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Analysis Of Agroforestry Development Strategy For Economic Improvement And Environmental Quality (A Case Study Of Idfos Indonesia Agroforestry Program)

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ABSTRACT

This research aimed to determine the effectiveness of agroforestry management development strategies in an effort to improve the economy and environmental quality in the forest area of Bandungrejo Village, Ngasem Sub District, Bojonegoro Regency through a SWOT analysis. This research used qualitative research using purposive sampling technique, it was the researchers determined the informants based on certain characteristics by considering the knowledge of the informants related to the phenomena studied. The location of this research was in the Perhutani KPS plots 41, 53, and 54 in Bandungrejo Village, Ngasem Sub District, Bojonegoro Regency with LMDH Rimba Tani as the target group for one month. The collected data was then analyzed using the SWOT method. The results showed that an effective development strategy used to improve the economy and environmental quality in forest areas was in quadrant II, it was supporting strategies to avoid the impact of threats (ST). ownership of each member, making compost and vegetable pesticides, developing agroforestry patterns with the application of appropriate technology to increase land productivity and production of economic benefits.

INTRODUCTION

There are many cases of illegal deforestation carried out rampantly by irresponsible people. This happens because of lack of firmness in the applicable law. Besides, there is a lack of government agency policies such as Perhutani in involving communities around the forest to be involved in caring for, maintaining and

supervising forest sustainability. On the other hand, the lack of programs or activities that bring benefits to communities around the forest so that most of them prefer to work on agricultural land that they already own rather than participate in maintaining government forests. As a result, there are many cases of timber theft in the forest.

As an effort of the government and communities in forest areas in maintaining forest sustainability, an agroforestry program is held. Agroforestry is a land management system that combines agricultural with forestry crops. The location of the research was in the cultivation of longan plants located in the KPS Perhutani plots 41, 53, and 54 along the banks of the river with an area of ± 25 ha. This area was chosen because of a river flowing in the Perhutani land area. The bare forest condition causes no water catchment area so that when it rains the land on the banks of the river collapses and the current condition of the river is less than 2 meters in depth.

Based on the explanation of the problems above, this agroforestry program is implemented as an effort to preserve the surrounding nature from the impact of forest damage. At the same time, it is an effort to improve the economy of the community around the forest through longan cultivation. Activities in this agroforestry program were carried out based on the policies of Law Number 23 of 2099 concerning Environmental Management and Protection, Government Regulation Number 28 of 1985 concerning Forest Protection, Minister of Environment and Forestry No. P.83/MENLHK/SETJEN/KUM.1/10/2016 concerning Social Forestry and LHK Ministerial Regulation No. No. P.83/MENLHK/SETJEN/KUM.1/10/2017 concerning Social Forestry in the working area of Perum Perhutani.

In order to determine the effectiveness of agroforestry program sustainability in the Bandungrejo Village area, in-depth analysis of the strengths and weaknesses of the program is needed to be considered in developing the management of longan cultivation for communities around forest areas. Another benefit of the agroforestry program is a strategy to reduce CO2 or carbon dioxide emissions to restore healthy and pollution-free air conditions.

In its cultivation, LMDH community grows 3 types of longan, including Diamond River, Matalanda (Pingpong) and Ittoh. Based on its characteristics, Diamond River Longan plant has a fairly wide adaptability. This type can grow both in the lowlands and highlands. In addition, “Diamond river” has several advantages including, flowering does not match the season and can flower at the age of 1-2 years. Matalanda (Pingpong) Longan has the characteristics of sweet and fresh fruit, and has thick fruit and seeds with thin skin and dry or not watery when peeled. Another advantage is that the longan can flower at the age of 1-3 years, has an elongated stem, flexible and leads in all directions with dark green leaves and small size. Because of its large size like Pingpong, this longan is named Pingpong longan or also called Matalanda. Itoh Longan is a longan resulting from a cross between the longan Diamond River and longan Pingpong, so judging from the appearance of the plant is more similar to that of Diomond River which has wide and wavy leaves with a fruit taste similar to longan Pingpong, such as sweet flesh, thick, dry and thick seeds. (Usman, 2004:8-10).

Lowland longan in Indonesia, such as itoh, pingpong and diamond river varieties can grow at an altitude of up to 700 meters above sea level (asl), but the best is in the lowlands to an altitude of less than 500 m (asl) and generally developed in areas with annual rainfall between 1,000 ± 3,000 mm with the number of dry months (< 60 mm) of 3 ± 6 months. (Tamura, et al., 2015:540).

LITERATURE REVIEW

The agroforestry system includes efforts to obtain yields or production from a combination of crops (seasonal), trees, and or livestock (animals) together either at once or in turns through socially, economically and culturally affordable land management. This understanding includes how the agroforestry system should be implemented to achieve its objectives.

According to Van Der Heide and Tomich explained that one of the main goals of any agricultural business including agroforestry is sustainable production which is characterized by long-term stability of production. Several indicators for the implementation of a sustainable agricultural system are: a) Natural resources can be maintained to support crop production in the long term, b) Use of labor is quite low, c) No land hunger, d) Maintained environmental conditions of soil and water, e) Low greenhouse gas emissions, f) Maintaining biodiversity. The absence of soil hunger in the system can be interpreted as sufficient soil organic matter content, maintenance of the structure and biological conditions of the soil as well as the protection of plants against pests and diseases. Agroforestry systems have flexibility in responding to various fluctuations or sudden changes, both physical (climate, pests, etc.), as well as economic and monetary changes (markets, prices). The flexibility of various agroforestry practices is likely to be a buffer against shocks, at least temporarily or in the short term. Therefore, the agroforestry system is an alternative land use that is expected to be able to compete with other systems.

The management of the agroforestry system is quite complex because it combines the fields of study of forestry science with agriculture and even animal husbandry, and combines forestry business with rural development to create harmony between agricultural intensification and forest conservation. Thus, sufficient detailed knowledge of each component involved in the system is required. One aspect that determines the success of implementing agroforestry is the interaction between trees and seasonal crops or with other trees, which is not easy to study. The study of the interaction process through field experiments requires large costs and takes a long time. The scope of studies or experiments is often very limited and the high diversity of the environment results in the results of a study not always being applicable in different places.

The use of simulation models (imitation) is one option to understand agroforestry systems efficiently and economically. Agroforestry modeling has proven to be able to take into account the effects of various site conditions and produce outputs that are close to reality. Empirical direct approach such as that of farmers, including directly trying, observing and proving it on their own land, can indeed give more accurate results. If this is applied to (formal) research, it will require a very large number of measurements so that it is difficult to implement and

inefficient. The availability of a simulation model can make it easier for farmers to make decisions and improve their land management strategies in the future.

All agricultural systems have the same goal of obtaining optimum crop production, but the management methods vary. The differences in management include differences in land provision techniques, the nature of the plants planted, their position or arrangement in the plot, fertilization, pruning and the planting calendar. For this reason, a basic knowledge of (1) the constituent plants: tree species, annual plants and growing weeds is required, (2) fertilization: the use of organic or inorganic fertilizers, (3) spatial complexity: land heterogeneity, decision making: based on standard rules and regulations. adapted to field conditions, (5) activity schedule which includes planting date, tillage, fertilization, weeding, harvesting and so on (Widianto, et al., 2003).

RESEARCH METHOD

This research used qualitative research because the data obtained were analyzed and used as an interpretation of the data found during the research in the field (Siyoto and Sodik, 2015: 27-28). This research used a purposive sampling technique, where the researcher determined the informants based on certain characteristics by considering the informants' knowledge related to the phenomenon under research. The research was carried out in Bandungrejo Village, Ngasem Sub District, Bojonegoro Regency with the target group LMDH Rimba Tani from 17 May 2022 to 17 June 2022. The data collection techniques used including interviews, observations, and documentation. Interviews were one of the techniques commonly used to collect research data in order to obtain more in-depth information related to the research topic. The researchers used structured planned interview (Yusuf, 2014: 376). Observation was a way for researchers to obtain data and information related to the phenomenon under study by participating in several activities carried out by informants, but not all activities of informants were followed (Sugiyono, 2013: 145). Documentation was a data collection technique carried out by a researcher by collecting various documents relevant to the research topic. This document could be in the form of document files, photographs or images, reports, and so on (Martono, 2016:87).

RESULTS AND DISCUSSION

Agroforestry Management Based on Longan Cultivation

In general, the land cultivated by the Forest Village Community Institution (LMDH) is land owned by Perhutani which then gives permission to the Forest Village Community Institution (LMDH) to carry out agricultural activities. This agroforestry program was carried out through a collaboration between IDFoS Indonesia as the institution that facilitated the agroforestry program and Pertamina EP Cepu as the party funding the agroforestry program. Agroforestry was a form of resource management that combined forest management activities or timber trees with short-term planting of commodities or crops. Longan planting locations were in plots of 40, 41, 53, and 54. In this program, forest land was managed by Pesanggem (land cultivators) who were members of an association called the Forest Village Community Institution (LMDH) Rimba Tani, with 28 members. All

members of LMDH Rimba Tani were from Bandungrejo Village (https://www.idfos.or.id/membaca/program-agroforestry-berbasis-kawasan-hutan-bersama-masyarakat/). At the stage of the tree planting process was divided into 3 stages which could be seen in the table below:

Table 1: Stage of Delivering Longa Plant Seeds

Year	Stage	Number of Plant Seed
2020	1	1,500
2021	2	1,000
2022	3	2,500

Souce: Interview Results of IDFoS Indonesia and LMDH Ngasem Members

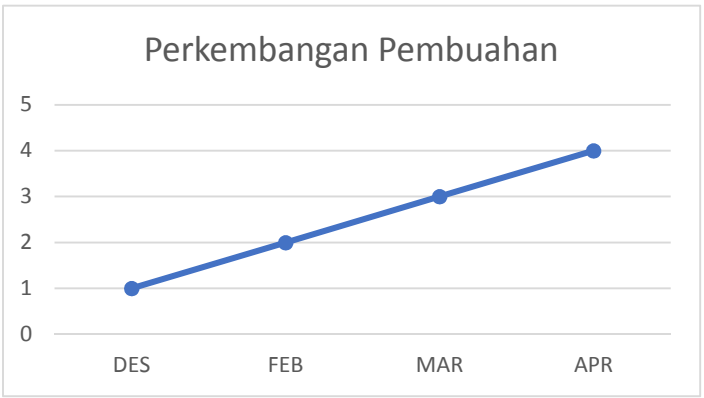
The table above showed the stages of providing seeds, it was in the first stage with 1,500 tree seedlings. The second stage Was given 1000 tree seedlings and the third stage was given 2500 tree seedlings. This stage was carried out with the aim of seeing the potential of the sustainability of longan cultivation and building a sense of ownership and responsibility for LMDH Rimba Tani as a Pesanggem (land cultivators).

In general, the land cultivated by the respondents was owned land that was managed simply. Owned land was land that had legally become the property of someone who was responsible for managing the land to obtain its benefits. Judging from its origin, land owned could be divided into two types, including land belonging to family inheritance and land belonging to gifts from other parties. From the results of interviews, the average respondent had their own land from the inheritance of the family that was managed. In managing sugar palm-based agroforestry, farmers mostly used the experience gained from their parents and the results of exchanges between farmers. Garden management was divided into several activities such as land preparation, seed preparation, planting, maintenance, harvesting, processing and marketing.

Impact of Longan Plants for Community Economy

At the beginning of agroforestry program establishment, one of the hopes was that the community around the forest area would have additional income from the sale of longan fruit that had been harvested. This was evidenced by the harvest had occurred twice in a year. There were 40-50% longan trees that bear fruit with ± 5 kilos of longan fruit per tree. This is supported by table data on the condition of the longan plant development as follows;

Graph 1: Longan Fruit Development



Source: Data Collection on Longan Plants in 2021-2022

Graph 1 described the development of longan plant growth. The presentation of the data above used the description of code 1 which had not been flowering yet, code 2 was flowering, code 3 was fruiting, and code 4 was harvesting. Based on the data in December, it showed that 100% of the longan trees had not flowered. In the next 2 months, it was February, 100% of the longan trees had started to flower. In March, the longan tree showed that it was 100% fruitful and in April, the longan tree entered the harvest season. The planting system was carried out simultaneously by members of LMDH Rimba Tani so that when the harvest period was also carried out simultaneously. While the process of growing longan was done traditionally, it was directly planted without fertilizer or watering.

There were some challenges faced by members of LMDH Rimba Tani, such as that many longan tree seeds were stolen by irresponsible people at night and there was no solution to prevent this theft from happening. This theft also did not only occur in longan tree seeds, but also occurs during the harvest season, where many ripe fruit trees were found already in a state of exhaustion on the tree before being harvested even though the longan fruit had been wrapped. An alternative effort was provided by the IDFoS Indonesia institution as the facilitator of agroforestry program activities, by providing new longan tree seedlings to be replanted by LMDH Rimba Tani. Meanwhile, to prevent theft of longan fruit that was ripe, the LMDH Rimba Tani tree wraps the longan fruit, but the result is still the same. As a result, LMDH Rimba Tani haD not yet experienced the results of the longan harvest.

Longan Plants Impacts for Community Ecology

The results of observations within a period of 5 months showed improved results so that the hope to return the forest to green could be carried out in a sustainable manner through the participation of the LMDH Rimba Tani community. On the other hand, the existence of longan trees can reduce carbon dioxide (CO2) levels and become an alternative to prevent soil erosion in rivers. Longan tree can store as much water content as the development of longan trees. It could be seen in the following table:

Table 3: Longan Tree Growth Development

Longan Category / Month	Dec	Feb	Mar	Apr
Height of Longan Tree (cm)	156	171	183	194
Diameter of Longan Tree (cm)	6,0	9,0	11,4	13,7

Source: Data collection on longan plants in 2021-2022

The data in the table above showed the average growth of longan tree height from December to April 2022, proving that the longan plant was alive. This was supported by the growth of trees in the period from December to February for 15 cm from a vulnerable tree height between 151 and 200 cm. In March, the longan tree grew for 12 cm from a vulnerable tree height of between 151 and 200 cm. Meanwhile, in April the longan tree grew for 11 cm from a vulnerable tree height between 151 and 200 cm. Longan tree circumference in December showed that the average tree circumference increased from 6 cm to 9 cm in February, an increase

of 2.4 cm in March and an increase of 2.3 cm in April. The decrease in growth in tree circumference occured due to entering the dry season, the intensity of rain decreased so that it had an impact on the growth of tree circumference. The condition of leaf pests increased during the rainy season, while the condition of weeds on longan plants decreased from February, March and April. Because these months entered the transition season and switched to the dry season.

Agroforestry Program Development Strategy Using SWOT Analysis

Strategic analysis of agroforestry development was carried out using a SWOT analysis (strengths, weaknesses, opportunities and threats). The SWOT matrix was a tool used to identify business strategy factors. The matrix served to clearly described how the opportunities and threats would be faced so as to produce four sets of possible strategic alternatives (Rangkuti, 2017).

IFAS / EFAS	STRENGTHS (S)	WEAKNESSES (W)
	• Availability of community organizations: LMDH Rimba Tani • There is support from Pertamina EP Cepu • Local wisdom is still maintained • Availability of longan tree seeds • Lots of farm animals	• Members of LMDH Rimba Tani are not used to caring for longan trees • Lack of knowledge of Pesanggem (cultivators) in overcoming longan theft • Lack of knowledge of Pesanggem (cultivators) in overcoming the causes of death of longan trees • There is no lighting around the cultivation site • There is no patrol schedule to guard ahead of the harvest season
OPPORTUNIES (O) • Perhutani access management permit • Assistance of farmers by NGOs • Quality products • Opening of markets/supermarkets • Increased income of LMDH members	STRATEGY S-O • Expanding the distribution of longan cultivation (S1, S2, S4, O1, O2, O3, O4, O5) • Optimizing agroforestry management and development by taking advantage of available market opportunities (S1, S2, S4, O4, O5) • Utilizing the presence of a companion in strengthening market relations (S1, S2, S4, O1, O2, O3, O4, O5) • Maintaining the form of local wisdom by maintaining the tradition of preserving the forest through	STRATEGY W-O • FGD among LMDH members and assistants in finding alternative solutions to overcome longan growth problems (W1, W2, W3, O1, O2, O3) • Provision of equipment on site: construction of ronda/huts and providing lighting (W4, W5, O4, W5, O1, O2, O3) • Creating market conditions for agrofestry products that are supported by the local government (W1, W2, W3, W4, W5, O1, O2, O3, O4,

	thanksgiving (S3, O1, O2, O3, O4, O5)	O5)
THREATS (T) • Theft of longan trees and fruit • Many longan tree seeds died • Uncertain seasonal conditions • Pests and diseases • Use of chemical fertilizers	**STRATEGY S-T** • Building a fence around the longan tree according to the ownership of each member (S1, S2, S3, T1) • Making compost and vegetable pesticides (S3, S4, S5, T4, T5) • Developing agroforestry patterns by applying appropriate technology to increase land productivity and production of economic results (S1, S2, S3, S4, S5, T1, T2, T3, T4, T5)	**STRATEGY W-T** • It is necessary to have FGDs with LMDH members in an effort to evaluate the effectiveness of the performance of government agencies and NGOs (W1, W2, W3, W4, W5, T1, T2, T3, T4, T5) • Separating access to longan plants managed by farmers from longan plants specifically for the general public (W1, W2, W3, T1) • Efforts to analyze and transfer technology management and development patterns in order to increase the production of agroforestry products (W1, W2, W3, W4, W5, T1, T2, T3, T4, T5)

Agroforestry Development Strategies Alternatives in Ngasem Sub District, Bojonegoro

1. Making a fence around the longan tree according to the ownership of each member (S1, S2, S3, T1)
   Making a fence could use a strong net with a high net installation system that must be above the plant height measured from the ground.
2. Making compost and vegetable pesticides (S3, S4, S5, T4, T5)
   With the presence of livestock and the surrounding conditions in the forest, it could be used to make innovations in the form of compost and vegetable pesticides to reduce the use of chemical fertilizers and minimize land destruction which affects the quality of life of the community.
3. Developing agroforestry patterns by applying appropriate technology to increase land productivity and production of economic quotients (S1, S2, S3, S4, S5, T1, T2, T3, T4, T5)
   The condition of agroforestry which is still manual and traditional allows LMDH members to develop appropriate technology to develop the productivity of longan crops for sale.

CONCLUSIONS AND RECOMMENDATIONS

Based on the research explanation above, the researchers concluded:

a. The development of agroforestry in Bandungrejo Village, Ngasem Sub District, Bojonegoro Regency was carried out traditionally and was still maintained today by Pesanggem (land

cultivators) because they still hold local wisdom which had great benefits.

b. Based on the results of the EFAS and IFAS matrix calculations for agroforestry development in Ngasem Sub District, Bojonegoro, it described the situation of the Pesanggem (land cultivators) in facing threats. However, Pesanggem (land cultivators) still had internal strength
c. Because the longan tree was still in the growth stage and the second harvest period since tree planting, from an economic and environmental point of view it had not shown a major impact on LMDH Rimba Tani.

As the description of the condition of the agroforestry program above, the researchers recommended several strategies that were an effort to deal with the shortcomings of longan cultivation. On the other hand, it was hoped that this could be a consideration for stakeholders in the future to be better and more advanced, including making a fence around the longan tree according to the ownership of each member to prevent the theft of longan plants and fruit, making compost and vegetable pesticides as a substitute of chemical ones at the same time served to fertilize the soil, developed agroforestry patterns with the application of appropriate technology to increase land productivity and production of economic results. This was carried out considering that the location was in the forest and was not easily accessible by using advanced technology tools, as well as considering the utilization of unused or not optimal resources in their utilization.

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