Potential Utilization of Durian Based Agroforestry in Lampar Village, Tamansari, Boyolali

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ABSTRACT. Lampar Village has a wealth of resources and potential in its agroforestry yard. However, there are still some management problems that affect the potential of agroforestry in Lampar village. Based on the problems that arise, the authors compiled a study on the potential use of durian plantation-based agroforestry in Lampar Village, Tamansari, Boyolali. The purpose of this research is to know the potential utilization and to design a strategy for managing durian plantation agroforestry in Lampar Village. The research was conducted for approximately 3 months, from May-July 2022. The method used was survey method through data collection techniques with field observations and interviews. Technical analysis in research using qualitative techniques. The data analyzed are primary data and secondary data. Lampar Village has a supportive environment for plantations with land conditions dominated by yards, where almost every resident's house can be found in garden land including durian gardens. The land problems that often occur include pest attacks, erratic seasonal changes, drought, changes in land use, to soil types that are only suitable for planting certain types of plants. Efforts that can be made are through increasing agricultural support facilities such as the procurement of a variety of plant seeds, planting methods, plant maintenance, pest/disease eradication, harvesting, and marketing of crop products as well as direct assistance in the field due to limited supporting facilities in agriculture.

1. Introduction

Agroforestry is one of the systems for the Social Forestry program under the auspices of the Ministry of Environment and Forestry or Kementrian Lingkungan Hidup dan Kehutanan (KLHK) Republik Indonesia since 2016 which is considered to be able to improve the welfare of communities around forest areas, to strengthen the food security system in Indonesia, especially during the Covid-19 pandemic. Agroforestry is one of the optimal and sustainable land use management, by combining forestry and agricultural activities to the social, economic, and cultural processing units of the community. Agroforestry has become one of the driving forces in sustainable land use so that environmentally friendly industries arise and reject massive land conversion actions (Ardini et al, 2020). Land conversion can cause environmental problems due to the scarcity of natural resources, climate change and the extinction of biodiversity (Afifah et al, 2021). Agroforestry is a combination of land management with the use of forestry, agricultural, and livestock cultivation systems at the same time so that it becomes one of the land conversion efforts that have negative impact (Sudomo and Hani, 2014). Agroforestry systems have been widely applied in several areas in Indonesia with local cultures attached to them.

Agroforestry plays an important role for environmental services by maintaining forest functions in supporting watersheds, reducing the amount of greenhouse gas concentrations, so as to preserve biodiversity so that it is far from extinction. Agroforestry is an alternative form of land use that has functions and roles that are closer to forests in terms of biophysical, social, and economic aspects (Olivi et al, 2015). The existence of agroforestry affects the condition of the physical properties of the soil which can reduce soil porosity thereby reducing infiltration. Agroforestry is able to maintain soil physical properties by producing litter so that soil organic matter increases and by increasing soil biological activity and plant roots (Amin et al, 2016). A complex agroforestry system can be defined as a sedentary agricultural system that involves a variety of tree-based crops, either intentionally planted or naturally growing on land and managed by farmers or communities that are managed based on cropping patterns and forest-like ecosystems (Hadi et al, 2016). One model of the agroforestry system is the talun garden system. Talun is a cultural area that includes a variety of communities, including plantation crops, horticulture, and forestry plants. The concept of agroforestry was first pioneered by the Canadian International Development Center team by identifying development priorities in the forestry sector in developing countries in the 1970s. The team concluded that forests in developing areas had not been adequately utilized and were limited to the selective exploitation of natural forests and forest plantations on a limited basis. Therefore, agroforestry is expected to optimize land use and prevent the spread of

degraded land, conserve forest resources, improve agricultural quality, and improve silvicultural intensification and diversification.

Lampar Village is a village located in Tamansari District, Boyolali Regency, Central Java Province. Lampar Village is dominated by activities from the livestock and plantation sectors. The main livestock sector in Lampar Village is cattle and chicken farming. In 2020, livestock commodities owned by farmers in Lampar Village include 1,5732 beef cattle, 798 dairy cows, 424 goats, 54 sheep, 27,000 broilers, and other livestock (BPS, 2021). In addition, plantations are also the dominant sector, where almost every resident of Lampar Village has an agroforestry plantation in the form of a talun garden or yard. Plants that can be found in the plantations of the Lampar Village community include corn, cassava, chili, rambutan, durian, banana, papaya, coconut, tobacco, ginger, coffee, pepper, and others. One of the main plantation commodities in Lampar Village comes from durian production. Based on BPS (2021), the average durian fruit production in Lampar Village in 2020 reached 112 quintals/hectare. Wai et al. (2010) explained that the fruit with the Latin name Durio zibethinus is a native tropical fruit originating from the Southeast Asian region and is the most favored fruit by people around the region because of its unique taste and different from other fruits. Durian fruit is a plantation product of high quality and economic value. This shows that Lampar Village has considerable potential in durian plantation - based agroforestry management. Therefore, this study is aimed to determine the potential utilization and to design a strategy for managing durian plantation agroforestry in Lampar Village, Tamansari District, Boyolali Regency.

2. Materials and Methods

2.1 Research Time and Location

The research location is located in a partner village, namely Lampar Village, Tamansari District, Boyolali, Central Java which is a division of Musuk District. Given the large administrative area of Lampar Village, the research was carried out in several hamlets and communities in Lampar Village. The Lampar Village area, which is located in Tamansari District, has an average height of 700 m above sea level and has a maximum temperature of 33°C and a minimum temperature of 18°C (BPS, 2019). The time of the research was carried out for a period of 3 months starting from May-July 2022.
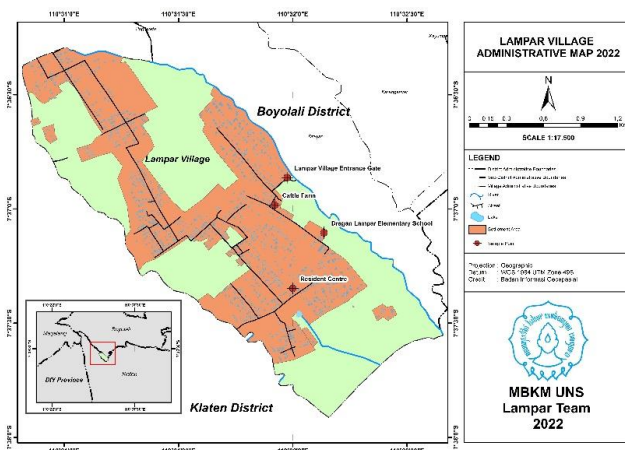

Fig. 1 Research Location in Lampar Village.

2.2 Procedures

The following research uses tools such as stationery, cameras and handphones for documentation and interview recording, as well as laptops or personal computers for data processing and article preparation. The materials used include paper, a list of questions, as well as supporting documents and references. The following research data collection methods are field survey and interview techniques. The field survey was conducted by observing and measuring environmental parameters using a 4 in 1 Envirometer. Interviews were conducted with stakeholders or the Lampar Village government as well as the Lampar Village community who have durian plantations and were selected to represent 5 hamlets. The interview technique used is an in-depth interview with a semi-structured interview type and an open-ended question. A semi-structured interview is a conversation with a specific purpose where this type of interview is more flexible than a structured interview, which has the aim of finding problems more openly with the informant being asked for their opinions and ideas (Kamaria, 2021). In this semi-structured interview, the instrument in the form of a list or interview guide can be formulated in advance, but at the time of the interview the questions that are more flexible and can be developed do not have to be exactly the same as the guidelines.

Fig. 2 Data Collection
(A: Interview with the community; B: Interview with stakeholders)

Fig. 3 Data Collection
(C: Field survey, D: Measurement of environmental parameters)

In addition, the following research was carried out in accordance with the workings or procedures shown in Figure 4. The research began with a study of literature from various existing libraries. Then, research sites are selected, research is planned, and problems are identified. After that, the primary data and secondary data were collected. Based on Sugiyono (2014), primary data is data obtained directly from data sources, while secondary data is data that is not obtained directly but from other sources such as literature. Primary data in this study were obtained from survey results and field observations, interviews, and documentation, while secondary data was obtained from literature studies in the form of journals, books, supporting documents, and so on. The data that has been collected is analyzed and discussed. Furthermore, recommendations and conclusions are formulated at the end.
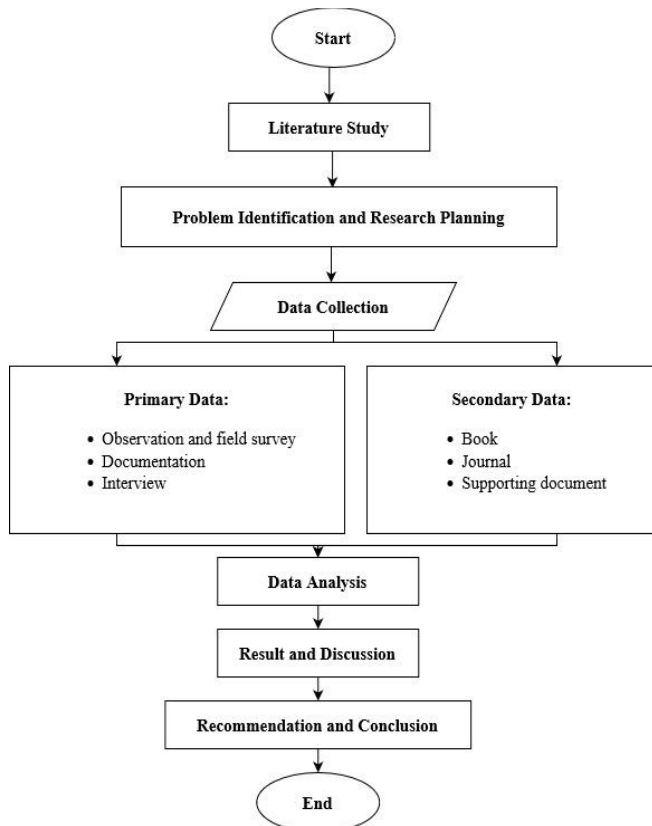
Fig. 4 Workflow Diagram

2.3 Data Analysis

This study uses a descriptive-qualitative analysis method which is a combination of techniques for exposing the condition of the research object through details so that it produces a presentation that contains concrete information (Yunas, 2019). The reason for using the qualitative method is that the object of research is the state of the field and vegetation for which there is no known numerical data in the form of the number and extent. The description of various agroforestry management patterns in Talun gardens cannot be explained using only numerical data (Kurniawan and Kurniawan, 2022). In addition, descriptive analysis is also useful for comparison with previous studies. Then for the presentation of practical recommendations, ideally using a descriptive method so that it is easily understood by readers, especially the people of Lampar Village.

3. Result and Discussion

3.1 Condition and Management of Durian Plantation in Lampar Village

Lampar Village is located in Tamansari District, Boyolali Regency, Central Java Province and is bordered to the north by Tlogowatu Village, south to Bandungan Village, east to Dragan Village, and west to Tangkil Kemalang Village. Lampar Village is located at the coordinates of 7037'12.838'' South Latitude and 110031'55,854'' East Longitude. Tamansari District consists of areas that are choppy to hilly, and hilly to mountainous with dry soil types (BPS, 2021). Lampar Village has an area of 371.0932 Ha in the form of dry land. Details of dry land use in Lampar Village include 142.1245 Ha for yards or houses, 202.8732 Ha for fields and gardens, 9 Ha for pastures/herders, and 142.1245 Ha for other purposes as shown in the figure. 4. This shows that most of the area in Lampar Village is used as a field or garden.
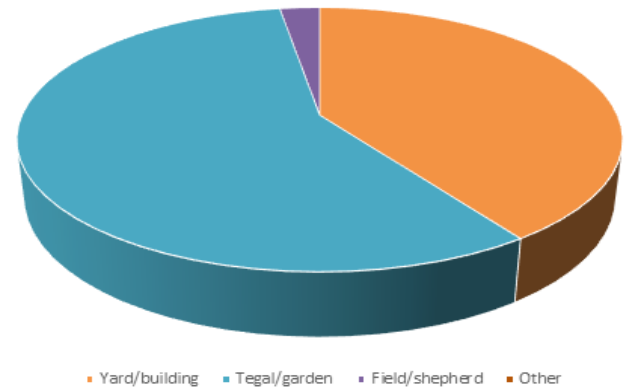

Fig. 5 Dry Land Area (Ha) According to Its Use in Tamansari District in 2020 (BPS, 2021)

Based on its geographical location, Lampar Village is located at an altitude of 700 meters above sea level so that it is a highland area with cool air, and is classified as a fertile and beautiful area. Lampar Village is included in the tropical climate. Based on BPS (2021) the amount of rainfall in Tamansari District during 2020 was 3,784 mm with a total of 142 rainy days, an increase from 2019 where rainfall rose as high as 1738 mm and the number of rainy days increased by 62 days. Based on the results of interviews, it is known that the soil in Lampar Village is andosol type. According to Fitriyani (2020), Andosol soil has a lot of organic and material content so it is suitable and fertile for planting crops, including durian. This type of soil also has chemical properties with an acidic to neutral pH, namely pH 5.0 to 6.5. This Andosol soil has moderate to high productivity and can absorb large amounts of water. In addition, from the results of field data collection, it is known that the environmental parameters in Lampar Village are as shown in table 1. The temperature in Lampar Village ranges from 30.41°C - 31.58°C. Based on BPS (2019), the maximum temperature in Tamansari District reaches 33°C and the minimum temperature is 18°C so that this temperature is still included in the cumulative area conditions in Tamansari District which are classified as tropical. Meanwhile, humidity in the village of Lampar is quite high, ranging from 63.2%RH - 74.3%RH. The amount of vegetation and trees in Lampar Village also has an effect on humidity. These environmental parameters indicate that the environmental conditions in Lampar Village are very suitable for plantation activities.

The majority of the people in Lampar Village also work in the plantation and livestock sectors. Based on the internal document of Lampar Village, namely the recapitulation of the population based on the work of Lampar Village (2022), the most dominant community livelihood is in the agricultural/plantation sector, which consists of 1138 people with 531 male gender and 607 female gender. In addition, there are 143 people who work as agricultural/plantation workers. This shows a fairly large utilization of the plantation sector in Lampar Village to support the economic conditions of the Lampar Community. However, based on the results of interviews with the community, people who own plantations say that the output from the plantation sector is not so large that they can meet their daily needs. Moreover, the harvest of crops in one year is also uncertain or seasonal so that they do

not only depend on the economic sector on agricultural products but also make agricultural products a business, including trading or buying and selling garden products such as young coconuts or *degan*, bananas, corn, chili, and others. The results of the trade are used as input or income to meet daily needs such as buying food, clothing, basic necessities, and others.

Table 1
Measurement Results of Environmental Parameters in Lampar Desa Village

N o	Coordina-te Point/ Parame-ters	Location			
		Lampar Village Entrance Gate	Plantations near Dragan Lampar Elementary School	Resident Centre	Cattle Farm
1	Coordinate Point	S-7.614380 – E110.532928	S-7.618173 – E110.053431	S-7.622458 – E110.533348	S-7.616367 – E110.532028
2	Wind Velocity (m/s)	0.5	1.0	0.4	0
3	Wind Direction	N-S	S-N	S-N	N-S
4	Temperature (°C)	30.91	31.3	31.58	30.41
5	Sunlight Intensity (Lux)	7020	4510	11500	4640
6	Humidity (RH)	69.8	63.2	63.5	74.3

Meanwhile, in terms of education, the Lampar community is dominated by 1261 people out of a total population of 3645 people who have graduated from elementary school/equivalent, while the number of people who have taken high school/equivalent is 444 people and for diploma and undergraduate is still low with a total number of less than 50 people. This causes plantation management in Lampar to still adhere to the traditional way because the community is still dominated by low education so that plantation activities are planted and managed in a limited and independent manner, and there is no sophisticated technological intervention. Based on the results of interviews, respondents from the community used to cultivate simple gardens which were managed by their own internal families. In addition, in terms of the age of the population in Lampar Village, as many as 737 people aged 0-14 years old (not productive), 2449 people aged 15-64 years old (productive), and 459 people over 65 years old (unproductive). This shows that the human resources in Lampar Village in the productive age category are quite large and have potential in terms of agriculture or plantations. Farmers with productive age in the range of 15-64 years old have good energy and willingness to work and think, while farmers who have passed the age of 65 years are considered unproductive because they do not have good energy and body resistance to work in managing agriculture (Saputro and Sariningsih, 2020).

Yard agroforestry is one form of agroforestry that is widely applied in Java, including in Lampar Village. The type of yard agroforestry has an important role for the community, namely as a buffer for economic needs and ecologically, socio-culturally, and aesthetically beneficial by combining food crops, either annual or annual with forestry plants permanently planted to form a canopy structure (Yustha, 2017). Yoman et al. (2018) stated that the type of yard agroforestry is a traditional system in the village when viewed from the vegetation its

composition has unique and interesting characteristics, and the ecosystem of this yard has a very diverse service function and plays an important role in the life of the community in the village. Commodities from yard agroforestry in Lampar Village are quite diverse, including durian, corn, cassava, chili, avocado, rambutan, and papaya. The average production (Kw/Ha) of plantation commodities in Lampar Village in 2020 can be seen in Figure 6.
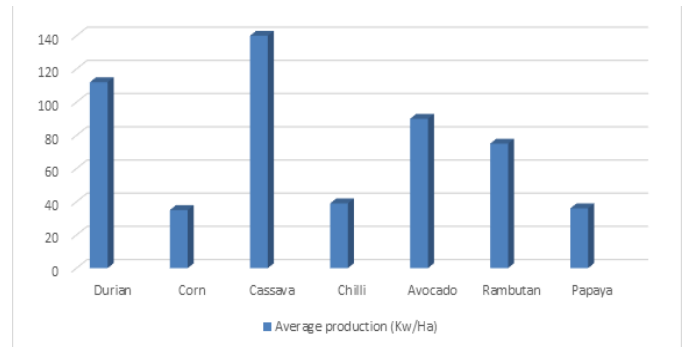

Fig. 6 Average Production (Kw/Ha) of Plantation Commodities in Lampar Village in 2020 (BPS, 2021)

One of the commodities from plantations in Lampar Village which is quite well known and has considerable potential is the durian plant, especially the local type of durian. Warrington (2020) stated that durian is a native plant of Southeast Asia which is generally grown in home gardens in rural areas and grown for commercial purposes. Durian fruit is also known for its large and prickly shape, sweet flesh taste, and unique intense aroma. Because of this attraction and benefits, durian fruit has also earned the nickname "*raja buah*" or "king of fruit". Based on Sobir and Rodame (2010), the classification of durian fruit plants is as follows.

Kingdom	: Plantatae
Division	: Spermatophyta
Subdivision	: Angiosperms
Class	: Dicotyledonae
Order	: Bombacales
Family	: Bombacaceae
Genus	: Durio
Species	: *Durio zibethinus Murray*

The content in durian fruit can be healthy as well as can cause disease if consumed in excess. This is because in 100 grams of seedless durian content, the calories contained in it can reach 153 calories. However, durian itself has many properties that can be used from parts of the plant. Pangkalan Ide (2011) in the book Health Secret of Durian states the benefits of the fruit include the following.

1. Benefits of Durian Fruit

Can prevent the impact of external aging factors or extrinsic aging, can increase blood pressure or iron, and contain vitamin C, calcium, carbohydrates, fats, protein, and iron that the body needs. In addition, durian fruit and roots are efficacious as traditional medicine to treat diseases such as swelling, jaundice, and skin diseases.

2. Durian Skin Benefits

Can be used as a mosquito repellent, can treat rashes (ringworm) on the skin, as well as constipation. In addition, the skin of the durian fruit can also be burned and the ashes are used in traditional concoctions to launch menstruation. Durian skin can also be used as a good rubbing ash material, by drying it to dry and burning it until it crumbles.

3. Benefits of Durian Leaves

Steeped water from durian leaves can be used as traditional medicine, mainly as a fever reliever or as an antipyretic drug.

4. Durian Wood Benefits

Wood from the durian tree can be used as fuel or firewood, and can be used in the manufacture of furniture or other crafts.

However, the potential and utilization of durian-based agroforestry plantations in Lampar Village in their existing conditions have not been utilized or managed optimally. Some of the wood from the trees is also used as furniture, sold to traders, and some are made into chicken coops. Even so, other parts of the durian plant have not been fully utilized, even though they have the potential to make products that can be marketed and support the community's economy. On the other hand, durian waste in the form of durian skin and seeds is still not managed properly. Durian skin and seeds, both from durian that have been consumed and from rotten fruit are still not used and are simply thrown away. This can cause environmental pollution and interfere with aesthetics and cleanliness if allowed to accumulate. In addition, there are still other agroforestry problems encountered. Based on the results of interviews with several residents of Lampar Village, it is known that land problems in yard agroforestry that often occur include pest attacks, erratic seasonal changes, drought, changes in land use, to soil types that are only suitable for planting certain types of plants. Most of the community respondents also stated that the uret pest is also a problem that is quite disturbing. Apriliyanto and Suhastyo (2019) stated that urethritis is one of the plant-disturbing organisms or *Organisme Pengganggu Tanaman* (OPT) that is destructive to plant roots, and has an impact on reducing plant productivity, and can even cause damage to plants. In addition to the presence of uret pests, the community is also worried about the presence of monkeys from the highlands who often come down and damage crops on plantations owned by residents. The monkeys usually descend because they want to find food or travel to ravine areas. Although these problems occur quite often, until now there is still no optimal follow-up to overcome them so that crop failures are still often found.

3.2 Agroforestry Strategy for Durian Plantation in Lampar Village

Seeing the existing conditions and various plantation problems in Lampar Village, the researchers compiled the steps of the agroforestry management strategy sorted into the following points:

1. Communization and development of farmers

Overall, there is no combination of farmer groups (*gapoktan*) that is evenly distributed and running well in Lampar Village. Therefore, the village government cooperates with the agriculture office at the district level, extension workers, and a team of outside experts to carry out intensive activities in the form of forming Gapoktan, cadre, and coaching related to the management of talun plantations with an agroforestry pattern. Participants who attended included all potential farmers and general residents, for example those with non-productive gardens. This is intended so that the active role of citizens can realize a circular economy through plantations as in the research by Nazaruddin and Anwarudin (2019). The target is the formation of gapoktan at the village level and farmer groups (poktan) at the hamlet or RW level. After being formed, materials are provided including types of plants, ideal planting patterns according to agroforestry principles, fertilization, pest control, and harvesting (Ruyadi et al, 2017).

Each poktan is formed by a management and membership structure that functions as a forum for communication, coordination, and a forum to carry out the production of durian plantations – as well as others – in an organized and directed manner. Once formed, it is planned to hold regular monthly meetings with a discussion agenda, namely plantation evaluation, problem solving, and future plans with assistance from a team of experts.

2. Field Data Collection

Until this research was published, the village and district governments did not yet have detailed data regarding the percentage of plantation area and its condition, types of plants, and the actual volume of plantation products. Therefore, the village government can form a special team tasked with finding actual data related to all aspects of plantations in Lampar Village. Referred from various sources and Cantika et al (2019). The important data recorded and very functional include: plantation area, percentage of productive plantation area, soil type, types of plants that exist based on time (annual), state of existing agroforestry patterns, problems in the garden, and fluctuations in plantation yields. for sale. The function of recording these data is for archiving and the basis for analyzing how well the plantation management in Lampar Village is. In addition, every action and planning should ideally take into account the existing field conditions, including planning for talun garden agroforestry patterns (Novita et al, 2021). Talun garden agroforestry needs to pay attention to aspects such as soil type, climate, and types of plants to be planted and have been planted.

3. Fulfillment of Field Needs

To realize an organized agroforestry plantation, it is necessary to have support in the form of infrastructure that can be taken from village funds or others. Determination of needs here is seen from the results of data collection and planning at the time of cadre development (Ruhimat, 2016). However, based on the observations of researchers, in order to idealize agroforestry in Lampar Village, at least facilities are needed such as agricultural tools, organic/chemical fertilizers, tools/drugs to kill rats and maggots, as well as tools for water distribution for watering plants (Paramita et al, 2013). This is based on the condition of the plantations in Lampar Village that have not been well organized, and there are still many farmers who only plant traditionally so that the results are not optimal and pests can easily attack, as in figure 7 and 8 below.

Fig. 7 Example of a plantation in Lampar Village that has not maximally implemented agroforestry

Fig. 8 Aerial image of the dominant plantation condition in Lampar Village

4. Assistance to Farmers in the Field

With the existence of poktan and gapoktan, a team of experts and extension workers can easily provide assistance when farmers manage their gardens (Rimbawati et al, 2018). The team of experts who have designed the agroforestry pattern will later be implemented by farmers with existing facilities or from assistance. Given the large number of plantation lands, each group can be accompanied at least once a week. In practice, the team of experts must be able to design so that the number of durian plantations can be maximized but farmers can still grow other crops such as corn, cassava, fruits, and other vegetables through the agroforestry approach. This is intended so that farmers can fulfill their needs through harvests that are sold every month, not just waiting for durian yields or seasonal crops (Nur Kholifah et al, 2017).

5. Monitoring and Evaluation

This step is an obligation for the village government to the sub-district to find out the percentage of implementation of the agroforestry program and its effectiveness, the problems found, and the complaints of farmers (Paramita et al, 2013). Here, after the program has been running for at least 1 year, monitoring and evaluation are carried out twice by the village government, extension workers, and representatives from the poktan. All monitoring data is then discussed in the Gapoktan meeting to find solutions in the future.

3.3 Agroforestry Management Recommendations

Based on the results of data obtained through interviews, the problems faced by the land are often pests, erratic weather changes, biophysical conditions (soil and climate), drought, changes in use of land, as well as the type of soil that can be planted for certain types of crops only. Therefore, efforts and solutions that can be done in order to overcome land problems are by providing supporting facilities such as plant seeds, compost, and adding agricultural support equipment (Salampessy et al, 2017). Agroforestry management that can be carried out by the Lampar Village community can be done in a traditional way. Traditional agroforestry management includes land management, procurement of various plant seeds, planting methods, plant maintenance, pest/disease eradication, harvesting, and marketing of crop products. There are limited agricultural equipment facilities, assistance must be carried out directly in the field. The agroforestry system is a combination of various types of trees with seasonal crops with/without livestock or animals (Nurida et al, 2018).

Management of agroforestry systems includes several aspects such as tillage, fertilization, weeding, pruning, and eradication of pests/parasites/diseases. Agroforestry management systems vary due to differences in the availability of capital and labor to socio-cultural backgrounds. Therefore,

agroforestry management must be based on principles that encourage the achievement of productivity, sustainability, and the dissemination of agroforestry systems in various areas and different conditions (Suryani and Dariah, 2012). Agroforestry management generally aims to maintain and increase the advantages of the agroforestry system and to eliminate its weaknesses in order to realize the sustainability of natural resources and the welfare of farmers. The development of agroforestry includes three aspects including increasing the productivity of the agroforestry system, seeking the sustainability of the agroforestry system, and distributing the agroforestry system as a land use option that offers better adoption in all aspects (Senoaji, 2012). In order for agroforestry to be carried out effectively and cover the needs of farmers, both for subsistence and service purposes, agroforestry should be an integral part of the program for overcoming land problems in the village (Rajagukguk et al, 2018). For the success of agroforestry management, it should be assessed by several factors including time period, economic rewards, necessities of life, biological productivity and sustainability to the suitability of plant species. In order to develop villages without destroying natural resources, we not only support versatile exotic agroforestry species, but also support local species that have been traditionally known and managed by rural farming communities for a long time.

4. Conclusion

Lampar Village has the potential for durian plantations and seasonal crops with a talun garden agroforestry pattern which is primarily beneficial for the community's economy. Then, with this potential, the strategy for realizing and managing durian gardens with an agroforestry pattern can be carried out through the following stages: regeneration and coaching; field data collection; fulfillment of field needs; farmer assistance; and monitoring and evaluation. These steps involve the village government, sub-district, agricultural services at the district/city level, as well as a third party, namely a team of experts or extension workers. Management of traditional agroforestry systems recommended by researchers includes several aspects such as tillage, fertilization, weeding, pruning, and eradication of pests/parasites/diseases.

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