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Determinants of Farming Patterns in Rice Cultivation in the Latenreng Irrigation Area in Soppeng District,South Sulawesi, Indonesia

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Abstract:
Research is a quantitative correlational study to find factors that influence farming patterns in the Latenreng irrigation area. The selection of research locations using the purposive sampling method. The data analysis used is descriptive, simple linear regression test, and multiple linear regression. The research results show that farmers 'knowledge about economic sustainability and farmers' knowledge about environmental sustainability and social sustainability expertise is in the medium category. Farmers' knowledge about financial sustainability, environmental sustainability, and social sustainability affect both individually and collectively the behavior of farmers in the Latenreng irrigation area of Soppeng Regency

Key Word: Farmers' knowledge about economic sustainability, farmer knowledge about environmental sustainability, farmer knowledge about social sustainability, farmer behavior

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I. INTRODUCTION

Agricultural development plays an essential role in national economic growth. The increase in population demands a guarantee of food security, which is indicated by rice availability throughout Indonesia. The Indonesian government focuses on the program to expand rice fields and increase their productivity. Farming patterns that prioritize production results sometimes ignore the sustainability of land quality and environmental conditions.

Sustainable farming patterns are inseparable from food security, so that food supply businesses need to pay attention to land quality. However, the strategy for agricultural sustainability sometimes has an impact on the risk of environmental degradation. River water pollution in Indonesia is generally caused by the accumulation of fertilizer and pesticide residues. With these considerations, the agricultural pattern should be directed towards friendly environmental management and is often referred to as a sustainable agricultural pattern.

Agriculture in Indonesia is a sector due to its potential and urgency. Along with population growth and the need for food, the government demands to study sustainable agricultural patterns. Rice is Indonesia's main food commodity because most of Indonesia's population consumes rice as the primary food. According to estimates through a historical approach, Indonesia's population in 2035 is estimated to reach 300,107,580 people, with a demand for rice of 75.39 million tons (Central Bureau of Statistics, 2017).

Sustainable agricultural development focuses on three aspects: fulfilling economic factors, social aspects, and environmental aspects. Apek economy includes efforts to fulfill food needs and community welfare. Furthermore, the social element has justice between generations and the development of social institutions in farming patterns. Thus, agricultural development must be in harmony between meeting needs and conserving land resources [1].

[2]the economic dimension is related to the concept of maximizing the income stream that can be obtained by at least maintaining the productive assets that are the basis for obtaining this income. The leading indicators of this economic dimension are efficiency and competitiveness, the magnitude and growth of added value (including profit), and financial stability.

The natural environment's dimension emphasizes the need for natural ecosystems' stability that includes biological life systems and raw materials. The matter is the maintenance of biodiversity and physical flexibility (genetic resources), soil, water, agro-climate resources, and environmental health and comfort [3].

Farmers 'knowledge is constructive and supports the ability to adopt technology in farmers' businesses, assuming that the higher the level of experience, the farmer's mindset will also be more comprehensive.

Cognitive aspect as a component of knowledge obtained from the process of thinking and analyzing a problem. Furthermore the affective aspect is knowledge that comes from the own experience while the psychomotor aspect is the ability to perform movements or activities related to the goals to be achieved. Despotovic [4] state that the mental feature relates to memory or belief; the affective component emphasizes feelings, emotional levels of acceptance or rejection; and the psychomotor element for physical skills. Humans are the key to changes in their environment because humans and their behavior can affect all existing creatures' survival.

Farmers' knowledge is beneficial and supports the ability to adopt technology in farming. The high level of farmer knowledge can also support efforts to manage agricultural land that does not damage the surrounding ecosystem.

Behavior does not happen immediately but is driven, both by internal and external factors. Several factors influence human behavior. Several factors influence responsible environmental action; these factors are knowledge of issues, skills to act, desire to serve, situational factors. The personality factors such as social and economic have effect to the human behavior.

Several factors must be considered in the agricultural pattern of rice cultivation, namely; 1) Soil management; soil management is part of land management that aims to create soil conditions that are conducive to germination, young plant growth, root development, plant development, seed formation and harvesting [5]. 2) Crop rotation, in determining the rotation pattern, both the type of crop/commodity, as well as the area and planting time, it is necessary to consider climatic conditions and water availability [6]. 3) The availability of water, the adequacy of water for plants in a rotation pattern is the first step to consider whether a crop.

Soppeng Regency is one of the areas in South Sulawesi Province that can develop the agricultural and livestock sector. The size of the Soppeng Regency is 150,000 ha. About 42% (64,139 ha) of this area is agricultural land consisting of 16% or 24,846 ha of rice fields (technical irrigated rice fields 12,644 ha (8%), semi-technical irrigation 2,731 ha (2%).) and nontechnical 9,471 ha (6%)), plantation 31,405 ha (21%) and plantation 7,888 ha (5%).

Increasing agricultural land and increasing farmers' number will affect farmers' behavior in carrying out pastoral processes. The success of agricultural development has provided very high support for meeting food needs. However, it is realized that behind this success, there are weaknesses that need to be corrected [8].

The objectives of this study are 1) To determine the description of farmers' knowledge about the sustainability of the economy in the *Latenreng* irrigation area, Soppeng Regency. 2) To find out the definition of farmers' knowledge about environmental sustainability in the *Latenreng* irrigation area, Soppeng Regency. 3) To find out the description of farmers 'knowledge about social sustainability in the irrigation area of *Latenreng*, Soppeng Regency. 4) To find the effect of farmers' knowledge on economic sustainability on farmer behavior in the *Latenreng* irrigation area of Soppeng Regency. 5) To see the influence of farmers' knowledge about environmental sustainability on farmer behavior in the *Latenreng* irrigation area, Soppeng Regency. 6) To find the power of farmers' knowledge about social sustainability on farmer behavior in the *Latenreng* irrigation area, Soppeng Regency.

This study describes the influence of farmer knowledge factors on sustainable agricultural behavior. The knowledge referred to his understanding of economic sustainability, understanding of social sustainability, and environmental sustainability knowledge.

II. MATERIAL AND METHODS

This research is quantitative with a correlational survey approach. The location of this research is Laringgi Village and Manorangsalo Village, Marioriawa Subdistrict, Soppeng Regency. This research population is the farmers who live in Laringgi Village and Manorangsalo Village, who have been selected as previously described. The sample of this study (respondents) was determined using the systematic random sampling method using the Taro Yamane formula [9].

The selected samples were 370 farmers, 153 farmers from Manorangsalo Village, and 217 farmers from Laringgi Village. The sampling technique of the 370 is using the random sampling technique.

The number of variables to be examined in this study consisted of 2 variables: the independent variable (variables that effect) with the symbol X and the dependent variable (variables that are influenced) with the symbol Y. The independent variable in question is the knowledge of farmers about economic sustainability. (X1), farmer knowledge about environmental sustainability (X2), farmer knowledge about social sustainability (X3), the dependent variable is farmer behavior (Y).

The data analysis technique used descriptive analysis techniques to describe each variable in the study and its distribution. Each variable is then tabulated in tables and figures. The researchers used correlational analysis by statistical to find the independent variables' influence on the dependent variable.

A simultaneous test or F test determines the effect of all dependent variables on the independent variable, with a confidence interval of 90% by comparing the sig values against the trusted image. The test criterion is that if tilapia sig. <0.05, it is concluded that there is an influence of knowledge of economic, social, and environmental sustainability on sustainable agricultural behavior.

III. RESULT

` Based on the results of research that have been conducted with 370 samples in Marioriawa sub-district, Laringgi village and Manorangsalo sub-district, Soppeng district, the following research results are obtained.

Knowledge of farmers about economic sustainability

Continuous knowledge includes three aspects, namely, conceptual, factual, and procedural. The analysis results are depicted in Figure 1, where the highest value in the conceptual aspect, namely caring of plant and the harvesting. The second factor indicated that the farmers know about the planting by their experience. This knowledge has the higher value in the factual aspect. While in the procedural aspect, the farmers knows about the technique for prevent the pest of disease.

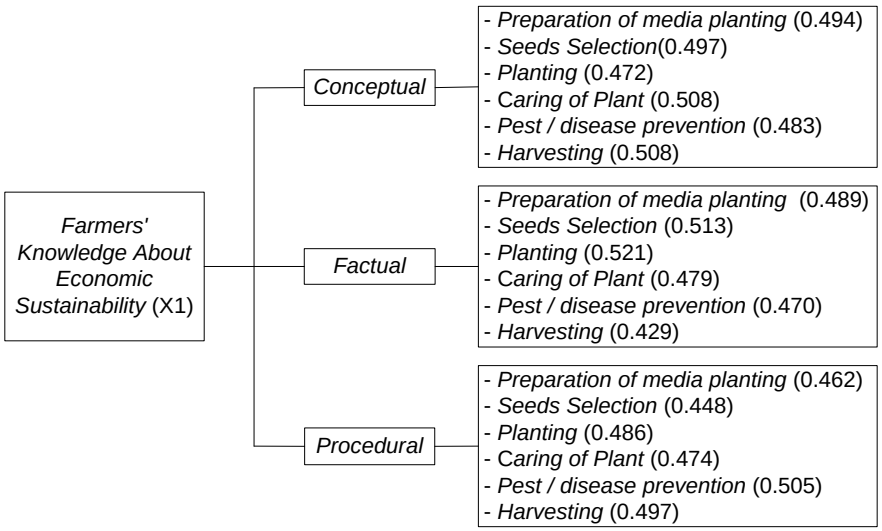

Figure no 1: Indicator Farmers' knowledge about economic sustainability

Farmers' knowledge about environmental sustainability

The analysis results are depicted in Figure 2, where the highest value in the conceptual aspect is the knowledge about the impact of chemical fertilizer on the ecological systems. Furthermore the factual knowledge was dominated by the impact of pesticide use. The procedural aspect indicated by the farmers' knowledge about the impact of machine use in the agricultural.

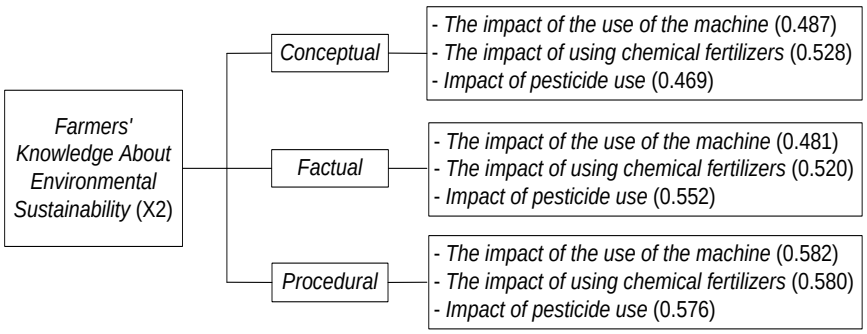

Figure no 2 : Indicator Farmers' knowledge about environmental sustainability

Farmers' knowledge about social sustainability

Based on Figure 3, the highest value in the conceptual aspect is social welfare. The analysis results on the factual part that the highest score is on social interaction points. And the highest score in the procedural aspect is access to information.

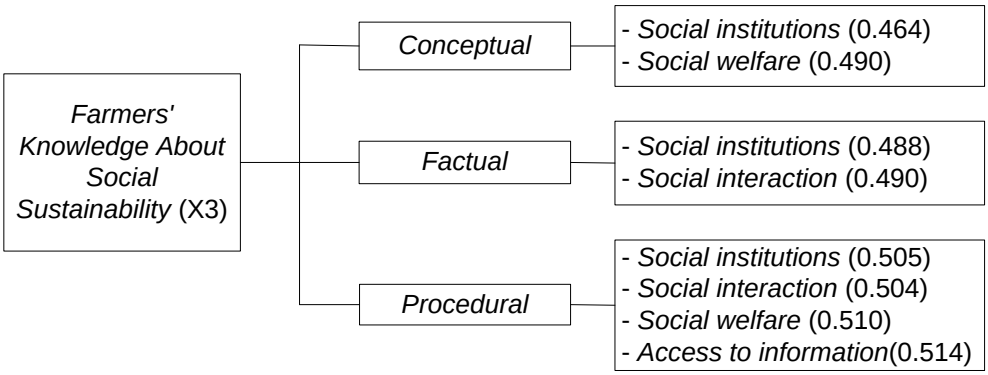

Figure no 4 : Indicator Farmers' knowledge about environmental sustainability

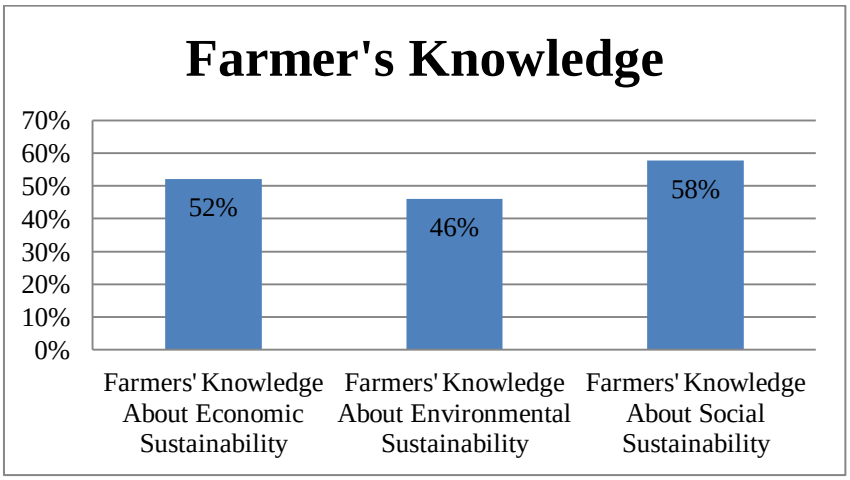

Figure no 4 : Diagram of farmers' knowledge about economic, environmental, and social sustainability

Based on Figure 4. Above, it can be explained that the highest farmers' knowledge of social sustainability.The influence of knowledge about economic, environmental, and social sustainability on farmer behavior.

Table no 1 : Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.635[a]	.404	.399	8.59848	1.415

a. Predictors: (Constant), X3, X1, X2

b. Dependent Variable: Y

Based on the R square value obtained by 0.404 (40.4%), this shows the independent variable's influence is 40.4%, while 59.6% is influenced by other factors not examined in this study. If these other factors are removed, the impact of the independent variables will be 39.9%. Plonsky et al. (2018) stated that the purpose of regression analysis is to find the estimated value of the regression coefficient and draw statistical inferences so that the high and low R2 values are not problematic. If in the analysis process, getting a high R2 is good, a low R2 value does not mean that the regression model is not good.

Table no 2 : Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18323.139	3	6107.713	82.610	.000[a]
	Residual	27059.793	366	73.934		
	Total	45382.932	369			

a. Predictors: (Constant), X3, X1, X2

b. Dependent Variable: Y

Based on the results of the analysis, the F value was 82.61, and the sig value. 0.00001. Because the sig value is 0.00001 <0.05 (5%) so that H1 is accepted, so it can be said that X1, X2, and X3 simultaneously influence farmer behavior.

Table no 3 : Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	55.612	1.802		30.859	.000
	X1	.585	.140	.210	4.179	.000
	X2	.665	.120	.287	5.547	.000
	X3	.965	.149	.295	6.481	.000

a. Dependent Variable: Y

The regression equation obtained:
Y = 55.612 + 0.585X1 + 0.665X2 + 0.965X3
The test results partially, knowledge about economic, environmental, and social sustainability affects farmer behavior. The higher the background, the better the farmer's behavior.

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IV. DISCUSSION

From the empirical study results, farmers in the *Latenreng* irrigation area in Mario-Nawa District tend to show rural communities with consensus habits in determining farming patterns. Community institutions known as farmer groups play an essential role in encouraging social interaction between farmers. This condition causes high knowledge of farmers' social sustainability in farming patterns. Besides, the community still adheres to traditional customs and prioritizes local culture.

The results showed that farmers' knowledge about economic sustainability in the *Latenreng* irrigation area significantly affected farmer behavior. This indicates that the higher the farmers' knowledge about financial sustainability, the better their action. Economically, farmers consider the impact of the well agricultural proccess. Farmers start planting pattern activity to plant media, then select seeds and plant and maintain the land. At this stage, farmers use human resources and mechanical equipment, which has implications for financing and harvest activities and storage of crops.

Economic sustainability is intended to produce goods and services, maintain government sustainability, and avoid sectoral imbalances that can damage agricultural and industrial production [10]. Sustainable agriculture can be done through improved soil management and crop rotation while maintaining soil quality and water availability to sustain increased agricultural production in the long term.

Farmers' knowledge of environmental sustainability has a significant effect on farmer behavior. The higher the experience of farmers about ecological sustainability, the better the behavior of farmers. Based on the research results, the farmers' knowledge about environmental sustainability is in the medium category. Still, it is not shown in the field because several processes are carried out by farmers who do not follow existing regulations. Farmers generally use fertilizers with doses that are not following government recommendations. As a result, they have an impact on the risk of water pollution. Likewise, pesticides are excessive and have a chance of disturbance to the ecosystem and nutrient cycling in the soil.

The negative impact on the environment due to farmer activities such as the use of inorganic fertilizers, pesticides, herbicides, and intensive land exploitation has been the subject of discussion for a long time. The consequences of environmental damage to land, water, and air, and living things are the reason for developing sustainable agricultural patterns. The use of these synthetic chemicals has implications for destroying the soil structure and the destruction of soil microbes. From day to day, our agrarian land becomes increasingly critical

[11]. Modern farming practices carried out unwise have resulted in environmental pollution, poisoning, disease, and death in living things, leading to disasters and catastrophes [12].

An environmentally sustainable system is carried out by utilizing and managing natural resources wisely without hurting the environment and acting lawfully for future generations [13]. Sustainable agriculture can be achieved by protecting, recycling, replacing, and maintaining the natural resource base such as land, water, and biodiversity, contributing to natural capital protection.

Farmers' knowledge of social sustainability has a significant effect on farmer behavior. The higher the farmers' knowledge about social sustainability, the better the farmer's behavior. This is shown from the farmers' social relations, and the farmers uphold the social and cultural norms that are adopted. For example, *tudang sipulung* and *mappadendang*, which are held annually, have become a social habit in farming patterns.

Social sustainability is defined as a system capable of achieving justice and equal access to natural resources and public services in the fields of health, gender, and political accountability [14]. In sustainable agriculture, social sustainability is concerned with the quality of life and well-being of those involved in this sector. Sustainable agriculture provides a solution to unemployment problems because this system can absorb more labor compared to conventional agricultural systems that prioritize the use of machines and heavy equipment

V. CONCLUSION

The farmers' knowledge about economic sustainability, environmental sustainability, and social sustainability have both partially and simultaneously have a significant effect on farmer behavior in the *Latenreng* irrigation area of Soppeng Regency

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