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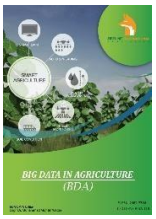

RESEARCH ARTICLE

THE ANALYSIS OF REPLANTING MODEL ON SMALLHOLDERS OIL PALM IN MUARO JAMBI DISTRICT JAMBI PROVINCE

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ABSTRACT

The traditions and planting techniques of oil palm cultivation by smallholders in the Muaro Jambi region, and the yields of fresh fruit bunches from smallholders vary. This result is because the plant's number and the age of plant affects the amount of oil palm production and the farmer's profit. The objective of research is to (1) analyze the smallholder replanting oil palm plantations' feasibility evaluated from the financial point of views using investment criteria, (2) analyze his, her, their, etc. smallholder. Sensitivity of replanting oil palm plantations to changes in input and output prices. The study was conducted in Muaro Jambi district. The data analysis method usages investment criteria using NPV, IRR, BCR, PBP and BEP. Research data used data obtained from questionnaires. In the Muaro Jambi region, up to 60 pure independent smallholder farmers replanted, oil palm samples were obtained through snowball sampling. The results of the study show that smallholder oil palm planting is feasible through conventional replanting and understory replanting. The results of the sensitivity analysis showed that when the price of production factors increases by 15% and the selling price of FFB is considered constant, and the selling price of FFB decreased by 15% and the price of production factors remains, both types of replanting of oil palm plantations are still feasible. Changes in FFB prices are more sensitive to changes in the value of investment criteria than changes in production factor prices.

KEYWORDS

Replanting Model, Oil Palm, and Feasibility Study

1. INTRODUCTION

The land acreage of oil palm plantations increases every year in Jambi Province, i.e. 688,810 ha in 2015 to 898,475 ha in 2019 with average increase of land acreage of 5.12 percent per year. Total production in 2015 of 1,857,260 tons increased to 2.348,221 tons in 2019 with an average production increase of 6.00 percent per year. Increased land acreage and smallholder oil palm production will continue to increase in the coming years (Anonymous, 2020a). Muaro Jambi District is one of the areas that has oil palm plantations growing very rapidly in Jambi Province. The total acreage of oil palm in the year of 2015 - 2019 in Jambi Province can be seen in the following table 1.

Table 1: Oil Palm Plantation Acreage and Production in Jambi Province Year of 2015 - 2019

Year	Acreage (ha)			Production (ton)		
	PR	PN	PS	PR	PN	PS
2015	425.564	26.919	236.327	1.028.008	86.062	743.190
2016	450.075	23.758	240.566	998.243	84.713	711.919
2017	457.321	23.991	254.783	1.013.114	90.699	806.216
2018	463.952	24.276	267.293	1.044.724	95.242	938.497
2019	586.940	21.678	289.857	1.375.617	88.239	884.365
Total	**2.791.113**	**146.803**	**1.513.313**	**6.422.997**	**529.245**	**4.786.223**

Source: *Dinas Perkebunan* Province of Jambi, year of 2020[a]

Muaro Jambi is a district that has the largest area of oil palm plantations in Jambi Province, namely 97,831.92 ha with a total production during 2019 of 189,663.45 tons. The smallholders oil palm plantation in that district has been operating since the 1980s. Therefore, most of the smallholder's oil palm trees are currently entering the final stages of the production cycle, so it is necessary to plan replanting activities (Anonymous, 2020b). Table 1 shows that smallholder oil palm plantations (PR) have a much larger area than the other two plantations. However, the problem that arises is the inability of the productivity of smallholder's oil palm plantations to compete with state plantations (PN) and private plantations

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(PS). This condition occurs due to various factors, both internally and externally from management actors, in this case farmers or planters. To find out the acreage of smallholder's oil palm plantations in Jambi Province can be seen in table 2.

Table 2: Land Acreage of Smallholders Oil Palm in Jambi Province Year of 2019

District	Land Acreage (ha)			Total (ha)	Production (ton)
	TBM	TM	TTM/TT		
Batanghari	10.629	41.494	228	52.351	140.905
Muaro Jambi	12.375	73.665	11.791	97.831	189.663
Bungo	21.929	36.715	1.621	60.265	115.222
Tebo	14.113	45.275	740	60.128	129.185
Merangin	11.443	53.198	5.376	70.017	210.336
Sarolangun	9.253	25.336	931	35.520	59.918
Tanjab Barat	19.162	77.222	0	96.384	249.033
Tanjab Timur	9.072	23.450	1.350	33.872	47.806
Kerinci	70	19	5	94	10
Total	**108.046**	**376.374**	**22.042**	**506.462**	**1.142.078**

Source: *Dinas Perkebunan* Province of Jambi, year of 2020[a]

Table 2 shows that Muaro Jambi District has the largest area of unproductive oil palm (TTM/TM) is classified as the largest old plant compared to other districts. This shows that the Muaro Jambi area has the largest area of unproductive smallholder oil palm plantations compared to other districts. In one of the sub-districts in Muaro Jambi District, Sungai Bahar Sub-District, it was an oil palm plantation area under the PIR program of PT. Perkebunan Nusantara VI. In this area, based on the data in table 3, it also shows that the sub-district has a fairly large area of non-productive or old plants that can be seen as follows.

Table 3: Land Acreage of Smallholders Oil Palm based on Sub-district in Muaro Jambi District, Year of 2019

District	Land Acreage (ha)			Total (ha)	Production (ton)
	TBM	TM	TTM/TT		
Jaluko	553	4.363	0	4.916	16.360
Sekernan	3.477	14.130	49	17.656	37.604
Kumpeh Ilir	376	12.001	22	12.399	24.679
Muaro Sebo	3.502	6.301	0	9.803	15.235
Taman Rajo	865	379	0	1.244	970
Mestong	235	3.209	0	3.444	6.689
Kumpeh Ulu	1.769	13.147	0	14.916	39.737
Sungai Bahar	**903**	**14.670**	**7.173**	**22.746**	**33.689**
Bahar Selatan	254	2.382	2.943	5.579	6.525
Bahar Utara	82	2.361	1.561	4.004	6.225
Sungai gelam	359	722	43	1.124	1.950
Total	**12.375**	**73.665**	**11.791**	**97.831**	**189.663**

Source: *Dinas Perkebunan* Province of Jambi, year of 2020[a]

Based on data in table 3, the area of non-productive or old plants in Sungai Bahar Sub-District reaches 60.83% of the total land area in the district. This condition is not only due to limitations in cultivating of oil palm plantations by farmers, but also causing bad situation the age of unproductive oil palm plants (aged 25 years and over) with productivity below 10 tons / ha/year (Anonymous, 2020b). In 2019 there has been replanting scheme in Sungai Bahar Sub-District. This shows that from 2017 to 2018 there was an increasing in the area for immature plants and a reduction in the area for non-productive or old plants (Anonymous, 2020a). Land acreage of target and realization of smallholder oil palm in Muaro Jambi District can be seen in the following table 4.

Table 4: Target and Realization of Replanting Land Acreage of Smallholders Oil Palm in Jambi Province, Year of 2017 – 2018

No	District	Year of 2017			Year of 2018		
		Target	Realization	%	Target	Realization	%
1	Merangin	685	555,18	81,05	4.000,00	0	0
2	Bungo	1.000	160,96	16,10	1.259,95	60,64	4,81
3	Muaro Jambi	1.000	293,11	29,31	3.500,00	197,75	5,65
4	Tanjab Barat	800	171,18	21,41	3.210,00	751,92	23,42
5	Batanghari	760	0	0	2.027,32	119,94	5,92
6	Tebo	0	0	0	1.740,00	0	0
7	Sarolangun	0	0	0	0	0	0
Total		**4.245**	**1.180**		**15.737**	**1.130**	

Source: *Dinas Perkebunan* Provinsi Jambi, year of 2020[a]

Table 4 shows that the realization of replanting activities has not met the target and tends to decline. Muaro Jambi District is the district that has the highest target in the implementation of replanting, but the realization of the implementation from 2017 achieved 29.31% and the target in 2018 of 5,65 ha has not been realized. This condition is of course inseparable from the influence of farmers' decisions as the main actors in oil palm farming.

2. Literature Review

Replanting is an effort to develop plantations by substituting old or unproductive plants with young plants, either as a whole or gradually, including managing plantations' risks such as affecting by regional spatial planning, forest areas and peat hydrological units (Anonymous, 2020c; Edison and Wahyuni, 2020; Ocenia et al., 2018). The Decree of the Director General of Plantations also states that replanting activities are carried out on ex-PIR plantations and also on independent plantations that have not used certified superior seeds (illegitimate). The conventional or simultaneous uprooting technique is carried out by uprooting old plants as a whole and followed by tillage and planting of young plants. This technique can also be followed up by planting intercropping plants such as legumes that help the soil to get additional nitrogen. This technique has the advantage of being a more ideal planting medium for plants because the soil is processed more intensively, so that in the long term it will have a good impact on the environment of oil palm plants. However, this technique has drawbacks, namely the disconnection of farmers' income from the sale of Fresh Fruit Bunches (FFB) and the cost of maintaining the plant for approximately 3 years (Audu, 2014; Arianto, 2008; Delfidelwina, 2013).

According to some researchers replanting oil palm can be carried out when the age of the plant has exceeded the economic age, which is about 25 years with productivity below 12 tons of FFB/ha/year which results in decreased income earned by farmers, difficulty in harvesting due to tall plants and making harvesting difficult, low harvest effectiveness, plant density, where areas with low density are not economical to manage so they need to be replanted (Ginting et al., 2008; Fauzi, 2012; Edison, 2020). The problem of low production and low quality is coupled with other problems, namely the price received by farmers does not have a high bargaining position in oil palm mills, therefore an investment assessment is needed to provide verification related to the financial feasibility of replanting plantation in conventional technique and underplanting technique.

The conventional or simultaneous uprooting technique is carried out by uprooting old plants as a whole and followed by tillage and planting of young plants. This technique can also be followed up by planting intercropping plants such as legumes that help the soil to get additional nitrogen. This technique has the advantage of being a more ideal planting medium for plants because the soil is processed more intensively, so that in the long term it will have a good impact on the environment oil palm plant. However, this technique has drawbacks, namely the disconnection of farmers' income from the sale of Fresh Fruit Bunches (FFB) and the cost of maintaining the plant for approximately 3 years.

Meanwhile, the underplanting technique is a replanting technique carried out by planting young plants among old plants. The recommended method is to uproot as much as 50% of the population of old plants with the aim of not hampering growth due to competition for nutrients and sunlight. Then for the remaining 50% of the old plants, 25% per year is poisoned. The advantage of this technique is that farmers still have the opportunity to earn income as long as the plants are replanted from old plants that have not been uprooted or poisoned. The disadvantages of this technique are technical problems, such as stunted growth of young plants due to poisoned old plant residues and competition for nutrients and sunlight.

This condition certainly causes losses in the long term because the plants cannot grow properly. Feasibility studies, such as smallholder cultivation of oil palm, need to be considered when assessing the profitability and economic stability of a business (Elijah et al., 2014). Feasibility studies help to analytically determine the long-term basis and financial impact of oil palm businesses (Poku, 2012). The data analysis method uses descriptive methods and the analytical tools used are investment feasibility analysis from the financial aspect [14] using the criteria: cash flow analysis, Net Benefit Costs Ratio (Net B/C Ratio), Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period and sensitivity analysis (Ibrahim, 2009).

3. Research Methodology

By considering Muaro Jambi District is one of large acreage oil palm plantations in Jambi Province, research area will be identified purposively in Muaro Jambi District Jambi Province. Research Samples are identified by Cluster Random Sampling methods. With considering sample attentions that have different replanting scheme for oil palm plantations, total samples are 60 households (30 samples for full replanting scheme of smallholder's oil palm farmers, and 30 samples for underplanting scheme of smallholder oil palm farmers). Research was conducted in 2021. The empirical approach to investigate two objectives stated in the beginning. Firstly, analyzing the feasibility evaluation of replanting models of smallholders' oil palm scheme. Secondly, analyzing the comparison between conventional replanting scheme and underplanting scheme smallholders oil palm plantations.

The first problem uses quantitative descriptive analysis by describing the performance of farmers in Sungai Bahar Sub-district and applying the calculation of farm income. The calculation of farm income can be formulated as follows (Shadbolt and Martin, 2005; Soekartawi, 2002; Pahan, 2012):

Oil palm plantation business income = profit - fixed costs (interest, wages, rent)

Profit = Sales - Variable costs (harvest costs, fees, etc.)

The second problem is answered by using the investment criteria analysis method used to determine the financial feasibility of a business. The data analysis method uses descriptive methods and the analytical tools used are investment feasibility analysis from the financial aspect using the criteria: cash flow analysis, Net Benefit Costs Ratio (Net B/C Ratio), Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period and sensitivity analysis (Fauzi, 2012; Shadbolt and Martin, 2005).

4. Finding and Discussion

4.1 Operational Cash Flow

Replanting of oil palm plantations with conventional techniques and underplanting techniques produces 8 years and was predicted for 25 years using planting of oil palm plantations with conventional techniques and underplanting techniques produces 8 years and is considered for 25 years, the conventional technology in the first and second years was not accepted because the oil palm plants were not yet produced, and then in the 3rd year, the conventional technology started production, resulting in the first income of the IDR. 6.64 million until the 25th year get an income of IDR. 696.64 million (Indra et al., 2018). The underplanting technique for the first year has received acceptance because in the underplanting technique there are still old plants that are still producing so that they get an income of IDR. 11.27 million until the 25th year income of IDR. 315.19 million. It can be seen that young plants in the underplanting technique in the first year to the fourth year on average have not received acceptance because the young plants in the underplanting technique have not yet produced so that they can produce for the first time in the 5th year for IDR. 5.16 million was not received until the 25th year IDR 278.16 million.

Cash flow is the last stage in the preparation of cash flow. At this stage, the cash flow record's income and expenditure at the end of the economic life of the oil palm plantation. Even though the economic life of the oil palm plantation ends, it still produces production that can be included in the cash flow of income, replanting of oil palm plantations with conventional techniques gets revenue in the 25th year, which is IDR. 25.38 million for planting technology, IDR 10.67 million for the production cost of replanting conventional techniques was of IDR. 14.67 million and the replanting of the underplanting technique spent IDR. 10.16 million, while for young plants in the replanting of the underplanting technique, a capital of IDR. 5.26 million. This makes the net cash flow or capital in the last year of replanting of conventional techniques still positive at the end of the economic life of IDR. 13.68 million, for the underplanting technique, the value is negative and IDR. 689. Analysis of the feasibility criteria for replanting of conventional techniques and underplanting techniques used financial feasibility with the criteria of Net Present Value (NPV), Internal Rate of Return, Net Benefit Ratio (Net B/C), and Payback Period. The discount factor used in this study is the prevailing interest rate of 4.5%. The results of the financial analysis can be seen in table 5. Table 5. showed value of NPV, IRR, Net B/C Ratio, and payback period for replanting of conventional techniques and underplanting techniques in Research Areas Years 1 to 25.

Table 5: The value of NPV, IRR, *Net B/C* Ratio, and *payback period* of conventional techniques and underplanting techniques

No	Criteria	Conventional Techniques	Underplanting Techniques
1	NPV (IDR)	356.612.925	83.750.145
2	IRR (%)	56,24	19,38
3	Net B/C Ratio	136,28	59,85
4	Payback Period (year)	6,42	5,35

Table 5 shows that oil palm plantations are replanting using conventional techniques, while bottom planting appears to have a positive value. The NPV value for replantation using conventional techniques is IDR. 356,613 million, the IRR value is 56.24%, the Net B/C value is 136.28 and the payback period is 6.42 years while the underplanting technique produces an NPV value of IDR. 83.75 million, the Net B/C value is 59.85 and the IRR value for the underplanting technique is 19.38% and the payback period is 5.35 years. This fact is in line with the research of that oil palm plantations in Sungai Bahar Sub-District are feasible to be planted where in terms of NPV > 0, IRR > 12,5% and Net B/C ratio > 1 (Susanti et al., 2014).

4.2 Net Present Value (NPV)

Net Present Value (NPV) is the multiplication value between the cash flows from additional benefits and the discount factor. The cash flow calculation is done by subtracting the gross benefits, namely the production value with the gross costs. This NPV calculation aims to determine the total amount of net benefits obtained by a business in terms of its current value. NPV is the net benefit value that has been discounted at a certain interest rate with an NPV value > 0. Oil palm plantations can grow and provide benefits. From Table 5, the calculation of the NPV of conventional replanting with a discount factor of 4.5% produces a value of IDR. 356,613 million which can be categorized as a financially viable investment. The calculation of NPV in the underplanting technique also uses a discount factor of 4.5%. The NPV calculation produces a value of IDR. 83.75 million.

This event can be categorized as a financially viable business. From the NPV value, it can be seen that the replanting of oil palm plantations with conventional techniques is considered more suitable for use by farmers because the NPV is greater than the replanting of the underplanting technique. The difference between the NPV value of conventional replanting techniques and underplanting techniques is IDR. 272.863 million. Replanting of conventional techniques is more feasible for farmers to use because conventional techniques are more efficiently and effectively. The research concurs with alternatives to traditional and under-grown models can provide economic benefits (Ridhwan et al., 2018). Conventional replanting is considered more efficient and efficient in management and supervision because there are more than the same plant ages so that it will optimize the use of production equipment and streamline operational costs.

4.3 Net Benefit Cost Ratio (Net B/C)

The Net Benefit Cost Ratio (Net B/C) shows the size of the benefits obtained compared to the cost that have been used (Ocenia et al., 2018). This analysis aims to find out how much income got compared to expenditure during the economic life of the oil palm plantation. Obtaining a B/C value > 0 means that the oil palm plantation business is feasible to cultivate. The net B/C value each year will be conducted the difference between the net benefit (+) and net benefit (-) so that a net benefit is got. In the replanting of conventional techniques, the net benefit value up to the 25th year is IDR. 442.75 million, then the net benefit value (+) of IDR.451.57 million is used as the numerator. The net benefit value of conventional technology to revitalize oil palm plantations reached 136,28. This means that each additional cost of IDR. 1.00 would be an additional net gain of IDR. 136,28. The net benefit value of underplanting oil palm rejuvenation is 59,85. This means each additional cost of IDR. 1.00 will get an additional net benefit of IDR. 59,85. The results of this study are much lower than the net benefit value [22] in the Sungai Bahar Regency area (Uche et al., 2017).

4.4 Internal Rate of Return (IRR)

IRR calculation is by trial and error as long as the NPV is still positive, the discount factor continues to be added to the positive and negative values for the next value. IRR lies between the two NPVs. Replanting of the experimental conventional technique using a discount factor of 25% and 27%, the NPV value obtained is IDR. 0.353 million, and -IDR. 0.241 million, so it has met the requirements for the IRR value, namely getting a positive NPV value and a negative NPV between the 2 discount factors used, the difference in the discount factor rate is 2%. After calculating the positive NPV and negative NPV, the IRR value is 56,24%, which means that the rate of return on business for each unit of capital is 56,24%. IRR value of underplanting technique is only 19,38%. When compared with the prevailing 12,5% interest rate for commercial banks, it can be concluded that the two replanting patterns are financially feasible.

4.5 Payback Period (PP)

The payback period aims to see the period of time needed to return the investment costs, the value of which will be compared to the age of oil palm plantation business (Alfizar et al., 2017; Dwijatenaya et al., 2019). Investment value conventional replanting techniques and underplanting techniques is IDR. 22.43 million and IDR. 20.05 million. The amount of the investment value is used as the numerator, according to because the net cash is different every year, the solution is to reduce the net benefit (Ernawati et al., 2021; Ernawati et al., 2019). The payback period for conventional replanting techniques is 6,42. Meanwhile, the calculation of the payback period for the underplanting technique is 5.35. This means that the return on investment in oil palm underplanting techniques is faster than conventional replanting techniques.

4.6 Sensitivity Analysis

Sensitivity analysis is intended to reassess and see the effect of the components of benefits and costs on business feasibility that will occur due to changing circumstances. Sensitivity analysis has been carried out by looking for the average increase in the exchange rate every year that occurred in 2020-2035. The sensitivity results analysis that has been carried out are changes in NPV, IRR, Net B/C, and Payback Period if there is a change in the increase in variable costs and a decrease in FFB prices. In this sensitivity analysis, there are 2 scenarios used: (1) Input factors is assumed to increase by 15%, while selling price of FFB is assumed to be increased by 15%, (2) Selling price of FFB decreased by 15% and input price was considered to be constant. The results of this analysis showed that a 15% increase in production factor prices followed by a 15% FFB price increase caused the NPV value to increase from IDR. 265.27 million to IDR. 447.25 million.

5. Conclusion

Traditional and under-planted smallholder oil palm cultivation in the Muaro Jambi region varies according to the yield of fresh fruit bunches. This result is because the plants' number and the age of plant affects the amount of oil palm production and the farmer's profit. The income of oil palm growers in the study area using traditional replanting techniques is higher than that of planting techniques. The smallholder oil palm plantation replanting model, both conventional and underplanting models, is suitable for use by farmers.

Investment criteria for the two models of oil palm replanting are that the NPV, Net B/C, IRR and Payback Period values are quite profitable for farmers. It is better to use the conventional model for oil palm replanting because it can produce higher productivity and more efficient plantation management than the underplanting model. The response to changes in the value of NPV, Net B/C, IRR and payback period is responsive to changes in FFB prices compared to increases in production factor prices. The increase in the values of NPV, Net B/C, IRR and payback period is very large if there is an increase in FFB. both the conventional replanting model and the underplanting model. The conventional model is more responsive than the underplanting model if there is an increase in FFB prices.

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References

Alfizar, S., Hasyim, I.A., and Affandi, I.M., 2017. Financial feasibility analysis of oil palm in Lampung Tengah District. Journal of Agribusiness Science, 5 (3), Pp. 228-234.

Anonymous, 2020a. Jambi in Number. State Planning and Development Board Provinsi of Jambi. Jambi.

Anonymous, 2020b. Sungai Bahar Sub-District in Number year of 2019. BPS Kabupaten Muaro Jambi. Sengeti.

Anonymous, 2020c. Indonesia Oil Palm Estate Statistics 2017 - 2019. Dirjen of Plantation Estate Jakarta.

Arianto, E., 2008. Indonesia oil palm production growth *1964-2007, diakses dalam*https:// strategika.wordpress.com/2008/12/05/Indonesia oil palm growth.

Audu, M.A., 2014. The Impact of feasibility study in enhancing growth and development of business organizations in Nigeria, OSR Journal of Business and Management (IOSR-JBM) 16 (6), Pp. 32-38.

Delfidelwina, 2013. Financial feasibility of oil palm estate evaluation in Rokan Hulu District. *Jurnal Agroekonomi*, 24 (1), Pp. 99 – 110.

Dwijatenaya, I., Nugroho, A.E., and Hakimin, 2019. Financial feasibility of oil palm plantation (A case study). Jurnal "Gerbang Etam*" Balitbangda,* 13 (1), Pp. 45-52.

Edison and Wahyuni, I., 2020. The effect of land typologies of smallholder's palm oil profit. Test Engineering & Management, 83 (1), Pp. 23473 – 23481.

Edison, 2020. Financial feasibility study of smallholder oil palm in Muaro Jambi District Jambi. IOP Conf. Series: Earth and Environmental Science, 583, 012012, Pp. 1 – 7.

Elijah, I.O., Cletus, I.E., Sylvester, C.I., and Dorcas, A.E., 2014. Small-scale palm oil processing business in Nigeria. A feasibility study: Greener Journal of Business and Management Studies, 4 (3), Pp. 070-082.

Ernawati, H.D., Saputra, A., Alamsyah, Z., Napitupulu, D.M.T. Yanita, M., and Fauzia, G., 2021. Analysis of independent oil palm farming income after replanting in Muaro Jambi District. IOP Conference Series: Earth and Environmental Science, Pp. 1 – 8.

Ernawati, H.D., Suandi, Yanita, M., and Qoirina, N., 2019. The impact of replanting oil palm plantations on the farming income of the Sungai Bahar community in Muaro Jambi Regency. IOP Conference Series: Earth and Environmental Science, Pp. 1 – 8.

Fauzi, Y., 2012. Oil palm. edit revision. Swadaya. Jakarta.

Ginting, E.N., Edy, S., Sutarta, Suroso, R., Heri, S., and Agus S., 2008. Oil palm replanting system underplanting system: Competition and Weakness. Research center of oil palm. Medan.

Ibrahim, H.M.Y., 2009. Business feasibility Study. Rineka Cipta, Jakarta.

Indra, S.B., Rozalina, and Nudin, O.F., 2018. Financial feasibility analysis of oil palm seedling business on UD. Jaya Tani Karang Baru Sub-district Aceh District Tamiang. J*urnal Agrisamudra,* 5 (1), Pp. 49 – 58.

Ocenia, Y., Yusmini, and Etwina, S., 2018. Financial feasibility analysis on integrated system and oil palm with semi intensif maintenance system (case study in farmers group tani sari in Sari Makmur Village Pangkalan Lesung Sub-district Pelalawan District*).* Journal Agribusiness and Community Empowerment, 2 (2), Pp. 49-57.

Ocenia, Y., Yusmini, and Etwina, S., 2018. Financial feasibility analyisis on integrated system and oil palm with semi intensif maintenance system (case studi of tani sarwo sari group in Sari Makmur Village Pangkalan Lesung Sub-district Pelalawan District Journal Agribusiness and Community Empowerment, 2 (2), Pp. 49-57.

Pahan, I., 2012. Complete Guard of oil palm from upstream to downstream. Swadaya, Jakarta.

Poku, K., 2012. Small-scale palm oil processing in Africa. Rome, Italy: Agriculture Services Bulletin 148. Food and Agricultural Organization of the United Nations.

Ridhwan, Muani, A., Komariyati, 2018. Feasibility analysis of estate investment on PT. Ladang Sawit Kendawangan in Ketapang District. *Journal Social Economic of Agriculture*, 7 (2), Pp. 120-139.

Shadbolt, N., and Martin, S., 2005. Farm Management in New Zealand., Oxford University Press. Australia.

Soekartawi, 2002. Analysis of farming. UI Press. Jakarta.

Susanti, E., Utabarat, S., and Muwardi, D., 2014. Alternative comparative analysis alternatif conventional oil palm replanting model with underplanting technique of smallholder oil palm estate (PIR) in Sungai Lambu Makmur Village Tapung Sub-district Kampar District. Agricultural Faculty University of Riau. Jom Faperta, 1(2).

Uche, C., Etowa, E.B., and Anele, P.C., 2017. Economic Analysis of Palm Oil Processing in Ikwerre and Etche Local Government Areas of Rivers State, Nigeria. Applied Tropical Agriculture, 22 (1), Pp. 5-8.