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An Economics Analysis of Oil Palm Cultivation in East Godavari District of Andhra Pradesh, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

An attempt has been made in this study to examine the economic analysis of oil palm cultivation in East Godavari district of Andhra Pradesh. The specific objective of the study were (i) to identify socio economic profile of the farmers/respondents in different size of farm in study area, (ii) to study cost and return and input output ratio of different size farm group in study area, (iii) to estimate disposal pattern and marketable surplus of oil palm in different size of farm groups, (iv) to work out price spread producers' share in consumers' rupee and marketing efficiency in different marketing channels and (v) to find out different problems in production and marketing of oil palm in different size of farm group in study area. The present study was conducted in East Godavari district of Andhra Pradesh. The primary data is collected from the oil palm producers through personal interview method with the help of well-prepared schedule and questionnaire for the production and marketing year 2022-23. The growth rate of area, production and productivity of East Godavari district was worked out by using exponential analysis. The simple mean and average method was used to work out the cost of cultivation, marketable surplus and disposal pattern of oil palm.

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1. INTRODUCTION

Palm oil (from the African palm oil, Elaeis guineensis) can be traced back to more than 5000 years ago. An area of palm oil plantations belonging to the people that have an area of 1025.91 ha of palm oil plantations (BPS, 2015). Palm oil was long recognized in West African countries. It is used widely among West African peoples as cooking oil. From the 1960's major palm oil plantation scheme was introduced by the government mainly to eradicate poverty [1-3]. Each settler was allocated 10 acres of land planted either with Palm oil or rubber, and they are given 20 years to pay off the land.Oil palm (Elaeis guineensis) is a tropical crop that originated in West Africa but is now grown extensively in many parts of the world, including Southeast Asia and South America. In India, oil palm was first introduced in the early 1960s, but commercial cultivation began only in the 1990s [4-7]. Overall, the introduction of oil palm in India has had mixed results, with some farmers benefiting from the crop while others continue to face challenges in its cultivation and marketing. Most of this arrives in crude form to be refined domestically, while about 30% comes already refined [8,9].

Palm oil was not much used in Indian cooking until its import was liberalized near the turn of the century. "As India opened up in the 1990s, it was attractive to import cheap palm oil to meet our needs, especially as a lack of investment in the local oilseed sector had led to its decline," explains Bhavani Shankar, a professorial research fellow in food and health at the University of Sheffield [10-14]. "The major exporters, Indonesia and Malaysia, were also strongly promoting their palm oil to new markets like India." In 2021, the Indian government launched the National Mission on Edible Oils to promote domestic oil palm cultivation, focusing on the nort Dr R Hemalatha, director of the Indian Council of Medical Research's National Institute of Nutrition (ICMR-NIN), explains that oil palm's superior productivity makesits oil the cheapest around.heast region and the Andaman and Nicobar islands. The goal was to reduce dependence on edible oil imports significantly.

1.1 Oil Palm Cultivation has Significant Implications for the Environment and can Contribute to Climate Change in Several Ways. Here are Some Key Aspects to Consider

Deforestation: One of the major environmental concerns associated with oil palm cultivation is deforestation. Large areas of tropical rainforests and carbon-rich peatlands are often cleared to make way for oil palm plantations. This clearance of natural vegetation leads to the loss of biodiversity, habitat destruction for wildlife, and releases significant amounts of stored carbon into the atmosphere [15,16].

Greenhouse Gas Emissions: The conversion of forests and peatlands for oil palm plantations results in the release of greenhouse gases (GHGs), primarily carbon dioxide (CO2) emissions. Deforestation and peatland drainage contribute to carbon emissions, exacerbating climate change [17-20].

Land Use Change: Expanding oil palm plantations often involve converting diverse ecosystems into monoculture landscapes. This shift in land use can result in reduced ecosystem resilience, soil degradation, and increased vulnerability to pests and diseases.

Water Resources: Oil palm cultivation requires significant amounts of water for irrigation. Unsustainable water extraction can lead to water scarcity, impact local water sources, and affect surrounding ecosystems.

Biodiversity Loss: The conversion of natural habitats into oil palm plantations can result in the loss of biodiversity, including the displacement and endangerment of various plant and animal species. Oil palm plantations typically support lower levels of biodiversity compared to natural ecosystems [21,22].

Efforts are being made to address these environmental concerns and mitigate the impact of oil palm cultivation. These include sustainable palm oil certification schemes, better land management practices, agroforestry approaches, and conservation efforts to protect high conservation value areas.

It's important to note that sustainable practices and responsible land management can help minimize the negative environmental impacts associated with oil palm cultivation. Organizations like the Roundtable on Sustainable Palm Oil (RSPO) have established criteria and standards for sustainable palm oil production, aiming to promote environmentally and socially responsible practices within the industry.

2. MATERIALS AND METHODS

East Godavari district was one of the oldest British administration areas of Andhra Pradesh. Rajahmundry is the biggest city in the district (third in the state) and a commercial Centre. The population of Rajahmundry District is 153,756 lakhs (2014 Census), making it the 34th in India and 4th in AP. The population density is 519 per sq. kms (AP: 308 per sq km; India: 382 per sq km). Rajahmundry has a gender ratio of 997 women for 1000 males (AP: 992 per1000; India: 940 per 1000) and a literacy rate of 70.37 percent. (AP: 67.66%; India: 74.04%). Agriculture is the main occupation of the people in our district. The delta land is being irrigated by canals of rivers. The climate conditions of the district are of extreme kind with a hot summers and cold winters and may be classified as tropical. The period starting from April to June is the hottest. Topography: latitude: 13.4788^{o} N , Longitude: 78.8383^{o} E , Rainfall: The average normal rainfallis 918.1mm. Soil: Three types of soils: black clay (3%), sand clay loams (22.3%), red loamy (34%). Availability of mineral sources : Gold, Low-grade iron ore, coal, lead-zinc.

The study was carried out in East Godavari district of Andhra Pradesh. The project was done in three phases; the first phase focuses on sample design used to select the district, block, village and respondent. 1. Sampling design 2. Sampling procedure 3. Nature and source of data 4. Data analysis.

2.1 Sampling Design

Selection of district was formed the first stage of sampling in East Godavari district of Andhra Pradesh state was selected for the present study. Selection of the block is the second stage of sampling. A complete list of 64 blocks are there under East Godavari district. Out of those 4 Blocks will be selected purposively. Selection of villages is the third stage of the sampling. Out of selected blocks 12 villages will be selected for the present study. Villages selected –Kolamuru, Morampudi, Bommuru, Nandarada, Rajanagram, Katavaram, Venkatapuram, Pettapuram, pedhapuram, tatipathri and adlamuru. The number of respondents has surveyed in the total population is known as sample size, total sample size is 10% of respondents.

2.2 Data Collection

Selected respondents were collected personally contacting them and interviewing with the help of scheduled questionnaires.

2.3 Primary Data

Primary data pertaining to the family composition, education level, occupation, age difference, farm size, farming experience etc. was collected directly from the respondents.

2.4 Secondary Data

Secondary data relevant to the study was collected from the published websites, Reports and Agricultural office, government& non-governmental institution of the particular study Area.

2.5 Market Functionaries/ Intermediaries

They also intended to study market functionaries, intermediaries at various level of marketing costs and margins. Samples of five preharvest contractors, five wholesalers, five retailers were selected.

2.6 Data Analysis / Tools

- The collected data was analyzed with the help of tools like Percentage analysis (Graphical Representation)
- Percentage=No. of respondent/Total no. of respondent x 100
- Simple Data Tables (Tabular Analysis)
- Tabular Analysis was used to compare the relation between two variables i.e., age, gender, occupation was compared with factors influencing the purchase intention of consumers for organic foods. It is also known as cross tabulation.

3. RESULTS AND DISCUSSION

1. General information of the farmers

The 28 – 38 and 66 to 75 age groups of therespondents are less 19% and 5% respectively who are belong to very young and

very old farmers. Again 39 – 45 age groups of the respondents are 22% and comparatively 46 - 55 age group of respondents are more in number i.e. 32% whereas 56 – 65 age category respondents are in the tune 20% of the total respondents.

Among them 13% of the respondents are illiterate, while 20% of the respondents finished their high school education and 26% are having +2 level of education. It is appreciated to learn that 22% and 17% of the respondents finished their graduation and post-graduation respectively.

The overwhelming majority of the oil palm growers were general category (91%) followed by backward 5%, Schedule caste 2% and schedule tribe 2%.

The tune of 78.3% of the sample respondents are living in nuclear family system and only 21.6% of the total respondents are enjoying the flavour of joint family in the study area.

From the Table 1, 14.1 % of the respondents have Greater than 10 hectares of land, they are generally large farmer whereas 20%have land holding 1-2 hectares, 26.7% farmers having 2- 4 hectares of land holding, 34.2% farmers are having 4-10hactares of land holding and 5% of the respondents have land holding less than 1-hectare (marginal farmer) acres.

In Table 1, it was observed that 9 % of the respondents were in low level income group followed by almost 28% and almost 63% of the respondents belong to the medium and high level of income group respectively.

Table 1. Showing general information of farmers. Respondents N=120

S. No.	Category	Frequency N = 120	Percentage
Age	<35	39	32.5
	35-50	51	50.5
	>50	30	17
	Total	120	100
Educational status	Illiterate	16	13.3
	Matrices	24	20
	Intermediate	32	26.6
	Undergraduate	27	22.5
	Postgraduate	21	17.5
Caste	General	96	80.1
	OBC	10	8.3
	SC	7	5.8
	ST	7	5.8
Family type	Joint family	26	21.6
	Nuclear family	94	78.3
Land holding	1-4 hectares (small farmer)	30	25
	4-10 hectares (medium farmer)	32	26.7
	Greater than 10 hectares (Large farmer)	58	48.3
Annual income	50,000 to 1,00,000	11	9.1
	1,00,000 to 2,00,000	33	27.5
	Above 2,00,000	76	63.3

2. Cost of Oil Palm Orchard

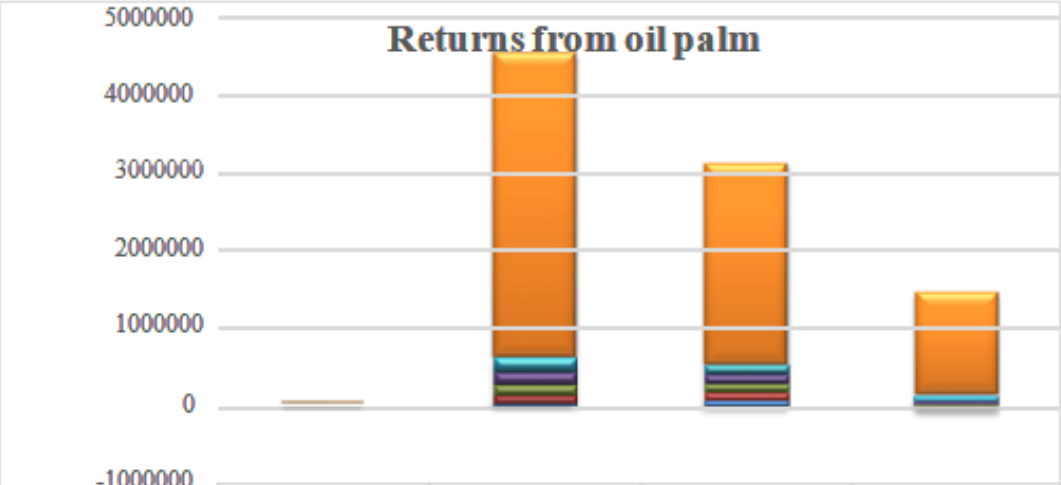
Table 2. The costs incurred (per hectare) in establishing oil palm orchards during pre-bearing period 1-3 years

S. No.	Particulars	1st Year	2nd Year	3rd Year	Total
A	**Variable costs**				
1.	Human Labor	29248 (27.47)	23767 (21.38)	24193 (20.14)	77238 (23.04)
1.1	Owned	3719.74 (3.88)	2924.63 (2.99)	2952.96 (2.77)	9597.33 (3.22)
1.2	Hired	26528.26 (23.59)	21842.37 (18.39)	22240.40 (17.37)	50340.67 (19.82)
2.	Machine Labor	9000 (11.42)	2600 (2.48)	1900 (2.27)	13500 (5.47)
2.1	Owned	1200 (1.71)	240 (0.37)	240 (0.34)	1680 (0.83)
2.2	Hired	6800 (9.71)	1360 (2.11)	1360 (1.93)	9520 (4.64)
3	Plant Material Cost	2430 (2.04)	-	-	2430 (0.70)
4	Manures	5050 (7.21)	5320 (8.26)	5410 (7.68)	15780 (7.70)
5	Fertilizers	5073.64 (5.81)	9170 (12.69)	14813.4 (18.19)	29057 (12.23)
6	Pesticides	2100 (1.57)	2100 (1.71)	2100 (1.56)	6300 (1.61)
7	Electricity Charges	2000 (1.43)	2000 (1.56)	2000 (1.42)	6000 (1.46)
8	Interest on Working Capital	1839.28 (2.05)	1451.69 (1.78)	1956.94 (1.92)	5247.91 (1.92)
	Total Variable costs	91269.18 (97.89)	72775.7 (71.61)	79166.3 (75.59)	226690.9 (82.64)
B	**Fixed Costs**				
1.	Land Revenue	1000 (0.71)	1000 (0.78)	1000 (0.71)	1000 (0.73)
2	Rental value of owned land	30026.2 (28.58)	30656.8 (32.08)	31354.5 (30.31)	92037.5 (30.28)
3	Depreciation	4472.5 (4.96)	4472.5 (5.39)	4472.5 (4.93)	13417.5 (5.08)
4	Interest on fixed capital	5732.5 (6.75)	5732.5 (6.75)	5732.5 (6.75)	17197.5 (6.75)
5	Annual share of Estd cost	-	2919.39 (4.54)	2919.39 (4.14)	5838.7 (2.85)
	Total fixed costs	41231.2 (41.00)	44781.19 (50.14)	41231.2 (46.81)	127243.6 (45.87)
	Total costs (A+B)	1,32,500.4	1,17,556.9	1,20,397.5	3,53,934.5

The total costs incurred during its pre-bearing period (1-3 years) stood at Rs.204914.24 ofwhich Rs.110922.94 (54.13%) was variable costs and Rs.93991.3 (45.87%) fixed costs

It can be seen in Table 2, that among the total costs the rental value of owned land formed the major item with Rs.92037.5 (30.28%) followed by human labor (23.04%), fertilizers (12.23%), manures (7.70%), interest on fixed capital (6.93%), machine labor (5.47%), depreciation (5.08%), annual share of establishment cost (2.85%), interest on working capital (1.92%), pesticides (1.61%), electricity charges (1.46%), land revenue(0.73%) and plant material (0.70%).

3. Returns from oil palm orchard



	Yield(tons)	Gross income (Rs.)	Total costs (Rs.)	Net income (Rs.)
Total	489.62	3916960	2594546	1322414
8th -25th year	24.16	193280	120699	72581
7th year	20.23	161840	117445	44395
6th year	17.32	138560	114298	24262
5th year	12.02	96160	110248	-14088
4th year	5.17	41360	79972	-38612

Graph 1. Showing returns from oil palm orchard

It is clear from the Graph 1, that the gross income obtained from oil palm orchards during its pre- bearing period, amounted to Rs.79028.2 which was contributed by intercrops. It is clear from the Table 2 that the oil palm orchardists incurred Rs.228238.94 towards cost of cultivation during pre- bearing period out of which Rs.23324.7 were incurred to raise intercrops and Rs.204914.24 to establish one hectare of oil palm. The income received during pre-bearing period could not compensate the costs incurred during the same period resulting in the negative net return of Rs.149210.45.

According to data indicated in Graph 1, there was an increase in yield from 5.17 tons (4th year) to 20.23 tons (7th year). Then there was stabilization in yield from 8th year with an average yield of 24.16 tons. The gross income also increased from Rs.41360 in 4th year.

4. Economic viability of oil palm orchard

The costs and returns are not the perfect measures to assess the profitability from investment made on oil palm orchards. These costs and returns are not comparable with the returns from field crops that are grown in the area. Before making a choice on any enterprise, it becomes necessary to examine the economic feasibility of that enterprise. Several techniques are available for evaluating the economic viability of oil palm orchards. For this project evaluation techniques were employed. Net present worth, Benefit- cost ratio and internal rate of return were employed to examine the economic feasibility of investment on oil palm orchards. In the present study the costs and returns had been discounted at 12,16,20, 24 and 28 per cent to estimate net present worth.

5. Price spread for palm production.

It could be observed from the Table 2, that the producer's share in the price paid by consumer is estimated to be around 80 percent in the study area. It implies that there is not much difference in the net price received by the producer whatever may be the type of channel he chooses to market his produce. The

marketing costs incurred by the producer are lower in Channel I, because of the absence of commission charges for the farmer. The marketing cost incurred by the preharvest contractor accounts for 3.35 percent of the consumer price. This was due to sales tax incurred by him. The wholesale earned a margin of 1.72 percent when he purchased from the preharvest contractors. Thus, the channel was found to be more beneficial to the producer as well as to the wholesaler. Price spread analyses shows that, Channel is best from the producers' point of view.

6. Farmer Share Analysis

This Table 4 showing the highest farmer's share is in the marketing channel I (farmers - factories) which is equal to 100 percent with the selling price at the farmer level and the same factory, which is Rs. 1,403, - while the lowest farmer 's share is in channel III (farmers - small agents - large agents - factories) which is 65.94 percent. The difference in farmer share that occurs in each marketing channel is due to differences in prices received by each marketing agency, the number of marketing institutions involved, and functions performed to increase prices at the consumer level, Rahmawati (2013). The higher the farmer's share, the lower the marketing margin, Sinaga (2014)And the lower the margin obtained, the channel will be efficient, the efficient channel is marketingchannel I, Fitriani (2014).

7. Constraints

It could be inferred that harvesting was the major constraint in the cultivation of oil palm with a mean score of (89.65) followed by lack of remunerative market price (83.45), lack of availability of labor (79.6), high input cost (77.05), pests and diseases (72.95), lack of HYV and

Table 3. Interpretation of price spread in channel I for palm fruit production

Sl. No.	Particular	Channel 1 amount for 1000 Palm fruit	Percentage
1	Producer Net Price Received	9908	88.07
2	Marketing Cost	92	0.81
3	Gross Price Received	10000	88.89
4	Pre harvest contractor		
5	Price Paid	10000	88.89
6	Marketing Cost	377	3.35
7	Marketing Margin	123	1.09
8	Price Received	1050	93.33
9	Wholesaler Price Paid	10500	93.33
10	Marketing Cost	436	3.88
11	Marketing Margin	64	0.57
12	Price Received	11000	97.78
13	Retailer Price Paid	11000	97.78
14	Marketing Cost	199	1.76
15	Marketing Margin	51	0.45
16	Price received or price paid by consumer	11250	100
17	Marketing cost	1104	9.8
18	Marketing margin	238	2.11
19	Price spread	1342	11.91

Table 4. Analysis of farmer's share through marketing channel I, II, & III

Marketing Channel	Price of the Farm Level (Rs/kg)	Price of the Consumer Level(Rs/kg)	Farmers' Share (%)
I	1.403	1.403	100
II	1.172	1.403	83.53
III	925	1.403	65.94

Source: Primary Data Analysis

Table 5. Constraints face by farmers in oil palm production

Sl. No.	Constraints	Score	Garrett's Rank
1	High input cost	77.05	IV
2	Lack of availability of labor	79.6	III
3	Difficulty in Harvesting	89.6	I
4	Lack of proper market price	83.4	II
5	Adverse climate factor	71.2	VII
6	Pest and disease	72.9	V
7	Lack of HYV and Earlybearing varieties	72.6	VI
8	Lack of credit facilities	65.6	IX
9	Lack of transport facility	67.6	VIII
10	Lack of subacidity	64.9	X
11	Lack technical information	63.7	XI

early bearing varieties (72.65), adverse climatic factors (71.2), lack of transportation facilities (67.65), lack of credit facilities (65.67), lack of subsidies (64.9) andlack of technical information (63.7).Manual harvesting of fresh fruit bunches was in practice in the study area. With the age, the height of the tree increases and consequently the harvesting becomes that much difficult as the laborer's have to exert greater amount of energy. As an alternative, mechanical harvesters were available in the market, but the maintenance costs were prohibitive.

4. CONCLUSION

Oil palm cultivation in Rajahmundry is a profitable agricultural practice that has the potential to generate significant economic benefits for farmers and landowners in the region. The climate and soil conditions in Rajahmundry are favorable for oil palm cultivation, and the crop requires relatively low maintenance while producing high yields of oil. However, the expansion of oil palm plantations in the region has also been linked to environmental concerns such as deforestation, biodiversity loss, and greenhouse gas emissions. It is therefore important to ensure that oil palm cultivation in Rajahmundry is carried out in a sustainable and environmentally responsible manner, through measures such as promoting the use of best management practices, supporting small-scale farmers and cooperatives, and encouraging the adoption of certification schemes that promote sustainable and ethical production practices.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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