

# Analysis of the Sustainability of Oil Palm Farming on Plasma Farmers in Sungai Lilin District Musi Banyuasin Regency South Sumatra Province Indonesia

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## Abstract

The aims of this research are to 1). Assessing the sustainable condition of smallholder oil palm farming based on social, economic, technical, environmental, and institutional dimensions on Indonesia Sustainable Palm Oil (ISPO) criteria in Sungai Lilin District, Banyuasin Regency. The location was selected by purposive location sampling in Sungai Lilin District, Musi Banyuasin Regency, and collected data research on October 2021. This research used a survey method and the sample used a random method (simple random sampling) by taking 72 palm oil plasma farmers. Empirical data were analyzed using the Rapfish Software and data was collected through in-depth interviews. The results of the analysis of The sustainability of sustainable oil palm plantations are included in the medium criteria with average sustainability index value of 51.92%, the social, economic, and technical dimensions are in the less criteria, while the environmental dimensions are in the good criteria and the institutional dimensions are in the medium criteria. Furthermore, the most sensitive indicators to the social dimension are public perception and the intensity and effectiveness of extension. The economic dimension is land productivity or income and agricultural inputs. The technical dimensions are technical planting and pest control.

**Keywords**— Farming, Oil Palm. Smallholders, Sustainability

## I. INTRODUCTION

Sustainable agriculture is the implementation of the concept of sustainable development in the agricultural sector. According to Salikin (2003) conceptually the sustainable agriculture approach is a pattern and perspective that must be developed by integrating economic, social and environmental aspects in a synergistic manner.

Agriculture in Indonesia, especially oil palm plantations, also supports sustainable agriculture by implementing Indonesian Sustainable Palm Oil (ISPO). This can be seen from the production of palm oil (CPO) in 2019 is estimated to increase by 12.92 percent compared to 2018 to 48.42 million tons. Currently, cooking oil is the main absorber of domestic oil consumption, reaching 70 percent

of the amount marketed domestically (Directorate General of Plantations, 2015).

Opportunities for the development of oil palm agribusiness are still quite open in Indonesia, mainly due to the availability of natural resources/land, labor, technology and experts. Indonesia is the world's largest producer and exporter of palm oil. In addition to increasingly open export opportunities, the domestic market for palm oil and palm kernel oil is still quite large. This is because Indonesia is a country with the largest area of oil palm plantations in the world and it always increases every year from 2010 of 5,780,000 hectares to 2014 of 7,407,090 hectares (Data and Information Center of the Directorate General of Plantations, 2016). However, Indonesian farmers still have problems in the cultivation process, from planting to farming processes.

According to the Data and Information Center of the Directorate General of Plantations in 2016, the condition of Indonesian palm oil is developing following the world market which changes every year with an average productivity of 16.99 tons/ha. This is because the interest in the use of oil palm for various industrial sectors makes the palm oil commodity continuously strived to increase its production and quality. However, the fact is that oil palm production in Indonesia does not always increase even though the area of oil palm plantations in Indonesia increases every year. This is inseparable from several problems found in the field. The problems that occur in oil palm plantations can be seen from the financial and non-financial aspects.

The financial aspect is an aspect that looks at the changes that may occur in the form of changes in production value and variable costs, while the non-financial aspect will look at the market, technical, management and legal, economic and social aspects, as well as the environment which are directly related to the business of doing sustainability in oil palm plantations in Indonesia. These problems indicate that oil palm plantations in Indonesia must be improved and developed in accordance with the demand on the world market which is currently concentrated on fulfilling sustainable oil palm plantations (Demiayanti et al., 2013).

South Sumatra Province, which is the fifth largest producer of palm oil in Indonesia after Riau, North Sumatra, and Central Kalimantan and West Kalimantan, with South Sumatra's palm oil production estimated at around 4,388,731 tons in 2021 and always experienced a growth of 6.74% recorded from 2017 to 2021 (Pusdatin 2021).

In 2018-2019 the area of oil palm plantations in Musi Banyuasin Regency is still the largest district in South Sumatra Province with an area of 356,131 Ha and 314,442 Ha. Therefore this problem is important to be investigated further in an effort to improve the development of community welfare which makes oil palm a regional superior commodity.

Sungai Lilin Sub-district is the seventh largest producer of palm oil in Musi Banyuasin Regency with a total production of 17,516 tons and a land area of 1,450 Ha in 2019. Consequently, the commodity of oil palm is one of the regional superior commodities that must continue to be improved because it involves the livelihoods of local people.

There are various problems in oil palm plantations, especially in Sungai Lilin District, Musi Banyuasin Regency, starting from the social aspect: lack of knowledge and information about environmentally and sustainable plantation management; economic aspect: low production and decreased in 2016 by 19,272 tons and in 2017 by 17,516, unstable income due to price fluctuations in 2016 FFB price of around IDR. 1447.3 and in 2017 the FFB price was IDR. 1335.5 (Rospiani, 2018), difficult access to capital; technical aspects: problems in the cultivation process, from planting to farming processes; environmental aspects: there is no legal force over the land use area for oil palm plantations; to the institutional aspect: less active institutions such as Oil Palm Plantation Cooperatives.

## **II. MOTIVATION AND OBJECTIVE**

From the various problems above, the issue of sustainability is becoming a priority in every aspects such as social, economic, technical, environmental and institutional. Therefore, researchers are interested in conducting a study on the analysis of sustainable plasma oil palm plantations in Sungai Lilin District, Musi Banyuasin Regency, which is expected to be an input in efforts to develop oil palm farming that can be felt equally by farmers, institutions, and companies.

## **III. METHODS**

### **Time and Place**

This research was conducted in Sungai Lilin Sub-district, Musi Banyuasin Regency, South Sumatra Province, Indonesia, October 2021.

### **Research Methods**

The survey method was used to obtain accurate information and descriptions about sustainable

palm oil in 5 dimensions (social, economic, technical, environmental and institutional) of plasma farmers. The collection of data, information collected directly through interviews using a questionnaire. The sustainability indicators are based on Indonesia sustainable palm oil (ISPO), such as:

1. The social dimension is measured using 7 indicators: local wisdom related to sustainable agriculture, level of education, intensity and effectiveness of extension, community perception of sustainable agriculture, participation of women workers in farming management, frequency of conflicts, knowledge and experience of the community in plantation management of sustainable palm oil.
2. The economic dimension used 7 indicators: land tenure or garden legality, labor potential, price stability of farmers' production or price fixing, land productivity and income, interest in farming, availability of agricultural input materials, and availability of business credit.
3. The technical dimension is measured by 7 indicators, namely land clearing, oil palm nurseries, oil palm planting techniques, control of plant pest organisms, plant maintenance to support productivity, harvesting, fruit transportation.
4. The environmental dimension: the suitability of oil palm plantation land, fire prevention and control, the area of managed plantations, conservation actions taken in case of land damage, the location of self-help gardens must be in accordance with spatial and environmental planning, pest management and disease, biodiversity conservation.
5. The institutional dimension: the existence of institutions such as farmer groups and cooperatives, farmer involvement in institutions, institutional management, institutional existence, institutional functions and benefits, membership of oil palm plantation farmer groups, business partners (companies).

The samples used were 72 farmers from 720 palm oil plasma farmers. Meanwhile, the indicators based on Indonesia Sustainable Palm Oil (ISPO) and used an ordinal scale with a scoring of 1-3: 1 (low), 2 (moderate), and 3 (high). Then, it is processed using RAPFISH software and the results are in the following categories:

**Table 1. Percentage of Sustainability Index Value**

| Index Value   | Category   |
|---------------|------------|
| 0% - 25%      | Bad        |
| 25.01% - 50%  | Not enough |
| 50.01% - 75%  | Enough     |
| 75.01% - 100% | Good       |

Source: Nurmalina, R. 2008. Journal of Agro-economy. Bogor Agricultural Institute

#### IV. RESEARCH HYPOTHESIS

Based on various previous research related to sustainable of palm oil plasma farmers. One of them is According to Muani, Ani., et.al. (2018) The results of the RAP-ISPO analysis of palm oil sustainability on five dimensions with 41 multidimensional attributes included in the moderately sustainable status with a sustainability index value of 69.77%. The highest sustainability index value is found in the technological dimension, which is 81.91%, while the lowest value occurs in the institutional dimension (53.80%) but is still considered quite sustainable, while the social dimension (70.45%) is ecological (72.18%) and economy (70.44%) are categorized as quite sustainable. Identified 15 sensitive/leverage attributes that affect the sustainability of oil palm. The conclusion is that the Ngabang plasma plantation in its management has implemented ISPO although it is not optimal, but through the improvement of the 15 attributes of the lever, the sustainability status of oil palm can still be improved in order to produce palm oil that is economically viable, socially feasible, and environmentally friendly according to ISPO standards. The hypotheses are formulated as follows:

1. It is suspected that the achievement of smallholder oil palm farming is quite

(medium) sustainable in Sungai Lilin District, Musi Banyuasin Regency.

- It is suspected that the achievement of smallholder oil palm farming based on the ISPO criteria dimensions, economic, social and technical dimensions will be more sustainable than the environmental and institutional dimensions.

## V. DATA ANALYSIS METHOD

The analysis used to answer the first objective of this research is RAP (Rapid Appraisal Technique) with the Multidimensional Scaling (MDS) method. The achievement of sustainable plasma oil palm plantations measured from five dimensions, such as social, economic, technical, environmental and institutional. the researcher used the sustainability analysis of the multidimensional scaling (MDS) method which is integrated in the Rapfish software modification. The statistical technique used is the ordinal measurement scale, where this scale not only categorizes variables into groups, but also ranks the categories.

The Rapid Appraisal method using the Rapfish software produced outputs such as diagrams, ordinances and distributions obtained through three stages of analysis, namely rapfish ordination, leveraging and monte carlo. In simple terms, the sustainability value scale is determined by a function of the attribute values of economic, technical, social, environmental and institutional aspects, with the formula:

$$IKb = f(E, L, S, T, K)$$

Where:

IKb = sustainability index value scale

E = economic aspect attribute score

L = environmental aspect attribute score

S = social aspect attribute score

T = technical aspect attribute score

K = institutional aspect attribute score

## VI. RESULTS

### Demographic Characteristics of Respondents

The demographic characteristics of respondents consist of age, education, experience, land area, and residence status. The sample farmers in Sungai Lilin Sub-district, Musi Banyuasin Regency have an average age of 52 years and

are classified as productive age. According to BPS (2021), a person's productive age ranges from 15 to 60 years plasma farmers with the most recent education at the elementary school level in the low category with 33 farmers or 45.84 percent. . In this study, the sample farmers have an average land area of about 2 ha. The largest land area is 2.37 ha, while the smallest land area is around 1.61 ha with a total area of oil palm plantations for sample farmers, namely 143.72 ha. Oil palm plasma smallholders in Sungai Lilin District 91.67% are transmigrants from Java, while 8.33% are local residents of South Sumatra. The number of sample farming families in Suka Damai Baru Village and Sri Gunung Village reached 253 people with 72 family heads. Meanwhile, based on gender, the majority were men with 67 farmers with a percentage of 93.06 percent while women were 5 people with a percentage of 6,94 percent.

*Table 1. Characteristics of sample farmers in Sungai Lilin Sub-district, Musi Banyuasin Regency in 2021 (n=72)*

| Characteristics          | Frequency | Percentage (%) |
|--------------------------|-----------|----------------|
| <b>Age (years)</b>       |           |                |
| 21-30                    | 3         | 4.17           |
| 31-40                    | 2         | 2.78           |
| 41-50                    | 20        | 27.78          |
| 51-60                    | 32        | 44.44          |
| 61-70                    | 15        | 20.83          |
| <b>Education (years)</b> |           |                |
| No school                | 0         | 0.00           |
| SD                       | 33        | 45.84          |
| junior high school       | 14        | 19.44          |
| senior High School       | 16        | 22.22          |
| Bachelor                 | 9         | 12.50          |
| <b>Residence status</b>  |           |                |
| Transmigrant             | 66        | 91.67          |
| Local                    | 6         | 8.33           |
| <b>Gender</b>            |           |                |
| Male                     | 67        | 93.06          |
| Female                   | 5         | 6.94           |

Source: Primary data analysis (2021)

### Sustainability of Oil Palm Farming for Smallholders in Sungai Lilin District

Wigena et al. (2009) stated that problems in the management of plasma oil palm plantations began to arise when the oil palms began to produce (fruit sand) where the management of the plantations was completely left to the farmers, while the Company was only a source of technical guidance. The behavior of plasma farmers becomes focused on efforts to pursue maximum short-term income and less concerned about long-term risks such as

decreased land productivity, environmental pollution and social conflicts.

The sustainability of smallholder oil palm farming in Sungai Lilin District was analyzed using a modified Rap-Fish analysis which includes five dimensions of sustainability, social, economic, technical, environmental and institutional dimensions. The measurement of these five dimensions uses 35 indicators or attributes referring to ISPO (Indonesian Sustainable Palm Oil).

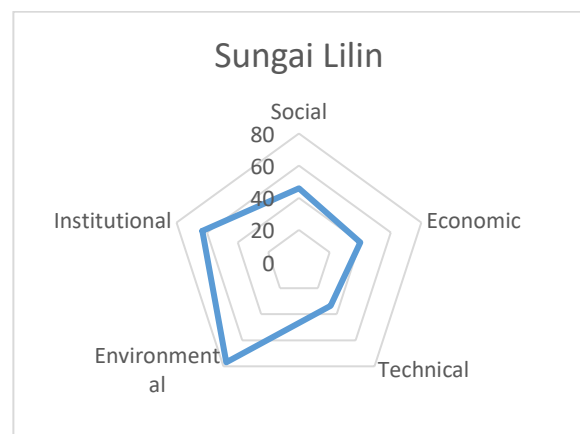
*Table 2. Maize Farming Sustainability Status in Tanjung Lago District, Banyuasin Regency*

| Sustainability Dimension | Index Value (%) | Mark S-Stress | RSQ  | Sustainability Status |
|--------------------------|-----------------|---------------|------|-----------------------|
| Social                   | 45.93           | 0.13          | 0.92 | Not enough            |
| Economy                  | 40,13           | 0.13          | 0.93 | Not enough            |
| Technical                | 33.45           | 0.13          | 0.92 | Not enough            |
| Environment              | 76.93           | 0.14          | 0.91 | Good                  |
| Institutional            | 63.14           | 0.13          | 0.92 | Enough                |
| Average                  | 51.92           |               |      | Enough                |

Source: Primary data analysis (2021)

The results of the analysis show that the opportunity for the sustainability of smallholder oil palm farming in Sungai Lilin District, Musi Banyuasin Regency is 51.15% which means "quite sustainable". There are three dimensions that are below the criteria: the social dimension of 45.93%, the economic dimension of 40.13% and the technical dimension of 33.45%. While the environmental dimension is in the good category, its sustainability status is 76.93%. Furthermore, the institutional dimension is 63.14%, which is enough (medium) category. Table 2 shows the sustainability status of smallholder oil palm farming in Sungai Lilin District, Musi Banyuasin Regency.

The S-Stress value for each dimension is lower than 0.25. According to Pitcher and Preikshot (2001) the S-Stress value which is below 0.25 indicates that the goodness of fit modified by Rap-Fish and can present the model well. Thus, the modification analysis *Rap-Fish* has interpreted the sustainability model of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency well.



*Figure 1. Kite Diagram of Palm Oil Farming Sustainability*

To determine the closeness between the data and the perceptual map, the RSQ (Squared Correlation) value is used. The RSQ value which is close to 1.00 explains that the existing data will be mapped perfectly. The results of the analysis show that the RSQ value of the five sustainability dimensions has a value close to 1, therefore the sustainability of oil palm farming

has been mapped perfectly. The results of the analysis of the sustainability of smallholder oil palm farming in Sungai Lilin District with five dimensions of sustainability are schematically shown in Figure 1.

### Social Dimension

The level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency from the social dimension was measured using 7 indicators: local wisdom, level of education, intensity and effectiveness of counseling, community perception, participation of female workers, knowledge and experience. Based on the results of the Rap-Fish analysis, the level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, from the social dimension, obtained a value of 45.93% which is categorized as not enough (low) sustainable. The distribution of respondent data in the sustainability index of the social dimension can be seen in Figure 2.

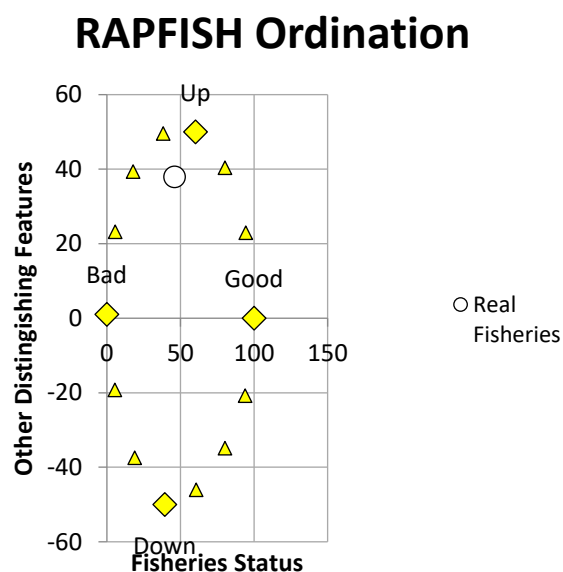


Figure 2. Oil Palm Farming Sustainability Index

Leverage analysis is an analysis that shows the sensitivity of each attribute to the sustainability value. Based on the results of the analysis of social dimension Leverage, there is one attribute that has more influence on the

sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, that is the Community Perception attribute which helps with a value of 17.44 which is the largest compared to other indicators. Therefore, to improve the sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, it is necessary to pay attention to these attributes.

### VII. ECONOMIC DIMENSION

The level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency from the economic dimension was measured using 7 indicators: plantation legality, labor potential, price stability of production, income, interest in farming, availability of agricultural input materials, and availability of business partners. Based on the results of the Rap-Fish analysis, the level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, from the economic dimension, obtained a value of 40.13% which is categorized as less sustainable because it has not entered the productive age of the plant. The distribution of respondent data in the sustainability index of the economic dimension can be seen in Figure 3.

Based on the results of the economic dimension Leverage analysis, there are indicators that have the most influence on the sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, namely indicators of land productivity (income) with a value of 16.03 which is the largest compared to other indicators. Therefore, to improve the sustainability of the economic dimension of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, it is necessary to pay attention to these attributes.

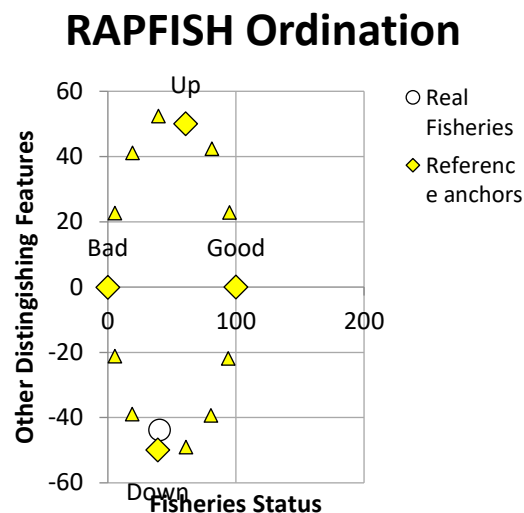


Figure 3. Sustainability Index on the Economic Dimension

### Technical Dimension

The level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency from the technical dimension was measured using 7 indicators: land clearing, oil palm seeds, oil palm planting techniques, controlling plant pest organisms (OPT), plant maintenance to support productivity, harvesting, transportation Fruit.

Based on the results of the Rap-Fish analysis on the level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, from the technical dimension, it was obtained a value of 33.45% which was categorized as less sustainable. This is because technically the management of oil palm plantations is managed by the Oil Palm Farmers Cooperative so that on average they pay workers from outside the family. The distribution of respondent data in the technical dimension sustainability index can be seen in Figure 5.

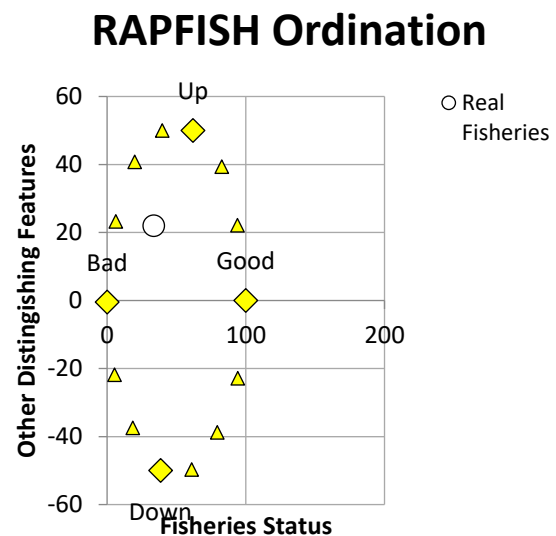


Figure 4 Technical Dimension Sustainability Index

Based on the results of the technical dimension Leverage analysis, there are indicators that most influence the sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, namely the technical indicators of oil palm planting with a value of 17.37 which is the largest compared to other indicators. Therefore, to improve the technical dimension sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, it is necessary to pay attention to these attributes.

### Environmental Dimension

The level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency from the environmental dimension was measured using 7 indicators: the suitability of oil palm plantation land, fire prevention and control, the area of planted land that is managed, conservation actions taken in the event of land damage, the location of the plantation. The environmental planning, pest and disease management, and biodiversity conservation.

Based on the results of the Rap-Fish analysis, the level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, from the environmental dimension, obtained a value of 76.93% which is categorized as good in sustainable because the plasma oil palm

farmers in Sungai Lilin Sub-district have received ISPO and RSPO certificates. The distribution of respondent data in the environmental dimension sustainability index can be seen in Figure 5.

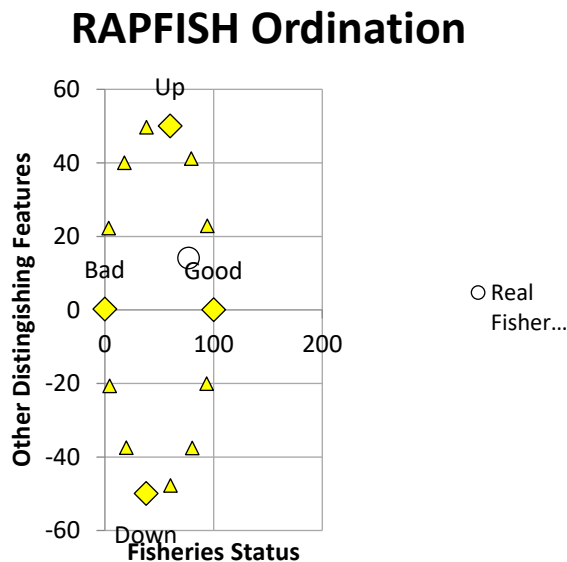


Figure 5. Environmental Dimension Sustainability Index

Based on the results of the technical dimension Leverage analysis, there are indicators that have the most influence on the sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, that is the garden location indicator must be in accordance with the spatial & agricultural environment with a value of 15.03 which is the largest compared to other indicators. Therefore, to improve the sustainability of the institutional dimensions of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, it is necessary to pay attention to these attributes.

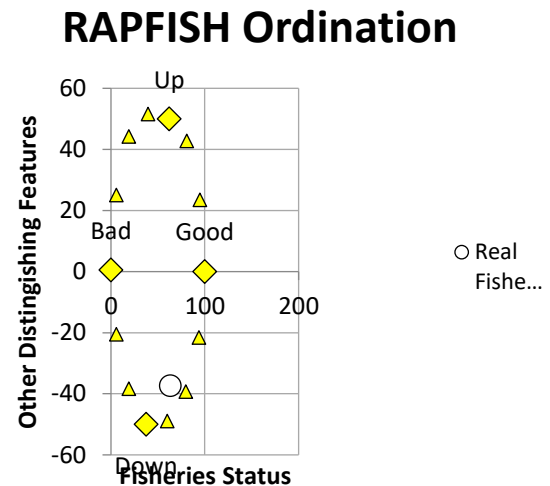


Figure 6. Institutional Dimension Sustainability Index

Based on the results of the Rap-Fish analysis, the level of sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, from the environmental dimension, obtained a value of 63.14% which is categorized as quite (medium) sustainable. This is because the plasma oil palm farmers in Sungai Lilin District are already actively participating in farmer groups or oil palm plantation cooperatives. The distribution of respondent data in the sustainability index of the institutional dimension can be seen in Figure 6.

Based on the results of the institutional dimension Leverage analysis, there are indicators that have the most influence on the sustainability of oil palm farming in Sungai Lilin District, Musi Banyuasin Regency, that is the institutional existence indicator with a value of 13.34 being the largest indicator.

## VIII. CONCLUSION

The results of the analysis of The sustainability of sustainable oil palm plantations are included in the medium criteria with average sustainability index value of 51.92%, the social, economic, and technical dimensions are in the less criteria, while the environmental dimensions are in the good criteria and the institutional dimensions are in the medium criteria.



## IX. ACKNOWLEDGMENTS

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