.

Material and Methods

The investigation was carried out in young oil palm plantation of AICRP on Palms (Oil palm) project at College of Horticulture, Mulde during the year 2014 to 2018 with objective to identify suitable and profitable crops at juvenile stage of the oil palm orchard. Banana (variety Kokan Safed Velch) I was planted in between the rows of oil palm at a spacing of 2 x 2.5 m, pineapple (variety Queen) was planted at 0.45 X 0.45 m in trench having dimension of 3 X 1m

(20 plants/ trench) prepared for soil and water conservation along the slop. The elephant foot yam (variety Gajendra) was grown in kharif during the year 2015, 2016 and 2017 at 0.75 X 0.75 min a plot size 4.7 X 2 m (12 plants/ plot) in interspaced of oil palm. Fertilizers were applied as per recommended dose. During the period from 2015-16 to 2017-18 three harvests of elephant foot yam and banana (main crop and ratoon) and only single harvest of pineapple were taken. Yield of mix crops and oil palm were recorded at a time of harvest.

The cost of cultivation, economics and benefit cost ratio were worked out based on the prevailing market prices. The yield other crops were converted to oil palm equivalent yield in order to the significance. The data were statistically analysed by the method described by Gomez and Gomez, (1984) [1].

Results and Discussion

The three years data on yield of oil palm as sole and in mixed cropping system are given in Table 1. Data in the table revealed that the yield in mixed cropping system was significantly increased every year than sole crop. It was 5.00, 12.40 and 14.20 t ha⁻¹ during 2016, 2017 and 2018 respectively. Whereas, it was 3.74, 9.51 and 9.9t ha⁻¹ during respective years in sole crop. The pooled mean indicated that yield increment in oil palm (FFB) in mix cropping was 36.40 per cent than sole crop.

The yield data of intercrops in mixed cropping system presented in Table 2 revealed that in first year, banana recorded the highest yield (2.9t ha⁻¹) while elephant foot yam recorded significantly highest yield (2.3 t ha⁻¹) during second year. During third year maximum yield was noticed in pineapple (2.5 t ha⁻¹). Pooled mean data revealed that the maximum yield (2.28 t ha⁻¹) was recorded in banana followed by elephant foot yam (1.82 t ha⁻¹).

The oil palm equivalent yield of intercrops (OEY) was estimated based on prevailing market prices of respective crop and presented in Table 4. During first year the maximum (OEY) yield (1.25 t ha⁻¹) was noticed in banana followed by elephant foot yam (0.56 t ha⁻¹) whereas it was zero in pineapple. The reason for no yield of pineapple could be due to slow establishment of crop because of less light penetration in the plantation. During the second year maximum OEY reported in elephant foot yam (1.59 t ha⁻¹) followed by banana (1.01 t ha⁻¹) and pineapple (0.34 t ha⁻¹). During this year also elephant foot yam recorded the highest yield (1.15 t ha⁻¹) followed by pineapple and banana. Pooled yield over three years indicated that elephant foot yam recorded the highest OEY (1.10 t ha⁻¹) followed by banana and pineapple. Overall OEY of three intercrops and oil palm was the highest (2.56 t ha⁻¹).

The total yield of oil palm and three intercrops oil palm equivalent yield (OEY) for three years are given in Table 6. Data revealed that total yield in intercrop including OEY of intercrop was 13.09 t ha⁻¹ while in sole crop it was 7.72 t ha⁻¹ which indicated 69.56 per cent yield increment due to mix cropping.

The data on economics of the mixed cropping system and sole oil palm crop are presented in Table 5 and Table 6. The cost

of production of sole crop for three years was Rs.1,63,000t ha⁻¹ while it was Rs.3,33,629 t ha⁻¹ in mixed cropping system. The gross returns per hectare for three years was Rs.5, 91,269/- in mixed cropping and Rs.1, 32,937t ha⁻¹ in sole crop. The net returns per year was the highest (Rs.89,549/-) in mixed cropping earning Rs.89,570t ha⁻¹ additional returns than sole crop. The highest B:C ratio (1.83) was noted in mixed cropping system as against 0.82 in sole oil palm crop as it is in juvenile phase. Similar finding were observed by Reddi *et al.*, (2015) [2] when okra was taken as intercrop in oil palm. Reddy and Suresh, (2009) found banana was the most profitable crop when compared with turmeric and spider lily. Thus study revealed that the yield of oil palm in mixed cropping system was triggered 36.40 per cent over sole crop along with the additional yield of intercrops (banana, pine apple and elephant foot yam) which provided the additional returns and highest the C:B ratio (1:1.82) suggesting the compatibility of oil palm for mix cropping.

Thus it can be concluded that grow in gbanana, pineapple and elephant foot yam as a mixed crop in young oil palm garden up to 4 years is the best proposition for earning additional returns from juvenile oil palm orchard under South Konkan region.

Table 1: Yield of oil palm in intercrops and sole crop

System	Oil Palm yield (t ha ⁻¹)			
	2015-16	2016-17	2017-18	Pooled mean
Yield of Oil Palm in intercrops	5.00	12.40	14.20	10.53
Yield of Sole Oil palm	3.74	9.514	9.916	7.72
SE ±	0.03	0.11	0.11	0.04
CD at 5%	0.1	0.34	0.34	0.12
% increase of yield over sole crop	33.69	30.39	43.29	36.40

Table 2: Yield of Intercrops in mixed cropping systems

System	Intercrop yield (t ha ⁻¹)			
	2015-16	2016-17	2017-18	Pooled mean
Banana	2.90	2.34	1.59	2.28
Pineapple	0.00	0.80	2.51	1.10
Elephant Foot Yam	0.93	2.63	1.90	1.82
Sole Oil	0.00	0.00	0.00	0.00
SE ±	0.02	0.05	0.02	0.02
CD at 5%	0.06	0.14	0.07	0.06

Table 3: Oil Palm Equivalent Yield (OEY) of different intercrops

System	OEY (t ha ⁻¹)			
	2015-16	2016-17	2017-18	Pooled mean
Oil Palm + Banana	1.25	1.01	0.69	0.98
Oil Palm + Pineapple	0.00	0.34	1.08	0.48
Oil Palm + Elephant Foot Yam	0.56	1.59	1.15	1.10
Oil Palm + Banana+ Pineapple + Elephant Foot Yam	1.81	2.94	2.92	2.56
Sole Oil	0.00	0.00	0.00	0.00
SE ±	0.01	0.03	0.01	0.01
CD at 5%	0.03	0.09	0.04	0.04

Table 4: Total oil palm equivalent yield (OEY) of mixed cropping system

System	Total Oil Palm yield (t ha ⁻¹) (Including intercrop yield)			
	2015-16	2016-17	2017-18	Pooled mean
Oil Palm + Banana+ Pineapple + Elephant Foot Yam	6.81	15.34	16.76	13.09
Sole Oil Palm	3.74	9.514	9.916	7.72
% increase of yield over sole crop	82.08	61.24	69.02	69.56

Table 5: Performance of Oil Palm and Intercrops during 2015-16 to 2017-18

Crops	Area covered under intercrops	Plant population (ha ⁻¹)	2015-16		2016-17		2017-18		Mean	
			Yield (tha ⁻¹)	Rs.	Yield (tha ⁻¹)	Rs.	Yield (tha ⁻¹)	Rs.	Yield (tha ⁻¹)	Rs.
Banana	3600 Sq.m.	1287	2.8	70,000/-	2.3	57,500/-	1.6	40,000/-	2.23	55,833/-
Pineapple	752 Sq.m.	2860	-	-	0.790	15,800/-	2.5	62,500/-	1.10	27,500/-
Elephant Foot Yam	240 Sq.m.	1716	0.895	35,800/-	2.5	87,500/-	1.9	66,500/-	1.77	61,950/-
Oil Palm within intercrop		143	5.0	29,000/-	12.4	71,920/-	14.2	82,360/-	10.53	61,093/-
			Total	1,34,800/-		2,32,720/-		2,51,360/-		
Oil Palm without intercrop		143	3.7	21,460/-	9.43	54,695/-	9.79	56,782/-	7.64	44,312

Table 6: Total cost and total returns due to intercrops and Oil Palm without intercrops

Particulars	Total Cost Rs.			Gross Total Cost Rs.	Gross Returns Rs.			Total Gross Returns Rs.	Net Returns Rs.	Net Returns/year Rs.	Additional Returns Due to intercrops / year (Rs.)	B : C ratio
	2015-16	2016-17	2017-18		2015-16	2016-17	2017-18					
Oil Palm with Intercrops	155,078/-	84,853/-	82,698/-	3,22,629/-	1,34,800/-	2,32,720/-	2,51,360/-	5,91,269/-	2,68,648/-	89,549/-	89,570/-	1.83
Oil Palm without Intercrops	53,000/-	55,000/-	55,000/-	1,63,000/-	21,460/-	54,695/-	56,782/-	1,32,937/-	(-) 30,063/-	(-) 10,021/-		0.82*
Sale price Oil Palm @ Rs. 5,800/t Banana @ Rs. 25/kg, Elephant foot yam @ Rs. 35/ kg and pineapple @ Rs. 25/ kg										(* In juvenile crop phase)		

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