## **RESEARCH PAPER**

### Adoption of Management Practices by Farmers in Relation to Yield of Oil Palm in Andhra Pradesh, India - A Survey

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#### ABSTRACT

Oil palm was introduced as an irrigated crop on a commercial scale in 1989 to meet the ever-growing demand of vegetable oil in India. The commercial cultivation of oil palm is a decade old and 30,000 ha is under oil palm cultivation in Andhra Pradesh. The individual farmers are producing as high as 35 t/ha, but the State average is very low at 5 t/ha. To know the adoption pattern and to enumerate various constraints in adopting the recommended package of practices, a survey was conducted among 213 respondents selected randomly and subjected to open ended questionnaire from 1250 farmers who attended the training at NRCOP, Pedavegi. Majority of the respondents were having less than two hectares (54 %), majority planted oil palm during 1993-96 (40 %), most of the respondents were following basin method of irrigation (76 %) with a frequency of 5-10 days interval (77 %); most of the respondents were applying lower doses of NPK (48 %) and 50 % were not applying magnesium and boron. Majority of the respondents applying fertilizers 2-3 times in a year (70 %). The major constraints perceived by respondents were lack of assured power supply, sufficient irrigation water and difficulty in harvesting FFBs. The major suggestions given by respondents were; there should be assured power supply and financial assistance for cultivation and installing micro irrigation systems.

#### INTRODUCTION

Oil palm (*Elaeis guineensis.* J.) has been introduced as an irrigated crop on a commercial scale since 1989 to meet the ever-growing demand of vegetable oils in India. Some of the attributes, which make oil palm attractive for cultivation, are 1. Perennial source of income to farmers, 2. Standard Government support price, 3. No theft problem, 4. Continuous source of oil to the oil thirsty country like India, 5. Good source of vitamin A and E. The area under its cultivation in India is spreading fast and being grown in many new and non-traditional places. To take advantage of the above attributes and to bridge the gap between the demand and supply, there by attaining self-sufficiency of vegetable oil production, Government of India has started Oil Palm Development Programme (OPDP).

Commercial cultivation of oil palm is a decade old and 30,000 hectares is under cultivation in Andhra Pradesh alone and it is the leading state in India in terms of acreage and production. Several individual farmers in the state have been able to harvest as high as 35t/FFB/ha. The production and productivity, however, remained very low at the state level i.e., 5 t/ha (AFC Report, 2002). Very limited work has been done on this crop adoption pattern, yield and income of the farmers. In order to identify the adoption pattern, and to enumerate the various constraints in adopting the recommended package of practices, a survey was conducted among the farmers who attended various training programmes at the National Research Center for Oil Palm, Pedavegi, West Godavari district of Andhra Pradesh. The results hopefully would spell out the physical, financial, technical and policy issues to be addressed for increasing the oil palm production in India. The study had been undertaken with the following specific objectives.

- 1. To find out the level of adoption of critical practices in oil palm.
- 2. To identify constraints in adoption of oil palm.
- 3. To elicit the suggestions of oil palm growers in implementation of oil palm development programme.

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#### METHODOLOGY

Among the 1250 farmers attended training programme on oil palm cultivation in the year 2001-2002, 213 farmers were randomly selected and subjected to open-ended guestionnaire. After having detailed discussions with subject matter specialists, five critical management practices as independent variables and yield as dependent variable were selected. Simple frequency was calculated based on the variable measured (namely size of farm holdings, Age of plantation, Frequency of irrigation, Quantity of farmyard manure applied, Usage of urea, single super phosphate, potash, magnesium, boron and frequency of fertiliser application) by taking highest and lowest score in that category. Yields obtained by farmers were categorized based on year of plantation and divided into three groups viz., 1989-90 to 1992-93, 93-94 to 96-97 and 2000-2001. Within a group, the yields obtained were categorized as low, medium and high for frequency and percentage was calculation. An open-ended questionnaire was administered to the respondents to elicit the perceived constraints and suggestions and responses were collected. The data thus collected were tabulated, analysed, and interpreted using necessary statistical tools.

#### **RESULTS AND DISCUSSION**

#### Farm Holding

Majority of the respondents (54%) owned land holding less than 2 ha followed by 2-4 ha (25%) and above 4 ha (21%) (Table 1). The results illustrate that most of the oil palm farmers are small farmers, thus the Governments objective of making oil palm as a small holders crop seems to be achieved.

## Table1: Distribution of respondents according to their size of farm holdings N=213

SI.No.	Farm size	Frequency	Percentage
1.	Below 2 ha	114	53.52
2.	2-4 ha	54	25.35
3.	Above 4 ha	45	21.13

#### Age of plantations

Thirty nine percent of the respondents were planted in the period 1993-97 followed by 34% during the period 1989-1993 and 26% during 1997-2001 (Table 2). The crop is introduced during the year 1987-88; however, the results showed that majority was planted in the period 1993-97 and most of the oil palm growers belonged to early majority adopter category. Adoption of management practices by farmers

Table 2: Distribution of respondents according to year of planting of oil palm N=213

SI.No	Year of planting	Frequency	Percentage
1.	1989-90 to 92-93	73	34.27
2	93-94 to 96-97	84	39.43
3	97-98 to 2000-2001	56	26.30

#### Irrigation method

The results showed that majority of the respondents have adopted basin method of irrigation (76%) followed by drip irrigation (16%), micro jet (5%) and least by flood irrigation (3%) (Table 3). The results illustrated that the basin method was more economical and feasible method of irrigation, however, with increasing depletion of ground water table, the farmers were slowly changing towards drip/ micro jet irrigation.

# Table3: Distribution of respondents according tomethod of irrigation adoptedN=213

SI.No.	Method of irrigation	Frequency	Percentage
1.	Basin	161	75.58
2	Flood	7	3.28
3.	Drip	34	15.96
4.	Micro jet	11	5.16

#### Frequency of irrigation

The results showed that majority of the farmers were following 5-10 days interval (77%) followed by above ten days interval (16%) and below five days interval (7%) (Table 4). This may be attributed to lack of sufficient irrigation water and erratic power supply. Oil palm having adventitious root system with a depth upto 0.6 to 1 meters and radius upto 1.8 to 2 meters, it requires copious irrigation and the average water required is 225 liters of water per day. Since majority of the farmers were following basin irrigation with 5-10 days duration, large quantities of water was flooded in the basins at a time. This resulted in deep percolation, which would not be available to the crop as the root system was very superficial, and the crop suffers periodic drought between two irrigations. It is therefore, recommended to give less amount of water with more frequent irrigations to avoid deep percolation losses.

# Table 4: Distribution of respondents according to frequency of irrigation given (basin method of irrigation) N=161

SI.No.	Frequency of irrigation	Frequency	Percentage
1.	Below 5 days	11	6.83
2.	5-10 days	124	77.02
3.	Above10 days	26	16.15

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#### Application of NPK

Oil palm crop responds very well to nutrient management and it is recommended to apply annually 1200-600-1200 gms of N-P, O,-K, O for adult palms, and 1/3rd and 2/3rd of recommended dose during first and second year of plantation. The results showed that, only 29% of the respondents were applying recommended dosage, while 48% of farmers are applying lower dosage and 23% were applying higher dose than recommended (Table 5). The results illustrated that, most of the respondents were applying lower dose than recommended dose and therefore more emphasis should be given to recommended dose of fertilizer application. Similar observations were made in a leaf nutrient survey conducted by Suresh et al., (2001). In their survey to ascertain the oil palm leaf nutrient status in districts of Andhra Pradesh revealed that 30 to 87.5 % of plantations were deficient in nitrogen, 37 to 82 % were deficient in phosphorus, 2 to 73.4 % were deficient in potash and 0 to 47.3 % were deficient in magnesium in different districts.

#### Application of magnesium and boron

Oil palm in the juvenile stage is more susceptible to secondary and micronutrient deficiencies, especially for magnesium and boron (Table 6). Oil palm requires 500 gm of magnesium for adult palms per year and 1/3<sup>rd</sup> and 2/3<sup>rd</sup> dose during first and second year of plantation. It also requires 50 g of boron in deficient areas every year. The results showed that only 30% were applying recommended dose of magnesium and boron, while 50% were not at all applying these essential nutrients.

#### Frequency of fertilizer application

The results showed that still 46% of the respondents were applying one to two times in a year (Table 7). Since there is ample scope for split application of fertilizers under irrigated conditions, N and K fertilizers use-efficiency can be improved by more split applications.

# Table 7: Distribution of respondents according to theirfrequency of fertilizer applicationN= 213

Frequency of	Frequency	Percentage		
Fertilizer application				
1	7	3.29		
2	91	42.72		
3	59	27.70		
4	48	22.54		
5	4	1.88		
6	3	1.40		
9	1	0.47		

#### Yield

Majority of the farmers (irrespective of their age of plantation) were in medium yield category) Table 8. This may be due to adoption of basin irrigation with a frequency of 5-10 days interval and application of lower to medium dosage of fertilizer application. Considering that, still a majority was not applying recommended dosage of fertilizers and applying at less frequent intervals, there was a scope for further improvement in yield.

There was yield gap of 26.25t/ha. in 10-14years age category, 27.25t/ha in 6-10 years age category and 20t/ha in 2-6 years age category between the high and low yielding plantations.

## Correlation coefficient (r) between various cultivation practices and yield

The results of correlation analysis (Table 9) revealed that the size of the farm holding had no effect on the yield, suggesting that both large and small holders were achieving high or low yield based on their ability to adopt

Table 5	: D	)istribu	tion o	f respond	lents	according	to	fertilizer	applic	ation

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Category	Niti	rogen	Phosph	orous	Potassi	um	Average
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Percentage
Lower dose	113	53.05	102	47.89	90	42.25	47.80
Correct dose	72	33.80	51	23.94	63	29.58	29.10
Higher dose	28	13.15	60	28.17	60	28.17	23.10

#### Table 6: Distribution of respondents according to magnesium and boron application

N=213

Category	Magn	esium	Bord	n	Average
	Frequency	Percentage	Frequency	Percentage	percentage
Lower dose	19	8.92	5	2.34	5.63
Correct dose	61	28.60	69	32.39	30.50
Higher dose	22	10.38	35	16.43	13.40
Not applied	111	52.10	104	48.84	50.47

Adoption of management practices by farmers

SI.No	Year of	Yield	Frequency	Percentage
	plantation	(t/ha)		
1	89-90 to	Low	10	13.70
	92-93	(5-13.75)		
	(10-14 years)			
		Medium	51	69.86
		(14-22.5)		
		High	12	16.44
		(22.75-31.25)		
		Total	73	100
2	93-94 to	Low	13	22.80
	96-97	(3.75-12.5)		
	(6-10 years)			
		Medium	36	63.16
		(13-21.5)		
		High	8	14.04
		(21.75-31.25)		
		Total	57	100
3	97 to 98 to	Low	11	26.83
	2000-2001	(0-6.5)		
	(2-6 years)			
		Medium	23	56.10
		(6.75-13)		
		High	7	17.07
		(13.25-20)		
		Total	41	100

Table 8: Distribution of farmers based on their yield(in corresponding year of plantation)N=171

recommended package of practices. A significant and high value of correlation coefficient between age of plantation and yield suggested that the low yields observed in the survey was mainly due to young age of the plantation and the yields were increasing with age. A positive correlation between yield and quantity of farmyard manure applied revealed that it was significantly affecting yield levels of the crop. A significant coefficient of correlation value between yield and frequency of fertilizer applied, frequency of irrigation (in basin method of irrigation), quantity of N, P and K revealed the importance of these management practices in achieving higher yields in oil palm.

#### Constraints perceived by oil palm growers:

The major constraints perceived by oil palm growers were:

- 1. Not being able to irrigate oil palm plantations due to lack of assured power supply.
- 2. Lack of irrigation water.
- 3. Difficulty in harvesting fresh fruit bunches.
- 4. Leaf braking and drooping.

Table 9: Correlation coefficient (r) between variouscultivation practices and yieldN =171

SI.No	Independent variables	Yield (r)	
1	Farm holdings	0.045	NS
2	Age of plantation	0.610	**
3	Frequency of irrigation	0.225	**
4	Quantity of FYM applied	0.170	*
5	Urea	0.184	**
6	SSP	0.230	**
7	Potash	0.227	**
8	Magnesium	0.123	NS
9	Boron	0.001	NS
10	Frequency of fertilizer	0.243	**
	application		

\*\* Significant at 1% level of probability

\* Significant at 5% level of probability

NS: Non significant

- 5. Split of bunches into two portions and bunch rot.
- Insufficient irrigation water forcing the farmers to shift to drip / micro jet irrigation for effective use of irrigation water.

#### Suggestions

Major suggestions given by respondents were:

- 1. Assured power supply.
- 2. Financial assistance from banks for cultivation and drip installation.
- 3. Subsidy for drip / micro jet irrigation.
- Subsidised fertilizer distribution three times in year instead of once.

The results suggested that to make oil palm more remunerative and sustainable under the irrigated conditions, the implementing agencies should provide assured power supply and financial assistance and subsidies for digging bore wells and drip / micro jet irrigation.

#### CONCLUSION

In Andhra Pradesh 30,000 ha area came under oil palm cultivation during 1987-2002. The major area was under cultivation by small farmers followed by big and large farmers. Majority of the farmers were following basin method of irrigation, however, it was advised to go for micro jet / drip irrigation for conservation of depleting water resources to avoid deep percolation loses and increase water use efficiency. Though the farmers were following ten days frequency of irrigation, it was advised to give frequent irrigation with less quantity of water in case of basin irrigation. The fertilizers were being applied in lower

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doses compared to recommended doses. Hence it was recommended to follow at the rate of 2.1 kg of urea or 4.8 kg of ammonium sulphate, 3.75-kg single super phosphate and 2 kg murate of potash and to modify these levels based on leaf and soil analysis. Though majority of farmers were following corrective measures of magnesium and boron, farmers are advised to apply fertilizers based on leaf nutrient analysis. One of the major constraints expressed by farmers was power supply, which needed to be seriously looked into. There was also need to provide 9-10 hours of uninterrupted power supply to make best use of the micro irrigation systems, as these systems have to be run with low discharge rates to avoid deep percolation losses. Some of the farmers expressed harvesting of fresh fruit bunches (FFB) in aged plantations as a constraint. The aluminum pole attached with sickle would cater the needs of harvesting of FFB in aged plantations. The subsidy component for bore wells, micro jet / drip irrigation and fertilizers required to be supported by state governments/entrepreneurs/financial institutions. Imbalance of major and micro nutrients could be avoided by judicial and rational application of fertilizers along with organic manures like Farmyard manure.

The results of survey indicated the probable reasons for yield gap between actual and potential and also helped in identifying management, research and policy priorities to make oil palm cultivation a more remunerative preposition

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