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Research Article

Extension Workers' Responsiveness in Providing Digital Competence to Young Farmers in Indonesia

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Abstract

This study assessed extension workers' responsiveness in providing extension services to young farmers (male and female) and its effect on digital competence in Indonesia. A quantitative survey was conducted with 214 young farmers in Solok Regency, West Sumatra, Indonesia. Data on extension workers' perceived responsiveness were collected through a structured questionnaire and analysed using descriptive statistics, Spearman's correlation, and an independent samples t-test. The results showed that female and male farmers perceived extension workers' responsiveness as high for the professional dimension (92.8% and 82.5%) as well as for the personal dimension (94.6% and 92.2%), respectively. However, social responsiveness was perceived as moderate by 73.9% of male farmers and 64.1% of female farmers, respectively. There was a positive and significant association between extension workers' responsiveness and young farmers' digital competence ($\rho = 0.373$), and a significant difference in digital competence between young male and female farmers ($t = 3.388$). These findings highlight the need for extension institutions and government agencies to collaborate to develop more inclusive, gender-responsive extension approaches through practical training and improved access to digital technologies.

Introduction

The development of information and communication technology (ICT) has accelerated the transformation of the agribusiness sector toward more efficient, productive, and sustainable systems. Digital technologies can improve efficiency, add value, and enhance the competitiveness of agricultural products (Oyelami et al., 2022) and are increasingly applied across agribusiness value chains through technologies such as the Internet of Things (IoT), blockchain, and digital extension systems (Finger, 2023). However, agricultural digitalisation continues to face challenges, particularly limited infrastructure, internet access, and farmers' digital competence (Ahsan et al., 2022).

In many agricultural areas of Indonesia, including West Sumatra Province, digital technology is still mainly used for basic communication, while its use for digital marketing, business decision-making, and agribusiness networking remains relatively limited (Fharaz et al., 2022). This issue is also relevant to Solok Regency, where digital transformation among young farmers remains an emerging process. Such limitations may affect market access and the competitiveness of farming enterprises (Ueno, 2022). These conditions indicate that agricultural digital transformation depends not only on the availability of technology but also on farmers' ability to use it productively.

Digital competence includes the ability to access information, use digital applications, conduct online transactions, and build digital-based business networks (Ferrari, 2012). Digital competence is increasingly important for young farmers, as digital technologies provide opportunities to access agricultural information, communicate with market actors, promote products, and support agribusiness activities (Sasmita et al., 2024). However, access to digital technologies alone does not ensure their effective use for agricultural purposes. Agricultural extension workers can support this process by helping farmers access relevant information, address problems, and develop the knowledge and skills needed for farming and agribusiness. Their responsiveness is therefore particularly relevant to young farmers' learning needs as agricultural information and learning increasingly involve digital technologies. Extension approaches that emphasise gender

equality and social inclusion can further provide more equitable learning and empowerment opportunities for young farmers (Puspita et al., 2026).

This issue is also relevant from a gender perspective, as women farmers may face greater constraints in accessing and using digital technologies, including limited training, economic opportunities and participation in technology-related activities (Sufian et al., 2023). Preliminary field observations also indicated differences between young male and female farmers in the use of digital applications, online marketing, and business networks. These findings provide a basis for examining gender differences in digital competence and the association between extension workers' responsiveness and digital competence. Drawing on Kassem et al. (2021) conceptualisation of responsiveness in extension services, this study defines extension workers' responsiveness as the provision of professional, personal, and social support to address young farmers' agricultural and digital information needs.

However, limited research has examined the association between extension workers' responsiveness and young farmers' digital competence while considering gender differences, particularly in the context of agricultural extension in Indonesia. Based on these conditions, this study assessed:

1. the level of extension workers' responsiveness in the provision of extension service among male and female extension workers;
2. analyse the correlation between extension workers' responsiveness and the digital competence of young farmers (male and female); and;
3. examine differences in digital competence between young male and female farmers.

This is to serve as a basis for developing a more inclusive and gender-responsive agricultural extension model.

Methodology

This study was conducted in Solok Regency, West Sumatra, Indonesia, which covers approximately 3,738 km² and is characterised by mountainous terrain and an agriculture-based economy (BPS Solok Regency, 2024). The main agricultural commodities include rice, horticulture, and smallholder plantation crops. Solok Regency was selected because it is an important agricultural centre in West Sumatra where digital technologies are increasingly used in agribusiness activities, particularly among young farmers.

The study targeted young farmers aged 19–39 years who had participated in training programmes related to digital competence and farming capacity and were members of young farmer communities. The population comprised 480 young farmers. Using the Isaac and Michael formula with five percent error rate, 214 respondents were selected as the sample.

Data were collected through structured questionnaires and complementary field interviews. The questionnaire measured farmers' perceptions of extension workers' responsiveness and digital competence, while interviews provided contextual explanations of the quantitative findings. The questionnaire was tested for validity and reliability before data collection. The Social and Humanities Research Ethics Committee of IPB University granted ethical approval (Ethical Clearance No. 2262/IT3.KEP-

IPB/SK/2026). Participation was voluntary, and respondents were informed of the study objectives, procedures, and data confidentiality before completing the questionnaire.

In this study, responsiveness refers to the extent to which extension workers provide professional, personal, and social support to address young farmers' agricultural and digital information needs. It was measured using a four-point ordinal scale based on farmers' perceptions and categorised as low, moderate, or high. The indicators of digital competence were included: information literacy, use of digital applications, digital transaction capabilities, and utilisation of digital media for agribusiness activities. The indicators were measured using a four-point rating scale ranging from "not capable" to "highly capable".

Percentages were used to describe extension workers' responsiveness and young farmers' digital competence. Spearman's rank-order correlation was used to examine the association between extension workers' responsiveness and digital competence, while an independent-samples t-test was conducted to compare digital competence between young male and female farmers.

Results and Discussion

Perceptions of Extension Workers' Responsiveness among Young Male and Female Farmers

Table 1 shows that both young male and female farmers rate the responsiveness of agricultural extension workers highly. However, differences were observed regarding certain dimensions of their responsiveness. The high level of responsiveness indicates that extension services are perceived as gender-responsive and that extension workers can provide assistance and access to information that meet specific needs.

The results show that 92.8% of young female farmers and 82.5% of young male farmers rated the professional responsiveness of extension workers as high, with scores of 72.1% and 78.9%, respectively. These findings suggest that extension workers are perceived as responsive in providing technical services, guidance, and agricultural information to both groups, with higher ratings from women. Such responsiveness is crucial for supporting the farmers' learning process. The quality of interaction and technical support provided by extension workers can strengthen farmers' capacity to carry out their farming activities.

Table 1: Perception of extension workers' responsiveness

Indicators	Score	Category	Female Percentage (%)	Male Percentage (%)
Professional: Technical recommendations and assistance, including guidance on digital agricultural applications.	0.0 – 33.3	Low	0	0
	33.4 – 66.6	Moderate	7.2	17.5
	66.7- 100.0	High	92.8	82.5
Personal: Positive attention, responsiveness to farmers' concerns, and opportunities to express problems.	0.0 – 33.3	Low	0	0
	33.4 – 66.6	Moderate	5.4	7.8
	66,7 – 100.0	High	94.6	92.2
Social: Friendly communication, opportunities to speak, motivation, and home visits.	00.0 – 33.3	Low	0.9	6.8
	33.4 – 66.6	Moderate	73.9	64.1
	66.7 – 100.0	High	25.3	29.1

Source: field survey 2026

Personal responsiveness was also categorised as high among both female (94.6%) and male (92.2%) farmers, with scores of 69.1 and 77.3. In the field, extension workers are considered open to receiving complaints and meeting the needs of young farmers without gender discrimination. Communication occurs through formal outreach activities and informal interactions. In this case, extension workers act as communication partners and sources of consultation for young farmers in facing various agricultural challenges. The participatory communication approach is considered effective in increasing farmer involvement in the extension learning process (Prajapati et al., 2025).

Social responsiveness was mostly rated as moderate among female (73.9%) and male (64.1%) young farmers, with scores of 51.7 and 50.9. The result also indicates limited opportunities for active participation and interaction. Interviews showed that women actively attended extension activities but tended to be less vocal, partly due to social and cultural norms emphasising respect in public forums. Their participation was higher when topics addressed household needs and familiar agricultural activities, but lower for technical cultivation and digital technology, which were perceived as more difficult to learn. This highlights the importance of social context and material relevance in encouraging women's participation in extension services (Njoku et al., 2025).

Although extension services in Solok Regency were generally perceived as responsive, strengthening women's active participation in communication, group activities, and

agricultural learning remains important. More inclusive, flexible, and participatory extension approaches are needed to support equitable digital competence development among young farmers. This study further extends the understanding of extension workers' responsiveness by highlighting its relevance to digital competence, suggesting that responsiveness involves not only access, participation, and service delivery, but also support for learning and the practical use of digital technologies in agriculture.

The Relationship between Extension Wworkers' Responsiveness and Young Farmers' Digital Competence

The analysis presented in Table 2 shows a positive and significant association between extension workers' responsiveness to young farmers' agricultural and digital information needs and their digital competence (ρ = 0.373). This finding suggests that young farmers who perceived higher levels of responsiveness from extension workers also tended to demonstrate higher levels of digital competence.

In the context of agricultural digitalisation, the role of extension workers extends beyond conventional agricultural learning to helping farmers access, understand, and use digital information and technologies. Studies in Indonesia show that extension workers increasingly use digital tools for information delivery, online consultation, digital learning, and communication with farmers (Puspaningtyas et al., 2024; Sugihono et al., 2025). Such support is relevant for young farmers who use digital technologies to access information, market products, and conduct agribusiness transactions, making digital skills important for the productive use of ICT and digital extension services (Sasmita, 2026).

Table 2: Correlation between extension workers' responsiveness and young farmers' digital competence

Variable	Spearman Coefficient (ρ)
Extension workers' responsiveness ◄⟶► digital competence	0.373*

*** P < 0.001.**

Nevertheless, complementary field interviews indicated that digital technologies were not always used productively. Several informants reported that smartphones were sometimes used more for entertainment than for agricultural activities, which they perceived as reducing young people's attention to farming. This finding suggests that access to digital devices alone does not ensure productive use and that strengthening digital competence should also involve the ability to use technology appropriately to support agricultural and agribusiness activities.

In this context, extension workers serve as facilitators who can help young farmers use digital technologies more effectively. Studies in Indonesia also indicate increasing demands for extension workers to develop digital competencies and integrate digital tools into information delivery and communication with farmers (Sugihono et al., 2025). From a gender perspective, extension services should provide inclusive and participatory

learning environments that consider the circumstances of both male and female farmers. This is consistent with research on gender-responsive extension, which highlights the importance of strengthening extension workers' capacity to support women's participation and empowerment through participatory approaches (Amanah et al., 2026; Ragetlie et al., 2022).

These findings extend the understanding of participatory extension by suggesting that meaningful participation involves not only farmers' involvement in extension activities and decision-making but also opportunities to acquire and apply digital knowledge and technologies. In this context, extension workers' responsiveness can be viewed as part of the institutional support associated with developing young farmers' digital competence.

Difference in Digital Competence between Young Male and Female Farmers

Table 3 shows a significant difference in digital competence between young male and female farmers (t = 3.388), with a higher mean score among males (83.59 ± 14.08) than females (77.83 ± 10.41). This finding indicates a gender disparity in digital competence among young farmers. Field interviews further indicated that young male farmers tended to use digital applications more actively for agribusiness marketing and transactions, while some female farmers used smartphones mainly for family communication and basic information. This suggests that the difference in digital competence may also be reflected in how digital technologies are used for productive agricultural activities. Previous studies similarly report that women farmers face greater barriers to accessing and using digital technologies and agricultural information, including limited training, infrastructure, education, and sociocultural constraints (Ragetlie et al., 2022; Sufian et al., 2023).

Extension workers play an important role in creating more participatory learning environments that provide young female farmers with greater opportunities to express their needs and participate in agricultural learning. This finding is consistent with (Fatchiya et al., 2025) who highlighted the need for agricultural extension policies to better accommodate women farmers' needs, participation, and access to agricultural development. In the context of digitalisation, gender-responsive digital extension can further support women's access to agricultural information, learning, and digital technologies (Ragetlie et al., 2022).

Table 3: Differences in digital competence of young male and female farmers

Gender	Mean	Stdev	t-statistic
Male	83.59	14.08	3.388*
Female	77.83	10.41	

***P<0.001**

Conclusion and Recommendations

Young male and female farmers generally perceived extension workers as responsive, particularly in the professional and personal dimensions. Extension workers' responsiveness was positively and significantly associated with young farmers' digital competence, while a significant difference in digital competence existed between male

and female farmers. These findings highlight the need for extension institutions and government agencies to strengthen inclusive and gender-responsive extension through practical training and improved access to digital technologies.

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