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The Influence of Digital Media (Webinars and Online Training) on the Capacity Development of Agricultural Extension Workers

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Abstract
This study aims to analyze the effect of digital media—specifically webinars and online training—on the capacity development of agricultural extension workers. A quantitative approach was employed using a survey method, with data analyzed through multiple linear regression using IBM SPSS. Digital media were measured through seven sub-variables: accessibility, content quality, interactivity, utilization, ease of use, effectiveness, and information reach and distribution. The results indicate that all digital media variables simultaneously have a significant effect on the capacity development of extension workers. However, partial analysis reveals that only interactivity, ease of use, and effectiveness have a positive and significant influence, while the other variables show no significant effect. These findings suggest that the effectiveness of digital media in enhancing extension capacity is determined not merely by access or information availability but by the quality of learning processes and the practical relevance of materials. The study concludes that digital media should be designed as interactive, user-friendly, and effective learning tools. The implications of this study provide a basis for improving digital training policies and strategies within agricultural extension systems.
Keywords: Digital Media; Capacity Building; Agricultural Extension; Webinars and Online Training

INTRODUCTION

The Ministry of Agriculture continues its efforts to achieve sustainable food self-sufficiency, supporting Indonesia's goal of becoming the world's food barn by 2045. The role of agricultural extension workers is crucial, as agricultural extension itself is an out-of-school education system designed to develop farmers' abilities—knowledge, attitudes, and skills. As a vital component of agricultural extension activities, extension workers are expected to enhance their capacity to effectively carry out their roles. Low capacity among extension workers can lead to a decline in extension activities due to weak interaction between extension workers and farmers. One approach to improving extension worker capacity is through the use of information and communication technology (ICT) (Lamm et al., 2019; Mugwisi et al., 2015; Nyarko & Kozári, 2021).

Sustainable adoption of innovation and capacity building among extension workers can be achieved through an approach that emphasizes both personal capacity and the capacity of their resources (Arowosegbe et al., 2024; Jayalekshmi & Mohanraj, 2024; Pandey et al., 2025). According to Sumardjo (2018), millennial extension workers, who are the mainstay of extension implementation, must master modern empowerment processes that utilize ICT and align with the Industrial Revolution 4.0. One key qualification is ICT literacy. The development of ICT has brought significant changes to agricultural extension methods. The digitalization of information is increasingly widespread within Indonesian society, creating broader learning opportunities and indicating a shift in learning paradigms—from constructivism to connectivism (Belawati, 2019). In the current information technology era, extension workers as learners not only compile learning outcomes from conventional training but also engage in learning through networks. Learning activities are now more dominated by

the exploration of ideas and discussions within online connections, where each learner can act as a critical peer and support one another through internet-based learning (e-learning).

Digital transformation in the agricultural sector is encouraging the use of digital media as tools for learning and capacity development among agricultural extension workers (Bhat et al., 2024; Keerthi et al., 2025; Priya et al., 2025; Sugihono et al., 2022). Webinars and online training offer flexible learning alternatives, enabling extension workers to access the latest information on cultivation technology, pest and disease control, agribusiness, and agricultural policies without leaving their assigned areas. Digital media also facilitate two-way interactions between resource persons and participants through online discussions, ensuring a participatory learning process. The use of webinars and online training has proven effective in improving the knowledge, skills, and professional attitudes of agricultural extension workers—particularly in addressing the dynamics of technological change and the increasingly complex needs of farmers. Through these activities, extension workers can access various learning resources, expand their professional networks, and enhance digital literacy, a crucial competency in the modern agricultural era (Asante, 2024; Rony & Heryadi, 2024; Syafuddin & Meidina, 2023). Online learning also supports the concept of lifelong learning for agricultural extension workers.

Current conditions indicate that the capacity of extension workers in Indonesia remains relatively low. Several previous studies have shown that this low capacity is reflected in weak competencies related to understanding regional potential, managing training, learning, communicating innovations, entrepreneurship, and navigating network systems (the internet). Research by Damanik (2011) also shows that extension workers often encounter difficulties in obtaining necessary information. As a result, their limited capacity hinders optimal performance as agents of change and impedes farming communities from achieving the desired behavioral transformations.

Extension organizations need to establish the level of competence required to identify expected performance standards. Clear competency thresholds for extension workers can serve as the foundation for selection processes, succession planning, performance evaluation, and competency development at various qualification levels. According to Setyowati (2015), extension worker competence comprises five key characteristics: (1) motives, (2) traits, (3) self-concept, (4) knowledge, and (5) skills.

Anwas's (2019) research on media utilization among extension workers indicates that the level of media use remains relatively low, partly due to limited motivation to utilize available media effectively. This low level of motivation affects the effectiveness of extension activities, as media play an essential role in facilitating information dissemination, enhancing audience engagement, and supporting learning processes. Consequently, inadequate media utilization may reduce the reach and impact of extension programs. These findings underscore the need to strengthen extension workers' motivation and capacity in media use through targeted training, institutional support, and the provision of appropriate technological resources to improve overall performance and service delivery.

Extension workers also face difficulties in accessing formal learning opportunities, as their work predominantly takes place in the field. Capacity development for agricultural extension workers is crucial given the increasing complexity of agricultural issues, such as climate change, productivity demands, environmental sustainability, and global market

dynamics. Extension worker capacity encompasses technical, methodological, social, and managerial skills, which must be continually updated to enable them to respond effectively to the evolving needs of farmers. Capacity development is an ongoing process aimed at enhancing the capabilities of individuals, organizations, and systems to achieve objectives efficiently and sustainably. In the context of agricultural extension, capacity development not only involves strengthening technical knowledge but also improving communication skills, information technology use, and problem-solving abilities at the field level..

Cirebon Regency currently has 224 agricultural extension workers spread across 40 Agricultural Extension Centers (BPP). These BPPs oversee 40 sub-districts, 412 villages, and 12 urban villages within the regency.

Data on the number of agricultural extension workers in Cirebon Regency can be seen in the following table.

Table 1. Number of Extension Workers at the Cirebon Regency Agricultural Service in 2025

No	Description	Honorarium (source of funds)			Employee		Total Employees
		State Budget	Regional Budget I	Regional Budget II	Civil Servant (PNS)	PPPK	
1	Civil Servant Extension Worker (PNS)	85			85		85
2	PPPK Extension Worker		6	87		93	93
3	THL TB-PPD		46				46
Total		**85**	**52**	**87**	**85**	**93**	**224**

Based on data from the Cirebon Regency Agriculture Service, the number of agricultural extension workers is recorded at 224, consisting of several employee categories. Extension workers with Civil Servant (PNS) status number 85, Provincial PPPK number 6, Regional PPPK number 87, and Daily Casual Workers Regional Agricultural Extension Assistants (THL–TBPPD) number 46. These workers are distributed across various work areas under the Agricultural Extension Centers (BPP) in Cirebon Regency.

Capacity development for agricultural extension workers in Indonesia is also mandated by the national extension system. Law Number 16 of 2006 emphasizes that extension workers must possess adequate competencies to carry out their extension duties professionally. Various studies have shown that there are still gaps in the capacity of extension workers, particularly in mastering technology, applying extension methods, and using digital media to support extension activities (Mardikanto & Soebiato, 2013). Capacity development for agricultural extension workers is therefore a strategic and continuous effort to improve extension performance and support the success of national agricultural development. Planned and systematic capacity development initiatives are expected to enhance the professionalism of extension workers, strengthen their roles in farmer empowerment, and promote an advanced, independent, and sustainable agricultural system.

Following the findings of Farida et al. (2023), Gitosaputro et al. (2025), and Thamrin et al. (2023), the utilization of information and digital technology by agricultural extension workers remains varied. On one hand, the use of information technology among extension workers tends to be low, primarily due to limited access to cyber and conventional media, age factors, limited availability of communication technology devices, and differences in information needs. Younger extension workers are generally more active in accessing digital media than older ones; however, the information obtained is not always fully disseminated to farmers, resulting in disparities in the utilization of agricultural information. The capacity of agricultural extension workers in several regions is relatively high and influenced by factors such as farmers' innovation needs, extension progress, sources of innovative technology, and the ability to access, evaluate, and create using cyber extension. The implementation of digital technology in the new normal era, such as cyber extension and smart farming, has been shown to improve the performance of agricultural extension workers through streamlined administration, efficient distribution of assistance, and enhanced effectiveness and efficiency of extension services.

The urgency of this research arises from several pressing factors. First, the Indonesian government has invested significant resources in developing digital infrastructure and online training platforms for extension workers, yet the outcomes and return on investment remain unclear without empirical evidence on what strategies are most effective. Second, as the agricultural sector faces increasingly complex challenges—including climate variability, pest outbreaks, and market fluctuations—extension workers must continuously upgrade their skills through effective learning modalities. Third, the findings of this study are expected to inform policy decisions regarding the design and implementation of digital training programs, ensuring that resources are allocated to elements that genuinely enhance capacity rather than those that merely increase access.

Based on the background description above, it can be concluded that developing the capacity of agricultural extension workers through digital media—particularly webinars and online training—is a critical measure to improve their competence and performance in addressing the challenges of modern agricultural development. This research was conducted to analyze the influence of digital media use, especially webinars and online training, on the capacity development of agricultural extension workers, particularly within the Cirebon Regency Agriculture Office. The findings are intended to serve as a foundation for formulating sustainable policies and strategies for strengthening agricultural extension.

METHOD

This study employed a descriptive quantitative method. The research technique used in this study was a survey. According to Sugiyono (2019), a descriptive quantitative research method is a method used to systematically, factually, and accurately describe a phenomenon, event, or situation regarding the facts and characteristics of a specific population or area. This study utilized IBM SPSS Statistics 25 software for data processing and analysis.

The population in this study consisted of ASN (Civil Servants or PNS and PPPK) extension workers of the Cirebon Regency Agriculture Service. The sampling technique used was proportional stratified random sampling. According to Sugiyono (2019), proportional stratified random sampling is a sampling technique used when the population has members or elements that are not homogeneous

and are stratified proportionally, meaning the number of samples from each stratum is determined based on its proportion within the population.

Research data were obtained from both primary and secondary sources. Primary data collection was conducted through a questionnaire. According to Sugiyono (2019), a questionnaire is a data collection technique that involves providing respondents with a set of written questions or statements to answer.

Data analysis in this study included validity testing, reliability testing, classical assumption testing, multiple linear regression, coefficient of determination, descriptive analysis, and hypothesis testing. All analyses were conducted using IBM SPSS Statistics 25 to ensure the accuracy, consistency, and feasibility of the analytical model in examining the influence of digital media (webinars and online training) on the capacity development of agricultural extension workers.

Instrument validity was tested using the product moment correlation with a significance criterion of <0.05, while reliability was measured using Cronbach's Alpha with a minimum acceptable value of 0.60. Classical assumption tests included normality (Kolmogorov–Smirnov), linearity, and multicollinearity (VIF and tolerance) as prerequisites for regression analysis. Multiple linear regression models were used to analyze the relationship between independent and dependent variables, complemented by coefficient of determination (R^2) testing to assess the contribution of independent variables. Descriptive analysis was applied to describe respondents' perceptions, while hypothesis testing was conducted through t-tests and F-tests to determine the partial and simultaneous effects of the independent variables on the dependent variable.

RESULT AND DISCUSSION

The number of respondents in this study was 30 people, so the *r* table value can be determined as a basis for testing the validity of the research instrument. Determination of the *r* table value is done by calculating the degrees of freedom (degree of freedom/df) using the formula df = n - 2, so that df = 30 - 2 = 28 is obtained. With these degrees of freedom and a significance level (α) of 0.05, based on the Pearson Product Moment correlation coefficient table, the r table value is 0.361.

The validity test results indicate that all statements in the research instrument are valid. This is indicated by the calculated r value for each statement item, which is greater than or equal to the table r value (0.361). Thus, each statement item has an adequate correlation with the total score of the measured variable.

Based on these results, it can be concluded that the research instrument used met validity criteria, ensuring that all statement items accurately and representatively measured the research variables. This valid instrument is then suitable for use in the next stage of analysis to obtain accurate and scientifically accountable research results.

Table 2. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
,907	52

Table 3. Results of the Kolmogorov-Sminorv Test for Normality

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		64
Normal Parameters [a,b]	Mean	.0000000
	Standard Deviation	28.15441020
Most Extreme Differences	Absolute	.094
	Positive	.072
	Negative	-.094
Test Statistics		.094
Asymp. Sig. (2-tailed)		.200 [c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

The results of the One-Sample Kolmogorov Smirnov normality test show an Asymp. Sig. (2-tailed) value of 0.200 (> 0.05), so it can be concluded that the residuals are normally distributed. Thus, the normality assumption in the analysis model has been met and the data is suitable for use in subsequent statistical tests, namely the T test, F test, and coefficient of determination.

Table 4. Multicollinearity Test Results

Coefficients [a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	X1	.473	2.115
	X2	.462	2,167
	X3	.582	1,719
	X4	.550	1,818
	X5	.591	1,691
	X6	.768	1,303
	X7	.728	1,373

a. Dependent Variable: Y

Based on the results of the multicollinearity test in the regression model above, all independent variables (X1–X7) have a tolerance value above 0.1 and a Variance Inflation Factor (VIF) value below 10. The tolerance value ranges from 0.462 to 0.768, while the VIF value is in the range of 1.303 to 2.167. These results indicate that there is no high correlation between the independent variables in the model. Therefore, it can be concluded that the regression model is free from multicollinearity symptoms, so that each independent variable (X) can explain the dependent variable (Y) accurately and the regression estimation results can be interpreted validly.

Table 5. Simultaneous F-Test Results

ANOVA [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59196,801	7	8456,686	20,816	,000 [b]
	Residual	22750,308	56	406,256		

Total	81947,109	63			

a. Dependent Variable: Y

b. Predictors: (Constant), X7, X6, X2, X5, X3, X4, X1

Based on Table 16, the calculated F value is 20.816 with a significance level of 0.000, which is <0.05. These results indicate that the independent variables X1, X2, X3, X4, X5, X6, and X7 simultaneously have a significant effect on the dependent variable (Y). Therefore, the regression model used is declared feasible and can be used to explain the relationship between the independent variables and the dependent variable. Thus, the results of this F test prove that the multiple regression model is overall significant and all independent variables together contribute to changes in the dependent variable (Y).

Table 6. Partial t-test results

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-36,288	29,509		-1,230	,224
	X1	-2,388	1,805	-,136	-1,323	,191
	X2	3,128	2,218	,146	1,410	,164
	X3	9,180	2,523	,336	3,639	,001
	X4	3,183	1,958	,154	1,626	,110
	X5	6,604	1,867	,324	3,538	,001
	X6	5,242	2,033	,207	2,578	,013
	X7	2,275	1,786	,105	1,274	,208

a. Dependent Variable: Y

The t-test is conducted to determine whether each independent variable (X) has a significant influence on the dependent variable (Y). The test criterion is that if the Sig. value is < 0.05, then the variable has a significant influence.

Multiple regression analysis is used to measure the extent to which several independent variables simultaneously influence the dependent variable. In this study, the independent variable studied is digital media (webinars and online training) with sub-variables including accessibility (X1), content quality (X2), interactivity (X3), utilization (X4), ease of use (X5), effectiveness (X6), and reach and distribution of information (X7). Meanwhile, the dependent variable is the capacity development of agricultural extension workers (Y). The influence of digital media (webinars and online training) on the capacity development of agricultural extension workers can be seen through the results of data processing using the IBM SPSS *Statistics* 25 program as follows :

Table 7. Results of Multiple Regression Analysis Test

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-36,288	29,509		-1,230	,224
	X1	-2,388	1,805	-,136	-1,323	,191

	X2	3,128	2,218	,146	1,410	,164
	X3	9,180	2,523	,336	3,639	,001
	X4	3,183	1,958	,154	1,626	,110
	X5	6,604	1,867	,324	3,538	,001
	X6	5,242	2,033	,207	2,578	,013
	X7	2,275	1,786	,105	1,274	,208

a. Dependent Variable: Y

Based on the results from the table, it can be seen that the results of the regression equation are:

$$\hat{Y} = a + b1x1 + b2x2 + b3x3 + b4x4 + b5x5 + b6x6 + b7x7$$

$$\hat{Y} = -36{,}288 + (-2{,}388)x1 + 3{,}128x2 + 9{,}180x3 + 3{,}183x4 + 6{,}604x5 + 5{,}242x6 + 2{,}275x7$$

The linear regression equation above shows the direction of each independent variable towards the dependent variable which can be described as follows:

1. The constant of −36.288 means that if all independent variables (X1–X7) have a value of zero, then the value of the dependent variable (Y) tends to be negative.
2. The regression coefficient of the accessibility sub-variable (X1) has a regression coefficient of -2.388, meaning that X1 has a negative effect on Y, but this effect is not statistically significant, so X1 has not been able to partially explain changes in the dependent variable.
3. The regression coefficient of the content quality sub-variable (X2) is 3.128, meaning that X2 has a positive effect on Y, but is not significant. Content quality (X2) has not made a significant contribution to changes in the dependent variable (Y).
4. The regression coefficient of the interactivity sub-variable (X3) has a regression coefficient of 9.180, meaning that X3 has a positive and significant effect on Y. The standardized beta value of 0.336 indicates that X3 is the variable that has the most dominant influence.
5. The regression coefficient of the utilization sub-variable (X4) shows a regression coefficient of 3.183, meaning that X4 has a positive effect on Y, but the effect is not statistically significant.
6. The regression coefficient of the ease of use sub-variable (X5) is 6.604, meaning that X5 has a positive effect on Y. The beta value of 0.324 indicates that X5 also makes a significant contribution in explaining the variation of the dependent variable (Y).
7. The regression coefficient of the effectiveness sub-variable (X6) has a regression coefficient of 5.242, meaning that X6 has a positive and significant effect on Y. X6 also plays a role in increasing the value of the dependent variable (Y).
8. The regression coefficient of the sub-variable of information reach and distribution (X7) has a regression coefficient of 2.275, meaning that X7 has a positive effect on Y, but this effect is not statistically significant.

Table 8. Results of the Determination Coefficient Test

Model Summary [b]

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.825 [a]	.680	.641	21.60171

a. Predictors: (Constant), X7, X6, X1, X3, X4, X5, X2

b. Dependent Variable: Y

Based on the analysis presented in Table 15, the correlation coefficient (R) of 0.825 indicates a strong and positive relationship between the independent variables (X1–X7) and the dependent variable (Y), namely the capacity development of agricultural extension workers. The R Square value of 0.680 demonstrates that 68.0% of the variation in extension worker capacity can be explained collectively by accessibility, content quality, interactivity, utilization, ease of use, effectiveness, and information reach and distribution. Furthermore, the Adjusted R Square of 0.641 indicates that, after adjusting for the number of predictors and sample size, the model explains 64.1% of the variance, while the remaining 35.9% is influenced by other variables outside the model. The F-test confirms that digital media, implemented through webinars and online training, simultaneously exerts a significant effect on the capacity development of extension workers. This finding supports the proposed hypotheses and reinforces the argument that digital-based learning interventions are strategically relevant in strengthening extension human resources.

At the partial level, however, the results present a more nuanced pattern. Accessibility (X1) does not significantly influence capacity development, suggesting that access alone is insufficient without meaningful engagement. Similarly, content quality (X2) does not show a significant effect, indicating that informative material must be supported by effective pedagogical delivery to translate into practical competence. Utilization (X4) is also insignificant, implying that participation in digital activities may still be administrative rather than developmental in nature. Likewise, information reach and distribution (X7) does not significantly affect capacity, reflecting that broad dissemination without interaction does not guarantee knowledge transformation.

In contrast, interactivity (X3) demonstrates a positive and significant effect and emerges as the most dominant variable. Active engagement—through discussion, question–answer sessions, and collaborative exchange—substantially enhances knowledge acquisition and practical skills. Ease of use (X5) also shows a significant positive effect, highlighting the importance of user-friendly platforms that minimize technical barriers and enable focus on learning substance. Effectiveness (X6) is likewise significant, confirming that digital media contributes to capacity development when it is directly applicable to field challenges and professional responsibilities.

Overall, these findings indicate that the success of digital media in strengthening extension worker capacity depends more on qualitative aspects of the learning process—particularly interactivity, usability, and practical relevance—rather than merely on access, quantity of content, or frequency of activities. This underscores that digital transformation in agricultural extension must prioritize meaningful engagement and applied learning to generate measurable capacity improvement.

CONCLUSION

Based on the results of the analysis and discussion, this study concludes that digital media in the form of webinars and online training simultaneously exert a significant influence on the capacity development of agricultural extension workers. This finding confirms the strategic role of digital-based learning in strengthening the competencies of extension personnel in the context of contemporary agricultural development.

However, partial testing reveals that only the sub-variables of interactivity, ease of use, and effectiveness have a positive and significant effect on capacity development. This indicates that the success of digital media in improving extension worker competence is primarily determined by the quality of interaction during learning activities, the user-friendliness of the technological platform, and the practical relevance and applicability of the material to field conditions. Interactivity facilitates knowledge exchange and problem clarification, ease of use reduces technical barriers, and effectiveness ensures that learning outcomes can be directly implemented in extension practices.

Conversely, the sub-variables of accessibility, content quality, utilization level, and information reach and distribution do not show a significant partial effect. These findings imply that the mere availability of access, informative content, or wide dissemination of information does not automatically translate into improved capacity. Without active engagement, meaningful participation, and the practical application of acquired knowledge, digital learning risks becoming procedural rather than transformational.

Overall, the study emphasizes that digital media should not be positioned solely as an information delivery tool. Instead, it must be strategically designed as an interactive, user-friendly, applicable, and outcome-oriented learning medium capable of transforming knowledge into measurable improvements in extension worker competence. These conclusions provide important implications for policymaking, the design of digital training programs, and future research on agricultural extension capacity development.

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