

Supply Chain Analysis of Oil Palm in Andhra Pradesh

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Received: 16-02-2023

Revised: 29-05-2023

Accepted: 07-06-2023

ABSTRACT

The current study focused on the oil palm's acreage, production, and productivity. According to the findings, there was an increase in the area planted with oil palm between 2011–12 and 2015–16. However, there was only a 1% increase in oil palm planting between 2016–17 and 2020–21. Oil palm planting expanded less from 2016 to 21 than it did from 2011 to 16. The production of palm oil grew between 2011 and 21. The productivity of palm oil has decreased by 8% between 2011–12 and 2015–16. Whereas, from 2016–17 to 2020–21, palm oil production increased by 3%. Farmers in the study region followed a single supply chain that eliminates middlemen and allows them to communicate directly with the business that processes oil palms. Additionally, during the processing of oil palm, by-products like crude palm oil (CPO), palm nuts, shedder fiber, palm fiber, D-muck, and sludge were created. Farmers' production and marketing difficulties were collated.

Keywords: Oil Palm, Productivity, Processing, Marketing, Constraints

Oilseed crops are the second-most significant driver of agricultural economics among field crops, following cereals. Oilseed self-sufficiency was attained during the early 1990s "Yellow Revolution," but it could only be sustained for a short period of time. India used to be one of the top importers of vegetable oils, while being the fifth-largest producer of oilseed crops worldwide (*Economic Times*, 2022). India is one of the biggest exporters of edible oils and a producer of oilseeds. India has the fourth-largest vegetable oil economy in the world, next to China, Brazil, and the United States (India Brand Equity Foundation, 2022). Oilseeds make up 10% of the value of all agricultural commodities, 13% of the gross cultivated land, and 3% of the GDP (NMOOP, 2018). The country's unique Agro-ecological characteristics are perfect for farming nine annual oilseed crops, including seven edible oilseeds (groundnut, rapeseed, mustard, sunflower, sesame, safflower, and niger) as well as

two non-edible oilseeds (castor and linseed) (castor and linseed). Over 27 million hectares of the country are used to cultivate oilseeds, largely on marginal terrain, with rainfed cultivation making up 72% of the total (NMOOP, 2018).

In 2020–2021, 36.5 MT of nine cultivated oil seeds will be produced. According to the Ministry of Agriculture's third advanced estimates, India imported 7.4 MT of edible oil in the following year (APEDA, 2021). The Ministry of Agriculture is working to increase domestic oil seed output in order to cut back on imports. The production of oilseeds has increased significantly, from 11.3 million tons in 1986–1987 to 33.22 million tons in 2019–20 (Kumar &

How to cite this article: Poojitha, A., Mathur, A. and Beniwal, A. (2023). Supply Chain Analysis of Oil Palm in Andhra Pradesh. *Agro Economist - An International Journal*, 10(02): 161-168.

Source of Support: None; **Conflict of Interest:** None



Tiwari, 2020). Palm oil imports from Indonesia and Malaysia account for a significant share of India's edible oil requirements, so it is essential to enhance production using indigenous resources. Oil palm is a relatively new crop in India and can yield 20-30 MT Fresh Fruit Bunches (FFBs) per ha, so there is a need to expand oil palm planting areas in order to boost palm oil production (NMOOP, 2018).

Global oil palm production

Palm oil is one of nine important oils sold on the international market for edible oils and fats. Nowadays, it is the greatest source of vegetable oil in the entire globe. Five nations – Indonesia, Malaysia, Nigeria, Thailand, and Columbia – produce more than 90% of the world's FFBs. Due to a large rise in palm oil output between 2000 and 2019, the world's production of vegetable oils more than doubled. With a share of 59% of global oil palm output, Indonesia is the largest producer in the world (USDA, 2022).

Imports and Exports of oil palm

The oil palm is imported by many countries along with India. According to United States Department of Agriculture in the year 2021, total world imports of palm oil are 481MMT in the year 2021.

India imported 775MMT of palm oil from around the world which made it the top most palm oil importer in the world. The share of India in world imports is 16%. China is the second largest importer of palm oil with 15% share in total imports followed by European Union with a share of 13% in total world imports. Pakistan, United States, Bangladesh, Egypt, Philippines, Kenya are the 6 major countries that import oil palm after India, China and European Union (USDA, 2022). The share of different countries in the world imports and the quantity imported by them is given in the table 1.

Table 1: Share of major countries in world palm oil imports

Rank	Country	Percent of World Imports (%)	Imports (1000MT)
1	India	16	7,750
2	China	15	7,100
3	European Union	13	6,200

4	Pakistan	7	3,500
5	Other countries	4	1,700
6	United States	3	1,625
7	Bangladesh	3	1,370
8	Egypt	2	1,200
9	Philippines	2	1,180
10	Kenya	2	1,080

Source: https://ipad.fas.usda.gov/cropexplorer/cropview/commodityView.aspx?cropid=4243000&sel_year=2021&rankby=Imports.

Table 2: Share of major countries in world palm oil exports

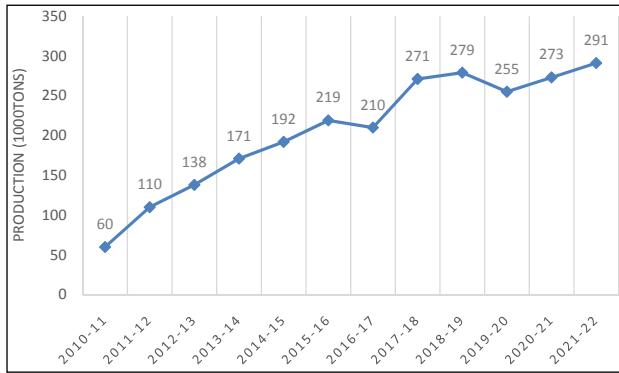
Rank	Country	Percent of World Exports (Percent)	Exports (1000MT)
1	Indonesia	56	28,000
2	Malaysia	33	16,220
3	Guatemala	2	810
4	Colombia	1	685
5	Papua New Guinea	1	584
6	Thailand	1	550
7	Honduras	1	425
8	Other countries	1	300

Source: https://ipad.fas.usda.gov/cropexplorer/cropview/commodityView.aspx?cropid=4243000&sel_year=2021&rankby=Exports.

Malaysia is the second largest exporter of palm oil and occupy a share of 33% in the total world exports. Guatemala, Colombia, Papua New Guinea, Thailand, Honduras are the 3rd, 4th, 5th, 6th, and 7th largest exporters of palm oil as shown in the table 2 (USDA, 2022).

Oil palm production in India

Palm oil accounts for nearly 80% of total edible oil imports; as a result, oil palm has been identified as a prospective crop that might contribute more than 3,00,000 hectares of land by 2025-26, with ambitions to expand to 6,50,000 hectares (PIB, 2021). Over the years the production of oil palm has increased substantially from 60,000 tons in 2010-11 to 2,91,000 tons in 2021-22 as per United States Department of Agriculture. The production growth of oil palm in India over the years from 2010-11 to 2021-22 is depicted below in the Fig 1..

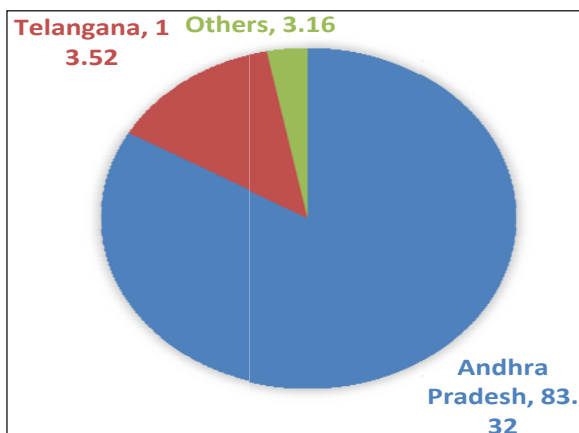


Source: <https://ipad.fas.usda.gov/cropeplorer/cropview/commodityView.aspx?cropid=4243000>

Fig. 1: Production growth of oil palm in India (2010-2022)

Andhra Pradesh produces the most oil palm in India, accounting for roughly 83.32% of total output, followed by Telangana, Kerala, Karnataka, Tamil Nadu, Goa, and Mizoram.

Telangana is the second largest producer of oil palm in India with a share of 13.52%. Other states occupy only a minor share of 3.16% in palm oil production in India. The production share of oil palm producing states is depicted in the Fig. 2.



Source: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1780271>

Fig. 2: Production share of oil palm producing states in India

Oil palm production in Andhra Pradesh

With a 1.62 lakh ha area, 14.09 lakh MT of FFBs (1.14 lakh Farmers), and an average yield of 19.81 tonnes per ha from the bearing plants, Andhra Pradesh

leads the nation in both oil palm output and area. At over 93,992 acres, the West Godavari district in Andhra Pradesh has the highest oil palm cultivation area (PIB, 2021).

Purpose of the study

The phrase “supply chain analysis” is used to describe the entire set of economic agents, which can include both natural persons like farmers, traders, or consumers as well as legal entities like businesses, governments, or development organisations. The main goals of this study are to identify the various supply chains in the oil palm industry, to analyse the use of by-products from the oil palm industry, to look at how production and productivity of oil palm have increased over the past five years, and to look at the challenges that farmers face in marketing and production.

METHODOLOGY

The study was descriptive in nature where primary information was collected from the farmers and the employee of the processing units. The oil palm growers and employee from processing units were considered in sampling frame. West Godavari district was selected for the sampling as the district is the highest producer of oil palm in the state. The sampling technique followed for selecting the district was purposive sampling. Three mandals (Nallajerla, Unguturu and Dwaraka Tirumala) were selected based on convenience sampling as the locations are nearby. Using stratified random sampling from each district 30 oil palm farmers were selected based on the land holding pattern. Total 90 farmers and 3 employees from 3 processing units was interviewed to collect primary data to carry out the study. Estimation of compound annual growth rate to know growth trends in area, production and productivity. Furthermore, a another objective was mainly designed to identify the major constraints faced by farmers in supply chain of oil palm and this analysis has been done using Garrett ranking.

RESULTS AND DISCUSSION

Growth trends in area, production and productivity of Oil palm in the study area

This objective was majorly focused to identify the

compound growth rate in area production and productivity of oil palm.

Compound annual growth rate in area of oil palm cultivation

According to Directorate of economics and statistics, Andhra Pradesh, in the study area, the area of oil palm cultivation had almost doubled from the year 2011-12 to 2020-21. The area of palm oil cultivation in the year 2011-12 was 0.46 lakh ha, in 2012-13 it is 0.5 lakh ha followed by 0.55 lakh ha, 0.61 lakh ha and 0.83lakh ha in the years 2013-14, 2014- 15, 2015-16 respectively. The area cultivated with oil palm had increased 16% from the year 2011-12 to 2015-16. The area of palm oil cultivation in the year 2016-17 is 0.86 lakh ha, in 2017-18 it was 0.9 lakh ha followed by 0.94 lakh ha, 0.98 lakh ha and 0.91 lakh ha in the years 2018-19, 2019-20, 2020-21 respectively. Whereas, from the year 2016-17 to 2020-21 the area under oil palm cultivation only increased 1%. Compared to 2011-16 there was less growth in the area of oil palm cultivation from 2016-21.

The Compound Annual Growth Rate (CAGR) in the area of oil palm cultivation was 8% from the year 2011-12 to 2020-21. The detailed changes in the percentage changes and compound annual growth rate in area under oil palm cultivation in study area from 2011-21 area over the districts is given in the table 3.

Table 3: Percentage changes and compound annual growth rate in area under oil palm cultivation in study area from 2011-21

Sl. No.	Year	Area (in lakh hectares)	Percentage change over the years
1	2011-12	0.46	16%
2	2012-13	0.5	
3	2013-14	0.55	
4	2014-15	0.61	
5	2015-16	0.83	
6	2016-17	0.86	1%
7	2017-18	0.9	
8	2018-19	0.94	
9	2019-20	0.98	
10	2020-21	0.91	
CAGR			8%

Source: <https://des.ap.gov.in/jsp/social/ASAG2020-21.pdf>
<https://des.ap.gov.in/jsp/social/APGLANE2015-16.pdf>

Compound Annual Growth Rate in production of Oil Palm

According to the Directorate of Economics and Statistics in Andhra Pradesh, oil palm production in the study region increased by nearly twofold between the years 2011-12 and 2020-21. The output of palm oil was 10.08 LT in 2011-12, 10.61 LT in 2012-13, and then 12.34, 13.07, and 13.08 LT in 2013-14, 2014-15, and 2015-16, respectively. Palm oil output grew by 7% between 2011-12 and 2015-16. The output of palm oil was 18.29 LT in 2016-17, 17.81 LT in 2017-18, and then 19.65 LT, 22.63 LT, and 21.87 LT in 2018-19, 2019-20, and 2020-21, respectively. Whereas, the production of palm oil grew by 5% from 2016-17 to 2020-21.

Compared to 2011-16 there was a little less growth in the production of palm oil from 2016-21. The percentage changes and compound annual growth rate in production of oil palm in study area from 2011-21 is depicted in the table 4.

Table 4: Percentage changes and compound annual growth rate in production of oil palm in study area from 2011-21

Sl. No.	Year	Production (in lakh tones)	Percentage change over the years
1	2011-12	10.08	7%
2	2012-13	10.61	
3	2013-14	12.34	
4	2014-15	13.07	
5	2015-16	13.08	
6	2016-17	18.29	5%
7	2017-18	17.81	
8	2018-19	19.65	
9	2019-20	22.63	
10	2020-21	21.87	
CAGR			9%

Source: <https://des.ap.gov.in/jsp/social/ASAG2020-21.pdf>
<https://des.ap.gov.in/jsp/social/APGLANE2015-16.pdf>

The Compound Annual Growth Rate (CAGR) in the production of palm oil was 9% from the year 2011-12 to 2020-21, which was 1% more than the area under oil palm cultivation.

Compound annual growth rate in productivity of oil palm

According to the Directorate of economics and statistics, Andhra Pradesh, the productivity of palm oil in the year 2011-12 was 21705 kg /ha, in 2012-13 it was 21097 kg/ha followed by 22319 kg/ha, 21482 kg/ha and 15867 kg/ha in the years 2013-14, 2014-15, 2015-16 respectively. The productivity of palm oil had decreased 8 % from the year 2011-12 to 2015-16. The production of palm oil in the year 2016-17 was 21279 kg/ha, in 2017-18 it was 19784 kg/ha followed by 20906 kg/ha, 23155 kg/ha and 24107 kg/ha in the years 2018-19, 2019-20 and 2020-21 respectively. Whereas, from the year 2016-17 to 2020-21 the production of palm oil had increased 3%.

Table 5: Percentage changes and compound annual growth rate in productivity of oil palm in study area from 2011-21

Sl. No.	Year	Productivity (in kgs/hectares)	Percentage change over the years
1	2011-12	21705	-8%
2	2012-13	21097	
3	2013-14	22319	
4	2014-15	21482	
5	2015-16	15867	
6	2016-17	21279	3%
7	2017-18	19784	
8	2018-19	20906	
9	2019-20	23155	
10	2020-21	24017	
CAGR			1%

Source: <https://des.ap.gov.in/jsp/social/ASAG2020-21.pdf> <https://des.ap.gov.in/jsp/social/APGLANE2015-16.pdf>

The Compound Annual Growth Rate (CAGR) in the productivity of palm oil was 1% from the year 2011-12 to 2020-21, which was less than the area and production.

Identification of existing supply chain in the study area

Farmers in the research region followed only one supply chain, which comprised a direct link between both the farmers and also the oil palm processing factory with no intermediaries involved.

Farmers Oil  Palm Processing Industries

By- products of palm oil

The processing of oil palm also gave the by-products like Crude Palm Oil (CPO), Palm nuts, Shedder fiber, Palm fiber, D-muck and sludge.

Crude palm oil

Crude palm oil is the important by-product of oil palm. It was sent to refineries to manufacture the palm oil. The oil refineries that are present in West Godavari are Kaleesuwari Refinery and Industry Private Limited, Santhoshimathaa Edible Oils Refinery Pvt Ltd and Ruchi Infrastructure Ltd. The cost crude palm oil was ₹ 1, 50,000 per ton as of April, 2022.

Crude Palm Oil  Refineries

Palm nuts

Palm nuts were procured by processing industries. These are one of the major by- products of oil palm. The palm nuts were procured in West Godavari by Godrej Agrovet Limited, Ch. Pothepalli, 3F Oil Palm Pvt. Ltd, Devarapalli and Nava Barat Limited, Uppalametta. There were no be any intermediaries for palm nuts procurement, processing companies had procurement points for palm nuts where farmers delivered the palm bunches. The cost of palm nuts was ₹ 18,000 per tonne as of April, 2022.

Palm nuts  Processing Industries

Palm empty bunches

Palm empty bunches were sent to brick industries. The cost of palm empty bunches was ₹ 100 per tonne as of April, 2022.

Palm empty bunches  Brick industry

D-muck

D- muck is decanter muck, it was sent to fish farmers in the local areas. The cost of decanter muck was ₹ 1000 per ton as of April, 2022.

Decanter  Fish farmers

Shredder fiber and palm fiber

The shredder fiber and palm fiber were used as biomass fuel for the processing industry itself. The excess fiber was sold to power generation houses nearby. The cost of fiber was 200 per ton as of April, 2022

Shredder fiber, Palm fiber  Power generation houses

Constraints faced by farmers in production and marketing of oil palm, constraints faced by palm oil processing factories

The constraints faced by farmers in production and marketing was collected and the data was analyzed using Garrett's ranking technique.

Constraints faced by farmers in production

The highest average score was obtained for non-availability of seedlings which made it major constraint followed by non-availability of seedlings, less subsidies on seedlings purchase, high infestation pests. These were the major constraints faced by farmers according to Garrett ranking technique which are given in the table 6.

Table 6: Constraints faced by farmers in production of palm oil

Constraints in production faced by farmers	Average Score	Garrett rank
Non-availability of seedlings	72.51	1
Less subsidies on seedlings purchase	71.2	2
High infestation pests	69.72	3
Poor technical guidance	56.81	4
Lack of improved varieties	49.28	5
Labor problem	47.46	6
Diseases occurrence	41.33	7
Non availability of pesticide	33.81	8
Non-availability of fertilizers	31.11	9
Poor irrigation facilities	24.74	10

Source: Researcher's own computation from primary data.

The major constraints faced by farmers according to the collected primary data were non-availability of seedlings, less subsidies on seedlings purchase, high

infestation pests, poor technical guidance and lack of improved varieties were identified.

Constraints faced by farmers in marketing of oil palm

Garrett ranking technique was used to identify the major constraints faced by farmers in marketing of oil palm. The major constraints faced by farmers according to the collected primary data were high transportation costs while moving the harvested oil palm from farm to processing factory, shortage of labor for various farming operations, grading problems. These were the major constraints faced by farmers according to Garrett ranking technique which are given in the table 7.

Table 7: Constraints faced by farmers in marketing of oil palm

Constraints in marketing	Average score	Garrett rank
High transportation cost	70.15555556	1
Shortage of labor	69.1	2
Grading problems	47	3
Weighment problems	45.41111111	4
High price fluctuations	44.26666667	5
Lack of accessibility of market information	25.75555556	6

Source: Researcher's own computation from primary data.

Constraints faced by processing units of oil palm

Garrett ranking technique was used to identify the major constraints faced by oil palm processing industry. The major constraints faced by oil palm processing units were poor quality of bunches such as unripe bunches, over ripe bunches. These were the major constraints faced by processing industries according to Garrett ranking technique which are given in the table 8.

Table 8: Constraints faced by processing industries of oil palm

Constraints faced by processing industry	Average score	Garrett score
Poor quality of bunches	77	1
Long stalk bunches	63	2

High transportation charges	51.33333	3
Price fluctuations	48.66667	4
Manpower problems	32.33333	5
Government subsidies	27.66667	6

Source: Researcher's own computation from primary data.

The remaining constraints faced by palm oil processing industries are long stalk bunches, high transportation charges, price fluctuations, manpower problems, government subsidies

IMPLICATIONS OF THE STUDY

Farmers, suppliers, and processors might find this study useful. As evidenced by the results, production and area under cultivation have grown through time, but productivity has declined. Work could be done to solve the productivity problem. The difficulties encountered during production, processing, and marketing could be leveraged to create a platform with the ability to assist farmers and processors in a way that can be beneficial for enhancing productivity and marketing of high-quality products created with palm oil.

CONCLUSION

Oil palm is one of the most profitable crop in Andhra Pradesh. In Andhra Pradesh, West Godavari district is selected for survey. Nallajerla, Unguturu, Dwaraka Tirumala mandals are selected in the district based on the convenience. From each district 3 villages are selected. From each village 10 farmers are selected for the study, which make 90 farmers as whole. There are 3 processing companies around the study area i.e., Godrej Agrovet Limited, Ch. Pothepalli, 3F Oil Palm Pvt. Ltd, Devarapalli and Nava Barat Limited, Uppalametta are selected for the survey

In the study area, from 2011-21 the compound annual growth rate in the area of oil palm cultivation is 8%, in production it is 9% while in productivity the compound annual growth rate is only 1%. From the past few years the area and production of oil palm has been increasing As the district is near the coastal region there is not much of a problem regarding irrigation. There are only few problems faced by farmers in palm oil cultivation. From the past 2 years the white fly attack is seem in oil palm, hence this has also become the one of the major problem

which is not faced before. In this year the availability of seedlings has decreased in the districts along the subsidies for oil palm seedlings purchase which made this as a constraint in oil palm production. The processing industries convey the changes in prices timely to the farmers. So, the farmers are well aware about the market price.

The processing companies directly procure oil palm bunches from the farmers. No intermediaries were involved in the procurement of oil palm. The by-products produced after processing are send to refineries, brick industries, power stations for further use. The major constraints faced by processing industries of oil palm are, as they procure oil palm bunches in whole, there will be unripe and over ripe fruits in the bunches which are not useful for processing. In the view of increasing diesel prices, the transportation charges are also increased. Price fluctuation in international markets also affect the price quoted by processing industries to farmers. Despite all these constraints oil palm is the one of the major plantation crop in the district.

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