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Transformation of Agricultural Extension in the Digital Era: Farmers' Perceptions of the Use of Social Media

Samaria[1], Nurul Afiza[1], Ramli[1], Arief Sirajuddin[1], Tri Septiani[2], Sema[3*]
[1]Department of Agriculture, Politeknik Pembangunan Pertanian Gowa, Gowa, Indonesia
[2]Study Program of Agribusiness, Faculty of Agriculture, Animal Science, and Fisheries, Universitas Puangrimaggalatung, Sengkang, Indonesia
[3]Study Program of Animal Feed Nutrition and Technology, Faculty of Agriculture, Animal Science, and Fisheries, Universitas Puangrimaggalatung, Sengkang, Indonesia
sema28292@gmail.com

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Corresponding Author: Sema, Universitas Puangrimaggalatung,
Email: sema28292@gmail.com

ABSTRACT

Farmers' perceptions play an essential role in the success of agricultural extension activities, as they reflect how farmers receive, understand, and respond to the information provided by extension agents. Differences in perception are often influenced by farmers' experiences, values, and ability to access digital technology. This study aims to analyze farmers' perceptions of social media–based agricultural extension and to evaluate changes in their knowledge and attitudes after participating in such activities. The research was conducted in Tenrigangkae Village, Mandai District, Maros Regency, using a survey method by distributing questionnaires to members of the Minasa Baji farmer group. Data were analyzed using the Likert scale to measure perceptions and the Spearman Rank test to assess correlations among variables, while changes were evaluated using the Wilcoxon test with SPSS 20 software. The results showed that farmers' perceptions of social media–based agricultural extension were categorized as fairly good, with a percentage score of 66%. All innovation attributes—relative advantage, compatibility, complexity, observability, and trialability—were very strongly correlated with farmers' perceptions (Spearman's rho > 0.80, p < 0.01) The evaluation revealed an increase of 24.6% in knowledge and 42.3% in attitude, with a total effectiveness of 62.45%. This study offers a novel contribution by integrating innovation attributes with a pre–post evaluation of farmers' knowledge and attitudes in social media–based agricultural extension.

Keywords: *Agricultural Extension, Digital Innovation, Farmers' Perception, Social Media, Spearman Rank*

INTRODUCTION

Agriculture is a strategic sector that plays a vital role in ensuring food security, supporting the national economy, and improving the welfare of rural communities. However, farmers in Indonesia still face various challenges, such as limited access to technological information, a shortage of agricultural extension officers, and geographical conditions that hinder the equitable distribution of agricultural innovation information. In this context, new innovations are needed to accelerate information flow and strengthen communication between extension workers and farmers. One increasingly relevant approach is the use of social media as an effective and efficient medium for agricultural extension (Syahyuti, 2019).

Extension itself is a systematic and integrated learning process for both primary actors and business actors in the agricultural, fisheries, and forestry sectors. Its main objective is to improve productivity, business efficiency, and farmers' income by enhancing their ability to access market information, technology, capital, and other resources that support welfare and environmental sustainability (Machmur, 2020; Arifin et al., 2023). Therefore,

extension activities play an important role in shaping farmers who are independent, innovative, and adaptive to technological developments in agriculture.

In the current digital era, social media has become an integral part of society's daily life, including among farmers. The main advantage of social media lies in its ability to disseminate information rapidly, reach a wide audience, and facilitate two-way communication between extension workers and farmers (Suratini et al., 2021; Yadav et al., 2022). In the context of agricultural extension, social media platforms can be used to share technological innovations, disseminate sustainable farming practices, and build discussion forums among farmers and extension agents (Hariadi, 2019). The use of this technology also aligns with the development of the Industrial Revolution 4.0, where digitalization serves as the driving force for transformation across various sectors, including agriculture (Nainggolan, 2019; Rahmawati et al., 2020).

Research findings in Indonesia indicate that social media has begun to be actively utilized in agricultural extension activities. For example, a study in Tiumang District, Dharmasraya Regency, found that extension workers used social media to deliver agricultural information, although they still faced obstacles such as low digital literacy among farmers and limited internet access (Rahmawati et al., 2020). Another study in Minahasa Regency revealed that platforms such as WhatsApp, Facebook, YouTube, and Instagram were used to support extension activities, and their effectiveness depended greatly on the frequency and duration of social media use (Suratini et al., 2021).

Similar phenomena have also been observed in other countries. A study in Thailand found that although most farmers owned smartphones, only a small portion used social media to obtain agricultural information, as it was primarily used for communication and entertainment purposes (Kanjina, 2021). Meanwhile, in India, farmers actively used WhatsApp and YouTube as sources of agricultural information, and factors such as education level, land area, scientific orientation, and innovativeness influenced the intensity of their usage (Yadav et al., 2022). Differences in perception and levels of social media utilization across regions show that farmers' understanding of the function of social media plays a critical role in the success of agricultural extension (Bahua, 2018; Schiffman & Kanuk in Bonanza, 2019).

At the Agricultural Extension Center of Mandai District, Maros Regency, the use of social media has proven to strengthen communication between extension workers and farmers. When extension materials are well understood and applied, improvements in farmers' knowledge, skills, and welfare can be achieved, signifying the success of agricultural extension programs. This study aims to analyze farmers' perceptions of social media–based agricultural extension at the Agricultural Extension Center of Mandai District, Maros Regency, and to examine the relationship between innovation characteristics and farmers' perceptions. In addition, this study seeks to evaluate changes in farmers' knowledge and attitudes after participating in social media–based extension activities in order to assess the effectiveness of social media as an agricultural extension medium.

RESEARCH METHODS

Location and Time

This research was conducted **from May to June 2024**. The study took place at the **Minasa Baji Farmers Group**, one of the farmer groups within the working area of the **Agricultural Extension Center (AEC)** of Mandai District, Maros Regency, **South Sulawesi, Indonesia**. **The location was selected purposively** because the farmer group is actively involved in agricultural extension activities and has begun utilizing social media as a source of agricultural information.

Tools and Materials

The tools used in this research included notebooks, pens, and a camera for documentation purposes. During the extension activities, a laptop and projector were used. The material used in the extension activities consisted of questionnaires.

Research Implementation Method

This study employed a quantitative approach using the survey method. Research using the survey method collects data from a predetermined and delimited sample of a population through questionnaires as the main data collection instrument (Abdussamad et al., 2024).

The research implementation method refers to the overall procedural stages of the study, including research design, determination of population and sample, implementation of extension activities, and evaluation of outcomes. The study was conducted in several stages: (1) identification of research location and respondents, (2) preparation and validation of research instruments, (3) implementation of social media–based agricultural

extension activities, (4) distribution of questionnaires before and after the extension activities, and (5) data analysis to assess farmers' perceptions as well as changes in knowledge and attitudes.

This methodological explanation emphasizes the sequence and logic of the research process, distinguishing it from data collection techniques, which focus specifically on how data were obtained from respondents.

Population and Sample

The population of this study consisted of all members of the Minasa Baji Farmer Group located in Tenrigangkae Village, Mandai District, Maros Regency. Given that the total number of group members was relatively limited (n = 50), a census approach was employed, in which all members of the farmer group were included as research respondents.The census approach was selected to ensure comprehensive representation of the population and to strengthen the validity of the findings, considering the relatively small population size.

Data Collection Techniques

The data used in this study consisted of primary and secondary data, obtained through the following methods:

1. Primary data**,** data collected directly through interviews with farmers in the research area.
2. Secondary data, data obtained from relevant institutions such as the Agricultural Extension Center (AEC)), village offices, and other supporting references.
3. Observation**,** data collection through direct observation of the research objects.
4. Questionnaire**,** a measuring tool in the form of a list of prepared questions designed to obtain data from respondents in the study. The questionnaires used included both the research questionnaire and the extension activity questionnaire.
5. Interview**,** conducted through question-and-answer sessions with farmers to obtain necessary information.
6. Activity Documentation**,** collection of relevant data from documents owned by respondents or related institutions.

Alignment with Statistical Analysis

The use of a census method with 50 respondents was considered appropriate to support the applied statistical analyses, including descriptive analysis using the Likert scale, correlation analysis using Spearman's Rank test, and comparative analysis using the Wilcoxon signed-rank test.Spearman's Rank correlation was selected due to the ordinal nature of Likert-scale data, while the Wilcoxon test was applied to evaluate changes in farmers' knowledge and attitudes before and after participating in social media–based agricultural extension activities. This combination of sampling strategy and statistical methods ensures methodological consistency and enhances the robustness of the research findings.

RESULTS AND DISCUSSION

Validity and Reliability Test

The validity and reliability tests are essential stages in research to ensure that the instruments used are truly capable of measuring what they are intended to measure and that they produce consistent data. Meanwhile, the reliability test is conducted to determine the level of consistency in the measurement results when the same instrument is used under similar conditions. A high reliability value indicates that the research instrument has good internal stability and can be used repeatedly with relatively consistent results. The results of the validity and reliability tests in this study are presented in Figure 1 below.

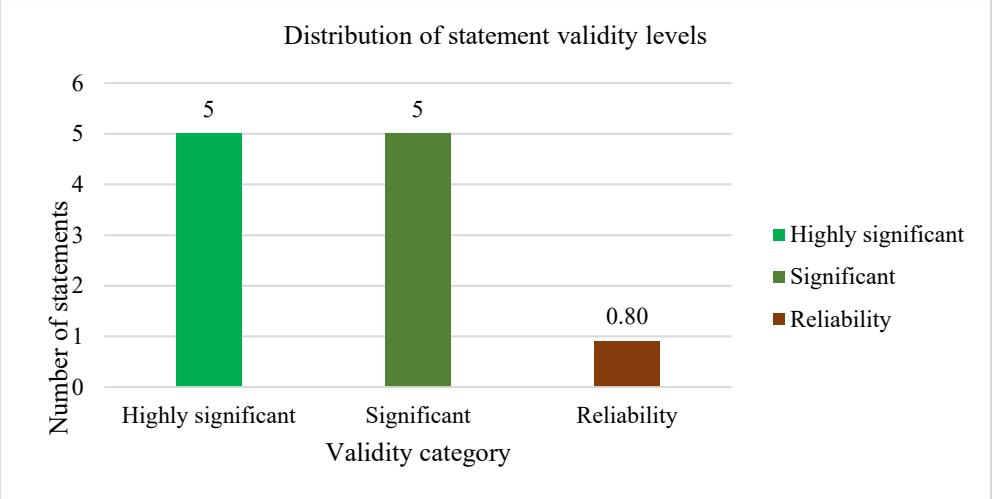

Figure 1. Graph Validity and Reliability Test

Based on Figure 1, the validity test conducted on 50 respondents and 50 question items (P1–P10) showed that all items had significant item total correlation values (either significant or highly significant correlations). This indicates that each item is capable of measuring the intended construct; therefore, the questionnaire is declared valid for further distribution. Validity refers to the extent to which an instrument measures what it is supposed to measure (Destrianto, 2023).

The results of the reliability test showed that the Cronbach's Alpha value was 0.80, which, according to general criteria, falls into the "highly reliable" category. According to Ghozali (2001), a Cronbach's Alpha value above 0.60 indicates acceptable reliability, while a value above 0.80 is considered very good. This finding is supported by Tavakol & Dennick (2011), who stated that an alpha value between 0.70 to 0.95 indicates good internal consistency, while an excessively high value (>0.95) may suggest redundancy among items. Thus, these results indicate that the instrument used has a high level of internal consistency and is suitable for use in the main research phase.

However, since the test was conducted with only 50 respondents, the reliability estimate remains preliminary and should be re-tested with a larger sample size to achieve more stable and representative results. Bujang *et al*. (2018) and Bujang and Baharum (2024) explained that small sample sizes (<30) in reliability testing can lead to unstable Cronbach's Alpha estimates; hence, further testing with an adequate number of respondents is necessary.

Moreover, the use of Cronbach's Alpha has several limitations, such as the assumptions of unidimensionality and tau-equivalence, which are often not fully met. Therefore, it is recommended to complement the reliability analysis with alternative methods such as McDonald's Omega, which is considered more accurate for measuring construct reliability, especially when the alpha assumptions are not fully satisfied (Dunn *et al*., 2014). Additional analyses such as Exploratory Factor Analysis (EFA) or Confirmatory Factor Analysis (CFA) are also suggested to examine unidimensionality and the underlying structure of the measured constructs (Hair *et al*., 2020).

Overall, the results of the validity and reliability tests indicate that the research instrument used in this study is of good quality in measuring the studied variables. The questionnaire is deemed appropriate for distribution to the main research respondents, with a note that re-testing on a larger sample size is necessary to confirm the stability of the reliability value.

Farmers' Perception Test

Perception is a psychological process that involves how a person evaluates, understands, and interprets an object or information received, either through direct experience or certain media. Perception is influenced by one's experiences, knowledge, and social environment, so each individual may assess the same object in different ways (Rahman *et al*., 2021).

Extension activities represent a person's engagement in an activity through conscious communication of information aimed at helping others, thereby enabling them to make the right decisions (Van den Ban and Hawkins, as cited in Juriko, 2019). In the context of agricultural extension, farmers' perception of social media is important because it determines the extent to which they are willing to accept and utilize information technology as a means

of agricultural learning and communication (Fitriani *et al*., 2022). Based on field findings, the farmers' perception of social media is presented in **Figure 2.**

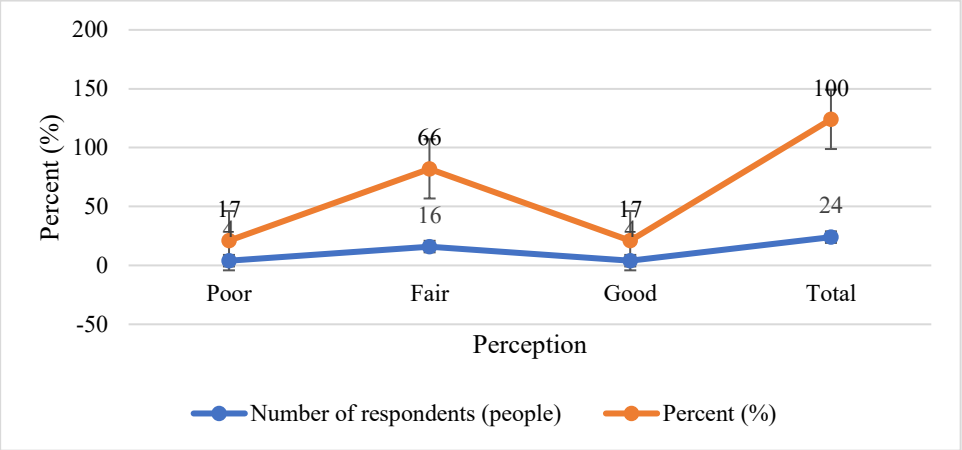

Figure 2. Graph Farmers' Perception Test

Based on field findings shown in Figure 2, it was found that farmers' perceptions regarding the use of social media by agricultural extension workers varied in terms of acceptance levels. A total of 17% of farmers had a poor perception, 66% had a fairly good perception, and 17% had a good perception of the use of social media in extension activities. The highest percentage in the "fairly good" category (66%) indicates that most farmers have recognized the benefits of social media as a source of agricultural information; however, there are still obstacles to its optimal application.

This finding aligns with Ardila *et al*. (2021), who stated that farmers' perceptions of digital media largely depend on factors such as age, education, and frequency of gadget use. Younger farmers with better internet access tend to have a more positive perception of social media as a communication tool for extension activities. Nevertheless, limitations in digital literacy and technical skills often remain the main challenges for farmers in rural areas (Nasution *et al*., 2023).

Extension activities are essentially a two-way communication process aimed at improving farmers' knowledge, skills, and attitudes through structured information exchange (Van den Ban & Hawkins, as cited in Juriko, 2019). In the digital era, the form of agricultural extension has transformed from face-to-face interactions into *cyber extension* based on social media platforms such as WhatsApp, Facebook, and YouTube (Indrawati *et al*., 2020; Lestari *et al*., 2024a). Although these platforms can broaden the reach of agricultural information, recent studies show that the effectiveness of digital extension remains limited due to low levels of direct interaction and limited feedback between extension agents and farmers (Prayoga *et al*., 2022; Rahmawati *et al*., 2025).

This condition is also reflected in the present study, where some farmers expressed dissatisfaction with social media–based extension activities, particularly regarding their understanding of the material and opportunities for discussion. The difficulty in understanding the material is attributed to farmers' limited ability to use digital devices, poor internet connectivity in rural areas, and the predominantly one-way delivery of materials (Wulandari *et al*., 2023).

Therefore, although the results indicate that farmers' perception of social media utilization falls into the "fairly good" category, agricultural extension workers need to innovate their communication approaches to make digital extension activities more interactive and contextual. The *blended extension* approach combining face-to-face and digital methods has been increasingly recommended to bridge the gap between extension workers and farmers (Saragih *et al*., 2025). Furthermore, enhancing farmers' digital literacy through community-based training programs is an essential step to support the transformation of agricultural extension in the era of the Industrial Revolution 5.0 (Putri *et al*., 2024).

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Spearman's Rank Correlation Test

Table 1. Spearman's Rank Correlation Test

Variable	Correlation Coefisien		Correlation
	x	y	
Relative advantage	0.80**	0.80**	Perfectly correlated
Compatibility	0.80**	0.80**	Perfectly correlated
Complexity level	0.80**	0.80**	Perfectly correlated
Observability	0.80**	0.80**	Perfectly correlated
Trialability	0.80**	0.80**	Perfectly correlated

Note: ** indicates highly significant results.

Based on the statistical test results presented in Table 1, the Spearman's Rank correlation coefficient (ρ) was found to be *Spearman's rho > 0.80, p < 0.01*, indicating a perfect and positive correlation between all independent variables (relative advantage, compatibility, complexity, observability, and trialability) and the dependent variable farmers' perception of social media–based agricultural extension. According to the interpretation criteria for correlation coefficients, when ρ falls within the range of 0.80–1.00, the relationship between variables is categorized as very strong (Budiman *et al*., 2024).

This result indicates that the higher the farmers' perception of innovation attributes such as relative advantage and compatibility with their conditions, the greater their level of acceptance and participation in social media–based extension programs. This finding aligns with the studies of Nuraini *et al*. (2021) and Widodo *et al*. (2023), which state that relative advantage and compatibility are the main factors influencing the adoption rate of digital innovations in agricultural extension. Farmers who perceive digital extension technologies as beneficial for improving knowledge, saving time, and providing easy access to information tend to have a positive perception and are more likely to adopt them sustainably.

Moreover, the factors of complexity and observability also play an important role in farmers' acceptance of technology. The simpler and easier a social media platform is to operate, the higher the likelihood that farmers will actively participate (Fitriani & Hidayat, 2022). In the context of digital extension, the ease of use of applications such as WhatsApp or Facebook is often the main consideration compared to more complex platforms (Ardila *et al*., 2021).

The trialability factor also has a significant effect on farmers' perceptions. Providing opportunities to try out extension media directly before regular implementation increases farmers' confidence in adopting new technologies (Rahmawati *et al*., 2025). These results reinforce Rogers' Diffusion of Innovations Theory, which explains that the adoption of an innovation is largely determined by perceptions of its attributes particularly relative advantage, compatibility, complexity, observability, and trialability (Lestari *et al*., 2024b).

Evaluation Results

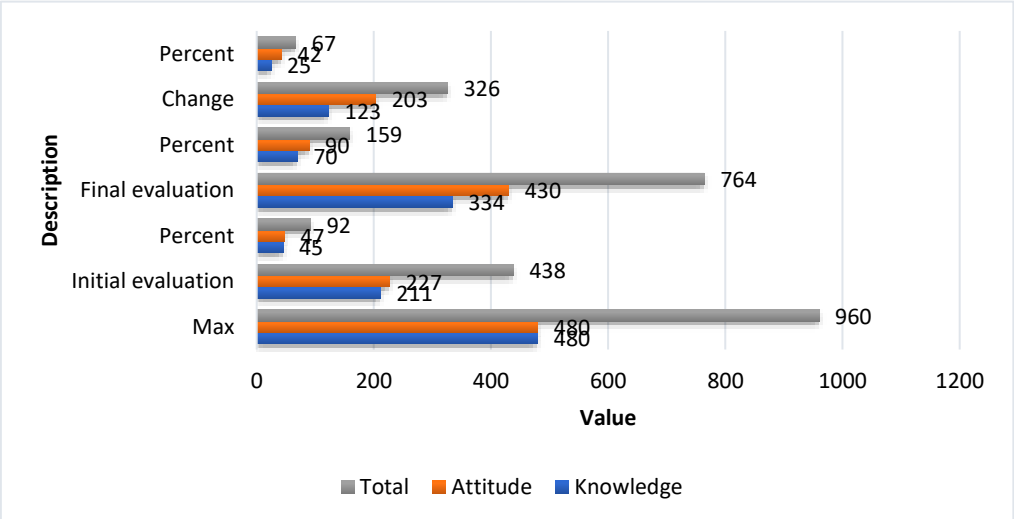

Figure 3. Graph Evaluation Results

Based on the results presented in Figure 3, there was an increase of 24.6% in the knowledge aspect and 42.3% in the attitude aspect after the implementation of social media based agricultural extension activities. This indicates that digital extension has a positive impact on farmers' cognitive and affective changes. The increase in knowledge suggests that social media has functioned as an effective medium for disseminating agricultural information quickly and widely (Putri *et al*., 2024). Meanwhile, the improvement in attitude reflects a shift in farmers' perspectives regarding the benefits of information technology in supporting their farming activities.

Wulandari *et al*. (2023) also reported that social media–based extension activities can enhance farmers' enthusiasm and confidence to participate in modern agricultural programs. However, the effectiveness of such activities largely depends on the ability of extension workers to present materials in an engaging and easy-to-understand manner, as well as to provide interactive discussion spaces.

Although the results show positive improvements, several challenges remain, such as farmers' limited digital literacy, poor internet connectivity in rural areas, and a lack of two-way interaction (Nasution *et al*., 2023). Therefore, a blended extension strategy a combination of digital and face-to-face methods is needed to make information delivery more effective and adaptable to local conditions (Saragih *et al*., 2025).

Overall, the findings of this study demonstrate that farmers' positive perceptions of innovation attributes, along with improvements in knowledge and attitudes, indicate the success of social media–based agricultural extension. Nevertheless, improving the quality of interaction and providing direct assistance remain essential to ensure that social learning processes among farmers can be sustained.

CONCLUSION

Based on the results of this study, the perception of farmers in the Minasa Baji farmer group regarding the use of social media in agricultural extension is categorized as fairly good according to the Likert-scale questionnaire. The Spearman's Rank correlation test showed a very strong correlation Spearman's rho > 0.80, $p < 0.01$between the variables of relative advantage, compatibility, complexity, observability, and trialability with farmers' perception, indicating that all these variables are interrelated and influence perceptions of digital extension. Evaluation results demonstrated an increase of 24.6% in knowledge and 42.3% in attitude, with a total effectiveness of 62.45% based on the Wilcoxon test. This indicates that the use of social media in agricultural extension can enhance farmers' understanding and attitudes toward technology-based agricultural innovations.

Based on the results, it is recommended that agricultural extension agents systematically utilize social media as a complementary extension tool by delivering simple, practical, and visually engaging content to reduce complexity and enhance observability and trialability among farmers. Policymakers should integrate social media–based extension into formal agricultural extension systems by strengthening digital capacity building for extension agents and improving rural internet infrastructure. Future research should focus on broader farmer populations and apply longitudinal approaches to evaluate the long-term impacts of digital extension on technology adoption, productivity, and farmers' welfare.

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