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The Effect of Agricultural Extension on The Level of Knowledge Among Rice Farmers In Kaloling Village, East Sinjai Subdistrict, Sinjai Regency

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ABSTRACT

Agricultural extension is one of the efforts to improve farmers' knowledge in managing rice farming, but the effectiveness of its implementation in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency still needs to be assessed because not all components of the extension program have had an optimal impact on improving farmers' knowledge. This study aims to analyze the effects of extension intensity, extension materials, extension methods, and extension workers' competencies on the knowledge levels of rice farmers. The study employed a quantitative approach using descriptive and associative (causal) research methods. Data were collected through a questionnaire distributed to 41 farmers selected using proportionate sampling, and then analyzed using multiple linear regression with the aid of SPSS version 26. The results of the study indicate that, individually, extension content (Sig. = 0.002) and extension methods (Sig. = 0.000) have a positive and significant effect on farmers' knowledge levels, whereas extension intensity (Sig. = 0.109) and extension workers' competence (Sig. = 0.266) do not have a significant effect. Simultaneously, all four variables had a significant effect on farmers' knowledge levels, with an F-calculated value of 142.947 and a significance level of 0.000. The coefficient of determination (R^2) value of 0.941 indicates that 94.1% of the variation in farmers' knowledge levels can be explained by the research model, while 5.9% is influenced by other factors outside the model. The results of this study indicate that the quality of materials and the application of appropriate extension methods are key factors in improving rice farmers' knowledge; therefore, these aspects require attention in the implementation of agricultural extension programs.

Keywords: *Agricultural Extension, Extension Intensity, Extension Materials, Extension Methods, Extension Workers' Competencies, Rice Farmers' Knowledge*

INTRODUCTION

The agricultural sector is a strategic sector in national development because it serves as a food provider, a source of employment, and a source of income for rural communities. One of the primary commodities that plays a crucial role in achieving food security is rice. South Sulawesi is one of the nation's major rice-producing regions, including Sinjai Regency, which has significant potential for the development of rice farming. Nevertheless, rice productivity in Sinjai Regency continues to fluctuate and tends to remain below the national average. This situation indicates that productivity gains depend not only on the amount of cultivated land but also on the quality of human resources specifically, farmers' knowledge of farm management.

Agricultural extension is one of the efforts to empower farmers through a learning process aimed at improving their knowledge, skills, and ability to adopt agricultural innovations. The effectiveness of extension is

influenced by various factors, such as the frequency of extension activities, the quality of materials, delivery methods, and the competence of extension workers. The village of Kaloling, in the Sinjai Timur subdistrict, was selected as the research site because it is an agricultural area where the majority of the population works as rice farmers and where active extension activities are conducted through farmers' groups. However, observations indicate that some farmers have not yet optimally implemented rice cultivation techniques due to limited knowledge and underutilization of agricultural technology.

Various previous studies have shown that agricultural extension programs influence productivity, behavioral change, the empowerment of farmer groups, and rice yields. Studies by Wati et al. (2020), Bahri (2019), Ariana et al. (2021), and Rasul et al. (2024) have primarily focused on the impact of extension services on productivity and farmer behavior. Meanwhile, research on the impact of extension on farmers' knowledge levels as an initial stage of innovation adoption—remains relatively limited, particularly studies that simultaneously examine the aspects of extension intensity, extension content, extension methods, and extension workers' competencies.

Based on this research gap, this study offers novelty by analyzing the effects of the four main components of agricultural extension—namely, extension intensity, extension content, extension methods, and extension workers' competencies—on rice farmers' knowledge levels. This study employs a quantitative approach using multiple linear regression analysis, which is expected to provide a more comprehensive picture of the effectiveness of agricultural extension in enhancing farmers' knowledge.

This study aims to analyze the effects of extension intensity, extension materials, extension methods, and extension workers' competencies—both individually and collectively—on the knowledge levels of rice farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency. The results of this study are expected to provide input for agricultural extension workers, local governments, and stakeholders in improving the quality of extension services so that they can support capacity building among farmers and sustainable agricultural development.

RESEARCH METHODS

This study employs a quantitative approach using descriptive and associative (causal) research methods to analyze the effect of agricultural extension on the knowledge level of rice farmers. The study was conducted in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency, given that this area is one of the rice-producing centers that actively carries out agricultural extension activities. The data used consist of primary and secondary data. Primary data were obtained through the distribution of questionnaires and interviews with rice farmers, while secondary data were obtained from the Central Statistics Agency (BPS), the Sinjai Regency Office of Food Crops, Horticulture, and Plantations, the Kaloling Village Office, and various relevant scientific literature.

The study population consisted of all 170 rice farmers who are members of farmer groups in Kaloling Village. The sample was determined using proportionate sampling, resulting in 41 respondents representing all farmer groups. Data collection techniques included observation, interviews, questionnaire distribution, and document analysis. The independent variables in this study consisted of extension intensity (X_1), extension content (X_2), extension methods (X_3), and extension worker competence (X_4), while the dependent variable was the level of knowledge among rice farmers (Y). All variables were measured using a five-point Likert scale, ranging from a score of 1 (strongly disagree) to a score of 5 (strongly agree).

Prior to the analysis, the research instrument was tested for validity using Pearson's product-moment correlation and for reliability using Cronbach's alpha to ensure that the instrument was suitable for use. Next, classical assumption tests were conducted, including tests for normality, multicollinearity, and heteroscedasticity, to ensure that the regression model met the statistical assumptions.

Data analysis was tailored to the research objectives. The first through fourth research objectives—analyzing the partial effects of extension intensity, extension materials, extension methods, and extension workers' competence on farmers' knowledge levels—were analyzed using multiple linear regression followed by a t-test (partial). Meanwhile, the fifth research objective—analyzing the simultaneous effect of the four extension variables on farmers' knowledge levels—was analyzed using an F-test (simultaneous) within the multiple linear regression model. The extent to which the independent variables explain the variation in farmers' knowledge levels was analyzed using the coefficient of determination (R^2). The entire data analysis process was conducted using IBM SPSS Statistics version 26 at a significance level of 5% ($\alpha = 0.05$).

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RESULT AND DISCUSSION

Based on the classical assumption test, all research data are normally distributed. The results of the normality test indicate that the sample size (N) used in this study was 41 respondents. The normality test was conducted using the Kolmogorov-Smirnov test with an Asymp. Sig. (2-tailed) value of 0.200. This significance value is greater than the specified significance level of 0.05 (0.200 > 0.05). Thus, it can be concluded that the research data are normally distributed. The results of the multicollinearity test showed that variable X1 had a tolerance value of 0.110 with a VIF of 9.067, variable X2 had a tolerance value of 0.103 with a VIF of 9.674, variable X3 has a tolerance value of 0.122 with a VIF of 8.226, and variable X4 has a tolerance value of 0.086 with a VIF of 11.635. The results of the multicollinearity test show that the variables extension intensity, extension material, and extension method have tolerance values above 0.10 and VIF values below 10. Meanwhile, the variable extension worker competence has a tolerance value of 0.086 and a VIF value of 11.635, indicating the presence of multicollinearity in that variable. These findings indicate that the competence of extension workers has a fairly strong relationship with other independent variables; therefore, these variables must be interpreted with caution. Based on the results of the heteroscedasticity test in Table 28, it is found that the Extension Intensity variable (X1) has a significance value of 0.992, the Extension Material variable (X2) has a value of 0.703, the Extension Method variable (X3) has a value of 0.476, and the Extension Agent Competence variable (X4) at 0.548. All independent variables have significance values greater than 0.05 (Sig. > 0.05). This indicates that there is no significant relationship between the independent variables and the absolute residual value (ABS_RES), meaning the regression model does not exhibit heteroscedasticity.

Multiple linear regression analysis was used to determine the extent of the influence of agricultural extension on the level of knowledge among rice farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency. This study focused on four independent variables (X): Extension Intensity (X1), Extension Content (X2), Extension Method (X3), and Extension Agent Competence (X4), in relation to the dependent variable (Y), which is the level of knowledge among rice farmers, as presented in Table 1.

Based on Table 1, the results of the multiple linear regression test between the independent variables Extent of Extension (X1), Extension Content (X2), Extension Method (X3), and Extension Agent Competence (X4)—and the dependent variable (Y)—the level of knowledge among rice farmers are as follows:

$$Y = 0.107 – 0.649X1 + 1.316X2 + 2.041X3 + 0.510X4 + e.$$

The regression equation can be interpreted as follows:

1. The constant (a) of 0.107 indicates that if the variables extension intensity (X1), extension materials (X2), extension methods (X3), and extension worker competence (X4) are held constant or set to zero, then the level of rice farmers' knowledge (Y) is 0.107.
2. The regression coefficient for extension intensity (X1), which is -0.649, indicates that a one-unit increase in extension intensity will reduce rice farmers' knowledge level by 0.649 units, assuming all other variables remain constant. This finding does not imply that more frequent extension activities will reduce farmers' knowledge, but rather suggests that a high frequency of extension activities does not necessarily reflect the effectiveness of those activities. This situation may occur if the extension materials are not well-suited to farmers' needs or fail to introduce new innovations that could expand their knowledge. Furthermore, farmers' attendance at extension activities may be merely a formality to fulfill their obligations as members of a farmers' group, resulting in low levels of active participation in understanding the material.
3. The regression coefficient for extension materials (X2), which is 1.316, indicates that a one-unit increase in extension materials will increase rice farmers' knowledge by 1.316 units, assuming all other variables remain constant.
4. The regression coefficient for the extension method (X3), which is 2.041, indicates that a one-unit increase in the extension method will increase rice farmers' knowledge level by 2.041 units, assuming all other variables remain constant. This variable has the largest regression coefficient and thus exerts the most dominant influence on rice farmers' knowledge level.
5. The regression coefficient for extension worker competence (X4), which is 0.510, indicates that a one-unit increase in extension worker competence will increase rice farmers' knowledge by 0.510 units, assuming all other variables remain constant.

Table 1. Multiple Linear Regression

Model	Unstandardized Coefficients
	B
Constant	0.107
Extension Activities (X1)	-0.649
Extension Materials (X2)	1.316
Extension Methods (X3)	2.041
Workers' Competencies (X4)	0.510

Source: Primary Data processed, 2026.

An F-test was conducted to determine whether there was a simultaneous relationship between the independent variables—namely, extension intensity, extension materials, extension methods, and extension workers' competence—and the dependent variable, namely, the level of knowledge among rice farmers.

Table 2. F Test

Model	F	Sig
Regression	142.947	0.000

Source: Primary data processed using SPSS (2026).

Based on Table 2, the results of the simultaneous test (F-test) show that the calculated F-value is 142.947 with a significance value (Sig.) of 0.000. This significance value is less than the significance level of 0.05 (0.000 < 0.05), so it can be concluded that the regression model used is significant. This indicates that, collectively, the variables extension intensity (X1), extension materials (X2), extension methods (X3), and extension worker competence (X4) have a significant effect on the level of knowledge among rice farmers (Y).

The results of the F-test indicate that the four independent variables are capable of simultaneously explaining changes in the level of knowledge among rice farmers. Thus, the hypothesis stating that extension intensity, extension materials, extension methods, and extension worker competence collectively have a significant effect on the level of knowledge among rice farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency, is accepted.

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Table 3. T Test

Model	t	Sig.
Constant	0.037	0.970
Extension Activities (X1)	-1.645	0.109
Extension Materials (X2)	3.322	0.002
Extension Methods (X3)	5.353	0.000
Workers' Competencies (X4)	1.129	0.266

Source: Primary data processed using SPSS (2026).

In Table 3, a partial test (t-test) was conducted to determine the effect of each independent variable—namely, extension intensity (X1), extension material (X2), extension method (X3), and extension worker competence (X4)—on the dependent variable, which is the level of knowledge among rice farmers (Y). The test was conducted by comparing the significance value (Sig.) with a significance level of 0.05. If the Sig. value is < 0.05, then that variable has a significant effect on the level of knowledge of rice farmers. Conversely, if the Sig. value is > 0.05, then that variable has no significant effect.

a. The results of the partial test show that the extension intensity variable (X1) has a calculated t-value of -1.645 with a significance value of 0.109. Since the significance value is greater than 0.05 (0.109 > 0.05), extension intensity does not have a significant effect on rice farmers' knowledge levels. Thus, the hypothesis stating that extension intensity affects the level of knowledge among rice farmers is rejected.
b. Next, the extension material variable (X2) yielded a calculated t-value of 3.322 with a significance level of 0.002. This value is less than 0.05 (0.002 < 0.05), so it can be concluded that extension material has a positive and significant effect on rice farmers' knowledge levels. Therefore, the hypothesis stating that extension materials influence the level of knowledge among rice farmers is accepted.
c. For the extension method variable (X3), a calculated t-value of 5.353 was obtained with a significance value of 0.000. Since the significance value is less than 0.05 (0.000 < 0.05), the extension method has a positive

and significant effect on rice farmers' knowledge levels. This variable also has the highest t-value compared to the other variables, indicating that the extension method is the most dominant variable influencing the level of knowledge among rice farmers. Thus, the research hypothesis is accepted.

d. Meanwhile, the extension worker competency variable (X4) has a calculated t-value of 1.129 with a significance value of 0.266. This significance value is greater than 0.05 (0.266 > 0.05), so extension worker competency does not have a significant effect on rice farmers' knowledge levels. Therefore, the hypothesis stating that extension workers' competence affects rice farmers' knowledge level is rejected.

The Effect of Extension Intensity on the Knowledge Level of Rice Farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency

Based on the results of the t-test, the calculated t-value was -1.645 with a significance value of 0.109. This significance value is greater than the significance level of 0.05 (0.109 > 0.05), indicating that the intensity of extension services does not have a significant effect on the knowledge level of rice farmers. These results indicate that the frequency of extension activities received by farmers has not yet been able to significantly improve their knowledge. This suggests that simply increasing the number of extension activities may not necessarily improve knowledge unless it is accompanied by improvements in the quality of the material, the delivery methods, and the active involvement of farmers in the extension activities.

In Kaloling Village, some farmers have been farming for quite some time, so their knowledge is derived not only from extension activities but also from farming practices passed down through generations. Therefore, the intensity of extension activities is not the primary factor determining farmers' knowledge growth. The results of this study differ from those of Aprilia Nur Rahma Wati et al. (2020), who stated that the intensity of extension programs influences changes in farmers' behavior. This discrepancy is likely due to differences in respondent characteristics, local conditions, and the implementation of extension programs

The Effect of Extension Materials on the Knowledge Level of Rice Farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency

Based on the results of the t-test, the calculated t-value was 3.322 with a significance level of 0.002. This significance value is less than 0.05 (0.002 < 0.05), indicating that extension materials have a positive and significant effect on rice farmers' knowledge levels. The regression coefficient of 1.316 indicates that every increase in the quality of extension materials will increase farmers' knowledge levels by 1.316 units, assuming all other variables remain constant.

This indicates that the material presented by the extension workers was aligned with the farmers' needs. Information on rice cultivation techniques, the use of high-yielding seeds, balanced fertilization, pest and disease control, as well as harvesting and post-harvest techniques, helped improve farmers' understanding of how to manage their farming operations.

These findings support Everett M. Rogers' Theory of the Diffusion of Innovations, which explains that high-quality information is the initial stage in the process of innovation adoption. The better the materials farmers receive, the higher their level of knowledge. The results of this study are also consistent with research by Larasati Sukmadewi Wibowo (2023), which states that extension materials and media influence the success of agricultural extension.

The Effect of Extension Methods on the Knowledge Level of Rice Farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency

The results of the t-test show that the extension method variable yielded a calculated t-value of 5.353 with a significance level of 0.000. Since this value is less than 0.05, the extension method has a positive and significant effect on the knowledge level of rice farmers. The regression coefficient of 2.041 indicates that the extension method is the variable with the greatest influence compared to the other variables.

These results indicate that the extension methods used by extension workers—such as lectures, discussions, demonstrations, and field practice—are effective in improving farmers' understanding. Field demonstrations provide farmers with the opportunity to observe the application of agricultural technology firsthand, making it easier to understand than through theoretical explanations alone.

Participatory extension methods also provide farmers with opportunities to ask questions, discuss, and share experiences regarding various problems they face during the rice cultivation process. Consequently, the learning process becomes more effective and helps increase farmers' knowledge levels.

The Effect of Extension Workers' Competence on the Knowledge Level of Rice Farmers in Kaloling

Village, East Sinjai Subdistrict, Sinjai Regency

Based on the results of the t-test, the calculated t-value was 1.129 with a significance value of 0.266. The significance value is greater than 0.05 (0.266 > 0.05), indicating that the extension workers' competence does not have a significant effect on the level of knowledge among rice farmers. Although the regression coefficient is positive at 0.510, this effect is not yet statistically significant. This indicates that the extension workers' competence has not yet become a dominant factor in improving farmers' knowledge at the study site.

This situation may be due to the fact that most farmers obtain information not only from extension workers but also from fellow farmers, social media, the internet, their own farming experience, and farmer group activities. Thus, the competence of extension workers is not the sole source of information for farmers.

Tabel 4. Coefficient of Determination (R2)

Model	R square	Adjusted R square
1	0.941	0.934

Source: Primary data processed using SPSS (2026).

Based on Table 4, the results of the coefficient of determination (R^2) test show that the R-squared (R^2) value is 0.941, or 94.1%. This indicates that the variables extension intensity (X1), extension materials (X2), extension methods (X3), and extension worker competence (X4) collectively account for 94.1% of the variation in rice farmers' knowledge levels (Y), while the remaining 5.9% is explained by other variables not included in this research model. Furthermore, the Adjusted R-Square value of 0.934 indicates that, after adjusting for the number of independent variables and the sample size, the regression model's ability to explain the variation in rice farmers' knowledge levels remains very high, at 93.4%.

The high R-squared value may be due to the fact that the variables used in this study are closely related to farmers' level of knowledge. Agricultural extension is fundamentally aimed at improving farmers' knowledge; therefore, variables such as extension intensity, extension materials, extension methods, and extension workers' competence are directly related to farmers' knowledge. Furthermore, all respondents in this study were members of a farmers' group in Kaloling Village who shared relatively similar characteristics. They participated in extension activities led by the same extension worker, received nearly identical materials, and operated under farming conditions that were not significantly different from one another. The similarity in the respondents' characteristics resulted in relatively uniform responses, thereby strengthening the relationship between the extension variable and the level of knowledge and yielding a high R-squared value. This indicates that the regression model used has a very high level of accuracy in explaining the relationship between the independent and dependent variables.

CONCLUSION

This study shows that each agricultural extension session influences the level of knowledge among rice farmers in Kaloling Village, East Sinjai Subdistrict, Sinjai Regency. Partially, the variables that have a significant influence on farmers' knowledge levels are extension materials and extension methods, while extension frequency and extension workers' competence do not have a significant influence. Simultaneously, extension intensity, extension content, extension methods, and extension workers' competence all have a significant effect on farmers' knowledge levels. These findings indicate that improving the quality of the content delivered and using appropriate extension methods are the most critical factors in enhancing rice farmers' knowledge

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