Identification and Economic Contribution of Intercrops to the Income of Oil Palm Farmers on Bangka Island

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Abstract: Oil palm smallholders have the initiative to plant intercrops in immature smallholder oil palm plantations to obtain additional income ahead of the oil palm harvest. The research was conducted to identify which intercrops were cultivated by farmers and to calculate the value of the contribution made to the income of oil palm farmers. The survey method was carried out in smallholder oil palm plantations on the island of Bangka. The researchers concluded that the types of intercrops cultivated by farmers included cucumber, tomato, long beans, and cassava. The intercropping contributes to income while at the same time supporting the maintenance costs of young oil palm plants. In this study, intercropping contributed 13.5% toward covering these costs. This means that intercrops are feasible to cultivate in order to intercrop with immature oil palm plants so that they can cover the costs of oil palm farming before producing FFB.

Keywords: Intercrops; Contribution; Income, Oil Palm Farmers

JEL: Q1, Q5, R1

1. INTRODUCTION

The existence of oil palm plantations on Bangka Island is growing very rapidly because this commodity is a source of Regional Original Income, absorbs labor, and provides big profits for companies. The presence of investors who are expanding oil palm plantations until 2022 in all districts on Bangka Island has caused a massive spread of oil palm plantations. In addition to providing benefits for the company, this commodity is the main source of income for farming families, especially smallholder plantations. The important role of the palm oil industry in the era of green agriculture on Bangka Island has also been seen based on Green objectives (Sitorus and Zasari (2022). On the other hand, oil palm plantations have the main problem felt by farmers, namely the length of waiting time/grace period required for producing oil palm plantations. This is the main reason for farmers to look for alternative businesses to increase income while waiting for a return on farming capital.

The presence of business diversification is one of the strategies to increase land productivity and the economic value of plantation companies. Land optimization is carried out through intercropping of various food and horticultural crop commodities as intercrops in the main crop planting area. Intercropping is a form of cropping pattern that cultivates more than one type of plant in a certain time unit intending to obtain optimal production results and maintain soil fertility (Rochmah et al., (2020). An intercropping pattern is a form of polyculture (mixed) cropping pattern. which is carried out between types of annual crops and annual crops. This system is usually carried out on estate crops or forestry crops, for example, rubber, teak, and oil palm plantations. In this system, annual crops are planted when annual crops are still small and immature plants. the immature plant area still has room to grow where it can be planted with intercrops. The fronds or crowns of the oil palm plants in the immature plant areas do not yet cover each other so that sunlight can still be used by intercrops planted in intercropping (Hasibuan et al., (2017); Nurhayati et al., (2020).
The intercropping pattern is beneficial for companies and partners as additional income because the company can manage it independently or in collaboration with employees or employee cooperatives, farmers or farmer groups, or other companies with a profit-sharing system (Kusumawati et al., 2019), another advantage of the system Intercropping includes efficiency improvements (labor, land use, and sunlight absorption); utilization of space between rows of young oil palm plants; technical culture of intercrops under plantation stands is similar to a monoculture cropping pattern and does not interfere with the growth and development of plantation crops; creating biological stability so that it can suppress pest and disease attacks and maintain the sustainability of land resources, especially soil fertility (Junaidi, 2020; Rochmah et al., 2020).

Considering that smallholder oil palm plantations in the Bangka Island region are the main source of income for farmers, while the waiting time for harvesting oil palm is quite long, namely three years after planting, the availability of data on types of intercrops and their role in the lives of oil palm farmers is very useful as a policy basis for stakeholders to prioritize the welfare of farmers. Based on this description, the research was conducted to identify intercrops cultivated by farmers and calculate the value of the contribution made to the income of oil palm farmers.

2. LITERATURE REVIEW

The Big Indonesian Dictionary (KBBI) states that the meaning of intercrops is planted among annual plants which are arranged regularly in the form of straight rows. According to Winarna (2015), intercropping is also known as intercropping, planting on a plot of land, where more than one type of plant is planted and grows together with regular spacing and rows. Intercropping in oil palm plantations is a seasonal cropping system (including Pajale) in rows between oil palm plantation lines to exploit empty areas during the immature period at 1 and 2 years of age.

Various reference sources explain that intercropping in oil palm can be done on seasonal and annual crops. Seasonal crops that can be planted include food crops (such as corn, rice, soybeans, and cassava) and horticulture (vegetables such as chilies, bitter melon, shallots, and fruits such as watermelons, pineapples, and bananas). According to Sutarta et al., (2012), the period of land use for oil palm for intercropping with intercropping is recommended to be only 2 years with consideration of the growth of the oil palm plants and the maintenance of the oil palm plants starting to be intensive. Meanwhile, intercrops in the form of annual plants can be agarwood, white teak, cocoa, and rubber. Gaharu is planted between oil palm plantations by adjusting the spacing. Meanwhile, white teak, cocoa, and rubber are planted on the edges of oil palm plantations (Sebayang and Winarto, 2014).

Proof that diversification of intercrops in oil palm plantations by planting various types of plants is useful for increasing the income of companies and partners, which have been cultivated by farmers, including chili plants (Suherman et al., 2018), corn (Saputra, H. (2018), and fruit plants (Hazzouri et al., 2015; (Mulyani and Las (2008) and various food crops (Arifin et al., 2016); Afandi, (2014).

3. METHOD

The Identification of intercrops in oil palm plantations was carried out using a survey method. Surveys are field activities aimed at obtaining facts from existing phenomena and seeking factual information, whether social, economic, or political, from a group or an area (Nazir, 2013). The survey was carried out on smallholder oil palm plantations on the island of Bangka covering South Bangka Regency, Central Bangka Regency, West Bangka Regency, and Bangka Regency. The data collected includes Types of plants, land area, and socioeconomic data of intercrop farming. The data obtained in this study were analyzed qualitatively and quantitatively. Qualitative methods are used to describe general conditions related to intercrop diversification data.

To calculate farmers' income from intercrops, the formula according to Suratiyah (2015) is used as follows:

\[ \text{Income from intercrops} = \text{Area of intercrop} \times \text{Price per unit of intercrop} \]

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a. Cost Analysis
Calculation of Total Cost is obtained by adding up Fixed Cost/FC with variable costs with the formula:
\[ TC = FC + VC \]
annotation:
- \( TC \) = Total Cost
- \( FC \) = Fixed Cost
- \( VC \) = Variable Cost

b. Revenue Analysis
Calculation of Total Revenue/ TR, is the multiplication between the amount of production (Y) and the selling price (Py) and is expressed by the following formula:
\[ TR = Py \cdot Y \]
annotation:
- \( TR \) = Total Revenue
- \( Py \) = price of product
- \( Y \) = quantity of production

c. Income Analysis
Income is the difference between revenue (TR) and total costs (TC) and is expressed by a formula:
\[ I = TR – TC \]
dimana :
- \( I \) = Income
- \( TR \) = Total Revenue
- \( TC \) = Total Cost

d. Intercropping Income Contribution
Intercropping income contribution is calculated as a percentage (%) of the contribution made by intercropping farming to the costs of smallholder oil palm plantations.

4. RESULTS AND DISCUSSION
Planting intercrops between oil palm trees is a matter that is still being discussed, the pros and cons. The positive perception of intercropping states that intercropping in oil palm plantations is a system of planting annuals (including rice, corn, soybeans/pajale) in rows between the oil palm plantations to take advantage of the empty area during the 1 and 2-year immature period (Winarna et al., (2015) Utilization of immature plant areas in oil palm has several advantages, namely in optimizing land use aimed at the Land Equivalent Ratio (LER), producing a variety of products, obtaining additional yields, improving fertility land and prevent erosion (BPTP, 2012). According to (Sutarta et al., (2012) the period of using oil palm land for intercrops with intercropping is recommended to be only 2 years with consideration of the growth of oil palm plants and maintenance of oil palm plants intensive start.

The results of a tracing survey of oil palm plantations in the Bangka Island region show that intercrop cultivation is only carried out by oil palm smallholders on smallholder plantations. This condition was also ascertained based on the results of interviews conducted with managers of palm oil companies operating in the Bangka region, namely PT. Gunung Maras Lestari, PT. Son of Bangka Mandiri, PT. Layang out the spread of Eka Persada, PT. Gunung Sawit Bina Lestari, PT. Bangka Agro Mandiri, and PT. The First Success of Oil Palm Earth. All oil palm plantation companies stated that they did not permit to plant intercrops on the oil palm plantations owned by the company, as well as the nucleus plasma plantations because the company wanted to prioritize so that the growth of the main crop, namely oil palm, was not disturbed. If intercrops

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are planted together with immature oil palm then the nutrients available around the roots of the oil palm will likely be absorbed by the by-crops/intercrops.

Even though the oil palm companies in the nearby village location are adamant against intercropping in oil palm plantations, the image of intercropping in nine villages is a fact that strengthens the claim that farmers are trying to find additional income opportunities while waiting for the oil palm to be ready to harvest. The findings from observations in smallholder oil palm plantations show that several types of intercrops are still cultivated by farmers in the Bangka Island region. Table 1 and Table 2 below show the location of smallholder plantations and the types of intercrops cultivated by farmers.

Table 1. Results of Identification of Intercrops in smallholder oil palm plantations in Bangka Regency

<table>
<thead>
<tr>
<th>No</th>
<th>Location Description</th>
<th>Product</th>
<th>Harvest Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Labu Village, Puding Besar District, Bangka Regency</td>
<td>Cucumber</td>
<td>after 3 months – 5 months</td>
</tr>
<tr>
<td>2</td>
<td>Mabat Village, Bakam District, Bangka Regency</td>
<td>Cassava</td>
<td>after 9 months – 12 months</td>
</tr>
<tr>
<td>3</td>
<td>Kace Village, West Mendo District, Bangka Regency</td>
<td>Tomatoes</td>
<td>after 2 months – 3 months</td>
</tr>
<tr>
<td>4</td>
<td>Neknang Village, Bakam District, Bangka Regency</td>
<td>Cucumber</td>
<td>after 3 months – 5 months</td>
</tr>
<tr>
<td>5</td>
<td>Gunung Pelawan Village, Belinyu District, Bangka Regency</td>
<td>Long Beans</td>
<td>after 45 days</td>
</tr>
</tbody>
</table>

Source: Field survey, 2022
Table 2. Identification Results of Intercrops in smallholder oil palm plantations in Central Bangka, West Bangka and South Bangka Regencies

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pinang Sebatang Village, Simpang Katis District, Central Bangka Regency</td>
<td>Product: Long bean, harvest age after 45 days</td>
</tr>
<tr>
<td>2.</td>
<td>Tempilang Village, Tempilang District, West Bangka Regency</td>
<td>Product: Tomatoes, harvest age after 2 months – 3 months</td>
</tr>
<tr>
<td>3.</td>
<td>Sinar Surya Village, Tempilang District, West Bangka Regency</td>
<td>Product: Long bean, harvest age after 45 days</td>
</tr>
<tr>
<td>4.</td>
<td>Simpang Rimba Village, Simpang Rimba District, South Bangka Regency</td>
<td>Product: Pineapple, harvest age after 18-24 months</td>
</tr>
</tbody>
</table>

Source: Field survey, 2022

Not in every oil palm plantation it is easy to find farmers planting intercrops. This condition is due to the monoculture pattern of oil palm plantations, and the age of the oil palm plantations, in general, has entered the age of production (above 3 years). From the search results, only 18 farmers were found planting intercrops. Observations in smallholder oil palm plantations show that there are intercrops that are cultivated intensively and the planting layout is in an orderly manner and the produce is sold, but most of the other smallholders only manage sober intercrops. Socio-economic data of farmers who plant intercrops can be seen in Table 3 below.

Table 3. Data of farmers planting intercrops in smallholder oil palm plantations in Bangka

<table>
<thead>
<tr>
<th>Uraian</th>
<th>Lowest</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of education</td>
<td>SD</td>
<td>SMA</td>
</tr>
<tr>
<td>Age</td>
<td>38 th</td>
<td>52 th</td>
</tr>
<tr>
<td>Farming experience</td>
<td>6 th</td>
<td>20 th</td>
</tr>
<tr>
<td>Land area</td>
<td>2 ha</td>
<td>4 ha</td>
</tr>
</tbody>
</table>

Source: Field survey, 2022

The following farming analysis proves the farmer's statement that intercropping provides economic benefits for farmers, more clearly seen in Table 4. The income calculated in this study is only the income of intercropping farmers because the oil palm plantations have not yet produced but have already incurred costs. Therefore, with the increasing cost burden, namely the operating costs of oil palm plants and the operational costs of intercrops, the income from intercrops can still be overcome to reduce the burden on oil palm farmers who carry out replanting activities of old oil palm plants.

Table 4. Analysis of the average cost of intercropping farming in immature oil palm plantations, https://equity.ubb.ac.id/index.php/equity doi 10.33019/equity.v11i1
In the calculations, the analysis of cucumber and long bean farming is used which is cultivated more intensively and the land area is measured and allows for calculations. Meanwhile, other crops such as tomatoes, pineapples, and cassava are only for farmers' daily consumption, and the number of plants is only small.

Table 5. Income Analysis of intercropping farming in immature oil palm plantations, 2022

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount / unit per month</th>
<th>Number of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem</td>
<td></td>
<td>1.500</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td>450 Kg/ha</td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td>8.000 Rp/kg</td>
</tr>
<tr>
<td>Revenue</td>
<td></td>
<td>3.600.000 Rp/ha</td>
</tr>
<tr>
<td>Cost per month</td>
<td></td>
<td>305.745 Rp/ha</td>
</tr>
</tbody>
</table>

**Income**

<table>
<thead>
<tr>
<th>Description</th>
<th>Rp/ha (for 2 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil palm farming costs</td>
<td>20.315.632</td>
</tr>
<tr>
<td>Intercrop income</td>
<td>74.746.488</td>
</tr>
<tr>
<td>Farm expenditure</td>
<td>72.000.000</td>
</tr>
<tr>
<td>Net income</td>
<td>2.746.488</td>
</tr>
</tbody>
</table>

Contribution of Intercrop income: 0.135 (d/a)%

Source: Results of primary data processing, 2022

In this study, it is known that intercropping contributes 13.5% in covering these costs. This means that intercropping is an important strategy for smallholder oil palm farmers to increase their income and cover operational costs. Further research is needed to investigate the sustainability and environmental impact of intercropping in oil palm plantations.
intercrops are feasible to cultivate to intercrop with immature oil palm plants so that they can cover the costs of oil palm farming before producing FFB.

5. CONCLUSION AND SUGGESTION

CONCLUSION
1. Intercrops cultivated by farmers in smallholder oil palm plantations on Bangka Island include long beans, cucumbers, tomatoes, cassava, and pineapples.
2. Intercrops contribute 13.5% in covering maintenance costs for young oil palm plantations. This means that intercrops are feasible to cultivate to intercrop with immature oil palm plants so that they can cover the costs of oil palm farming before producing FFB.

SUGGESTION
Considering that the contribution of intercropping is quite large for farmers in covering the costs of oil palm farming, it is necessary to provide intensive assistance from agricultural extension workers to provide knowledge for farmers in managing intercrops in the most economical way and at the same time optimally support the growth of the main crop, namely oil palm.

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REFERENCE


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