TUR#3C-2-a-1-2-The Performance of Oil Farm Cultivation

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The performance of oil palm cultivation in Muaro Jambi District

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Abstract. The development of oil palm plantations aimed to eliminate poverty and underdevelopment, especially in rural areas through enhancement of the incomes of the smallholders. However, most of the number of plants have entered the rejuvenation period, which influenced the performance of the cultivation. The objective of this research was to identify the performance of the oil palm cultivations in Muaro Jambi District and analysed the oil palm smallholding incomes. Using survey method, the results showed that age of the smallholder plantation, land size and price, have affected the number of costs incurred and the revenues in old-aged plants. The annual income per smallholder farmer reached IDR 38,211,648 or IDR 18,964,782 per hectare per annum. The research indicated that it would be better to maximize the activities in the use of agricultural inputs and be aware of the most current related innovations and technologies in productivity improvement of oil palms.

1. Introduction

The plantation sub-sector has a wide opportunity to become the mainstay of exports. Development in plantation sector is directed to accelerate the rate of production growth from private, smallholders and state plantations. Among the estate crops, oil palm is perceived not only as a potential crop in the economic development, but also in alleviating poverty [1]. Oil palm has become one of the most important national income sources for the Indonesian economic system. Since 2009, Indonesia has become the largest producer of palm oil in the world [2], [3]. Promoting oil palm plantations have increased farmer's incomes as well as enhancing economic development [4], [5], [6], [7], [8], [9].

Development of smallholder plantations encourages the improvement of farmer welfares and foreign exchange in addition to the absorption of labours in the upstream industry sector, namely the plantations themselves and the downstream industries [10]. The prospect of developing smallholder oil palm plantations is very much determined by the existence of economic policies that favour the people, in order to encourage the realization of the welfare. Oil palm is the main commodity of farmers in Jambi Province.

Muaro Jambi Regency is a regency in Jambi Province with the largest oil palm plantation area that covers 21.22% of the total area of oil palms in Jambi Province and contributes the second largest producer of 181,832 tonnes with the productivity of 2,381 kg/ha/year. The plantations in the Sungai Bahar Sub-district were established in 1983 by PTPN VI of which the latter was established by the Central Government through the Transmigration Programme as a response to the national programme to develop areas outside Java. The transmigration programme was integrated into the oil palm plantation

development through a partnership programme between the company (large) and the smallholder plantations known as PIR-Plasma Pattern. In such partnership, the term plasma refers to the farmers of the Transmigration Programme. Hence, the partnership of PTPN VI Sungai Bahar Oil Palm Plantation Programme is called the PIR-Trans [11].

The oil palms in Tanjung Sari Village were classified under the category of producing crops (TM) which could be divided into 3 age levels, the 6-10 years, the 11-15 years and e 16-20 years. Each age level will produce different levels of production. Production is one of the factors that influence the level of income in addition to price and production factor. The use of production factors such as capital, land area, infrastructure and labour, are considerations that farmers take into account when conducting cultivation. The income level of the farmers will be determined by the FFB production, the FFB prices and the farming costs to be incurred by farmers in the oil palm cultivation process. The objective of this research is to identify the performance of oil palm cultivations in Muaro Jambi District and analyse the smallholder incomes in cultivating the oil palm.

2. Method

The research was conducted in Sungai Bahar Sub-district of Muaro Jambi Regency. The survey collected data on the: (1) description of smallholder oil palm plantations, (2) oil palm production, (3) plant age, (4) land area, (5) production costs, and (6) price of unity (IDR/kg). Data were collected from primary and secondary sources using direct interviews.

The research location was selected based on purposive sampling. The Tanjung Sari Village was selected since it represented an area with the largest plantation age of 16-20 years. The number of farmers who cultivated oil palms of 16-20 years of age totalled to 270 families. The sampling method used was quota sampling, which is a technique for determining a sample of the population with certain criteria up to the desired sample quota, using the formula from Yamane, T (1967) [6] where the 12.5% precision level of samples obtained is as follows:

$$n = \frac{\mathrm{N}}{\mathrm{N}.(\mathrm{D})^2 + 1}$$

Where:
n = Quantity of the sample
N = Population quantity
D = Precision level (12,5%)

The sample obtained was 52 samples with a plant age of 16-20 yea[13] Data analysis was done descriptively and also quantitatively by calculating the production costs using the following formula [12]:

$$TC = FC + VC$$

Where:
TC = (Total Cost) (IDR/Ha/Year)
FC = (Fixed Cost) (IDR/Ha/Year)
VC = (Variable Cost) (IDR/Ha/Year)

To calculate the income of oil palm cultivation by using the formula as follows:

$$PD = TR - TC$$
$$PD = (Y\ x\ Py) - TC$$

Where:
PD = Income (IDR/Ha/Year)
TR = (Total Revenue) (IDR/Ha/Year)
TC = (Total Cost) (IDR/Ha/Year)
Y = FFB production (Kg/Ha/Year)
Py = FFB price (IDR/kg)

3. Empirical results

Data area, production and productivity of smallholder oil palms in Muaro Jambi Regency, according to the 2016 sub-district as given below in table 1.

Table 1. Total Land Area of Immature Plantations (TBM), Crops (TM), Old Plants (TT), Production and Productivity of Oil Palms According to District in Muaro Jambi Regency in 2016

Sub-district	Total Land Area (ha)				Production (Ton)	Productivity (kg/ha/ year)
	TBM	TM	TTM/TR	Total		
Jambi Luar Kota	563	4,330	-	4,893	16,310	3,767
Sekernan	3,662	13,930	49	17,641	37,394	2,684
Kumpe Ilir	341	12,001	22	12,364	24,679	2,056
Muaro Sebo	4,367	6,680	-	11,047	16,205	2,426
Mestong	318	3,109	-	3,427	6,569	2,113
Kumpe Ulu	1,881	13,027	-	14,908	39,227	3,011
Sungai Bahar	**929**	**19,413**	**11,970**	**32,312**	**46,439**	**2,392**
Sungai Gelam	385	672	43	1,100	1,790	2,664
Total	12,446	73,162	12,084	97,692	188,613	2,578

Source: Plantation Division, Jambi Province, 2016

As seen in table 1, out of the eight sub-districts in Muaro Jambi District, Sungai Bahar has the widest area of oil palm plantation with a total area of 32,312 ha, which was capable of producing 46,414 tons with a productivity of 2,392 kg/ha/year. The number of non-yielding crops/damaged plants, which reached 11,930 Ha, was suspected to be the reason for the existence of large oil palm areas with low productivity. This sub-district has expanded into three sub sub-districts, one of which is the Sungai Bahar Selatan sub-district, whereas the second widest sub-district for oil palm-producing land. The Tanjung Sari Village is the second largest oil palm plantation village after Bukit Makmur Village. The production has reached 1,368 Ha, approximately about 21% of the total 6,567 Ha in the Bahar Selatan District.

Respondents in this study were oil palm smallholder farmers. Some limitations to the research included characteristics that were expected to hinder and influence the willingness and ability of farmers in cultivation, including age, level of education, training experience and total family members. The smallholder farmers comprised of various ages, ranging from 30 to 65 years old. Most of the respondents were around the ages of 43-48 years old under the category of productive age, who still had the physical abilities to work their land. With regards to the length of oil palm farming, it was found that the longest experience in oil palm farming was about 30 years and the lowest was about 7 years with an average activity of oil palm cultivation of 19 years. Data showed that the most of the farmers (43.31%) have been engaged in oil palm farming between 19 to 24 years, while the shortest length of being an oil palm farmer was 7 to 12 years (6.9%). The experience of this effort shows that farmers have had long enough experiences in operating palm oil.

As many as 24.13% of the farmers were high school graduates (SMA), while 52% graduated from elementary school (SD), 16% graduated from junior high school (SLTP), and 9% graduated from universities (PT). The level of education influenced the efforts to implement, process and increase production. The farmers individually owned their oil palm plantations of various land sizes. Of the 58 respondents, 77% had a land area of 1-3 ha, 14% had a land area of 4-6 ha and 9% had a large land area of 7 ha.

3.1. Description of oil palm cultivation

Land as an input that influenced the level of production would have a positive impact. In the study area, the land status was individually owned with a total land area per farmer approximately 3 ha. The age of the plants varied greatly from 6 to 20 years, with the oldest between 16 to 20 years (46%) of whom were Ex-PIR plant or plasma farmers whose plantations were firstly developed by PTPN VI and the

production was managed by KUD Dwi Jaya. The cultivation technique carried out by the farmers was of standard, beginning with the preparation of seeds focussing on superiority and quality. The average planting distance was 8x9 m, to allow the growth of the oil palm trees. In carrying out the maintenance, the farmers applied fertilisers to compete with the growth and obtained a maximum harvest outcome, as well as the provision of medicines to fight protect the plants from diseases and weeds. The types of fertilizers used were Urea, KCL, TSP and Kieserite, with the following dosages: 2.0-2.5kg/ph/year for urea, 2.5-3.0kg/ph/year for KCL, 0.7- 1.0 kg/ph/year for TSP and 1.0-1.5 kg/ph/year for Kieserite. Fertiliser was given 2-3 times a year. As for the use of medicines, the average farmers used Gramaxonmore obtained from KUD Dwi Jaya where the payments could be made in instalments. Other maintenance activities included pruning to stimulate plant growth. Pruning was done once every 6 months to one year, which often required 3 to 4 days.

The harvesting process in the study area was carried out twice a month or 24 times in one year. Direct production was marketed to plantation companies, including from Pinang Tinggi Plant and PT. ALS. In 2017, the average production for the 16-20 year old plant was 44,159 kg/year or 16,891 kg/ha/year with the current price of IDR 1,421. FFB marketing was carried out through KUD Dwi Jaya where farmers sell their FFB to KUD and the KUD would channelled them to palm oil mills according to price and distance.

3.1.1. The cultivation revenue

Revenue is the result of the multiplication between production and selling price. The amount of revenue of a business is influenced by the amount of production with the unit price of production. The higher the amount of production and the unit price of production, the higher the revenue and vice versa. Fresh Fruit Bunches are what the farmers produced from their plantations. This research found that for the plants aged 16-20 years, the average production was 34,159/kg/farmer/year and the average per hectare was 48,481 kg/year, which gave the revenue of IDR 48,629,089/farmer/year or an average revenue per hectare of IDR 24,213,563/ha/year. Revenues from the oil palm cultivation in the study area are tabulated below in table 2.

Table 2. Production and Revenue from Oil Palm Cultivation in 2017

No	Description	Revenue farmer/ha/year 16-20 year	
		Per farmer	**Per ha**
1	Production (kg/year)	34,159	18,481
2	Price (IDR)	1,421	1,421
	Total	**48,629,089**	**24,213,563**

3.1.2. Cost of production in oil palm cultivation

Production costs are the values of various inputs in the form of objects and services used during the production process. In general, the costs incurred in the production process consisted of fixed costs and variable costs. Variable costs in farming included the cost of purchasing fertilizer, medicines, and labour costs, while fixed costs included equipment depreciation, road maintenance, etc. The followings were the costs incurred by the farmers in oil palm cultivation.

a. *Fixed Cost*

The fixed cost was the depreciation cost of the equipments through the reduction of the purchase value of the equipments in the remaining value of the tool divided by the economic life of the instrument. The instruments used were hoes, machetes, dodos, egrek, *kep, gancu, angkong, and tojok*. After calculating the depreciation cost of each equipment, the average cost of the depreciation of agricultural equipment used by the farmers totalled to IDR 319,802/year or IDR 160,459/ha/year.

b. *Variable Cost*
Variable costs, are costs incurred due to the amount of products produced, in other words, these costs are influenced by the amount of production. This fee (Table 3) is the cost used in the production process which was calculated for one year. Included in the variable costs, were the cost for purchasing fertiliser, medicine, labour costs outside family members and cost of FFB transportation which included motorbike and gasoline.

Table 3. Variable Cost of Oil Palm Cultivation in 2017

No	Variable Cost	Cost (IDR/farmer/ha/year) 16-20 years	
		IDR/farmer	**IDR/ha**
1	Fertiliser	4,467,946	2,251,112
2	Medicines	303,077	150,466
3	Labour Cost (outside the household)	4,348,154	2,197,795
4	Other costs	978,462	488,849
	Total	**10,097,639**	**5,088,222**

Data shows that fertilizer costs incurred by farmers are the highest cost among other costs. The optimal use of fertilizer is expected to help plant growth and increase the production of oil palm farming. The Farmers obtained fertilizers through middlemen and KUD. The types of fertilizer used by farmers are NPK phonska, SP-26, UREA, KCL and Dolomite. Fertilizer is given 3 times in one year with an average cost of IDR 4,467,946/year and IDR 2,251,112/ha/year. Research [13] states that the average cost of oil palm fertilizer at the age of 20 years and over in the village of Ujung Tanjung Sungai Bahar Selatan District is IDR 1,287,499/Ha/year. This is not much different from the results of this study with the average cost of fertilizer at the age of plants 16-20 years of IDR 2,251,112/Ha/year.

Medicines cost incurred by the farmers was IDR. 303,077/year or IDR. 150,466/ha/year. While the calculated labour costs were the costs directly incurred by the farmer, the basis of the calculation is the labour costs outside the family where the average labour costs incurred by farmers was IDR 4,348,154. The year and for the cost per hectare is IDR 2,197,795/ha/year. Furthermore, based on the research by [13] states that the average labour cost of oil palm at the age of 20 years and over is IDR 2,775,623/Ha/year, this is not much different from the research area the costs incurred amounted to IDR 2,197,795/Ha/year. For other costs, what is calculated is the cost of motorbike gasoline and road maintenance. The cost of motorbike gasoline is used to refuel motor vehicles that will distribute fresh fruit bunches to the collection site. The average costs incurred was IDR 978,462/year or IDR 488,849/ha/year. The total cost of oil palm farming is the sum of fixed costs and non-permanent costs. Data analysis resulted in the total production cost of IDR 10,417,441/farmer/year or IDR 5,248,781/ha/year for 16-20 years old oil palm trees. The total cost of oil palm farming can be seen in table 4.

Table 4. Production Cost in Oil Palm Cultivation in 2017

Description	Cost (IDR/farmers/Year)	(IDR/Ha/Year)
	16 – 20 Year	**16 20 Years**
Fixed Cost (FC)		
Depreciation cost	319,802	160,459
Total (FC)	**319,802**	**160,459**
Variable Cost (VC)		
Fertiliser	4,467,946	2,251,112
Medicines	303,077	150,466
Labour costs (outside the household)	4,348,154	2,197,795

Description	Cost	
	(IDR/farmers/Year)	(IDR/Ha/Year)
	16 – 20 Year	16 20 Years
Other costs	978,462	488,849
Total (VC)	**10,097,639**	**5,088,222**
Production Cost (FC + VC)	**10,417,441**	**5,248,781**

3.1.3. The income generated by oil palm cultivation

The income of cultivation is the difference between revenue and costs incurred during production. In this study, income refers to the income that the farmers received in one year, while the revenue is the product of production with selling prices. The total income earned by each farmer is given in Table 5.

Table 5. The Income Analysis of Oil Palm Cultivation, 2017

Description	Income	
	16 – 20 Year	
	(IDR/farmer/year)	IDR/ha/year)
1. Revenue		
a. Production (Kg)	34,159	18,481
b. Price (IDR)	1,421	1,421
Total revenue (IDR)	**48,629,089**	**24,213,563**
Fixed Cost (FC)		
a. Price (IDR)	319.802	160.459
Total (FC) (IDR)	**319.802**	**160.459**
Variable Cost (VC)		
a. Fertilizer	4,467,946	2,251,112
b. Medicines	303,077	150,466
c. Labour cost (outside the household)	4,348,154	2,197,795
d. Other Cost	978,462	488,849
Total (VC) (IDR)	**10,097,639**	**5,088,222**
4. Total Cost (FC + VC)	**10,417,441**	**5,248,781**
5. Income (Revenue – Total Cost)	**38,211,648**	**18,964,782**

The findings were similar to the research by [5] that many smallholders have benefited substantially from the higher returns to land and labour provided by oil palm, although the district authorities and smallholders cooperation played key roles in the realization of benefits.

4. Conclusions

a. Oil palm farming in Muaro Jambi Regency is dominated by plants aged 16-20 years, which were ex-PIR or Plasma plants. At these ages, the production level were very low attributed to several factors.
b. The level of income earned by the farmers was high at a certain level of production. Farmers earned an income of IDR 38,211,648/farmer/year or IDR 18,964,782/ha/year.

5. Recommendation

a. Farmers should maximize using production factors and be able to innovate using current technologies to increase the productivity of the oil palm trees.
b. Farmers must conduct replanting because the production was no longer optimal.
c. The roles of the government in conducting counselling and in replanting activities, were highly recommended to assist the farmers in developing oil palm farming to improve their household welfare.
d. The performance of the smallholder oil palm plantations could be improved by applying Good Agricultural Practices.

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