International Journal of Sustainable Development and Planning
Vol. 19, No. 7, July, 2024, pp. 2737-2744
Journal homepage: http://iieta.org/journals/ijsdp

Land Dynamics of Cocoa Plantations Towards Healthy Landscape

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https://doi.org/10.18280/ijsdp.190730

Received: 5 August 2023
Revised: 14 February 2024
Accepted: 20 July 2024
Available online: 30 July 2024

Keywords:
healthy landscape, cocoa plantations, land use, agroforestry, AHP analysis

ABSTRACT

North Luwu Regency is one of the largest cocoa producers in South Sulawesi where production has tended to decline in the last 5 years. This research aims to look at the dynamics of cocoa land use towards a healthy landscape through implementing good plant spacing, designing agroforestry concepts and implementing good farming systems in 3 landscape clusters. This research uses descriptive correlation analysis to answer objectives 1 and 2 and Analytical Hierarchy Process (AHP) to examine objective 3. The research was conducted in North Luwu Regency, South Sulawesi Province from June to August 2022. From the results of data analysis carried out on 30 farmers, 3 extension workers and 3 MSME actors obtained the results: 1) Focus on landscape studies for cocoa cultivation in 3 clusters, namely clusters 2, 5 and 7, obtained data in cluster 2 with low cocoa production levels in the range of 400-500 kg/year with service contributions high environmental level, 2) Activities that have been carried out by SFITAL in providing assistance to cocoa farmers in terms of implementing plant spacing, agroforestry design and good farming systems through socialization activities, field schools, farming courses, mentoring as well as monitoring and evaluating activities and 3) The results of the AHP analysis show that there is a good application of the GAP concept, where this point is 5 times more important than the planting distance criteria and agroforestry design is 3 times more important than the planting distance criteria.

1. INTRODUCTION

Cocoa plantation development is a long-term investment so it must be planned carefully. Aspects that must be considered include mixed garden system design, farmer institutions, land resources, labor, capital, planting materials, market access, processing process requirements (fermentation boxes, drying machines, storage warehouses), long-term market perspective, and varieties suitable supporting plants [1]. In a landscape, there are various forms of land use, such as agriculture, forestry, biodiversity conservation, and urban areas. The actors who manage these forms of land use have different goals, so they need to be set by stakeholders on a scale that is small enough to remain manageable, but large enough to provide a variety of functions for stakeholders with different interests [2].

The concept of a healthy landscape is based on a landscape that reflects the mosaic of land use, the presence of flora and fauna, human activities and supporting infrastructure that exist in a geography [3]. The landscape approach understands the relationships created by interactions between humans, agriculture, forestry, fisheries, non-agricultural livelihood systems, biodiversity, and infrastructure to create land use management schemes to achieve development goals while improving environmental quality based on shared values and co-benefits [4]. The landscape approach can be defined as a framework for integrating policies and practices for multiple competing land uses through the application of adaptation and integrated management systems [5]. The landscape approach seeks to address the global challenges of poverty alleviation, food security, climate change and biodiversity loss [6].

According to Gkoltsiou and Paraskevopoulou [7], suitable plant types are not only reflected in terms of growth, economic value and ability to adapt to a particular environment, but also their ability to form an ideal growth structure. This needs to be supported by ensuring that the combined species are planted on land that meets the requirements of the growing location. Land management includes land management systems, planting patterns and plant types that are adapted to the type of soil, soil capacity, elevation and slope of the land [8]. Inappropriate agricultural land management in sloping areas will cause increased surface runoff and land degradation which can reduce land productivity, resulting in critical land.

Indonesian cocoa has a varied and wider agroclimate and elevation, so it has the potential to produce high quality cocoa with a distinctive taste and aroma [9]. The quality and taste of cocoa are influenced by the clone or variety, agroecology (soil type, elevation, climate, fertilization), harvest time, picking,

processing and storage methods. Factors that influence quality and taste, one of which is elevation, must receive primary attention because these factors are difficult to modify.

To cultivate cocoa sustainably and healthily, it is very important to design an agroforestry system that resembles the structure of native local forests, promotes high biodiversity, and stratifies production systems. Agroforestry or agroforestry is often defined as integrated land management by combining woody plants with seasonal crops and/or a combination of livestock [10], based on the principle of sustainability where there is interaction between the constituent components which is useful for increasing income for farmers. Apart from having the potential to provide economic benefits for farmers, agroforestry can also repair ecosystems damaged by deforestation and monoculture plantation systems (similar).

Table 1. Landscape conditions in North Luwu Regency

No.	Subdistrict	Slope Class (%)	Altitude Above Sea Level (m)	Information
1	South Sabbang	8-15	25-100	Wavy
2	Sabbang	8-15	25-100	Wavy
3	Baebunta	8-15	25-100	Wavy
4	South Baebunta	3-15	25-100	Wavy
5	Masamba	3-15	25-100	Sloping, Wavy
6	Mappedeceng	3-15	25-100	Sloping, Wavy
7	Malangke	0-8	0-100	Sloping
8	West Malangke	0-8	0-100	Sloping
9	Sukamaju	0-15	25-100	Wavy
10	South Sukamaju	0-15	25-100	Wavy
11	Bone-Bone	0-8	0-100	Sloping
12	Tana Lili	0-8	0-100	Sloping
13	Seko	15-30	>1000	Hilly
14	Rongkong	15-30	500-1000	Hilly
15	Rampi	15-30	>1000	Hilly

Source: North Luwu Central Agency of Statistics, 2021.

North Luwu Regency is one of the cocoa production centers in Indonesia [11] (Table 1). Cocoa farmers in this area have implemented cocoa cultivation with the agroforestry concept which combines cocoa plants with fruit plants (coconut, durian, banana, mango, rambutan, langsat, and duku), as well as woody plants (jabon, gamal, teak, bitti and uru wood), as well as other plants such as pineapple, patchouli, pepper, chili, and various vegetables. The diversity of trees in an agroforestry system adds variety to sources of income for farmers. If cocoa fails to provide financial benefits (for example due to pest and disease attacks or falling commodity prices), then other commodities can become an alternative source of income, where these benefits are not available in monoculture cocoa plantation systems [12].

BPS data for 2021 shows that the Gross Regional Domestic Product (GRDP) of North Luwu Regency in the agricultural sector contributed 47.02%, of which 22% was contributed by the plantation subsector, including cocoa. Based on this data, the area of cocoa plantations is 40,814 hectares with production reaching 30,856.05 tons with a productivity level of 1,005 tons/ha/year [13]. North Luwu Regency is one of the largest cocoa production centers in South Sulawesi, supported by an area of 7,502.58 square km [14].

The landscape approach taken is focused on 3 main clusters, namely:

- Cluster 2 (low cocoa production potential, high environmental services): Masamba, Baebunta and Sabbang
- Cluster 5 (medium cocoa production potential, medium environmental services): Sukamaju, Malangke and West Malangke
- Cluster 7 (high cocoa production potential, low environmental services): Sabbang, South Sabbang, Baebunta and South Baebunta)

The main problems encountered at the research location were: 1) the recommendations given were still uniform regardless of the type and landscape conditions of the cocoa farming being developed, and 2) farmers in developing their cocoa farming have not done it intensively and still use chemical fertilizers, especially urea and NPK in high doses, which actually triggers the rate of global warming, and 3) there are still many farmers who cultivate cocoa commodities in monoculture.

The objectives of this research are: 1) to see the focus of cocoa development studies on land cluster typology, 2) to see the types of activities carried out by SFITAL in relation to maintaining healthy landscapes of cocoa plantations, and 3) which landscape components have the greatest leverage in land dynamics towards healthy landscape in North Luwu Regency.

Studies on cocoa plantation landscapes [15] have been carried out by many researchers, but in-depth research is related to healthy landscapes of cocoa plantations which are divided into several clusters to obtain policy models involving several stakeholders (IFAD, ICRAF, North Luwu Regional Government, Mars, and Rainforest Alliance (RA) to collaborate in overseeing this program while carrying out joint monitoring and evaluation is the first time this has been carried out in North Luwu Regency.

2. MATERIALS AND METHODS

The research was conducted in North Luwu Regency with the consideration that North Luwu is the area with the largest cocoa planting area in South Sulawesi and has also entered into an MoU with ICRAFF through the SFITAL (Sustainable Farming Introphical Asian Landscapes) program. The research design carried out a qualitative and quantitative approach. To answer objectives 1 and 2, a descriptive correlational approach was used with perpetrators through surveys and interviews, while to answer objective 3, data analysis was carried out using the AHP method with the steps: 1) determining criteria data, 2) determining criteria values using pairwise comparisons based on a comparison scale 1-9, and 3) adding up the values in each column of the matrix created previously by referring to the questionnaire and observation instruments. Data collection was carried out for two months from June to August 2022.

Random sampling is based on area or region (Cluster Random Sampling) where the research population is grouped according to area or place of domicile of population members. The target groups are cocoa farmers and micro, small and medium enterprises operating in 3 landscape clusters as well as accompanying extension workers. Samples were taken purposively with certain considerations [16, 17] by selecting

30 cocoa farmers, 10 each from each land cluster, 3 MSME actors, and 3 agricultural extension workers.

Data and information were obtained from respondents using a questionnaire containing the identities of farmers, extension workers and MSME actors as well as activities carried out related to the healthy landscape of cocoa fields. The data analysis used is the Analytical Hierarchy Process (AHP). The tool used in the research is a documentation tool, namely a camera, while the materials needed are administrative maps, image photos, and analysis standards/criteria, AHP questionnaires related to the application of cocoa planting distances, agroforestry design and good farming systems as well as supporting data for cocoa plantations. The software used in this research is Expert Choice version 11, and Autocad 2007 [18].

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Land cluster typology

In the context of cocoa commodity-based agricultural development in North Luwu Regency, the Lestari Cocoa working group (Pokja) team established a land suitability policy in 3 landscape forms, namely highlands, lowlands and coastal areas [19]. This was stated by the Cocoa Indonesia Rainforest Alliance Team Manager who said: "This study targets cocoa farmers in North Luwu Regency who cultivate cocoa commodities in 3 landscape clusters. The farmers who will be selected are Cluster 2 (low cocoa production potential, high environmental services): Masamba, Baebunta and Sabbang, Cluster 5 (medium cocoa production potential, medium environmental services): Sukamaju, Malangke and West Malangke, Cluster 7 (production potential high cocoa, low environmental services): Sabbang, South Sabbang, Baebunta and South Baebunta) (Interview on 16 April 2022).

The landscape design of cocoa gardens in North Luwu Regency in the 3 clusters observed is based on several main criteria presented in Table 2.

Table 2. Main components of the cocoa plantation landscape in North Luwu Regency

No.	Criteria	Cluster 2	Cluster 5	Cluster 7
1	Planting distance	3x3 meters (1,111 trees/ha)	4x4 meters (625 trees/ha)	3x3 - 4x4 meters
2	Agroforestry design for cacao and fruit crops	Semi-complex	semi-monoculture	semi-monoculture
3	Healthy Cocoa Farming System	Medium - good	Medium - less	Medium – less

Source: Primary Data after processing, 2023

From the results of the assessment carried out on 30 farmers with facilitation by 3 extension workers in 3 landscape clusters, the following data was obtained:

a) Setting plant distance

The planting distances used by farmers in North Luwu Regency vary, for the cluster typology where in cluster 2, 9 farmers apply closer planting distances with a planting distance of 3x3 meters and 1 person uses a planting distance of 3x4 meters. In cluster 5, 8 people used a planting distance of 4x4 meters, while 2 people used a planting distance of 4x4.5 meters, while in cluster 7, the planting distance used was more varied, where 3 people used a planting distance of 3x3 meters, 5 people used a planting distance of 3x4 meters and 2 farmers with a planting distance of 4x4 meters. Setting horizontal planting distances from cocoa plants to protective plants, namely in clusters 5 and 7, a minimum planting distance of 3 meters from the cocoa stem with plants that are developed to have deep roots and small leaves such as durian. While in cluster 2, a minimum of 5 meters from the cocoa stem for plants that have the same roots as cocoa such as rambutan. Vertical plant spacing is carried out in cluster 2, by adjusting the distance between the cocoa canopy and the shade canopy. For young plants (less than 4 years old), the distance is a minimum of 2 meters, while for productive cocoa the minimum distance is 7 meters.

b) Design of agroforestry for cocoa and fruit crops

Data obtained from field observations are: 1) Cluster 2 with the target location being Tulak Tallu Village, Sabbang District with 4 respondents, all of whom practice the cocoa-durian-langsat-cempedak planting pattern. The cocoa plants are side grafting plants planted since 2008-2010 through the Gernas Cocoa program with a production of 300-400 kg/ha/year, while the young plants are side grafting seeds for plants with several types of clones in the same cocoa field, namely MCC clones. 02 and 01. The condition of the area in this sub-district is highland (mountains around 80%) [20], 2) Cluster 5, with the target village of Kapidi in Mappedeceng Sub-district with 3 respondents using a cocoa-durian-coconut planting pattern. The cocoa plants produce from 2-3 years old, with an average number of trees of 600/ha with a planting distance of 4x4 m side by side (mixed) with durian plants of around 14-20 durian trees/Ha and coconut trees of 10-15/Ha. The optimal production amount for cocoa plants in 2020 with an average production of 500-600 Kg/year, while durian plants which are generally local varieties as agroforestry plants that are 7 years old produce an average production of 100 talaja/ha, the price of durian is IDR 30,000 - Rp. 45,000/talaja (3 durians) with 1 harvest season a year, 3) Cluster 7 (3 respondents with a cocoa-banana planting pattern in South Baebunta District). The selected village was Lara Village, founded by 1 respondent and 2 people in Mukti Jaya Village with a production of 600-750 kg/year, while the banana production was harvested every 2 months at 20-30 bunches/harvest/ha at a price of 25,000/bundle.

c) Healthy Cocoa Farming System

Of the 30 respondents who were assessed, data was obtained in cluster 2, as many as 8 people who carried out land cultivation, eradicating weeds and pests still used natural ingredients with an organic concept, while 2 farmers used pesticides. In clusters 5 and 7, all farmers have used pesticides in their farming. With the activities carried out by SFITAL, the use of pesticides in farming in clusters 5 and 7 has slowly begun to be reduced by farmers.

3.1.2 Activities supervised by SFITAL

The concept of a healthy cocoa farming system [21] was prepared in Focus Group Discussion (FGD) activities between SFITAL and the Sustainable Cocoa Working Group Team (Pokja) which is a combination of several cocoa observer stakeholders in North Luwu Regency, as follows:

Table 3. Concept of healthy cocoa farming SFITAL program in North Luwu Regency

No.	Cocoa Strategy Sustainable	Criteria	Intervention	Indicator Key
1	Allocation and use land sustainable	Application principles conservation	Allocation of land with consideration suitability land and area protect	Planting New cocoa is prohibited on slopes of 45º
			Expansion limited garden cocoa	Switch function land plantation cocoa
			Development of cocoa agroforestry	Cocoa agroforestry area
			Rejuvenation allocation land cocoa	Land area rejuvenation cocoa
2	Increase productivity and diversification product cocoa	Application practice good agriculture (GAP) incl control pest integrated	Cultivation cocoa with the application of GAP	Types of varieties cocoa
				Amount farmers who use it material plant pest resistant
				Use organic fertilizer
				Frequency attack pests and diseases
				Productivity cocoa
				Ratio extension workers and farmers cocoa
3	Increase productivity and diversification cocoa	Diversification product cocoa	Diversification product cocoa	Amount type product the cocoa produced farmer
			Agribusiness cocoa	Amount power Work sector cocoa
			Diversification Product cocoa	Amount farmers do fermentation
				Cocoa prices fermentation
4	Increase productivity and diversification product cocoa	Use method without burn in preparation land	Opening land without burn	Frequency fire land
				Regulation area about opening land without burn
				Technical manual opening land without burn
				Partnership opening land without burn

Source: SFITAL, 2022.

The concept of healthy cocoa farming in the table above is an activity program that has been agreed upon between ICRAF through the SFITAL program and the North Luwu Regency government which is realized in the field by assisting farmers, especially in terms of:

a. Use of organic ingredients

Of the 30 cocoa farmer respondents, in managing their farming activities, the activities carried out were conducting field schools so that farmers applied organic fertilizer twice a year to cocoa plants at the beginning of the rainy season and the end of the rainy season. In terms of the concept of using organic materials, SFITAL's main activities in clusters 5 and 7 are directed at utilizing forage fertilizer from the waste of protective tree prunings and cocoa plants with the concept of making rorak in the form of holes dug or cross-sections of soil made to cut slopes or contour lines measuring 1 meter long. and 30 cm wide with a depth of 30 cm. This roof functions to store water and as a place to make compost. The number of Rorak in 1 ha is 200 or every 5 – 6 cocoa trees are made into a rorak. The rorak that has been made is filled with 10 kg – 11 kg of manure or cow dung / rorak. The root can be filled with prunings/twigs or cocoa pod shells from the harvest until they are full, then covered with soil. After 3 months of dismantling, when the compost is ready, the compost is aerated and then spread around the cocoa stems and functions as a source of nutrients for plants, namely in the form of compost.

b. Environmental Services

In the 3 clusters observed, there are differences in environmental services, especially in terms of income, where in cluster 2 areas, plants are more resistant to pest and disease attacks, thus providing better economic benefits to farmers, in addition to providing direct (tangible) benefits in the form of goods such as wood, rattan and bamboo and honey bees. Non-tangible benefits obtained in the form of services are: maintained groundwater cycle, soil fertility, natural beauty and fresh air. Meanwhile, for clusters 5 and 7, the benefits obtained include wood, coconuts and bananas [22]. From this environmental service, information was obtained from 3 MSME actors, namely farmers as entrepreneurs in 3 clusters utilizing and managing different natural products, where in cluster 2 the MSME actors were engaged in processing the use of sap to make brown sugar, processing durian products and utilizing honey from nature. In cluster 5, MSME actors process bananas into various processes, while MSME actors in cluster 7 process coconuts into copra. This increase in added value provides an improvement in the level of welfare for cocoa farmers.

c. Land conditions

Land use is the goal of humans in exploiting land cover [23]. Changes in the ecosystem and environmental carrying capacity can be detected from changes in land use which are reflected in the form of land coverage and land use. The higher the intensity of environmental use by humans, the greater the reduction in the environmental carrying capacity [24].

Table 4. Condition of cocoa farmland, types of plants developed and amount of cocoa production in 3 Clusters in North Luwu

No.	Description	K2	K5	K7
1	Land Use	Simple	Simple-optimal	Simple-optimal
2	Land Conditions	Fertile- sloping	Less fertile-flat	Tends to be flooded
3	Land Suitability	In accordance	Very suitable	Very suitable
4	Annual/woody plants	Durian, sugar palm, bitti, uru, langsat, rambutan, sengon and mango	Coconut, teak, jengkol, durian, rambutan, mango and palm oil	Coconut, durian, rambutan, mango, bitti
5	Annual plants	Pepper, vanilla	Kepok Banana	Kepok banana, Patchouli
6	< 5 years	450 kg	500 kg	800 kg
7	6 -15 years	300 kg	400 kg	700 kg

Source: Primary Data After Processing, 2023

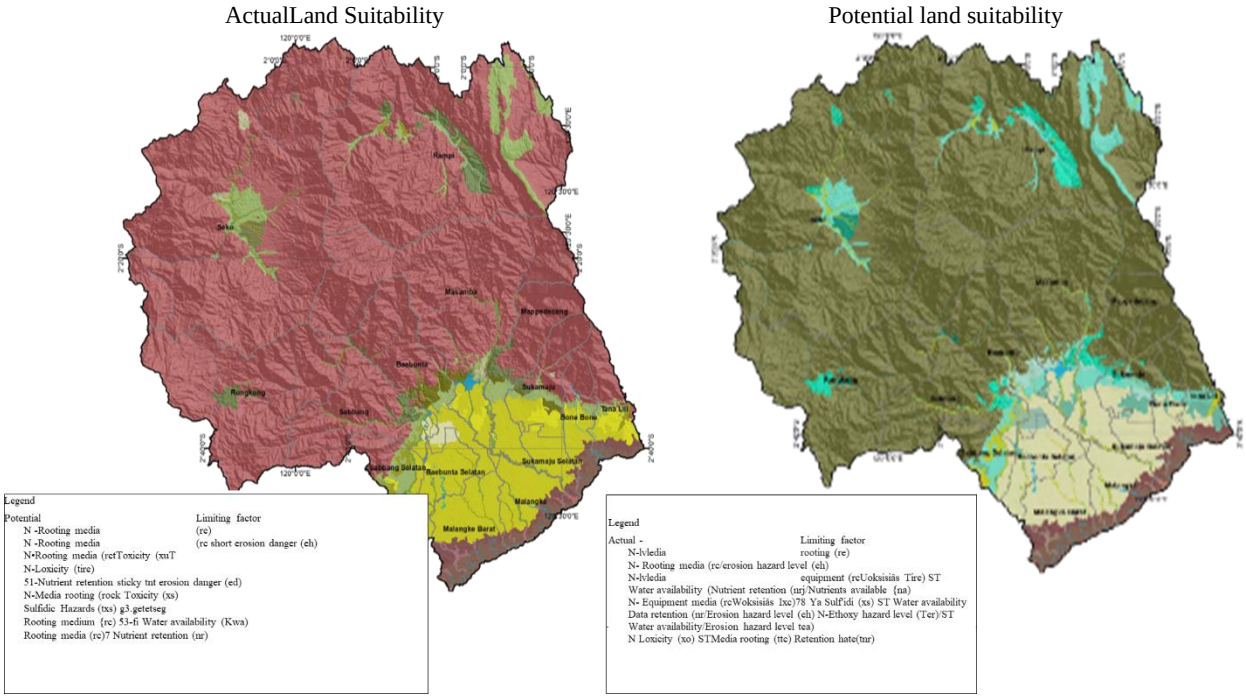

Figure 1. Cocoa land suitability in North Luwu Regency

Table 4 above shows that land use for cocoa plantations in North Luwu Regency is still managed in a simple way to near optimal, where the condition of the land is still fertile enough to be suitable for cocoa plants, so the suitability of the land is presented in Figure 1.

The results of research in 2022 in North Luwu, show that the surface flow rate on monoculture oil palm land in North Luwu is almost twice as high as the surface flow on cocoa-palm agroforestry land and cocoa-durian agroforestry land, this is a sign that agroforestry land has greater potential good in soil and water conservation. It is further said that high surface flow rates are generally accompanied by high levels of erosion or soil loss which will have an impact on reducing soil fertility levels and increasing the risk of land degradation. This research was conducted to analyze soil characteristics, infiltration, erosion of carbon stocks in eight types of land use in North Luwu, namely secondary forest, cocoa-durian agroforestry, cocoa-palm agroforestry, shrubs, monoculture cocoa, monoculture oil palm, coconut agroforestry and monoculture coconut [25].

d. Planting other crops besides cocoa

Other crops developed by farmers are in the 3 clusters, where apart from the cocoa plants developed by farmers in the 3 clusters were found a variety of annual plants such as durian in all clusters plus coconut plants and several types of trees while annual crops were still dominated by bananas. From the results of the field assessment data were obtained, namely: in cluster 2, cocoa plantations generally plant various plants including durian, langsat, rambutan, bitti wood and uru wood. In clusters 5 and 7, the plants developed by farmers include cocoa, durian, coconut, jabon wood and oil palm [26].

e. Plant maintenance

Cocoa plantation care is divided into two phases, namely care in the immature plant phase (TBM) and the mature plant phase (TM). Treatment in the TBM phase is manual cleaning of weeds on plant plates, fertilizing, pruning permanent and temporary shaders, pruning the shape of cocoa plants, and controlling pests and diseases. Weed control in the TBM phase is carried out on cocoa plant discs or plant paths, carried out using a sickle or hoe. In this phase, chemical weed control can disrupt the growth of cocoa plants because some of the herbicides can get on TBM cocoa leaves. Of the 3 clusters observed, plant maintenance in cluster 2 is relatively lighter, when compared to clusters 5 and 7 because it must be handled seriously, especially in terms of pruning, drainage arrangements and fertilization [27].

f. Production

The area of cocoa plantations in North Luwu in 2020 was 40,814 hectares and production reached 30,856.05 tons [28].

From field data obtained from 30 respondents, production data was obtained which was still low, especially in cocoa plants over 6 years old, where in cluster 2 the average production was 300 kg/ha/year which was very far from the potential of 800-900 kg/ha/year.

3.2 Discussion

Analysis regarding determining criteria for healthy land on cocoa plantations in North Luwu Regency using the AHP method. The goal to be achieved through this method is to determine the components of the cocoa landscape that have high leverage. According to the AHP hierarchy, there are several levels used, namely level 1 regarding the aim of analyzing the healthy landscape of cocoa plantation land, level 2 is the criteria used to determine the criteria for healthy land for cocoa plantations in North Luwu Regency, and finally level 3 which is an alternative level that can be used Benchmark cocoa plantation cluster. The decision making process is to choose the best alternatives. In this case, there are 3 alternatives related to the dynamics of cocoa plantation land towards a healthy landscape, namely plant spacing, agroforestry design and good cocoa farming systems. The next step is to structure the problem to determine the possible value of the 3 selected alternatives by considering the risks that will occur with the final concept being used as the basis for face-to-face comparisons so that a single criterion is obtained which is the solution to the existing problem. The following can be explained the AHP hierarchical structure used, namely (Figure

2):

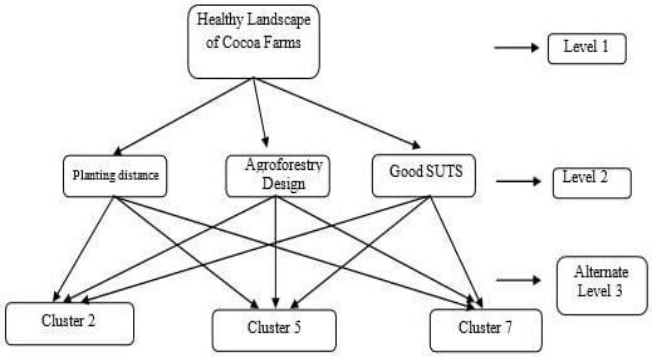

Figure 2. AHP hierarchical structure of healthy cacao farm landscapes

The analysis carried out for level 2 is related to the criteria for determining healthy cocoa land clusters, namely the criteria for planting distance, agroforestry design and healthy cocoa farming systems. Questionnaires were distributed to 30 respondents who were assisted in filling them out. The results of the questionnaire are arranged in the form of a pairwise comparison matrix below (Table 5).

Table 5. Pairwise comparison matrix for all criteria

	Plant Spacing	Agroforestry Design	Healthy Cocoa Farming System
Plant spacing	1	3	5
Agroforestry design	3/1	1	1
Healthy cocoa farming system	5/1	1	1

Source: primary data after processing in 2023

The calculation of pairwise comparisons is in accordance with the theory presented by Saaty [29], for all criteria, the initial step is to give a value of 1 diagonally in the matrix table used in comparing the same criteria. The comparison results in Table 6 show that the criteria for a healthy cocoa farming system [30] are 5 times more important than the planting distance criteria, while agroforestry design is 3 times more important than planting distance. The criteria for agroforestry design are as important as the criteria for a healthy cocoa farming system [31]. The next stage is that Table 6 is converted into decimal form and then added up for each column as in the following:

Table 6. Pairwise comparison matrix for decimal data

	Plant Spacing	Agroforestry Design	Healthy Cocoa Farming System
Plant spacing	1,000	3,000	5,000
Agroforestry design	0,333	1,000	1,000
Healthy cocoa farming system	0,200	1,000	1,000
Total	1,533	5,000	7,000

Source: primary data after processing in 2023

Data that has been decimalized and added up in columns will then be normalized. Normalizing data is done by dividing each value in a column by the total number of columns. Based on normalized data, we will obtain the eigenvector value from the average value for each row in the pairwise comparison matrix, explained as follows (Table 7):

Table 7. Normalized pairwise comparison matrix

	Plant Spacing	Agroforestry Design	Healthy Cocoa Farming System	Vector Eigen
Plant spacing	0.652	0.600	0.714	0.655
Agroforestry design	0.217	0.200	0.142	0.186
Healthy cocoa farming system	0.131	0.200	0.142	0.157

Source: primary data after processing in 2023

The results of analysis of calculation data carried out using Expert Choice software from the 3 main criteria used as a reference by the SFITAL Program in maintaining a healthy landscape [32] cocoa plantations in North Luwu Regency on 3 land clusters explain that the concept of a healthy cocoa farming system applies the Good Principles. A good Agriculture Parctice (GAP) with the main components being the use of organic materials, environmental services, land conditions, soil cover, planting other crops besides cocoa, tree planting, plant maintenance and improving production shows that the criteria for a good farming system are 5 times more important than Plant spacing criteria and agroforestry design are 3 times more important than plant spacing criteria. The main implication is that a good farming system will stimulate optimal plant growth, land use will also be maintained so that it will have a better environmental impact.

Based on a study conducted by Wattie and Sukendah [33], it was found that agroforestry practices that have optimal diversity and productivity are able to provide balanced results throughout land cultivation, thereby ensuring the sustainability of farmers' income. Communities around forests that are poor and food insecure can obtain direct benefits in the form of forest products and indirect benefits as a livelihood system to improve welfare by using forest resources in a sustainable and sustainable manner. The similarity is that the concept of healthy landscape management through agroforestry activities can increase the farming income of cocoa farmers.

From these findings, it becomes a recommendation for policy makers to implement farming with the agroforestry concept while still paying attention to the planting distance between the main cocoa crop and other crops which are intercropped by implementing a healthy cocoa farming system with good farming management in accordance with existing land clusters in North Luwu Regency.

4. CONCLUSIONS

From the results of field assessments with the main actors in analyzing land dynamics towards a healthy landscape on cocoa plantations in North Luwu Regency, the following results were obtained:

1. The focus of the landscape study for cocoa cultivation is on 3 clusters, namely clusters 2, 5 and 7, where the problems encountered in cluster 2 were found to be low

cocoa production levels in the range of 400-500 kg/year with high environmental services.

2. Activities that have been carried out by SFITAL in providing assistance to cocoa farmers in healthy landscapes, especially in terms of implementing plant spacing, agroforestry design and good farming systems through socialization activities, field schools, farming courses, mentoring as well as carrying out regular monitoring and evaluation of activities.

3. The results of the AHP analysis show that components of a healthy cocoa farming system are implemented using the GAP concept well, where this point is 5 times more important than the planting distance criteria and agroforestry design is 3 times more important than the planting distance criteria. This shows that a healthy farming system will provide better production and carrying capacity of the land and environment so that the sustainability of farming can be maintained.

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