The Development Strategies of Cocoa Cultivation (*Theobroma cacao* L.) in Soppeng District

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Abstract. The development of cocoa cultivation is currently optimal in Soppeng Regency and is still experiencing problems or problems such as managing recommended cocoa plants due to limited knowledge of farmers, increasing pests and diseases caused by improper application of cultivation systems, and erratic seasonal changes. , the condition of plants that are old or damaged, resulting in unproductive plants. These factors greatly affect the life and welfare of cocoa farmers. This study aims to identify factors that support farmers in developing cocoa cultivation in Soppeng Regency and analyze business strategies for developing cocoa cultivation at the farmer level in Soppeng Regency. The study showed that the Internal Factor Strategy Analysis Matrix (IFAS) for developing cocoa cultivation consisted of the highest strength factor in the appropriate agro-climate conditions, supportive natural resources and the experience and skills of farmers in cocoa farming. Meanwhile, the highest weakness factor is the application of cocoa management that is not according to recommendations. The External Factor Strategy Analysis Matrix (EFAS) measures the opportunity factor of local government support to make cocoa a leading commodity in the plantation sector and education and training through field schools. Meanwhile, the highest factor is the factor of pests and plant diseases. Based on the SWOT diagram analysis, the results obtained coordinates 0.67; 2,17, where these coordinates are in Quadrant I, which is an aggressive strategy, where this strategy can be used in developing cocoa cultivation in Soppeng Regency, namely utilizing the support provided by the government by increasing cocoa farming from upstream to downstream, doing extension and training in applying technology to farmers, creating demonstration plots based on agro- climatic conditions and available natural resources as training sites for cocoa farmers.

1. Introduction

Cocoa (*Theobroma cacao* L.) is a commodity with high economic value which plays an important role in the national economy, especially as a source of employment, income and foreign exchange. Even though, more than 90% of cocoa is produced by smallholder plantations, Indonesia is the fourth largest cocoa producer and exporter in the world after Ivory Coast, Ghana and Ecuador. World cocoa production currently reaches around 4.79 million tonnes which mostly supplied by Ivory Coast (43%), Ghana (20%), Ecuador (6%), Indonesia (6%) and the rest by other producing countries [1].

One of the largest cocoa producing provinces in Indonesia is South Sulawesi. Based on the statistics estimation figure, in 2020, South Sulawesi is the third largest cocoa producer region in Indonesia which produced 108.983 t of cocoa with the growth of production around 24%.

Nevertheless, cocoa productivity in some cocoa producer districts in South Sulawesi remains low. One of the districts is Soppeng which only produced 3,372 t of cocoa with its productivity was only 0.47 t/ha [2]. Even though Soppeng and the other regions have the potential to produce high quality cocoa due to ideal climatic conditions (annual rainfall and average daily temperatures), the productivity is still below the optimum level (2-3t/ha).

Currently, the development of cocoa cultivation is not optimal in Soppeng Regency and it is still experiencing several obstacles both upstream and downstream which require more intensive, integrated and sustainable handling. According to previous studies the low of production level are mainly caused by land use change and inappropriate agricultural practice. Based on statistical data from the Department of Horticulture and Plantation Sector in Soppeng Regency, until 2016, the area of cocoa cultivation in Soppeng was still recorded at 18,883 hectares. However, until the end of 2018, the total area of cocoa plantation has decreased significantly to 15,938 hectares [3]. The cocoa plantation in Soppeng is predicted to be decline with more widespread land use change.

Besides, the decreasing of cocoa plantation area, the rate of decline in productivity of cocoa plants is mostly caused by pests and disease as well as old trees population. This condition does not only occur in Soppeng Regency but has become a national problem in cocoa development. Soppeng's cocoa bean production fell to 3,372 tons in 2019 compared to 2016's production of 12,360 tons. Along with the development of cocoa, it is undeniable that there are obstacles or problems such as management of cocoa plants that are not according to recommendations due to limited knowledge of farmers, increasing attacks of pests and diseases caused by improper application of cultivation systems, old trees, and climate changes resulting in unproductive plants. These factors greatly affect the life and welfare of cocoa farmers. Therefore, the aim of this study is to identify the factors that support farmers in developing cocoa cultivation in Soppeng Regency and analyze the business strategy for developing cocoa cultivation at the farmer level in Soppeng Regency.

2. Methodology

This research was conducted in Soppeng district in three different region (Marioriwawo, Lilirilau, dan Citta). The study location was purposively selected because the study sites are among the centers of cocoa production in Soppeng.

2.1 Types and sources of data

Primary data is data obtained from interviews, questionnaires, and observations. Interviews and discussions with cocoa experts and farmers using a questionnaire prepared for assessment and discussion related to internal and external factors that affect the development of cocoa cultivation. Secondary data is data obtained from reviewing relevant literature, publications from related agencies, books and journals. Secondary data are also obtained from literature studies and previous research results which are still relevant and valid for the purposes of this study. Secondary data collected includes data on land area, production and productivity of cocoa plants.

2.2 Data collection techniques

The data collection technique is carried out in several stages as follows:

1. Interview, namely collecting data by using a questionnaire or questions that have been prepared. Qualitative data collection is required from respondents who can provide more detailed information. Interviews were conducted with respondents, in this case agricultural business actors (cocoa farmers), to obtain the desired data and information. According to Prabowo (1996) the interview is a method of collecting data by asking a respondent something, the way is by having a face-to-face conversation.
2. Observation, namely data collection by directly observing the object under study, is carried out to complete the data obtained from interviews and recording. Direct observations or observations were made on the conditions of the cocoa gardens and cross-check regarding cultivation techniques and other important things that were considered relevant so that they could provide additional data on the results of interviews.
3. Documentation, namely the collection of data obtained in activities in the form of images.
4. Literature study is carried out in the form of data collection techniques by conducting study studies of books, literatures, notes, reports, information from official government documents that have been published which are related to the problem under study.

2.2 SWOT analysis

To formulate strategic steps to improve cocoa crop productivity, data analysis was carried out using a SWOT analysis. SWOT analysis is a planning tool which aims to identify the strengths, weaknesses, opportunities, and threats of a business. When facing a certain situation or before making a decision, we should consider the positive and negative aspects, advantages, and disadvantages of our decision. SWOT analysis will help us to identify the current situation and consider it more compressive before making a choice. We can consider the cocoa development plan in several regions and analyze it using SWOT. There have been several examples of successful application of SWOT analysis in the agricultural sustainable development and agroindustry planning strategy [4]. SWOT analysis is divided into the internal and external environmental analysis. The SWOT matrix is the simplest approach and tends to be subjective. The SWOT matrix is essentially combining opportunities, threats, strengths, and weaknesses in a matrix. According to [5], the SWOT Matrix can clearly illustrate how external opportunities and threats faced can be adjusted to the strengths and weaknesses they have are as follows:

Table 1. SWOT matrix

	Strenghts (S)	Weakness (W)
Opportunities (O)	S-O strategy	W-O strategy
Threats (T)	S-T strategy	W-T strategy

All internal and external factors that have been identified are grouped in a SWOT matrix which is then qualitatively combined to produce a classification of strategies that includes four alternative strategies, namely:

1. S-O strategy, this category contains various alternative strategies that utilize opportunities using their strengths.
2. W-O strategy, this category is to take advantage of external opportunities and overcome weaknesses
3. S-T strategy, this category is to utilize strenghts to overcome threats
4. W-T strategy, this strategy is based on activities that are defensive and try to minimize existing weaknesses and avoid threats [4].

Cocoa production on several land class has its own particularity when facing different internal situations and external environment. SWOT analysis was carried out to analyze the opportunities and threats in the external environment, and the strengths and weakness looking internal to the plantation. Weighting and scoring in SWOT analysis are carried out based on the interview results which are then justified in the form of scores. The weight value is obtained from the average of each question divided by the average total of the questions given by the respondent. The rating scale ranging from 4 (Outstanding) to 1 (Poor), based on the influence of these factors on the development conditions of cocoa cultivation in Soppeng. The rating for strength is positive (4= very large, 3= large, 2= moderate, and 1= small), while the rating for weakness is negative (4 = small, 3 = moderate, 2 = large, and 1 = very large). Each rating amount is the average of the ratings given by the respondent. Furthermore, final score is the multiplication value the weight and rating of the same factor. Each rating scale is the average rating given by the respondent.

3. Result and Discussion

3.1 The farmers's factors that influence cocoa cultivation

Factors possessed by a farmer that influence the implementation of cocoa cultivation development activities are the age of the farmer, education, number of dependents in the family, area under cultivation, and experience of cocoa farming.

Table 2. The area of cultivation, production, and productivity of cocoa in the study sites

District	Area (Ha)	Production (kg)	Productivity (kg/ha)
Marioriwawo	36,65	253,48	169,23
Lilirilau	24,90	204,62	194,36
Citta	11,48	285	260,48
Total	73,03	743,10	624,07

Table 3. The factors possessed by a farmer that influence the implementation of cocoa cultivation development

Parameter	Level	Percentage (%)
Farmers' age	15 – 19 years	0
	20 – 24 years	0
	25 – 29 years	3,08
	30 – 34 years	4,62
	> 35 years	92,3
Education level	Uneducated	13,85
	Elementary School	50,77
	Junior High School	16,92
	Senior High School	15,38
	University level	3,08
Agribusiness experience (years)	< 10	4,62
	10 – 20	29,23
	21 – 30	49,23
	> 30	16,92
Dependent family members (person)	None	1,54
	1 person	4,62
	2 person	13,84
	3 person	20,00
	> 3 person	60,00

3.1.1 Farmer's age

Farmer age is related to physical strength, enthusiasm, experience and level of adoption. Based on farmer age data (Table 3), it shows that at the research location, the average age range of the respondent farmers > 35 years is 60 people with a percentage of 92.3%. This shows that the respondent farmers are still in the productive age, which means that physically the respondent farmers still have sufficient manpower to carry out their cocoa farming activities.

Age of the farmer is one of the factors that is closely related to the ability to work in carrying out farming activities, age can be used as a benchmark in seeing someone's activities at work if the age is still productive, it is likely that someone can work well and optimally [6]. Farmers of productive age have excellent physical abilities and mindsets to be able to absorb new innovation information and apply it [7]. Age of farmers influences the process of plant cultivation starting from the thought process to the process of running the cultivation activities [8].

3.1.2 Education level

The level of education generally represents creativity in thinking and acting. Formal and non-formal education is quite influential on a farmer to respond the technological innovations related to improving skills in farming management which are carried out properly. The education level of farmers where highly educated farmers are relatively faster in implementing innovation adoption. Low education results in a lack of knowledge in utilizing available natural resources.

Based on the education level data of the respondent farmers (Table 3), in Marioriwawo, Lilirilau, and

Citta Districts the education level is dominated by elementary school or equivalent with 33 farmers (50.77%), then the education level with the least respondents is the bachelor degree or equivalent with 2 farmers (3.08%). It shows that the level of education of the respondent farmers is quite low, which is closely related to the ability of farmers to adopt new technologies that can support the improvement of cocoa farmer farming.

Based on the data, farmers not only need formal education but also need to get non-formal education such as counseling and training that can improve skills and insights to cocoa farmers. In accordance with the opinion of [9], which argues that training is an effort to improve and develop human resources, especially to develop intellectual knowledge of each educational institution, requiring changes in behavior in students (educational goals), including changes in knowledge, attitudes and abilities. According to [10], farmers who have higher education both formal and informal have broader insights, especially in understanding the importance of productivity. Awareness of the importance of productivity plays an important role in encouraging efforts to increase agricultural production.

3.1.3 Experience in farming business

The data in Table 3 shows that the most number of respondent farmers' farming experience is in the range of 21-30 years with 32 respondents (49.23%), then in the range of 10-20 years with 19 respondents (29, 23%). This explains that the longer a person tries to farm, the more knowledge and skills that can be obtained so that farmers become skilled so that the chances of success in developing their farming business are greater where this will affect the amount of income to be generated.

A person's experience in farming is influential in accepting new innovations. Farmers who have been farming for a long time will find it easier to implement innovations than beginner farmers or new farmers. Farmers who have been farming for a long time will find it easier to apply extension recommendations as well as the application of technology [11].

3.1.4 Number of family dependents

The number of family members will affect the farmer's working level. The more family members, the more active the farmers are to work because they have many family dependents. Family members are included in the workforce in the family who can help the head of the family in farming.

Table 3 shows that the number of family members who are dependents of the family is mostly in the range of > 3 people as many as 39 respondents (60%), and respondents who do not have dependents are 1 respondent (1.54%). The data shows that the number of family dependents on the respondent farmer has a considerable influence on his farming activities. The more the number of dependents, the more the farmers spend. In addition, the number of dependents in the family also shows how many workers in the family can help in the farming process.

According to [12], the number of family dependents greatly affects the work participation of the cocoa farmer family, if there are many family members of productive age in a family, the number of family dependents will increase so that it will encourage someone to work to meet the needs of their family. Likewise, on the other hand, the smaller the number of productive family members, the fewer dependents on the family, which will reduce the work participation of the cocoa farmer families. The effect of the number of family dependents on the level of work participation of family members is positive. It means that the higher the number of family dependents, the higher the level of work participation of family members.

3.1.5 Plant productivity

Each aspect of the cultivation technique contributes to the productivity of the cocoa plant in each region. The data presented in Table 3 shows the productivity of cocoa plants in each sub-district of the research location, where this data is the total cocoa productivity data in Soppeng Regency, which is 624.07 kg / ha with a production of 743.03 ha on a land area of 73.03 ha. The productivity of cocoa is still low because in general, farmers still use planting material originating from seeds and not superior clones. According to [13], the development of superior planting material for cocoa can be done vegetatively or generatively, but most cocoa farmers still prefer generative propagation using beans because it is easier. Even so, the source of seeds for this propagation still comes from the mother plants around the cocoa plantation which he considers uggul. Globally, this condition is the main cause of low productivity of the cocoa plant.

Low productivity is also caused by the adoption of a cultivation system that is not as recommended. According to [14], improper application of cocoa cultivation techniques such as poor plant care and unbalanced fertilization also affects the decline in productivity of cocoa plantations in Indonesia. In general, farmers carry out simple maintenance, namely by doing careless pruning and excessive

fertilization.

Table 4. Matrix of Internal Factor Strategy Analysis (IFAS) on the development of cocoa cultivation in Soppeng District

No	Internal factor	Weighted Value	Rating	Score
Internal Strengths				
1	Suitable agro-climatic conditions	0.15	3.49	0.52
2	Natural resources	0.15	3.57	0.54
3	Farmer organization	0.13	2.91	0.38
4	Experience and skills of farmers in cocoa farming	0.15	3.38	0.51
Sub Total		0.58		1.94
	Internal Weaknesses			
1	Plants that are old / not productive	0.13	3.11	0.42
2	The level of education / human resource of farmers is still low	0.07	1.66	0.12
3	The implementation of cocoa cultivation Management is not according to recommendations	0.17	4.00	0.69
4	Farmers do not ferment cocoa beans	0.4	1.00	0.04
Sub Total		0.42		1.27
Total		1.00		3.22
Difference of Internal Strengths and Weaknesses = 0,67				

Table 4 shows that the total IFAS value for the development of cocoa cultivation is 3.22 which consists of a strength score of 1.94 with the highest strength score located in the appropriate agro-climatic conditions, supportive natural resources and the experience and skills of farmers in farming cocoa. Meanwhile, the weakness score was 1.27 with the highest score of the weakness factor, namely the factor of implementing cocoa cultivation management that was not in accordance with the recommendation with a score of 0.17. By considering the existing strengths and weaknesses, cocoa cultivation is still in a strategic position that is strong enough to continue to be developed because the strength factor is more dominant than the weakness factor. This means that the strengths possessed can be put to good use to overcome weaknesses. The results of data analysis on external factors (opportunities and threats) in the field were obtained, then entered in the External Factor Strategy Analysis (EFAS) (Table 5).

Table 5. External Factor Strategy Analysis Matrix (EFAS) on the development of cocoa cultivation in Soppeng District

No	Internal factor	Weighted Value	Rating	Score
External Opportunities				
1	Local government support makes cocoa a leading commodity in the plantation sector	0.19	4.00	0.75
2	Education and training through field schools	0.19	4.00	0.75
3	Development of demonstration gardens as a training tool for farmers	0.17	3.71	0.64
4	Increased demand for cocoa production	0.16	3.38	0.53
Sub Total		0.71		2.67
External Threats				
1	Erratic patterns of the rainy season and dry season	0.05	1.00	0.05
2	The use of chemical fertilizers is getting bigger	0.10	2.03	0.19
3	The attack of pests and plant diseases is getting higher	0.10	2.08	0.20
4	Transfer of commodities	0.05	1.15	0.06
Sub Total		0.29		0.05
Total		1.00		3.18
Difference of Internal Strengths and Weaknesses = 2.17				

Table 6. Classification of cocoa cultivation development strategy issues in Soppeng Regency

Internal and external factors	**Strenghts (S)** a) Suitable agro-climatic conditions and natural resources are appropriate b) Farmers' institutions that are still active c) Experience and skills of farmers in cocoa farming	**Weakness (W)** a) Plants are old / not productive b) The level of education / human resources of farmers is still low c) The application of cocoa cultivation management is not according to recommendations d) Farmers do not ferment cocoa beans
Opportunities (O) a) Support from local governments to make cocoa plants a leading commodity in the plantation sector. b) Education and training through field schools c) Development of demonstration gardens as a training tool for farmers d) Increased demand for cocoa production	**S-O strategy** a) Take advantage of the support provided by the government by increasing cocoa farming from upstream to downstream. b) The need to provide counseling and training on the application of technology to farmers so that they can increase their ability to cultivate cocoa farming. c) Creating demonstration plots based on agro-climatic conditions and available natural resources as a training ground for cocoa farmers.	**W-O strategy** a) Rehabilitation of old or unproductive plants. b) Improve training for farmers on cocoa cultivation and post-harvest techniques for cocoa plant development. c) The need to apply cocoa cultivation management in accordance with recommendations.
Threats (T) a) Erratic patterns of rainy and dry seasons. b) Increasing use of chemical fertilizers c) Pests and plant diseases. d) Commodity competition	**S-T strategy** a) Making organic fertilizers in groups (farmer groups) to reduce the use of chemical fertilizers. b) To control pests and diseases in groups by using experience and agro-climatic conditions as a reference. c) Utilizing farmer groups as a platform to create highly competitive cocoa products.	**W-T strategy** a) The use of organic materials / compost to reduce the use of chemical fertilizers, b) Carry out conservation to minimize the danger of erosion by making terraces or mounds and planting ground cover crops, c) Increase knowledge about good cocoa cultivation management to solve problems in cocoa plants.

3.2 Alternative strategy decision making in SWOT analysis

Based on the assessment of IFAS (Internal Factor Analysis System) and EFAS (External Factor Analysis System) carried out on the development strategy of cocoa cultivation in Soppeng Regency, the total IFAS average value is 3.22 with a strength score of 1.94 and The weakness score value is 1.27, while the total EFAS average value is 3.18 from the opportunity value of 2.67 and the threat value of 0.50.

If the internal factor assessment matrix is combined with the external factor assessment matrix, it can be seen the position of the cocoa cultivation development strategy in Soppeng Regency. The position of the cocoa cultivation development strategy uses a position matrix so that it will produce a coordinate point (x, y), where the x value is the difference between internal factors (strengths - weaknesses) and the y value is the difference between external factors (opportunity - threat). Based on Tables 4 and 5, it is obtained that the value of x> 0 is 0.67 and the value of y> 0 is 2.17 (Figure 1).

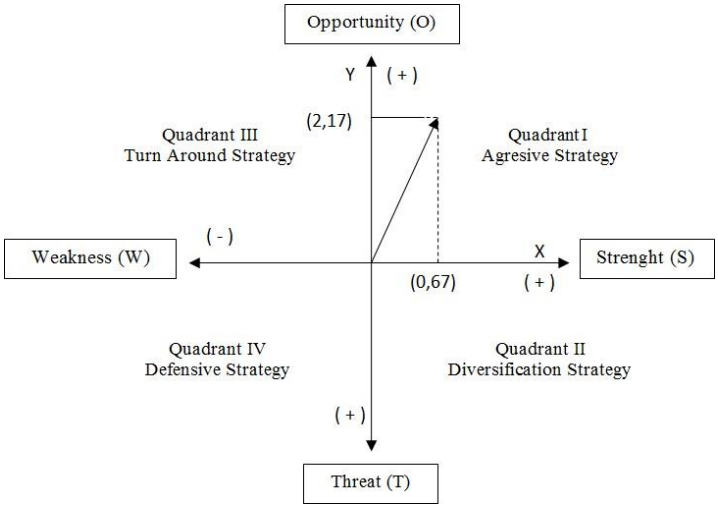

Fig 1. Analysis of the strategy diagram for the development of cocoa cultivation in Soppeng Regency

Based on the SWOT diagram analysis in Figure 1, the results of the coordinates are 0.67; 2.17, where these coordinates are in Quadrant I, namely an aggressive strategy. This strategy shows a very favorable situation because this strategy describes a very good situation because there are strengths that are used to seize profitable opportunities. The development of cocoa cultivation in Soppeng Regency has strengths and opportunities that are integrated and mutually supportive, namely by using all factors of strength to take advantage of existing opportunities.

Technically, the alternative aggressive strategy used based on the strength factor which is an internal factor and an opportunity factor which is an external factor in the development of cocoa plant cultivation is to take advantage of the support provided by the government by increasing cocoa farming from upstream to downstream. The government encourages downstream cocoa development, but the upstream must also be increased so that farmers' cocoa productivity increases. The government's upstream program is to prepare superior seeds through the BUN 500 program for the next five years.

The next alternative strategy is to provide counseling and training on the application of technology to farmers so that they can improve their ability to cultivate cocoa farming, and create demonstration plots based on agro-climatic conditions and available natural resources as training places for cocoa farmers. Until now, the application of cocoa cultivation technology at the farm level is still low, therefore it requires training and counseling on technology and innovation for the development of cocoa cultivation.

The Agricultural Research and Development Agency (Balitbangtan), Ministry of Agriculture, has produced many technological innovations to increase cocoa production, including high yielding superior varieties, specific location fertilization, crop pruning, pest and disease control, and be anquality improvement through fermentation. However, until now there have not been many technological innovations that have been adopted by farmers. Therefore, it is necessary to carry out various dissemination activities through demonstration plots, training, and print media [15].

4. Conclusion

The average percentage of cocoa cultivation technology adoption rate in the three districts is in the medium category, namely 66.61%. Increased adoption of cocoa cultivation technology has a positive effect on improving the physical quality of cocoa beans, the correlation coefficient of the adoption of cocoa cultivation technology with a bean weight per 100 grams is 0.680, the adoption of cocoa

cultivation technology with a weight per bean of 0.583, the adoption of cocoa cultivation technology with a bean length of 0.391, and the adoption of cocoa cultivation technology with a cocoa bean thickness of 0.547.

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