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The Relationship Between the Role of Agricultural Extension Workers and Farmers' Technology Adoption in Increasing Rice Production at the Agricultural Extension Center of Samaturu District, Kolaka Regency

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Abstract

Efforts to increase rice production have so far remained focused on major production centers, while villages with potential paddy fields supported by technical, semi-technical, or simple irrigation systems have not been fully empowered. In Samaturu District, agricultural extension workers—both Civil Servants and Daily Freelance Agricultural Extension Support Personnel (THL–TBPP)—face institutional constraints because rice production improvement programs are still dominated by the Kolaka Regency Agriculture Service. This study aims to: (1) analyze the relationship between the role of extension workers and increased rice production, (2) analyze the relationship between farmers' technology adoption and increased rice production, and (3) examine the simultaneous effect of the role of extension workers and technology adoption on increased rice production. The study was conducted from January to May 2025 in the administrative area of Samaturu District. The study population consisted of rice farmers who had been farming for at least two years, with a sample of 30 farmers selected using snowball sampling. The variables examined were the role of extension workers (X1), technology adoption (X2), and increased rice production (Y). The data were analyzed using correlation and regression tests. The results showed that the role of extension workers did not contribute significantly to increased rice production, while technology adoption also had no significant effect. However, simultaneously, the two variables demonstrated a synergistic relationship that could jointly support increased rice production.

Keywords: extension workers' role, rice production, Samaturu District, technology adoption.

INTRODUCTION

Rice is a strategic commodity as well as an important political commodity because it is the staple food of more than 95 percent of Indonesia's population. Rice farming plays a major role in providing employment and serves as a source of income for approximately 21 million farming households; therefore, the sustainability of rice production is one of the fundamental indicators of national food security (Halimah & Subari, 2020). The government continues to implement various policy interventions to increase rice production, including the National Rice Production Enhancement Program (P2BN), which aims to maintain food stability and preserve rice self-sufficiency (BPS Statistik Kolaka, 2024).

The achievement of rice self-sufficiency in 1984 demonstrated that agricultural extension made a substantial contribution to increasing rice production. Through the Mass Guidance Program (BIMAS) and the training-and-visit extension system, extension workers encouraged farmers to apply rice cultivation technologies such as the "five farming practices" (panca usaha tani), which had a significant impact on productivity (Feder & Anderson, 2018). In the modern context, the roles of extension workers as facilitators, communicators, organizers, and change agents remain key factors in agricultural transformation (Halimah & Subari, 2020).

At present, the development of rice production in Indonesia remains concentrated in major production centers. However, Singkut District has potential that can be optimized, particularly because most villages in the area have paddy fields that could be further developed. Agricultural extension workers are important actors in transferring innovations to farmers, but their effectiveness is still affected by various institutional constraints. Some rice production improvement programs continue to be managed by the regency's technical agencies, so coordination with extension workers at the district level has not operated

optimally (Dewi Tri Setyorini, Mukson, 2023). This situation has resulted in limited mentoring intensity and a less-than-optimal role for extension workers in guiding farmers.

In addition to institutional constraints, the success of efforts to increase rice production is strongly determined by the level of technology adoption among farmers. The technology adoption process includes the stages of becoming aware, understanding, evaluating, trying, and applying innovations in farming activities (Rogers & Everett, 1983). Various studies have shown that the adoption of modern rice cultivation technology has a significant effect on productivity, input efficiency, and farmers' income (Puspitawati, 2019). Factors such as the quality of extension services, access to information, government support, and farmers' socioeconomic characteristics influence the success of technology adoption (Pandeglang et al., 2022).

The growing demand for national food security and sustainable rice production makes the role of extension workers and the level of technology adoption among farmers important factors in agricultural development. At the regional level, particularly in Samaturu District, these two factors need to be tested empirically to determine the extent of their contribution to increased rice production. Therefore, this study was conducted to analyze the relationship between the role of agricultural extension workers, the level of technology adoption, and increased rice production as a basis for developing policies and farmer empowerment strategies in the future.

Research Questions

1. Is there a relationship between the role of agricultural extension workers and increased rice production?
2. Is there a relationship between farmers' technology adoption and increased rice production?
3. What is the joint effect of the role of extension workers and technology adoption on increased rice production?

METHOD

This study used a quantitative approach with a descriptive-correlational design to analyze the relationship between the role of agricultural extension workers, the level of technology adoption, and increased rice production in Samaturu District, Kolaka Regency. The study was conducted from January to July 2025 in Samaturu District, which was purposively selected because it is a rice farming development area and an agricultural extension service area. The study population consisted of all rice farmers residing in Samaturu District, while the sample comprised 30 farmers selected using snowball sampling, namely the selection of respondents through successive recommendations from previously selected farmers until the required sample size was reached. The data consisted of primary and secondary data (Miles, M. B., Huberman, A. M., & Saldaña, 2014).

This study involved three main variables: the role of extension workers (X1), technology adoption (X2), and increased rice production (Y). The extension workers' role variable covered their functions as advisors, technicians, liaisons, organizers, and change agents. The technology adoption variable included the stages of becoming aware, paying attention, evaluating, trying, and applying rice cultivation technology. Increased rice production was measured based on changes in harvest yields, improvements in harvest handling, and paddy grain prices during the last four harvest seasons. Data were collected through questionnaires, structured interviews, agricultural data documentation, and a review of relevant supporting literature (Syahrullah & Djuanda, 2024).

The research instrument was tested for validity and reliability. Instrument validity was tested using Product Moment correlation to determine the suitability of each statement item, and invalid items were excluded from the analysis. Instrument reliability was tested using the split-half technique, with the criterion of $r > 0.60$ indicating that the instrument was reliable. The prerequisite tests included the Lilliefors normality test to ensure that the data were normally distributed and Bartlett's homogeneity test to ensure equality of variance among data groups. After all analysis prerequisites had been met, Pearson correlation analysis was used to determine the relationship of the extension workers' role and technology adoption variables with increased rice production. In addition, multiple linear regression analysis was performed to test the partial and simultaneous effects of the two independent variables on the dependent variable. The results were presented descriptively and inferentially to describe the strength of the relationships and effects among the variables in this study.

RESULT AND DISCUSSION

Respondent Characteristics

The respondents' characteristics provide an overview of the sociodemographic conditions of rice farmers in Samaturu District, Kolaka Regency, which affect their ability to accept innovations and participate in extension activities, as shown in Table 1 below:

Table 1. Characteristics of Rice Farmer Respondents in Samaturu District, 2025

No.	Characteristic	Category	Number (Persons)	Percentage (%)
1	Age (years)	26–70 years (average 50.5)	30	100
2	Age Category	< 30 years	3	10
		30–64 years (productive age)	21	70
		≥ 65 years	6	20
3	Education	No formal education	1	4
		Elementary school	2	8
		Junior high school	13	44
		Senior high school	8	28
		Higher education	6	16
4	Number of Training Sessions Attended	2–8 times (average 3 times)	30	100
5	Farming Experience	< 10 years	14	46
		10–20 years	9	28.6
		> 20 years	7	25
6	Cultivated Land Area	< 5,000 m²	14	44
		5,000–10,000 m²	11	37.9
		> 10,000 m²	5	17.2
7	Irrigation Type	Technical irrigation	15	51.9
		Semi-technical irrigation	10	33.3
		Non-technical irrigation	5	14.8

Source: Primary data analysis, 2025

Based on Table 1, the respondents' average age was 50.5 years, with an age range of 26–70 years. Although some respondents were elderly, the majority (70%) were in the productive-age category (30–64 years). This indicates that most farmers still had adequate physical condition and work capacity to develop their rice farming businesses. This is consistent with Puspita and Suwarto (2023), who stated that younger farmers generally have a stronger willingness to learn and adopt new innovations more quickly, although they have less experience than senior farmers.

The respondents had varied levels of education, with the largest proportion having completed junior high school (44%). A total of 28% had completed senior high school, and 16% had attended higher education. This relatively adequate level of education indicates that most farmers were able to understand extension messages and agricultural technology information. According to Herijanto (2012), formal education affects farmers' ability to assess the benefits of technology and make rational farming decisions. This condition supports the acceleration of innovation adoption in the field.

In addition to formal education, experience in participating in training is an important factor in strengthening farmers' capacity. The respondents had attended rice cultivation training 2–8 times, with an average of three training sessions. Training helps strengthen farmers' practical skills and increases their confidence in trying new technologies, as explained by Zamzam and Taufiq (2023). In terms of farming experience, most respondents (46%) had less than 10 years of experience, while 28.6% had 10–20 years of experience and 25% had farmed for more than 20 years. This experience is an important asset for understanding the dynamics of rice cultivation, although farmers with longer experience do not always adopt innovations more quickly (Puspita & Suwarto, 2023). The combination of experience and education constitutes the main capital for successful technology adoption.

The respondents' cultivated land area varied, with an average of 5,330 m². A total of 44% cultivated less than 5,000 m², indicating that most respondents were smallholder farmers. Farmers with larger landholdings can generally apply technology more efficiently because a larger scale of operation provides greater flexibility in using technological inputs (Maria & Oliveira, 2022). In addition, most farmers (51.9%) used technical irrigation, which is the most suitable irrigation type for supporting increased productivity because it provides a more stable water supply.

Based on these overall characteristics, it can be concluded that farmers in Singkut District were in conditions sufficiently supportive of accepting technological innovations, provided that they received intensive extension services, adequate access to information, and support from effective agricultural institutions. These characteristics provide an important basis for understanding technology adoption patterns and farmers' responses to the role of agricultural extension workers.

Descriptive Analysis

Role of Extension Workers

The results showed that the performance of agricultural extension workers' roles in Singkut District was still relatively low. Four respondents (13.3%) stated that extension workers only occasionally performed their roles, 15 respondents (50%) stated that extension workers rarely performed their roles, and only 11 respondents (36.7%) considered that extension workers frequently performed their roles. These findings indicate that most farmers had not optimally experienced the presence of extension workers in carrying out their five basic functions: advisor, technician, liaison, organizer, and change agent (Mardikanto, 2010).

These results are consistent with the study by Aldin et al. (2024), which stated that weak extension quality is often caused by a limited number of extension workers, insufficient institutional support, and excessively heavy workloads. Similarly, Syahadat et al. (2024) found that the low intensity of extension visits caused farmers to feel that they did not receive adequate assistance, thereby limiting the effectiveness of agricultural innovation dissemination. This condition may hinder farmers' learning processes and slow the adoption of agricultural technology.

Technology Adoption

The process of technology adoption among farmers showed considerable variation. Based on the questionnaire results, 1 respondent (3.3%) was at the awareness stage, 1 respondent (3.3%) was at the attention stage, 10 respondents (33.3%) were at the evaluation stage, 11 respondents (36.7%) were at the trial stage, and 7 respondents (23.3%) had reached the technology application stage. Compared with Rogers' innovation adoption theory, some farmers had reached the advanced stages, particularly trial and application. Nevertheless, the figure of 23.3% at the application stage indicates that fewer than one-quarter of the farmers had fully integrated technology into their farming activities. This condition is consistent with Halimah and Subari (2020), who stated that although farmers are aware of modern technology, not all of them can apply it consistently because of limited costs, minimal extension services, and age and education factors. Other findings by Sofia, Fadila, and Pertanian (2022) showed that successful technology adoption is strongly influenced by extension quality, access to information, and farmers' experience. Thus, the results of this study indicate that the technology adoption process still requires stronger assistance from extension workers.

Increased Production

Based on the analysis results, 21 respondents (70%) stated that their rice production had tended to remain unchanged during the previous two years, while 9 respondents (30%) reported a slight increase. These findings indicate that the dynamics of production growth remained relatively stagnant. This is consistent with the findings of Prasetyo and Agnes (2022), who stated that increased rice production is strongly influenced by the application of cultivation technology, irrigation quality, and the intensity of extension assistance. Because most farmers had not fully adopted technology, stagnant production was a reasonable condition. Puspita and Suwarto (2023) also stated that increased rice production can only be achieved when farmers apply modern cultivation systems, such as superior varieties, balanced fertilization, and integrated pest and disease management. With technology adoption still limited and the role of extension workers not yet optimal, the increase in production experienced by farmers in Singkut District tended to be slow.

Relationship between the Role of Extension Workers and Increased Rice Production

The results showed that the role of agricultural extension workers in Singkut District had not been implemented optimally. The questionnaire results indicated that 50% of respondents stated that extension workers rarely performed their roles, 13.3% stated that they occasionally performed their roles, and only 36.7% stated that they frequently performed their roles. These findings demonstrate that the intensity and quality of extension assistance remained low, particularly in carrying out the functions of advisor, technician, liaison, organizer, and change agent, as outlined in Mardikanto's theory (2007).

The statistical test results showed that the relationship between the role of extension workers and increased rice production was very weak, as indicated by a correlation value of $r = 0.12$ and a coefficient of determination of $r^2 = 1.4\%$. This means that the role of extension workers contributed only 1.4% to increased rice production, while 98.6% was influenced by other factors such as pest attacks, paddy grain prices, water availability, and agroecosystem conditions. The nonsignificant effect of extension workers was reinforced by the F-test result ($0.396 < 3.35$) and the t-test result for variable X1 ($0.63 < 1.70$). Thus, statistically, the role of extension workers had no significant effect on increased rice production. This condition is consistent with the findings of Putra et al. (2021) and Syahyuti (2020), which showed that weak extension institutions and overlapping programs among agencies can reduce the effectiveness of extension workers in the field.

Field conditions further clarify these findings. Rat infestations, which occur almost every year, have not been completely controlled. Extension workers and the agriculture service have not provided

adequate technical solutions, apart from emergency measures involving rat extermination. The limited role of extension workers in this technical aspect has prevented farmers from obtaining relevant innovations to improve their productivity, unlike the BIMAS era, which strongly emphasized technical improvement through fertilization, the use of superior varieties, and pest and disease control (Feder & Anderson, 2018).

Relationship between Farmers' Technology Adoption and Increased Rice Production

Technology adoption is a key factor in increasing production. However, the findings of this study showed that most farmers in Singkut District were at the evaluation stage (33.3%) and trial stage (36.7%), while only 23.3% had actually reached the innovation application stage. This means that technology adoption had not yet reached full implementation. The statistical test results showed a correlation of r = 0.38, indicating a moderately strong relationship between technology adoption and rice production; however, the F-test and t-test results were not significant (calculated F = 0.53 < critical F = 3.49; calculated t = 0.73 < critical t = 1.70). Therefore, statistically, technology adoption had no significant effect on increased rice production. This phenomenon indicates that although farmers had begun trying innovations, the implementation of technology had not yet increased harvest yields.

Relationship of the Role of Extension Workers and Farmers' Technology Adoption with Increased Rice Production

The simultaneous analysis produced a correlation of R = 0.40 and a coefficient of determination of R^2 = 16.6%, meaning that the combination of the role of extension workers and technology adoption contributed 16.6% to increased rice production. Although this relationship was stronger than the partial effect of each variable, the F-test and t-test results still showed that the simultaneous effect was not statistically significant. These findings can be interpreted to mean that the role of extension workers and the level of technology adoption are conceptually related but have not yet produced a measurable impact on rice production. This demonstrates that the extension and technology adoption systems in Singkut District were still ineffective and had not reached the stage of comprehensive innovation dissemination.

CONCLUSION

The conclusion derived from the descriptive, correlation, and regression analyses regarding the relationship between the role of extension workers, technology adoption, and rice production in Singkut District reveals several key points. First, the role of agricultural extension workers did not have a significant effect on increasing rice production. Although they carried out their duties as advisors, technicians, organizers, liaisons, and change agents, their contribution was minimal at only 1.4%, indicating that extension activities in the field were not yet fully effective in enhancing farmers' productivity. Second, farmers' adoption of technology also showed no significant impact on rice production. Even though some farmers had reached the stages of evaluation, trial, and application, its contribution was limited to 13.6%. External factors such as pests, weather conditions, and price fluctuations played a more dominant role in determining production outcomes. Third, when considered simultaneously, the role of extension workers and technology adoption also did not significantly influence rice production, despite a weak synergistic relationship with a combined contribution of 16.6%. This synergy, however, suggests that technology adoption could become more effective if supported by high-quality, intensive, and continuous extension services. Overall, rice production in Samaturu District, Kolaka Regency, was more strongly influenced by external factors such as pest conditions, irrigation water availability, and grain price dynamics, while the role of extension workers and the level of technology adoption had not yet contributed optimally to productivity.

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