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# Analysis of independent oil palm farming income after replanting in Muaro Jambi District

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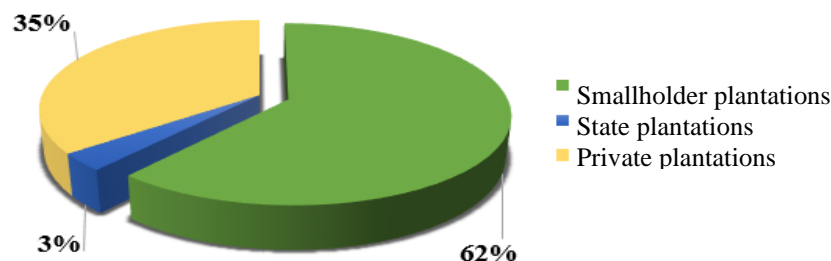
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**Abstract.** Palm oil is a plantation commodity that has high economic value and has the potential to be developed in Jambi Province. One of the districts in Jambi Province whose farmers cultivate oil palm is Muaro Jambi. This research was conducted to analyse independent oil palm farming income after replanting in Sungai Bahar Sub-District, Muaro Jambi District. This study shows that there are still many farmers in the study area who only cultivate oil palm as their main source of income (43.3%). Farmers own 2 lands, i.e., replanted land is the land that has been replanted by farmers or land when they partnered with an oil palm plantation company where replanting was carried out in 2011, 2012, and 2019. Whereas the non-replanting land that was purchased or opened by farmers independently and independently still at the age of productive oil palm plants. The income earned by farmers from the land that has been replanted is IDR. 22,229,912/year and from the land that has not been replanted is IDR. 15,840,852/year.

## 1. Introduction

The largest center of oil palm plantations is on the island of Sumatra with an area of oil palm plantations on the island of Sumatra in 2017 amounting to 8,355,034 hectares with a production of 25,152,448 tons. One of the Provinces that commit oil palm on Sumatra Island is Jambi Province. Data showed that the total area of oil palm plantations in Jambi Province in the year 2017 was 789,563 Ha [1,2]. Based on the ownership status, it can be found that most (62 %) of the oil palm plantation in Jambi province is owned by smallholder households as shown in Figure 1 below.



**Figure 1.** Area of oil palm plantation area by status of cultivation in Jambi Province 2017.



The role of smallholder oil palm plantations as the backbone of foreign exchange earnings and employment is increasingly evident. Today smallholder oil palm plantations are a vital part of the global palm oil supply chain [1]. Oil palm plantations in Jambi Province are spread throughout the districts, namely Batanghari, Muaro Jambi, Bungo, Tebo, Merangin, Sarolangun, Tanjung Jabung Barat, Tanjung Jabung Timur. Sungai Bahar Sub-district has the largest land area, amounting to 27.91% of the oil palm plantation total area in Muaro Jambi District, with the largest number of farmers and was able to contribute the third largest production of 33,689 tons in 2017. Productivity level oil palm in Sungai

Bahar Sub-district in 2017 only reached 2,296 Kg/Ha. The low productivity is indicated as a result of the area of old or damaged plants which reach 11,839 hectares or 43.38% of the total area of oil palm. This condition requires farmers to be able to rejuvenate as an effort to increase the productivity of oil palm plants and farmers' income. The problem that arises when farmers do replanting is the loss of income from oil palm farming which is the main source of income in meeting household needs and farming production costs. This problem causes farmers to look for other sources of income to cover income lost due to replanting.

Some oil palm plantation in Sungai Bahar, especially thus in ex-unit I till VI, actually was planted in 1983 – 1985. It is meant that some plants have already exceeded the recommended economic 25 years of age. Old oil palm plantations cannot produce optimally and can be detrimental to farmers because the labor and costs sacrificed are not proportional to the income received by farmers. In this condition, oil palm replanting activities need to be done as a solution to increase the productivity of palm oil so that it can improve the welfare of oil palm farmers. Based on the data discussed above, it is necessary to study the characteristic of smallholder oil palm farming in Sungai Bahar Muaro Jambi District and how the smallholder income from oil palm farming changed after replanting.

## 2. Methods

This research analyzes post-replanting oil palm farming income. Descriptive analysis was carried out to explain the general picture of oil palm farming and observations related to other supporting data based on questionnaires, reports and analyze the data obtained through questions, observations, conditions and situations in the study area.

In this study, the nominal approach used in calculating oil palm farm income, namely the approach without regard to the time value of money, but the price used is applicable, so that it can be directly calculated the amount of expenditure and the amount of revenue in a process period production. According to [3,6] farm income can be measured in value by calculating the difference in total revenue and total costs within one year or each cycle of farm production. Farm income can be formulated as follows:

$$Pd = TR - TC \quad (1)$$

In which :

Pd = Farm Income  
TR = Total Revenue  
TC = Total Cost

### 2.1. Overview of oil palm farming

Sungai Bahar Sub-district is one of the oil palm producing districts in Muaro Jambi District and has the largest area of oil palm plantations. Sungai Bahar Sub-district has been cultivating oil palm starting in 1983 and at present most of the oil palm land has been replanted. Replanting was first carried out in 2011 and 2012 with conventional techniques. In 2019 replanting is carried out with the same technique, namely conventional techniques, only different in the process of replanting. The difference in the replanting process is the chipping technique or old plant chopping, where the replanting of 2011 and 2012 old plants are not done chopping only stacked on the edge of the land with intact conditions.

*2.1.1. Land area.* The land is the main factor of production in farming. According to [3], the broader the land cultivated, the higher the production and income per unit area. Farmers who have large land will produce high if managed properly, and vice versa farmers who have narrow land will produce a little more added if not managed properly. Mostly smallholder oil palm farmers in Sungai Bahar District cultivate their own oil palm land. Farmers who participate in conventional replanting activities generally have another land outside the replanted land. Farmers who have narrow land mostly choose to replant in the insert, because farmers have no other source of income other than oil palm farming, and are afraid of losing income if they follow conventional replanting. 43 farmers own more than one land location or have another land besides the land they are replanting.

*2.1.2. Land management.* Due to the limitation of funds, farmers generally rejuvenate their old oil palm conventionally without using mechanical equipment. The process of sowing old plants and tillage takes about 10 days. Land preparation begins with manual cutting and felling of old trees and followed by preparing planting holes and pre-fertilizing using rock phosphate (RP) fertilizer. Funds used for the replanting process come from the Palm Oil Plantation Fund Management Agency (BPDPKS). The process of land replanting in this replanting is slightly different from the previous replanting, the process of replanting is carried out utilizing Zero Burning, which is how to chop/chop/chipping so that it is easy in the weathering process. The purpose of this enumeration is to simplify and speed up the decomposition process (decomposition) so that palm biomass can be reused as fertilizer for new plants. Besides enumeration is also useful to prevent pests such as beetles. Beetles will quickly attack the trunks that are toppled in intact conditions. The replanting stage consists of the pile and head piles, pile point blanks, ditch or drainage piles, road piles, chopped up and piles, trenching or drainage and roads, horse making, piling, pitting, planting and step by step planting.

*2.1.3. Planting.* The initial and most important stage in the oil palm planting process is the preparation of qualified seedlings. Traceable superior and high-quality seeds are the most key success factor in oil palm cultivation. Seedlings are the main factor that must be prepared after the land has been cultivated. In addition to being the first factor, seedlings are also a factor that greatly supports the success of the oil palm plantation cultivation business. The quality of oil palm seedlings determines the future of the cultivation business for the next 30 years. The use of traceable quality seeds can increase the chances of obtaining optimal production results and at a good price. The survey results show that in general, farmers in Sungai Bahar District replant old oil palm trees with certified seeds obtained from PTPNVI Marihat. While the spacing used is 8 x 9 m according to the recommendation of PTPN VI. The data obtained also showed that smallholder farmers who carried out replanting in 2019 have received financial assistance from BPDPKS. They have used a new high-yielding variety named TN-1 seeds obtained from PT. Bakti Tani Nusantara. This group of the farmer in doing replanting was carried out at a spacing of 8.5 x 8.5 x 8.5 meters with a triangular system.

The group of smallholders who carried out oil palm replanting in 2019 did it in the following stages: The first step taken in oil palm rejuvenation is the installation is a stake to straighten the direction of the rows and the spacing determined before planting is carried out. The second stage is the process of clearing the land from crop residues and making conventional planting holes. This stage can take approximately 3 days per hectare. Making the planting hole must be done at least 2 weeks before planting. The third stage is to place the oil palm seedlings into each prepared hole and carry out the initial fertilization. Plants derived from high-quality oil palm seedlings will give satisfactory results as long as the plants are still alive, whereas oil palms from seeds of unclear origin will not guarantee to produce standard fruit or bunches [4,5].

*2.1.4. Maintenance.* Post planting activities are maintenance of immature plants (TBM). This activity is carried out to make sure that plants can grow well and be able to provide good production as well. The maintenance of oil palm trees is carried out after the young plants are planted in the field. The first

activity carried out by farmers in the period of caring for these young plants is fertilization. Fertilization is done after the plants are 3 weeks to 1 month old. This fertilization is aimed to spur growth and obtain maximum yields. Fertilizer is applied twice a year. The results showed that apparently, the farmers did not do it in together. This fertilization treatment is carried out by farmers depending on financial conditions and rainfall. Generally, farmers use NPK Phonska, Urea, KCL, SP-36 and Dolomite fertilizers. Along with these fertilization activities, the important activity that farmers carry out is controlling pests and diseases. This activity is very important so that plants can survive and grow well.

Weed is a plant whose presence is undesirable on agricultural land because it can reduce the production to be achieved and the scrambling process occurs nutrient in the process of fertilizing oil palm plants in progress. Treatment is done twice in one year. The use of herbicide doses (Rund-Up and Gramaxon) of independent smallholders is 3.68 Liters/Ha. The next important activity in the maintenance stage is pruning. Pruning activities are carried out to stimulate oil palm plants to quickly produce flowers and fruit. The process of pruning oil palm fronds is carried out seasonally. Because of the oil palm trees are still small so the process is not too difficult. Farmers do pruning 1 to 24 times a year for land that has not been replanted, this is due to the age of various oil palm plants age which is ranging from 8 years to 16 years.

In the maintenance phase of replanting oil palm plants, it can be seen that farmers use more family labor than wage labor. Apart from limited funds, this is also because since the plants are still relatively small and uniform so that farmers have not found significant difficulties in carrying out maintenance. On the other hand, for old oil palm plants that have not been replanted yet, farmers use more paid labor because of the size of the oil palm trees that are already large and producing. Generally, pruning is done at the same time as harvesting with the same wage contract..

*2.1.5. Production.* Harvesting is the process of taking fresh fruit bunches (FFB) from oil palm plants. Oil palm plants start producing from 3 to 4 years of age. Harvesting intensity depends on the quality of the seedlings and the intensity of care during the immature crop period. If maintenance activities are carried out according to standards, the frequency of harvesting can be done at least 24 times a year. Characteristics used by farmers to harvest are color changes in ripe fruit and the fall of 3 to 5 fruits in a bunch.

### **3. Results and discussion**

Based on the results of the study, the area of oil palm plantations replanted by farmers reaches an average of 2.13 hectares. Farmers own more than one plantation with different locations of oil palm farming, the replanting land is in the village where the respondent farmers live, which land when partnering with an oil palm plantation company, while other lands owned by farmers are generally outside the village where farmers live purchased or inherited the land that is opened independently.

It was found that there are still some (43.3 %) farmers who only cultivate oil palm as the main source of family income. Farmers who replanted oil palm in 2019 carried out a combination of intercropping by planting corn and watermelon, 9 farmers who planted corn and 7 farmers planted watermelons. Farmers who do not intercrop on replanted land lease their land to be planted by watermelon by other farmers, who have capital, but there is no profit-sharing system but the rental costs are paid by caring for the oil palm land that has not produced yet. Businesses outside the agricultural sector carried out by farmers are as harvest farmers 6 farmers (10%), transportation services 2 farmers (3.3%), stalls of 3 farmers (5%), and as a village apparatus of 1 farmer.

The research showed that on replanting farm area, during the period June 2018 to May 2019, one year before replanting was carried out, the average farmer could harvest 18,170 tonnes/ha. This production achievement was slightly greater than the yield obtained from the land that had not been replanted yet, 17,309 tonnes/ha. Basically, the amount of product produced is very much influenced by the number of plants and the maintenance that are carried out by farmers every month, such as

applying fertilizers, eradicating weeds and pruning leaves. The performance of oil palm farming owned by farmers who participated in the rejuvenation in 2011, 2012 and 2019 can be seen in Table 1.

**Table 1.** Performance of oil palm farmers owned by farmers who implement replantation in 2011, 2012 and 2019.

Performance	Replanting in 2011 and 2012		Replanting in 2019	
	Replanting Land	Non-replanting Land	Replanting Land	Non-replanting Land
Land Size (Ha)	2,00	2,47	2,33	2,57
Number of Farmers (People)	30	14	30	29
Plant Age (Year)	7 - 8	10 - 15	0,4 – 0,5	8 - 16
Spacing (Meters)	8 x 9	8 x 9	8,5 x 8,5 x 8,5	8 x 9
Seed Type	Marihat	Marihat etc	Tenera	Marihat etc
Number of Plants (Trees/Ha)	130	125 - 130	142	125 - 130
Fertilization (Times / Year)	2	1 - 2	2	1 - 2
Treatment (times / year)	2	1	2	1
Pruning (Times / Year)	24	24	-	24
Harvesting (times/year)	24	24	-	24
Production (kg/ha/year)	18,170	17,309	-	15,484

The difference between replanting in 2011 and 2012 with replanting in 2019 is in the area of land, age of plants, spacing, types of seeds, number of plants and TBS (Fresh Fruit Bunches) production. The main difference between land that has been replanted and land that has not yet been replanted is at the level of products produced, yields on land that are replanted are higher than those that have not been replanted at 18,170 kg/ha/year and 15,484 to 17,309 kg/ha/year. The difference in the production of TBS (Fresh Fruit Bunches) is different because the types of seeds used on land that has been replanted are certified superior seeds, whereas on land that has not been replanted are not superior seeds and are not certified. Another factor is the distance of planting and the number of oil palm trees, in the rejuvenation area in one hectare there are 130 - 142 trees while in the non-rejuvenating land there are 125 - 130 trees. This difference in production is also inseparable due to differences in fertilizing and trimming the midrib.

Farmers' income is the production value after deducting the costs incurred per production period. The income received by farmers in this study is the amount of oil palm production times the price, then reduced by the total costs incurred per year. Revenue is the result of multiplication between production and selling prices [2]. The amount of revenue received by farmers for each rupiah spent in farming production activities is influenced by the number of products produced and the unit price of products produced. The higher the number of production and unit price of products produced, the greater the farm receipts, conversely the lower the amount of production and unit price of products produced, the lower the revenue. To determine the acceptance of oil palm farming on land that has been rejuvenated and that has not been rejuvenated, it can be seen in Table 2.

**Table 2.** Acceptance of oil palm farming in research areas June 2018 - May 2019.

Description	Replanting in 2011 and 2012				Replanting in 2019	
	Replanting Land		Non-Replanting Land		Non-Replanting Land	
	Per Farmer	Per Ha	Per Farmer	Per Ha	Per Farmer	Per Ha
Land Size (Ha)	2.00	1.00	2.46	1.00	2.57	1.00
Number of Plants (Stems)	260	130	311	126	324	126
Production (kg)	36,340	18,170	42,754	17,309	39,792	15,484
Price (Rp)	945	945	945	945	945	945
<b>Acceptance</b>	<b>34,341,300</b>	<b>17,170,650</b>	<b>40,402,530</b>	<b>16,357,005</b>	<b>37,603,440</b>	<b>14,632,380</b>

**Table 3.** Production costs of oil palm farming in the study area June 2018 - May 2019.

Description	Replanting in 2011 and 2012				Replanting in 2019	
	Replanting Land		Non-Replanting Land		Non-Replanting Land	
	Per Farmer	Per Ha	Per Farmer	Per Ha	Per Farmer	Per Ha
<b>Fixed Costs (FC)</b>						
1. Hoe	30,673	15,336	32,736	13,307	41,301	16,077
2. Machete	15,144	7,572	15,704	6,383	16,758	6,523
3. Dodos	28,578	14,289	0	0	6,599	2,568
4. Egrek	0	0	53,194	21,623	46,216	17,99
5. Kep	66,569	33,284	71,161	28,927	60,929	23,717
6. Ambiguous	6,279	3,139	6,384	2,595	5,555	2,162
7. Wheelbarrow	94,063	47,031	90,675	36,859	91,113	35,467
<b>Total Cost (FC)</b>	<b>241,306</b>	<b>120,651</b>	<b>269,854</b>	<b>109,694</b>	<b>268,471</b>	<b>104,504</b>
<b>Variable Cost (VC)</b>						
1. Fertilizer	6,877,667	3,438,833	5,527,333	2,246,883	11,276,552	4,389,530
2. Medicines	896,166	448,083	2,015,000	819,105	401,207	156,112
3. TKLK	3,702,916	1,851,458	8,670,333	3,524,525	9,015,862	3,508,117
4. Other Costs	393,333	196,666	450,000	182,926	429,655	167,248
<b>Total Cost (VC)</b>	<b>11,870,082</b>	<b>5,935,040</b>	<b>16,662,666</b>	<b>6,773,439</b>	<b>21,123,276</b>	<b>8,221,007</b>
<b>Total Cost (FC + VC)</b>	<b>12,111,388</b>	<b>6,055,691</b>	<b>16,932,520</b>	<b>6,883,133</b>	<b>21,391,747</b>	<b>8,325,511</b>

According to [6] fixed costs are costing whose total amount remains constant and is not influenced by changes in the volume of activities or activities to a certain degree. The fixed costs in this study are the costs of depreciation of the tool. Variable costs are the size of the costs incurred that affect or are influenced by the number of products produced. Variable costs in oil palm farming in the study area are costs that are used up in the production process (costs of using fertilizers, medicines, labor, and other costs such as motor gasoline and taxes). Production costs are the overall costs incurred in oil

palm farming by adding up the fixed costs and variable costs. Production costs for oil palm farming in the study area can be seen in Table 3.

**Table 4.** Oil palm farming income in the study area June 2018 - May 2019.

Description	Replanting in 2011 and 2012				Replanting in 2019	
	Replanting Land		Non-Replanting Land		Per Farmer	Per Ha
	Per Farmer	Per Ha	Per Farmer	Per Ha		
<b>A. Revenue</b>						
Production (Kg)	36,340	18,170	42,754	17,309	39,792	15,484
Price (IDR)	945	945	945	945	945	945
<b>Total Revenue (IDR)</b>	<b>34,341,300</b>	<b>17,170,650</b>	<b>40,402,530</b>	<b>16,357,005</b>	<b>37,603,440</b>	<b>14,632,380</b>
<b>B. Cost</b>						
Fertilizer	6,877,667	3,438,833	5,527,333	2,246,883	11,276,552	4,389,530
Drugs	896,166	448,083	2,015,000	819,105	401,207	156,112
Outside the Family Workforce	3,702,916	1,851,458	8,670,333	3,524,525	9,015,862	3,508,117
Other Costs (Gasoline and Tax)	393,333	196,666	450,000	182,926	429,655	167,248
Shrinkage Tool	241,306	120,651	269,854	109,694	268,471	104,504
<b>Total Cost (IDR)</b>	<b>12,111,388</b>	<b>6,055,691</b>	<b>16,932,520</b>	<b>6,883,133</b>	<b>21,391,747</b>	<b>8,325,511</b>
<b>Income (A – B) (IDR)</b>	<b>22,229,912</b>	<b>11,114,959</b>	<b>23,470,010</b>	<b>9,473,872</b>	<b>16,211,693</b>	<b>6,306,869</b>

The amount of income received by smallholder farmers in oil palm farming is presented in Table 4. Based on research results, it can be seen the amount of income received by farmers before and after replantation, sourced from farmers who replanted in 2011/2012 as many as 30 farmers. Where, the age of oil palm plants that have been replanted at the moment is 7 and 8 years. Based on the results obtained it can be concluded that the income received by farmers has increased after farmers do rejuvenation, this is in line with one of the goals of rejuvenation which is to increase the income of oil palm farmers.

#### 4. Conclusions

Oil palm smallholder who did replanting in 2011, 2012 and 2019 differently in undertaking replantation. The different particularly occurred in chipping old plants and types of seedlings used as well as different plant spacing. Farmers have two different locations of oil palm plantations, where the first is a rejuvenating plantation and the second has not been replanted. Production produced in the two different fields, this is because of the number of plants and the age of the plant affect the amount of production. The income earned by farmers from oil palm farming is IDR 22,229,912/farmer/year from land that has been replanted and IDR 15,840,852/farmer/year from land that has not been replanted.

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