What is the priority pattern for replanting the independent smallholders oil palm in Jambi Province?

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Abstract. Oil palm has become one of the most important sources of national income in Indonesia's economic system. Jambi Province contributed 5.87 percent of palm oil to national production, with 8.54 percent of the national land area, that supplies 57 Palm Oil factories (PKS) in Jambi Province. From an area of 791,025 hectares of oil palm, 66.66 percent was cultivated by smallholders. However, the independent smallholder has constraints replanting the old or damaged tree from the financial side, technical and social, and institutional. In terms of that condition, it is essential to analyse the priority pattern for replanting the independent smallholder's oil palm in Jambi Province. Research carried on eight districts in Jambi Province. Focus Group Discussion held to collect the data from experts purposively and analysed it by Analytical Hierarchy Processes (AHP). The result showed that independent smallholders should prioritize the partnership pattern and the independent pattern with institutional replanting in Jambi Province. It is expected to become oil palm plantation institutions and increase the income and yield of independent smallholder fresh fruit bunch

1. Introduction
Oil palm has increased welfare and food security for low-income families in Indonesia. Until 2020, the total oil palm area has reached 16.38 million hectares, of which 6.72 million hectares are smallholders palm oil. Inadequate knowledge and capital resources lead to the sustainability of smallholder oil palm plantations. Statistical data shows that there are 2.78 million hectares of oil palm plantations that already reached the replanting period until now. Among of old and damaged oil palm trees, about 2.27 million (81.65%) hectares of them are plasm and smallholder oil palm farm, while the rest are PIR-BUN and other plasm kinds [1]. The main producer of palm oil in global is Indonesia [2]. Promoting oil palm has increased farmers’ incomes and economic development [3-5]

Although oil palm cultivation affects vary from time to time [6,7]. Oil palm development, among others, provides benefits in increasing the income of smallholders and the community, production, which becomes the raw material for the downstream industry that creates added value in the nation. The increasing need for domestic vegetable oil and the enormous potential export value of crude palm oil (CPO) has triggered the growth in Indonesia's area of oil palm plantations. In 1980, the size of oil palm plantations was only 295 thousand hectares, but in 2018 it had become 14.68 million hectares, an increase of more than 4,000 times. The area of smallholder oil palm plantations grew the most, which was more than 94.02% during the 1980-2019 period or an average of 2.41% per year. [8]. Data shows that oil palm is grown commercially in at least 25 of the 34 provinces in Indonesia [9] and contributes I
260 IDR trillion (2.75%) of Indonesia's National income in 2016. Oil palm cultivation currently absorbs more than 5.5 million workers in the on-farm sector (plantation) and providing a foreign exchange of 287 IDR trillion in 2017.

By province of 2017, national production in Jambi Province contributed 5.87 percent of palm oil to national production, with 8.54 percent of the national land area. that supplies 57 Palm Oil factories (PKS) in Jambi Province. 660,198 farmers' families manage the plantation sector in Jambi Province. This sector contributed to the provincial GDRP of 17.2 percent in 2017. Where there was 32 percent of smallholder involved in the oil palm business. From an area of 791,025 hectares of oil palm, 66.66 percent was cultivated by smallholders (PR), 3.01 percent of the State Estates (PBN), and the rest by Private Estates (PBS). [10]. The smallholder plantation area is 526,822 Ha, and the condition of the plant that has entered the replanting period is 63,114 Ha—replanting Targets through the BPDPKS (oil palm plantation fund management agency). Framework for Jambi Province covering an area of 20,000 Ha.

Smallholders' fundamental problem is the productivity is still low, an average of 2.987 tons / Ha, far above the national productivity, which reaches 3.82 tons / Ha. This situation is driven by the first result of the improper application of cultivation technologies such as uncertified seedlings, improper application of fertilizers, and harvest time where the harvest criteria have not been met all the time. This constraint occurs because of the limited training or outreach to increase the knowledge and understanding of smallholder; information asymmetry occurs, namely easy access to information and information needs that are not timely. Besides, it is also necessary to provide technical assistance to smallholder specifically. Another problem that smallholders face is the age of oil palm that is past the economic age

The resultant condition is that replanting is a must. When faced with replanting, the smallholder does not necessarily do so because the oil palm cultivation activities are the smallholder's primary income source. They are worried when replanting how to obtain a source of income during the Immature Crops. The cost of replanting the oil palm is also a consideration for them to carry out replanting and the availability of tools such as chipping and processing ex-plantation land. The root of the problem above is the weak bargaining position of smallholders, both caused by the absence of a vital institution. The existing smallholders' institutions are more pragmatic based on the needs or fulfill the requirements to get help or facilitation from the government. The institutional formation has not been based on the concept of integration and sustainability of institutional management. So that if the smallholder should do replanting, what is the priority pattern to replanting the independent smallholder oil palm in Jambi Province?

2. Materials and methods

The research place was in Jambi Province, Sumatra Indonesia. The research variable used in this study is the AHP variable in the form of alternative policies to find patterns of replanting the smallholder oil palm plantations in Jambi Province. Research variables in this study are explained as follows: Absorption of labour, Social, economic and ecological sustainability, Replanting Costs, Marketing. While alternative replanting patterns include independent patterns, patterns with local government initiatives, partnership patterns, and cooperative patterns. The population is the whole element, or elementary unit, or research unit, or unit analysis with certain characteristics used as research objects. In contrast, the sample is a small part of the population members taken according to certain procedures to represent the population. Sampling is carried out in quotation (quoted sampling). The purposive sampling technique with the criteria represent each field of expertise and is prioritized to experts who have a level of recognized expertise. Number of experts required to use AHP (Analytical Hierarchy Process) quite a few people [11].

The purposive Sampling is done by choosing ten key persons because in applying the AHP method, the priority is the quality of the data from the respondent and does not depend on the quantity. Therefore, AHP assessment requires expert judgment as a respondent in making decisions in the selection of
alternatives. The experts here are competent people who influence making policy or comprehend the information needed. These respondents will be interviewed using a questionnaire in data collection, and a focus group discussion is also carried out to explore more in-depth information related to alternative patterns of replanting oil palm for smallholder in the province of Jambi.

The data from the interviews and questionnaires and the FGD results are processed using the Method AHP (Analytical Hierarchy Process) to produce a replanting pattern for smallholder oil palm s in the study area the steps of analysis as described in the analysis methodology.

The process of analytical hierarchies (AHP) is one of the procedures used by decision makers in dismantling systemic problems, associating priority determination with some criteria. AHP is a tool to simplify complicated and unstructured circumstances. It also plays a role in controlling variables or sections in a sequence, sharing numeric values with relative consideration for each variable. Lastly do synthesis of different types of consideration or indicators, and decide which variables have the highest priority and play a role in influence the results. [12]. There are 4 (four) basic principles of Analytic Hierarchy Processes (AHP), as explained below:

2.1. **Compilation of the hierarchy**
The preparation of the hierarchy goal is to describe the problem resolved. Become an element through the principle of solving (decomposition), namely criteria and alternatives, then arranged into a hierarchical structure.

2.2. **Criteria and alternatives assessment**
Pair comparison or comparative judgment as an assessment of multiple criteria and alternatives

2.3. **Priority determination**
The purpose of determining priorities is to determine the specific criteria and alternatives. The relative comparison values for determining the relative ranking of all other options. An expert can compare both qualitative and criteria quantitatively. It was through the judgment specified for product weights and priorities. Weight or priority is calculated by the manipulation matrix or through the completion of mathematical equations

2.4. **Logical consistency**
There are two meanings or we can group terms of logical consistency (1) it is needed a uniformity and relevance First are similar objects and (2) Second is concerning the level of relationship between objects based on specific criteria [13]. Generally, pairwise comparisons, are each element, rather than pairing with aspects or criteria set. Form a companion comparison in the matrix at this base. In carrying out evaluations/ comparisons, experts increased AHP using a scale from 1/ 9 to 9. If options A and B are calculated to be the same, up to A and B are given grades If, for example, A is better/ preferable than B, until A is given a value of 3 and B is given a value of 1/ 3. If A is preferred by B, up to grades A to 1, 6, and B to 0, 4.

Alternative evaluations [14], which use a scale between 0, 1 to 1, 9, are considered more logical, of the sort presented in Table 2. If A is slightly better/ preferred than B, up to A is given grades 1, 3, and B rated 0, 7, showing a close distance of 30% of the value of 1. If A is preferred by B, up to grades A to 1, 6, and B to 0, 4.

Use evaluations such as Table 2, until a comparison between criteria can be found. makes it less difficult, in Table 2, to use the assumption that there are only 4 criteria. The table can be summarized as follows: cij is the result of evaluating / comparing criteria i and j ci. The distribution of the value that is owned by the criterion i c is the sum of all ci values. The weight of the i criterion is obtained by dividing the value of ci. with c
Table 1. Pairwise comparisons in matrix

| Pattern of Replanting | Provincial independent | Provincial initiation | Partnership | Cooperation |
|----------------------|-----------------------|----------------------|-------------|-------------|
| Independent          | 1                     |                      |             |             |
| Provincial initiation|                      | 1                    |             |             |
| Partnership          |                      |                      | 1           |             |
| Cooperation          |                      |                      |             | 1           |

Table 2. Value scale

| Value Result          | Value A | Value b |
|-----------------------|---------|---------|
| A is very much preferred over B | 1.9     | 0.1     |
| A is far more preferable than B    | 1.6     | 0.4     |
| A is slightly preferred over B     | 1.3     | 0.7     |
| A is the same as B                 | 1.0     | 1.0     |
| A is slightly less like B          | 0.7     | 1.3     |
| A is much less preferred than B    | 0.4     | 1.6     |
| A is very much less preferred than B | 0.1    | 1.9     |

Table 3. Comparison between criteria

| Criteria | CR1  | CR2  | CR3  | CR4  | Total | Weight |
|----------|------|------|------|------|-------|--------|
| CR1      | -    | C12  | C13  | C14  | C1    | bc1=c1/c |
| CR2      | C21  | -    | C23  | C24  | C2    | bc2=c2/c |
| CR3      | C31  | C32  | -    | C34  | C3    | bc3=c3/c |
| CR4      | C41  | C42  | C43  | -    | C4    | bc4=c4/c |
| Total    | C41  | C42  | C43  | -    | C4    |         |

Using the same procedure, the next step is to compare options (OP) for each criterion. Table 4 Here illustrates the comparison between options (4 options) create criteria 1 (C1) with the following description: oij is the result of evaluation / comparison between option i and k create criteria jth, oi. is the sum of the value of option i, o is the sum of the entire oi value. boij is the value of option i create jth criteria. This option assessment process continues for all criteria

Table 4. Comparison between options for C1 criteria

| C1  | OP1  | OP2  | OP3  | OP4  | Total | Weight |
|-----|------|------|------|------|-------|--------|
| OP1 | -    | o12  | o13  | o14  | O1    | be1=c1/c |
| OP2 | o21  | -    | o23  | o24  | O2    | be2=c2/c |
| OP3 | o31  | o32  | -    | o34  | O3    | be3=c3/c |
| OP4 | o41  | o42  | 43   | -    | O4    | be4=c4/c |
| Total| O4    |      |      |      |       |         |

The synthesis of assessment results is the final stage of AHP. This synthesis is the sum of the weights each choice is obtained for each criterion after being given these criteria' weight. In general, the value of an option is as follows:
\[ \text{bopi} = \sum_{i=1}^{n} \text{boij} \times \text{bcj} \]  

(1)

\[ \text{bopi} = \text{bo11} \times \text{bc1} + \text{bo12} \times \text{bc2} + \text{bo13} \times \text{bc3} + \text{bo14} \times \text{bc4} \]  

(2)

This formula's presentation can be in tabular form assuming that there are 4 criteria with 4 options. For example, the priority value / option weight 1 (OP1) is obtained by multiplying the weight value in the criteria by the value linked to this criterion make option 1 as follows:

3. Results and discussion

Palm oil is the dominant plantation commodity cultivated in Jambi Province, especially in eight regencies in Jambi Province. The main crop yield of oil palm is oil palm fruit, while the fruit processing is oil. The age of the oldest oil palm plant is 32 years. Land ownership status in the study area consists of land bought, grants, and own land (open forest). Production facilities in the study area consisted of fertilizer, seeds, agricultural tools, and machinery. Farming conditions in the study area consisted of oil palm, age of oil palm plantations, distance to the nearest mill, oil palm production, crop rotation, land status, and the origin of oil palm plantations.

The land is the main factor of production in farming. 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, smallholders who have narrow land, will produce a little more added if not managed properly. [15] The area of oil palm plantations cultivated by farmers in this research area is the area of their oil palm. The land area with the largest percentage with a land area of 0.5 to 5.5 hectares, about 87.50% smallholder. The average area of oil palm plantations owned by smallholder is 3.5 hectares, with the smallest area of 0.5 hectares and the largest area of 47 hectares in the research area. The age of oil palm in the study area is generally above the economic age of oil palm. Old oil palm plantations cannot produce optimally and can affect smallholders because the labour and costs are not proportional to the income received by smallholders. In this condition, the replanting activities need to be done to increase palm oil productivity again to improve the welfare of the smallholders. Generally, in replanting, the smallholders faced many constraints from the technical side, financial, and social and institutional problem.

The results of the data analysis show that the priority scale to choose the pattern for replanting the oil palm for smallholder as follows: the most important factor to consider in replanting is the cost of replanting (0.33) economic, social and ecological sustainability (0.2), then the strengthen the institution (0.19), employment (0.16) and of marketing institutions (0.14). Smallholders faced obstacles in carrying out the replanting because of some reasons. One of the reasons is the absence of savings during the period of immature and the terms and conditions that must be met to get the grant. The item of financing replanting, which is the main obstacle for independent smallholders, is the cost of land clearing. These activities are ranging from logging to cutting. Logging should use modern equipment. The cost of doing the land clearing process dominates the land's cost as much as 55 percent. [16]. Besides the replanting cost, the procedure to get the agency's funding (BPDPKS) not so easy. The smallholders should unite in one group, and the land must be in one overlay. Besides, the term and condition for the certificate ownership also make the process not easy for smallholders. Moreover, if they still have the responsibility to pay the bank's debt or another resource funding to fulfil the daily need to finance their children to school.
The second concern is economic, social, and ecological sustainability. Why are economic factors they become their concern because if they are replanting, they will lose their income. Sourced from research in the field, a smallholder farmer who carries out replanting has no debt, has other sources of income such as other commodities, or moreover has other oil palm plantations cultivated not only old plants and damaged when smallholder farmers are still under supervision by the industry. But for smallholder who does not have other sources of income, they have to utilize the land during the TBM period by planting annual crops or horticulture.

Based on the survey results in Sungai Sahut village, Tabir Selatan subdistrict, Merangin Region, smallholders located in Tabir Selatan subdistrict, Merangin Region, the replanting process for 222 hectares, not all of the smallholder's farms located in the same overlay. The KUD (Cooperation) that covered the smallholders could convince third parties who cut and chipped on the spot. The farmer's cooperation supports them in replicating by visiting one by one house and gave them enlightenment that the replanting should do as soon as possible to ensure the cultivation's sustainability. The third valuation is strengthening the institution. From the research, most of the smallholders do not join the cooperation. The number of Smallholders who do not corporate into the institution, either member of the farmer groups or cooperatives, amounted to 65.16%. Only 34.84% of farmers are incorporated or become institutional members. Most farmers believe that KUD is not going well because smallholder funds' management is not done transparently. Many smallholder groups are not active and only formed when there is assistance from the government. Empower employment also becomes a concern for smallholders. Usually, they become labour, such as freight labour or work in the field as a free daily worker.

Farmer institutional capacity building is carried out in line with agricultural extension activities by motivating farmers to participate in farmer institutions. Designing agricultural outreach needs by giving a load on strengthening individual farmers' capacity while strengthening institutional capacity. Stakeholders should design the pattern, especially the government, to increase extension labour capacity in the field, using participatory approaches oriented to farmers' needs to conduct extension activities and strengthen extension institutions. The last weight is the marketing or distribution of the fresh fruit bunch (FFB). While the smallholder who does not join the cooperative institution sell their FFB to the local trader or local loading, belong to the village trader. The average smallholder sells their FFB to the local traders, with farmers' distribution of 51.41%. The lowest distribution of palm oil marketing objectives is the farmers who sell their produce to farmer groups with some 6.56% farmers. Marketing objectives also determine the price that will be received by independent smallholders. If they do replanting, the farmer's guarantee is the channel or place to distribute the FFB at a reasonable price. If they sell it to the local trader, the age of the FFB does not determine the price unless they sell it to the cooperation. The smallholder does not have much bargaining power and act as a price taker. Using good seedling also determines the price of the FFB if they distribute it to the factory via cooperation or partnership.

The price of FFB is susceptible to high fluctuations during the rainy and dry seasons. The difference in the price of FFB also occurs due to the policies of each region in determining the price and the vulnerability of price games to the smallholder who is not included as plasma farmers [17]. The price of FFB at the level of independent smallholders is relatively low. The independent farmer has no bargaining power with the buyer. Smallholders received prices unilaterally by collectors (toke). Another reason for price pressure is the distance between the plantation and the factory. The problem is that the factory accommodates FFB production centers, especially in independent palm oil plantations. The result is in line with what was revealed by [17] that to strengthen the community’s economy, and agroindustry are necessary conditions that guarantee a macroclimate conducive to raising smallholders purchasing power parity agricultural-based economic activities.

The price of FFB received by smallholder is inseparable from the factors that influence the high and low prices of FFB that will be received by independent oil palm farmers. Factors affecting the price of FFB received by the smallholder are seed quality, amount of fertilizer, crop maintenance, crop age, and marketing channel (factory, loading point, and collecting traders). When there is a decline in the price
of FFB, smallholder needs to take good care of their oil palm cultivation so that the number of FFB can increase and do other cultivation such as horticulture. The final stage that must be done in using AHP as the decision-making model is the synthesis of judgment, which constitutes the sum of the weights obtained for each choice in each criterion after being weighted from these criteria. Based on the synthesis of the four criteria used, the scale replanting pattern priorities for independent smallholders, is as follows.

Table 5. Synthesis of the Four Criteria used, the scale replanting pattern priorities for Independent Smallholders

| Priority            | Independent | Government Initiation | Partnership | Cooperation |
|---------------------|-------------|-----------------------|-------------|-------------|
| Independent         | 0.279       | 0.38                  | 0.25        | 0.33        | 0.32        |
| Government Initiation | 0.227      | 0.34                  | 0.15        | 0.25        | 0.23        |
| Partnership         | 0.331       | 0.11                  | 0.38        | 0.25        | 0.33        |
| Cooperation         | 0.214       | 0.17                  | 0.22        | 0.33        | 0.33        |

Based on Table, it can be seen that the pattern of partnership becomes the first priority scale and follow by independent government initiation and cooperation. The partnership could be done with the company with consideration: 1) Replanting calculation is done together and transparently, 2) Institutional strengthening, 3) Replanting costs are only limited to funds from BPDPKS, 4) Farming assistance is needed. The independent smallholder needs the partnership because they have some constraint to topple and chipping. The pattern of replanting doing by theirs is independent institutional with some consideration as follows: 1) Partnership with companies in terms of certified seed procurement and marketing certainty, 2) Having legal entity/legality, 3) Directly the funds channelled to farmers, 4) There must be assistance from technical agencies such as from the plantation division or independent institutions. 5) Its is should accompany by programs supporting sustainability, such as economical alternatives and savings.

Figure 1. The replanting pattern priorities scaled for independent smallholders

Increased production and productivity through competitive seeds that will ultimately impact the quality of the palm fruit. Similarly, independent smallholders’ income can be utilizing institutional reinforcement of smallholders both as individual and groups, or groups with cooperatives and cooperatives with companies. Farmer groups need to be carried out continuously and directed at changing farmers’ mindset in implementing the agribusiness system. The farmer group aims to realize independent farmers who act as objects in agricultural development. Independent smallholders in a
group and companies as partners are expected to become oil palm plantation institutions and increase the income and yield of independent smallholder

4. Conclusions
The pattern priority for replanting the independent smallholder oil palm is a partnership followed by independent management institutionally with some assumption. In the future the institutions play a role in raising the income and yield of independent smallholder Fruit fresh bunch

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