Farmer's Behaviour Development Strategy on Sustainable Cocoa Farming in Bone Regency

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Abstract— **The demand for cocoa beans from year to year has increased, while yearly production is stagnant and tends to decline. This phenomenon is necessary to conduct other studies apart from the agronomical aspect, related to farmers' behaviour. The purpose of this study was to (1) determine farmers' behaviour in cocoa sustainable farming and (2) determine the level of each variable in sustainable cocoa farming. (3) Finding strategies to develop farmers' behaviour on sustainable cocoa farming. The data was obtained by taking a sample using the cluster random sampling method from 180 respondents. Data analysis using stepwise multiple regression and SWOT analysis. The results showed that (1) the behaviour of cocoa farmers is the medium category tended to be high. (2) the knowledge of ecosystems is medium, knowledge of the environment is medium, knowledge of farming is medium, farmers' attitude in farming is medium, farmers' attitude to preserve the environment is medium, farmers' motivation in farming is high, farmers' to maintain the environment is medium. Farmers' commitment to farming is high, and farmers' commitment to preserving the environment is medium. (3) Stepwise multiple regression results showed that five variables that can be used in formulating the strategy are farming knowledge, farming attitudes, farming motivation, farming commitment and commitment to maintaining the environment. The SWOT analysis result showed that the strategy is in quadrant I, which is a strategy that utilizes strength factors to take advantage of opportunities (S-O Strategies)**

Keywords: *behaviour, sustainable cocoa farming, knowledge, attitude, motivation, commitment*

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I. INTRODUCTION

Cocoa (*Theobroma cacao* L) is one of the agricultural commodities whose role is quite important for the national economy, especially as a provider of employment, a source of income and foreign exchange. In Indonesia, cacao is cultivated by about one million small farmers and is an important driver of the rural economy. Indonesia is the third largest producer of cocoa beans, placing it as one of the main cocoa producers in the world after the Ivory Coast and Ghana [1]. More than half of these producers are smallholders in Sulawesi, who produce about 60 to 71% of national production [2] ; [3]. The main cocoa production centres in the last 5 years are Central Sulawesi, South Sulawesi, Southeast Sulawesi, West Sumatra, West Sulawesi, Lampung, and Aceh.With the achievement of South Sulawesi's Gross Regional Domestic Revenue (GRDP) growth, the plantation sector in 2013-2017 experienced a significant increase with a growth value of 17.84 trillion rupiahs of the 9 leading plantation commodities. Cocoa was the commodity with the highest export value of US$ 67,521, or 66.19% of the total export value of South Sulawesi, placing South Sulawesi Province as the second largest cocoa-producing centre in Indonesia. The smallholders cocoa farms in South Sulawesi Province is 91.24% spread over 10 districts with the largest contribution above 10% coming from 2 districts, namely North Luwu (21.139%) and Luwu (19.72%), while 8 other districts contribute under 10 %. The remaining 8.76% is a contribution from other districts [1].

The demand for cocoa beans from year to year has increased, while production from year to year is stagnant and tends to decline. The World Cocoa Foundation revealed that the demand for cocoa has increased by 3% per year in the last 100 years. And, it is estimated that the increase in world cocoa demand in the coming years will increase at the same level [4]. Farmers took shortcuts by opening new lands in primary forests to meet rising cocoa bean demand [5].

Bone Regency is one of the areas for cocoa development that has been declared in the Provincial Strategic Area. Based on plantation statistical data [4] Bone Regency is one of the regions in South Sulawesi that has a very large area of cocoa cultivation after North Luwu and Luwu Regencies and the largest number of farmers among cocoa farmers in South Sulawesi is 32,582. The sub-districts that make a major contribution to cocoa production in Bone Regency are Lamuru, Lappariaja, and Libureng sub-districts.

The smallholder cocoa farms area in Bone Regency is 22,900 ha, with a production of 10,692 tons. From this amount of production, it can be said that the productivity level is still low at 0.542 tons/ha when compared to the national average productivity of 0.7 tons per hectare. farmer. So far, most studies have only focused on the level of adoption of innovations in agriculture, and there are still few studies that focus on psychosocial studies related to the behaviour of cocoa farmers in sustainable farming [6]. Based on the problems raised, the purpose of this study is to (a) determine the description of farmers' behaviour on cocoa sustainable farming in Bone Regency, (b) find out the description of the level of knowledge of ecosystems, the environment, and farming, farming attitudes, and environmental preservation; motivation to farming and environmental preservation; farmers' commitment to farming and environmental preservation (c) Understanding the strategy for developing farmers' behaviour on sustainable cocoa farming if the five independent variables are implemented simultaneously.(d) Developing a strategy for farmers' behaviour in Bone Regency for sustainable farming.

II. LITERATURE REVIEW

Strategy

According to[7], strategy is a large-scale plan, with a future orientation, to interact with competitive conditions to achieve goals. Strategy is a comprehensive master plan, that explains how the company will achieve all the goals that have been set based on the mission that has been set previously [8]. [9] strategy can be defined as a series of actions aimed at achieving long-term goals based on studies and research that have been carried out, the strategy for developing commodity agribusiness systems must be carried out by formulating efficiency and integrating nodes in each agribusiness subsystem. According to [8], strategic management is a series of decisions and actions that lead to the preparation of a strategy or several effective strategies to help achieve goals or objectives. SWOT analysis is an analysis that can formulate a strategy or plan by looking at the strengths and opportunities that are owned to minimize the weaknesses (Weaknesses) and threats (Threats) faced.

Farming

Farming as the set of natural resources that exist in that place which are needed for agricultural production such as land and water, improvements made to the land, sunlight, buildings erected on the land, etc [10]. According to [11], farming is a science that studies how a person allocates existing resources effectively and efficiently to obtain high profits at a certain time. It is said to be effective if farmers or producers can allocate the resources they have or are controlled as well as possible and is said to be efficient if the use of these resources produces outputs that exceed inputs. [12] said that farming science is a science that studies ways to determine and coordinate the use of production factors as effectively as possible so that agricultural production provides better income for farming families.

The Concept of Sustainable Farming

The Triangle Framework of the Concept of Sustainable Development, (including agriculture and agribusiness) is declared sustainable, if the activity is economically, ecologically and socially sustainable [13]. Economically sustainable means that a development activity must be able to produce economic growth, capital maintenance and efficient use of resources and investment. Ecologically sustainable means that these activities must be able to maintain ecosystem integrity, maintain environmental carrying capacity and conserve natural resources including biodiversity. Meanwhile, socially sustainable, requires that a development activity should be able to create an equitable distribution of development outcomes, social mobility, and institutional development. In other words, the concept of sustainable agriculture is oriented to three dimensions of sustainability. Namely: sustainability of economic business (profit), sustainability of human social life (people), and sustainability of natural ecology (planet).

Behaviour

Behaviour occurs when something is needed to cause a reaction, which is called a stimulus. And the factors that influence the formation of behaviour are internal factors (the individual himself) and external factors (from outside) [14]. Internal factors include knowledge, perception, intelligence, emotion, motivation and so on which function to process external stimuli. While external factors include the physical and non-physical environment such as climate, humans, socio-economics, and culture. Behavioural elements consist of invisible behaviours such as knowledge (cognitive) and attitudes (affective), as well as visible behaviours such as skills (psychomotor) and real actions (action). Everyone's behaviour patterns can be different but the process of occurrence is fundamental for all individuals, which can occur because it is caused, driven and shown to the target[15]. The theory of planned behaviour (TPB) as in [16] explains that behaviour is influenced by a person's interest in environmental problems or the intention to be involved in environmental protection. There are three antecedent variables, namely (1) attitudes towards behaviour, (2) subjective norms and (3) behavioural control. The three antecedent variables that have been mentioned affect the formation of an individual's behavioural intentions

Knowledge

Knowledge is the result of human sensing, or the result of someone knowing about objects through their senses (eyes, nose, ears, and so on). By itself, at the time of sensing to produce knowledge is strongly influenced by the intensity of attention and perception of the object. Most of a person's knowledge is obtained through the sense of hearing, namely the ear and the sense of sight, namely the eye [14]. [17] knowledge is the initial stage of perception which then gives birth to attitudes and in turn gives birth to actions or actions. The existence of good knowledge about a thing will encourage behavioural changes in the individual, where knowledge about the benefits of a thing will cause a person to be positive about it, and vice versa. The existence of a genuine intention to carry out activity can ultimately determine whether the activity is carried out.

Attitude

Humans are not born with certain attitudes or feelings, but attitudes are formed throughout their development. According to [18] attitude is a learned emotional predisposition to respond consistently to an object. While [17] attitude is a certain regularity in terms of feelings (affection), thinking (cognitive), and predisposition of one's actions (conation) towards an aspect in the surrounding environment. Furthermore, according to [20] people who have a positive attitude toward a psychological object if they like (like) or have a favourable attitude, on the other hand, people who are said to have a negative attitude toward a psychological object if they dislike (dislike) or have an unfavourable attitude towards a psychological object. Furthermore, [19] stated that two approaches classify thoughts about attitudes. The first approach regarding the components of affective, conative, and cognitive attitudes is known as the triadic scheme (tricomponent), the three components collectively organize individual

attitudes. The second approach arises because of dissatisfaction with the explanation of the inconsistencies that occur between the three components in forming attitudes.

Motivation

The term motivation, like the word emotion, comes from Latin, which means to move. In studying motivation, the goal is to study the causes or reasons that make us do what we do. Motivation refers to a process in humans that causes them to move towards a goal or move away from an unpleasant situation [21]. [22] intrinsically motivated activity as an activity that a person performs without a clear reward but the activity itself or the feelings that result from the activity. Together with Ryan, he defined Self-Determination Theory (SDT) in 1985. They stated that people are intrinsically motivated if their basic needs for competence, autonomy, and relatedness are met. [23] the need for intrinsic motivation to change in individuals. SDT is a continuum range, meaning that at first the individual is still externally motivated until later he can do it himself. The process of generating intrinsic motivation is not something that just exists but requires a continuum process. Policymakers also need to provide supportive assistance. Thus, individuals will become more integrated not only intraphysically, but also socially.

Commitment

Commitment as a psychological state that relates to a person with his environment and which has implications for decisions to do or not to do [24]. Which divides three dimensions, namely a) affective commitment, also called emotional commitment refers to the individual's emotional attachment to his environment, b) commitment to sustainability, commitment related to the costs associated with leaving the environment, for example, loss of capital, income, and so on, c) normative commitment related to internalized pressures to act in meeting its goals and environment. Normative commitment is based on feelings of loyalty and obligation. [25] commitment is a reciprocal process that operates at the group and individual levels and commitment is a dynamic process in which feelings of commitment rise and fall over time reflecting changes in the relative value of relationships between groups and individuals. Some researchers describe that commitment has cognitive (thought), affective (feeling), and motivational components, others describe several types of commitment. envy (such as moral commitment, structural commitment and personal commitment). [26] commitment as an attitude. People who has commitment are people who are willing to involve themselves in their community. In this case, the farmer is willing to donate everything he has for the benefit of his community, with the intention that his existence will remain in good condition. Furthermore, [27] a person is considered committed if he is willing to sacrifice his energy and time relatively more than what has been set for him, especially in efforts to improve his work.

III. RESEARCH METHOD

This research was carried out from November 2021 to April 2022. The research location is in Lamuru District, which is one of the centre of cocoa production in Bone Regency, by taking three villages as research sample areas, namely Sangeng Palie, Mattampa Bulu and Massenreng Pulu. Random cluster sampling method with 180 respondents cocoa farmers in the area.
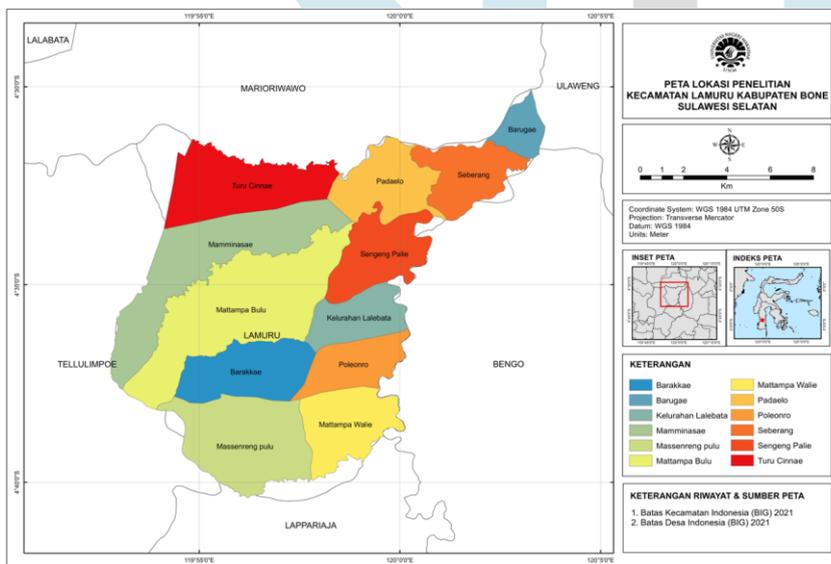

Figure 1 Map of the Research Area of Lamuru District, Bone Regency

Type of research is a correlational study with the dependent variable is farmers the behaviour in sustainable cocoa farming (Y), and the independent variables are X1: Ecosystems knowledge, X2: Environmental knowledge, X3: Farming knowledge, X4: Farming attitude, X5: Attitudes to preserving the environment, X6: Farming motivation, X7: Motivation to preserving the environment, X8: Farming commitment, X9: Commitment to preserving the environment. Statistical analysis with stepwise multiple regression and SWOT analysis.

IV. RESULT AND DISCUSSION

Descriptive statistical analysis of farmers' behaviour in sustainable cocoa farming (Y), from the 180 samples analysed as shown in table.1. below.

Table 1. Frequency Distribution of Farmer Behaviour in Sustainable Cocoa Farming

Categoty	Interval Score	Frequency	Percentage (%)
Very Low	52 – 59	14	7,78
Low	60 – 67	20	11,11
Medium	68 – 75	75	41,67
High	76 – 83	59	32,78
Very High	84 – 91	12	6,67
Total		180	100,00

The results showed that the behaviour of cocoa farmers in the medium category tended to be high with indicators are : cocoa farming management, crop maintenance, environmental preservation, harvest and post-harvest.. The descriptions related to the indicators of farmer behaviour in sustainable farming are as follows:

a. Cocoa Farming Management

Cocoa production is widely recognized in the research area, because of hilly topography that permits farmers to grow on dry land. In this scenario, monoculture cocoa farming predominated. A local variety was produced, with an average age of more than 20 years. This demonstrates that farmers in the research area have been practicing cocoa growing for a long period. Despite the fact that numerous extension efforts have been carried out by both government and commercial entities, they continue to use conventional agricultural practices. According to [28], most farmers are risk-averse, while a few are neutral; in reality, none of the farmers had a courageous attitude toward risk in farming. Such behavior results in reluctance to change or anything unfamiliar.

b. Crop Maintenance

Traditional crop maintenace in the research area. Cocoa growers frequently do the following tasks: pruning, fertilization, and pest and disease management. The cocoa plants in the research area are over 20 years old. It will take rehabilitation efforts using side grafting procedures employing superior clones to improve cocoa plant productivity. Pruning the cocoa plant and its cover, fertilizer and soil conservation, and pest and disease management are all key maintenance operations throughout the mature crop period. Due to insufficient crop maintenance expenditures, cocoa producers in the research region are often no longer using the suggested crop production strategy. Fertilization operations are only carried out once a year, however fertilization for cocoa trees should be done at least twice a year. period, this has consequences for the sustainability of the environment in the research area. Long-term hazards include not just decreased agricultural output due to higher fertilizer and pesticide input, but also the potential of harm to land resources. This is in line with the findings of [29], who said that the usage of pesticides and fertilizers had a significant influence on environmental damages while being below permissible limits. Furthermore, the excessive and imbalanced use of fertilizers and pesticides has a detrimental impact on farmers' productivity and revenue, as well as producing other environmental harm, which is anticipated to jeopardize agricultural development's sustainability.

c. Environmental Preservation

Compliance with ecological rules allows humans to live in peace with environment; nevertheless, sensible use of nature is also required (conservation). Natural resource conservation actions include resource protection, preservation, and long-term utilization. The goal of natural resource conservation is to: (i) save natural resources, including plants and animals, from extinction; (ii) keep the genetic integrity of the organism's biota; and (iii) keep the ecosystem balanced and stable as a habitat for biota/organisms [30]. Farmers grow shading trees without maintenance, giving the impression that their farms are neglected. As agronomic, use of land conservation is the planting of shading tree, which seek to reduce rain drops directly and thereby limit the pace of soil erosion and landslides. Shading tree on cocoa farm, according to [31], are plants that are purposely grown to protect excessive of sunlight and the soil from erosion.

d. Harvest and Post Harvest

Harvesting activities are carried out traditionally, by picking ripe fruit and gathering it all together, without any sorting of pod or separation of healthy pod and pod was attacked by pests and diseases. And for pod splitting activities, most farmers still use machetes, which can cause damage to the cocoa beans and, as a result, affect the quality of the cocoa beans. Similarly, most farmers do not separate the beans after harvest, so both healthy beans and beans afflicted by pests and illnesses are intermingled, then placed in sacks to be transported home to dry. The majority of farmers utilize tarpaulins for drying activities, dried under sunlight on the streets. At the moment, the price of dried cocoa beans at the farmer level isis IDR 30,000/kg.

Description of Variables on Sustainable Cocoa Farming in Bone Regency

- Ecosystem Knowledge

 Descriptive statistical analysis of farmer knowledge about ecosystems (X1), from 180 samples analyzed are shown in the table 2. below.

Table 2. Frequency Distribution of Farmers' Knowledge of Ecosystems on Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	1 – 3	0	0
Low	4 – 6	12	6,67
Medium	7 – 9	136	75,55
High	10 – 12	32	17,78
Very High	13 - 15	0	0
Total		180	100,00

The empirical fact found in the field is that the management of cocoa plantations in the research area is carried out traditionally and in cocoa farming activities, most cocoa farmers depend on chemicals. This can have implications for the sustainability of the ecosystem in the research area because its use has been done for a long time. [32] states that the relationship between humans and ecosystems cannot be separated from each other. Ecosystem management is also not free from human knowledge of the ecosystem itself. This knowledge structure determines the pattern of relationships that are built between humans and the surrounding ecosystem.

The long-term perspective, in this case, does not only bring risks, such as low crop productivity and increased input of fertilizers and pesticides, but also the threat of damage to land resources. This is in line with the statement of [29] that the use of pesticides and fertilizers makes a major contribution to environmental impacts even though their use is still within the permitted limits. Furthermore, [5] stated that after a period of 20 years of intensive plantation practice, yields decreased due to soil damage, nutrient imbalances, and increased incidence of pests and diseases. One way to increase farmers' knowledge is to provide extension related to ecosystem management in cocoa plantations.

- Environmental Knowledge

Descriptive statistical analysis of farmers' knowledge of the environment (X2), from 180 samples analysed are shown in the table no. 3. below.

Table 3. Frequency Distribution of Farmers' Knowledge of the Environment in Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	1 – 3	0	0,00
Low	4 – 6	12	6,67
Medium	7 – 9	127	70,56
High	10 – 12	41	22,78
Very High	13 - 15	0	0,00
Total		180	100,00

The variable the environmental knowledge on cocoa sustainable farming is in the medium category. This is because farmers still lack knowledge about the environment related to environmental preservation and conservation of both soil and water. Farmers are more concerned with the outcome of their cocoa farms than maintaining the environment. [30] state that compliance with ecological laws causes humans to live in harmony with nature, utilizing nature wisely and also maintaining it (conservation). Natural resource conservation activities include protection, preservation, and sustainable use. Natural resource conservation aims to: (i) prevent natural resources, both plants and animals from being endangered; (ii) maintain the genetic purity of the organism's biota; (iii) maintain the balance and stability of the ecosystem as a habitat for biota/organisms. Therefore, sustainable agriculture requires farmers' knowledge related to environmentally oriented agricultural businesses so that crop production remains sustainable so that they can produce high quality products, competitive, and meet to market preferences.

- Farming Knowledge

Descriptive statistical analysis of farmer knowledge of farming (X3), from 180 samples analysed are shown in the table 4. below.

Table 4. Frequency Distribution of Farmers' Knowledge of Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	1 – 3	0	0,00
Low	4 – 6	3	1,67
Medium	7 – 9	94	52,22

High	10 – 12	78	43,33
Very High	13 - 15	5	2,78
Total		180	100,00

The variable knowledge of farmers about sustainable cocoa farming in Bone Regency is in the medium category and tends to be high. This is due to the fact that the majority of responders had more than 20 years of experience in cocoa production. This shows that cocoa farming in the research area has been cultivating by farmers for a long time, so that the high experience of cocoa farmers shows that farmers have knowledge and skills about cocoa farming during that period. This is in line with the opinion of [33]suggested that the higher the knowledge of farmers about cocoa farming, the higher the individual's perception. Farmer's knowledge is one of the capitals to facilitate the absorption of information and to implement cocoa cultivation. The level of farming experience, level of farming knowledge and level of social interaction have a real relationship with the perception of cocoa farmers in a sustainable.

- **Farming Attitudes**
Descriptive statistical analysis of farmers' farming attitudes (X4), from 180 samples analysed are shown in the following table .5 below.

Table 5. Frequency Distribution of Farmers' Attitudes in Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	51 - 55	3	1,67
Low	56 – 60	37	20,56
Medium	61 – 65	101	56,11
High	66 - 70	29	16,11
Very High	71 - 75	8	4,44
Total		180	100,00

The variable of farmers' farming attitude in the medium category. This is because most of the respondent farmers are 51-60 years old, and rely on more than 20 years of cocoa farming experience. and the level of formal education is very minimal, on average only up to junior high school level. [34] states that education is a process to shape a person to acquire new knowledge, skills, and attitudes. Besides that, respondents generally behaved normally in farming where positive and negative attitudes were still in balance. The attitude of farmers shows doubt about information technology for sustainable cocoa farming. These doubts are based on considerations of the cost and complexity of the innovation, and farmers experience inconsistencies in attitudes. Farmers' attitudes significantly affect their ability to access agricultural technology information. The more farmers agree to information on agricultural technology, the more their ability to seek and obtain information related to cocoa farming will increase in a sustainable manner.

- **Preserving Environment Attitudes**
Descriptive statistical analysis of the attitude of farmers to maintain the environment in sustainable cocoa farming (X5), from the 180 samples analyzed are shown in the following table 6 below:

Table 6. Frequency Distribution of Farmers' Attitudes on Preserving Environment on Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	48 – 52	6	3,33
Low	53 – 58	35	19,44
Medium	59 – 63	99	55,00
High	64 – 68	29	16,11
Very High	69 – 73	11	6,11
Total		180	100,00

Farmers' attitudes toward environmental preservation in sustainable cocoa cultivation are in the middle category, with low conative indicators.. This is because farmers carry out their farming activities only thinking how to get profits quickly. This is also reflected in activities in an effort to maintain soil fertility by fertilizing. Most argue that inorganic fertilizers (chemical) are easy to apply and the accessibility of cocoa farmers to inorganic fertilizers is very easy, and their view is that by fertilizing with inorganic fertilizers the results can be seen quickly. Farmers in the study area are still unsure about the use of inorganic fertilizers. Such doubts are based on considerations of the timing and complexity of the innovation, and farmers experience inconsistencies in attitudes.

This is in line with the opinion of [16], where attitudes towards behavior are determined by a combination of individual beliefs about the positive and or negative consequences of performing a behavior with the individual's subjective value of the consequences of that behavior. Further [20], states that people who have a positive attitude towards an object psychologically, if they like (like) or have a favorable attitude, on the contrary, people who are said to have a negative attitude towards psychological objects if they dislike (dislike) or have an unfavorable attitude.

- **Farming Motivation**

Descriptive statistical analysis of the motivation of farmers on cocoa sustainable farming(X6), from 180 samples analyzed are shown in the following table 7 below.

Table 7. Frequency Distribution of Farmers' Motivation for Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	64 – 69	2	1,11
Low	70 – 75	13	7,22
Medium	76 – 81	59	32,78
High	82 – 87	75	41,67
Very High	88 – 93	31	17,22
Total		180	100,00

Variable of farming motivation is high category. This is due to farming are driven by intrinsic motivation with the sole purpose of meeting the requirements of the farmer and his or her family (subsistence). Reflected from the management of cocoa farming is still traditionally obtained from generation to generation and based on the experience of farmers who are around it.According to [22], changing individual behavior requires intrinsic motivation. The process of generating intrinsic motivation is not something that just exists but requires a continuum process. Policy makers also need to provide supportive assistance. Thus, individuals will become more integrated not only intraphysically, but also socially. External (extrinsic) encouragement is reflected in the hilly topography of the research area that allows farmers to only do farming on dry land in this case is plant cultivation. cocoa. Besides that, another factor in doing this farming is that it is equipped with long experience in farming.

According to [35] experience is the possession of knowledge experienced by a person within a certain period of time as a result of learning. This cocoa farming experience plays a role in the motivation for farming so that farmers in the research area have been accustomed to cultivating cocoa plants for a long time and this experience has been passed down from generation to generation. So they think that cocoa farming can fulfill their household needs.

- **Environmental Preservation Motivation**

Descriptive statistical analysis of farmers' motivation to preserving the environment (X7), from 180 samples analysed are shown in the following table 8 below.

Table 8. Frequency Distribution of Farmers' Motivation Preserving Environment on Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	68 – 72	11	6,11
Low	73 – 77	21	11,67
Medium	78 – 82	112	62,22
High	83 – 87	29	16,11
Very High	88 – 92	7	3,89
Total		180	100,00

The variable of farmers' motivation to maintain the environment in sustainable farming in Bone Regency is in the medium category. The majority of farmers in the research area motivation to preserving the environment is influenced intrinsically. This is due to farmers conduct environmental preservation activities solely to take advantage of the potential of the existing land as well as additional income for farmers apart from this cocoa farming. They preserve the environment by planting crops on the sidelines of the cacao plants which they know as shading tree. And most of the protective plants are bananas and coconuts with the aim of getting benefits other than the cocoa. This is in line with the opinion of [36] which states that farmers with high incomes will have the opportunity to choose plants to be cultivated or farmed rather than farmers with low incomes. Farmers with low incomes are less likely to take risks when selecting plants to plants to cultivate due to financial reason. Therefore they do not have a strong motivation to maintain the environment. Furthermore, according to [37], motivation is a potential force that exists within a human being that can be developed by himself or developed by a number of outside pressures that essentially revolves around monetary and non-monetary rewards, which can affect the results of their overall performance. Positive or negative, which depends on the situation and conditions faced by the person concerned.

- **Farming Commitment**

Descriptive statistical analysis of the commitment of farmers on cocoa sustainable farming(X8), from the 180 samples analysed are shown in the table 9. Below.

Table 9. Frequency Distribution of Farmers' Commitments in Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	36 – 41	2	1,11
Low	42 – 47	9	5,00
Medium	48 – 53	55	30,56

High	54 – 59	97	53,89
Very High	60 – 65	16	8,89
Total		180	100,00

The variable of farmers' commitment to sustainable cocoa farming in Bone Regency is in the high category with affective indicators in the high category, medium sustainability and moderate normative. This is because farmers feel satisfied in cacao farming, where the research area has a high community structure, and the culture of "collaborative" called gotong royong" is still exist. And this culture is not only a family relationship, but also because they feel they have the same profession and the same goals. The interaction of farmers in the community structure is a valuable social capital in the research area. This is in line with the statement of [38] social capital is the ability of the community to relate to each other and work together to build a strong network and achieve certain goals, the cooperation that occurs includes reciprocal and mutually beneficial relationships between communities that are built on the basis of trust and strong social norms.

- Environmental Preservation Commitment
Descriptive statistical analysis of the commitment of farmers to maintain the environment in sustainable cocoa farming (X9), from 180 samples analysed are shown in the following table 10 below.

Table 10. Frequency Distribution of Farmers' Commitment to Preserve the Environment on Sustainable Cocoa Farming

Category	Interval Score	Frequency	Percentage (%)
Very Low	52 – 59	14	7,78
Low	60 – 67	20	11,11
Medium	68 – 75	75	41,67
High	76 – 83	59	32,78
Very High	84 –91	12	6,67
Total		180	100,00

The variable of farmers' commitment to maintaining the environment in sustainable cocoa farming in Bone Regency is in the medium category, and following indicators categories : affective is high, sustainability is medium and normative is medium. This is due to farming knowledge is obtained traditionally, from farmers around them and who are already familiar with the agricultural practices that have been carried out so far. This is related with [39]view of the social learning theory that the formation of behavior is obtained by emphasizing the value of the social environment.
Farmers' commitment to environmental preservation, the majority of farmers have a negative commitment to soil protection by employing chemical fertilizer. They thought it is simple and that cocoa farmers could easily get inorganic fertilizers. When using inorganic fertilizers quickly visible results. This is in accordance with the statement [40]) the satisfaction is an antecedent to commitment. This indicates that a person is satisfied with the results of his work if something can provide benefits and tends they likely to continue doing it. [41] stated that if the innovation does not provide benefits, the attitude of farmers tends to change and farmers only tend to be results-oriented without consideration for product quality or environmental concerns, resulting the behavior of farmers not environmentally sound. [24] commitment as a psychological state that relates to a person with his environment and which has implications for decisions making. In the context of environmental preservation, commitment may be defined as a farmer's readiness to do and work more in order to enhance his farming by keeping a better environment, so that the intended goals can be fulfilled successfully and efficiently.

Behavioural Development Strategy
In this section, the researcher analyses the hypothesis based on multiple regression analysis to find a model of farmer behaviour in sustainable cocoa farming , then a multiple regression analysis is executed, i.e.: ecosystem knowledge (X1), environmental knowledge (X2), farming knowledge (X3), farming attitude (X3). X4), attitude toward environmental preservation (X5), Farming motivation (X6), motivation toward environmental preservation (X7), farming commitment (X8), commitment to preserving the environment (X9) in Stepwise multiple regression.
The first stage is to insert nine independent variables in the model so that the effect of the nine independent variabless can simultaneously be known. Based on the results of multiple regression analysis shown in table 11. below:

Table 11. Partial Test Results of the Ninth Independent Variables

		Coefficients[a]				
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.073	3,014		3.673	.000
	X_1	.133	.153	.045	.872	.385
	X_2	.444	.210	.136	2.114	.036
	X_3	459	.144	.194	3.179	.002
	X_4	.257	.081	.205	3.161	.002

X_5	.264	.166	.107	1.593	.113
X_6	.890	.199	.288	4.466	.000
X_7	.396	.160	.158	2.473	.014
X_8	.398	.104	.226	3.823	.000
X_9	.449	.147	.226	3.065	.003
a. Dependent Variable: Y					

Table 11 indicates where the t- nine independent variables are significant, the terms of significance = 0.000 < 0.05. Then five variables were choosen that have a significant contribution to the dependent variable. Five variables are farming knowledge (X3), farming attitude (X4), farming motivation (X6), farming commitment (X8), and commitment to care for the environment (X9). Then used stepwise regression.

Based on the results of the stepwise multiple regression analysis, the combination of independent variable models can be seen in table 12 below:

Table. 12 Stepwise Multiple Regression Analysis

ANOVA^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1147,696	1	1147,696	113,808	,000^b
	Residual	1795,032	178	10,084		
	Total	2942,728	179			
2	Regression	1474,855	2	737,427	88,921	,000^c
	Residual	1467,873	177	8,293		
	Total	2942,728	179			
3	Regression	1622,127	3	540,709	72,062	,000^d
	Residual	1320,601	176	7,503		
	Total	2942,728	179			
4	Regression	1686,225	4	421,556	58,712	,000^e
	Residual	1256,503	175	7,180		
	Total	2942,728	179			
5	Regression	1719,568	5	343,914	48,923	,000^f
	Residual	1223,160	174	7,030		
	Total	2942,728	179			
a. Dependent Variable: Y						
b. Predictors: (Constant), X6						
c. Predictors: (Constant), X6, X8						
d. Predictors: (Constant), X3, X6, X8						
e. Predictors: (Constant), X3, X4, X6, X8						
f. Predictors: (Constant), X3, X4, X6, X8, X9						

To determine the effect of the five models, can be seen in the results of the advanced regression analysis (Model Summary) in table 13 below.

Table 13. Effect of Simultaneous Model on Y

Model Summary^f				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.625^a	.390	.387	3.175
2	.708^b	.501	.496	2.879
3	.742^c	.551	.544	2.739
4	.757^d	.573	.563	2.679
5	.764^e	.584	.572	2.651
a. Dependent Variable: Y				
b. Predictors: (Constant), X6				
c. Predictors: (Constant), X6, X8				
d. Predictors: (Constant), X3, X6, X8				
e. Predictors: (Constant), X3, X4, X6, X8				
f. Predictors: (Constant), X3, X4, X6, X8, X9				

Table 13. shows that the greatest correlation coefficient is 0.764. Model 5. has a very strong correlation with the dependent variable (Y). The coefficient of determination is 0.584. The influence of the independent variable on the dependent variable (Y) is 58.40%.

Based on the results of the Stepwise regression analysis, The five variables are farming knowledge, farming attitude, farming motivation, farming commitment and commitment to preserving the environment. Therefore, to accelerate the development of farmer behavior in sustainable cocoa farming in Bone Regency, the five variables can be used by stakeholders, both from the government, private parties, and other parties involved in sustainable cocoa development.

This policy can be implemented by creating a coaching program in the form of counseling and training for cocoa farmers or cocoa farmers that includes the following materials : (a) knowledge about sustainable cocoa farming, (b) farmer attitudes in cocoa farming, (c) motivation in cocoa farming, (d) commitment to cocoa farming, and (e) commitment to protecting the environment. This program should be implemented consistently, integrated, and accompanied with demonstration plots (demplots) to accelerate the process of developing farmer behavior in sustainable cocoa farming.

Farmers' Behavior Development Strategies for Sustainable Cocoa Farming in Bone Regency: SWOT Analysis

1. Internal Factors

Analysis of the strength and weakness factors can be seen in the IFAS (Internal Strategic Factors Analysis Summary) matrix in the following table 14.

Table 14. IFAS Matrix

No	Strategic Factors	Weight	Rating	Score
Strengths				
1	Farming motivation	0,17	5	0,83
2	Farming Commitment	0,17	4	0,67
3	Farming attitude	0,11	4	0,44
4	Farming knowledge	0,11	4	0,44
5	Commitment to preserve environment	0,11	3	0,33
Total		**0,67**		**2,72**
Weaknesses				
1	Ecosystem knowledge	0,06	2	0,11
2	Attitude to preserve environment	0,06	3	0,17
3	Environmental knowledge	0,11	2	0,22
4	Motivation to preserve environment	0,11	3	0,33
Total		**0,33**		**0,83**

Based on table 14 above, the total strength value is 2.72, the value is obtained from the total number of weights multiplied by the rating so as to produce the total value. While the total value of weakness is 0.83 the value is obtained from the total number of weights multiplied by the rating. This indicates that the strength possessed in Lamuru Subdistrict, Bone Regency in developing cocoa farming is greater than the existing weakness factor. The result of strength minus weakness is 1.89.

2. External Factors

Analysis of the opportunity and threat factors can be seen in the EFAS (External Strategic Factors Analysis Summary) matrix in the following table 15.

Table 15. EFAS Matrix

No	Strategic Factors	Weight	Rating	Score
Opportunities				
1	Topographic / natural carrying capacity	0,09	4	0,36
2	Price commodity is consistent	0,06	3	0,18
3	Low competitor commodity	0,06	4	0,24
4	Potential export market	0,09	4	0,36
5	High demand	0,09	5	1,15
6	Government/non-government support	0,06	4	0,24
Total		**0,45**		**2,55**
Threats				
1	Low farmer competencies	0,09	1	0,09
2	Lack of interest of the younger generation on farming	0,09	1	0,09
3	Farmers are not environmentally friendly	0,06	2	0,12
4	Climate change	0,06	3	0,18
5	Pest and disease attack	0,09	1	0,09
6	Use of local varieties	0,09	2	0,18
7	Land conversion	0,06	3	0,18
Total		**0,55**		**0,94**

Based on table 15. the total value of the opportunity is 2.55 the value obtained from the total number of weights multiplied by the rating so as to produce the total value. While the total value of the threat is 0.94, the value is obtained from the total number of weights multiplied by the rating. This indicates that the opportunities in Lamuru Subdistrict, Bone Regency in developing cocoa farming are greater than the existing threat. The result of opportunities minus threats is 1.61.

3. Quadrant Analysis

Based on analysis of the strategic factor analysis (IFAS and EFAS), found that the value strength is greater than weakness and so is the value of opportunities and threats. The SWOT quadrant analysis can be seen in figure 2.
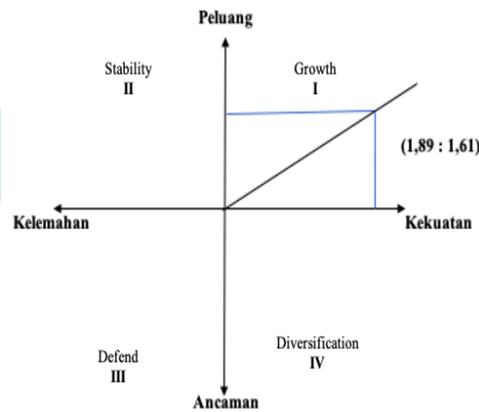
Figure 2. Quadrant Analysis

According to figure 2, the strengths are greater than the weaknesses, resulting in the X axis in the SWOT diagram, and the threats are smaller than the opportunities, resulting in the Y axis in the SWOT diagram with a value indicating that the difference between opportunities and threats is 1.61, while the difference between strengths and weaknesses is 1.89 then the strategy for developing farmer behavior in sustainable cocoa farming in Bone Regency is in the quadrant I (Growth) which supports an aggressive strategy or S-O (strength–opportunity) strategy. The existing strengths and opportunities can be utilized to minimize weaknesses and threats for developing farmer behavior in sustainable cocoa farming.

4. SWOT Matrix

The strategy for developing farmer behavior in Bone Regency for sustainable cocoa farming may be further characterized by suggesting various approaches. Use their particular strengths to take advantage of opportunities/opportunities or to avoid threats, and overcome weaknesses.

The SWOT quadrant analysis found that the strategic position was in quadrant I, This position supports the growth/development strategy. According to [8] the cell or quadrant 1 is the situation most desired by policy makers, because in this cell the unit has various opportunities and has various strengths that encourage the use of these opportunities. [42] the SO (Strengths-Opportunities) strategy is a variety of strategies produced through a perspective that stakeholders may use the strengths to take advantage on various opportunities. The details of this strategy are as follows: (1) Using farmers' motivating strength to cultivate with available land potential. (2) Using farmers' commitment to farming with the support of consistent cocoa commodity prices, (3) Using farmers' attitudes to farming by responding to high demand and large potential of global markets, (4) Using farmers' knowledge of farming by utilizing government support in increasing farmers' capacity in sustainable farming, and (5) Using farmers' commitment to preserving the environment by developing environmentally friendly (eco-lab) products.

The details of the above strategy can be implemented by developing a coaching program for cocoa farmers that includes materials such as: (a) farmer motivation in farming, (b) farmer commitment in cocoa farming, (c) attitude in cocoa farming, (d) knowledge of cocoa farming in a sustainable manner, and (e) commitment to environmental protection. This program should be carried out in a sustainable, integrated way by all stakeholders, and it should be accompanied with demonstration plots to accelerate the process of developing farmer behavior on sustainable cocoa farming.

V. CONCLUSION

Based on the description, the conclusions of this study are:
1. The behavior of farmers on sustainable cocoa farming in Bone Regency is in the medium category.
2. Knowledge of ecosystems, the environment, and farming is classified as medium category. farming attitude,and attitude toward environmental preservation is classified as medium. Farming motivation is high, while the motivation to preserving the environment is medium. Farming commitment is high, while the commitment to preserving the environment is medium.
3. Variable that will be addressed by stakeholders for developing farmer behavior, are farming knowledge, farming attitudes, farming motivation, farming commitment, and commitment to preserving the environment.

4. The strategy for developing farmers' behavior on sustainable cocoa farming in Bone Regency is in quadrant I (Growth) which supports an aggressive strategy or S-O (strength–opportunity) strategy. This indicates that the farming development plan in Bone Regency has strengths and opportunities that may be used to reduce the weaknesses and threats.

VI. ACKNOWLEDEGEMENT

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