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# The Influence of the Use of Polygon-Based Geographic Information Systems on Agricultural Extension Activities in Cirebon Regency

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**Abstract**

This study is motivated by the need to enhance the effectiveness of agricultural extension activities through accurate spatial data utilization. The objective of this research is to examine the influence of polygon-based Geographic Information Systems (GIS) on agricultural extension activities in Cirebon Regency. A quantitative descriptive approach was employed using a survey method involving 64 agricultural extension officers selected through stratified random sampling. The data were analyzed using validity and reliability tests, classical assumption tests, and multiple linear regression analysis. The results indicate that polygon-based GIS usage simultaneously has a significant effect on agricultural extension activities, with an $R^2$ value of 0.629. Partially, the analytical aspect of GIS shows a positive and significant effect, while the technical, functional, and perceived benefit aspects exhibit positive but insignificant effects. These findings suggest that spatial analytical capability is the most critical factor in improving extension effectiveness. The study concludes that the successful implementation of polygon-based GIS depends not merely on the availability of technology but also on the analytical capacity of extension officers. The implications of this study highlight the importance of strengthening spatial analysis competencies to support data-driven, targeted, and sustainable agricultural extension planning.

**Keywords:** Agricultural Extension; Polygon; Geographic Information System.

## INTRODUCTION

Agriculture is a strategic sector in the Indonesian economy, particularly in Cirebon Regency, known as a food barn with vast agricultural potential. Furthermore, advances in agriculture, such as the use of modern technology and irrigation systems, have increased the productivity and economic well-being of the farming community in the region. However, disseminating agricultural information and technology to farmer groups still faces challenges in terms of the effectiveness and accuracy of extension services (Antwi-Agyei & Stringer, 2021; Barakabitze et al., 2015; Mapiye et al., 2023; Priya et al., 2025).

Geographic Information System (GIS) is an information system used to manage, store, manipulate, analyze, display and produce computer-based geographically referenced information (Tiranda & Henny, 2016). Government Regulation Number 45 of 2021 concerning the Implementation of Geospatial Information – Article 16, states that the implementation of geospatial information is carried out through the activities of a) collecting geospatial data, b) processing geospatial data and geospatial information, c) storing and maintaining geospatial data and geospatial information, d) disseminating geospatial data and geospatial information, and e) using geospatial information. This system enables more accurate spatial representation for agricultural areas with complex administrative and land boundaries (Janssen et al., 2017; Ozcelik & Nisanci, 2015; Padhiary et al., 2025; Vafaeinejad et al., 2025; Veith et al., 2015).

Geographic information systems (GIS) are currently the primary basis for presenting data and information related to spatial data and other supporting information, such as calculating fertilizer requirements based on the area of land cultivated by farmers. Furthermore, the use of these information systems supports data observation and collection, data storage, and data analysis, which can be used to inform conclusions (Iqbal, 2022).

The importance of polygons can help resolve several issues faced by extension workers, ranging from spatial data presentation, determining work areas that do not overlap with other extension workers, and addressing the need for sustainable agricultural planning (Guastella & Pareglio, 2016; Mathenge et al., 2022; Wijaya & Offermans, 2019). Land area, which forms the basis for determining subsidized fertilizer, is one manifestation of sustainable agricultural planning, as these polygons can provide a more accurate picture of the extent and boundaries of farmers' cultivated land. This aligns with research using the polygon method on *Google Earth* to estimate the area of parking areas and local revenue from parking fees (Agus Setiawan et al., 2021).

Land availability data and information are expected to support the formulation of food security strategies in a region. Not only food crops, but other supporting commodities such as horticulture and plantations also play a crucial role in realizing Indonesia's food self-sufficiency program. Based on data from the Cirebon Regency Statistics Agency (BPS Kabupaten Cirebon, 2025), Cirebon Regency's land is categorized into two groups: agricultural land and non-agricultural land. Within agricultural land, there are rice paddies, divided into land planted with rice and land not planted with rice.

The largest fruit production is mango, which is 422,801 quintals, followed by bananas at 58,485 quintals. Meanwhile, vegetable production in Cirebon Regency is dominated by shallots, followed by large chilies at 320,944 quintals and 41,537 quintals. The area of sugarcane plantations in Cirebon Regency is 4,571.55 ha with a production (crystal) of 21,305.68 tons. The rice planting area is 91,395 ha and the rice harvest area is 90,587 ha. With a production of 683,880 tons of dry grain harvested. The harvest area for secondary crops such as corn in 2024 is 4,630 ha with a production of 44,581 tons. For sweet potatoes, the harvest area is 124 ha with a production of 2,730 tons. The soybean harvest area was 56.5 ha with a production of 48.9 tons.

Various relevant previous studies served as references and comparisons in determining the direction of this research. A summary of these previous research findings is presented in tabular form to facilitate the assessment of each study's contribution to the current study, as shown in Table 1 below:

**Table 1. Previous research**

| No | Researcher/Year | Research Title | Research result |
|---|---|---|---|
| 1 | Zulvi, Audrey Oktia and Muhktar (2025) | Web-Based Agricultural Extension Information System at the Aceh Province Agriculture and Plantation Service | The GIS technology integrated into the system also facilitates mapping of potential agricultural land and superior products in the area, which in turn helps in better agricultural planning. |
| 2 | Anugerah, M. Daffa MH, et al., (2024) | Geographic Information System in the Agriculture and Plantation Sector in the Jambi Region | The use of GIS technology has the potential to provide positive contributions to stakeholders, including farmers and economic actors in the agricultural sector, in the decision-making process that is more based on accurate information. |

| | | | |
|---|---|---|---|
| 3 | S, Nikyta Pratiwi, et al., (2022) | Distribution of Agricultural Products in Mapilli District Based on Geographic Information System (GIS) Case Study: Agricultural Extension Center (BPP) Mapilli District | With the help of geographic information system (GIS) tools to provide information related to distribution mapping by introducing various types of plants and agricultural products from year to year so that they can be known by the wider community. |
| 4 | Gitosaputro, S., et al., (2025) | The Performance of Agricultural Extension Workers in Utilizing Digital Tools in the New Normal Era in North Lampung Province | The impact of digitalization implemented by agricultural extension workers on their performance has enabled them to optimize their role in supporting food security and improving farmer welfare in this digital era. This not only increases operational efficiency but also expands farmers' access to information and knowledge. |

Source: Zulvi, AO & Muhtar (Zulvi & Muhktar, 2025) ; Anugerah, M. Daffa MH, et al., (Daffa My Honest Anugerah et al., 2024) ; S, Nikyta Pratiwi, et al., (Pratiwi.S et al., 2019) ; Gitosaputro, S., et al., (Gitosaputro et al., 2025) .

Although various previous studies have examined the use of Geographic Information Systems (GIS) in agriculture, these studies generally focused on mapping regional potential, land suitability, and the distribution of agricultural commodities in general. To date, there is limited research specifically analyzing the use of polygon-based Geographic Information Systems to support agricultural extension activities, particularly at the district level. Furthermore, the use of GIS in the context of extension has largely not been comprehensively studied by linking GIS technical indicators as independent variables (X) to the performance or effectiveness of extension activities as dependent variables (Y). Yet, agricultural extension activities play a strategic role in increasing farmers' capacity and require the support of accurate, structured, and easily interpretable spatial data by field extension workers.

Furthermore, this study identified a research gap related to the measurement of extension variables, which are rarely structured based on regulatory provisions. In this context, the polygon-based GIS usage variable (X) is measured through four main indicators, while the agricultural extension activity variable (Y) is measured through five indicators, three of which are adjusted to the provisions of the Minister of Administrative and Bureaucratic Reform Regulation concerning Functional Positions of Agricultural Extension Workers and their Credit Points. This approach has not been widely applied in previous studies, which generally have not integrated regulatory-based extension performance indicators with GIS technology. Therefore, this study aims to fill this gap by analyzing how the use of polygon-based GIS influences agricultural extension activities in Cirebon Regency in a more measurable and systematic manner, and in accordance with applicable extension policies.

The implementation of GIS within the Cirebon Regency Agriculture Office has begun in agricultural spatial data planning and management activities. The Agriculture Office now has a Google Earth-based polygon map of agricultural areas that functions to map the boundaries of rice fields and the work areas of farmer groups in each sub-district. The map preparation process was carried out in a participatory manner, involving Farmer Group Chairs, sub-district Economic Development (Ekbang) personnel, and community leaders who understand village and agricultural boundaries. The involvement of these local stakeholders aims to ensure geometric accuracy, the validity of boundaries, and the precision of mapped land information.

The urgency of this research stems from several pressing factors. First, the Indonesian government has invested substantial resources in developing geospatial infrastructure and promoting digital agriculture, yet empirical evidence on the effectiveness of these investments for extension services remains limited. Second, agricultural extension workers in Cirebon Regency face increasing demands for precision in planning, targeting, and evaluating extension programs, which require accurate spatial data and analytical tools. Third, the participatory polygon mapping initiative undertaken by the Cirebon Regency Agriculture Office represents a significant innovation that needs systematic evaluation to inform future scaling and replication in other regions. Fourth, as Indonesia pursues its food self-sufficiency goals, the role of extension workers becomes increasingly critical, and understanding how GIS can enhance their effectiveness is essential for achieving national agricultural development targets.

The implementation of polygon-based GIS is an appropriate step to facilitate the delivery of relevant information, supported by visual displays in the form of data and map locations. This polygon-based GIS is expected to become a strategic tool in supporting agricultural extension activities in Cirebon Regency by providing an overview of the specific technical needs of each region, serving as a basis for developing extension programs, and supporting agricultural development policies in Cirebon Regency, thereby enabling more effective and sustainable extension activities.

## METHOD

The research design used was a descriptive quantitative method, with a survey approach. According to Sugiyono (2018), quantitative methods are research methods based on the philosophy of positivism, used to study specific populations or samples. Data collection uses research instruments, and data analysis is quantitative or statistical, with the aim of testing predetermined hypotheses.

The population in this study was 178 agricultural extension workers in Cirebon Regency, consisting of 85 civil servants and 93 PPPK workers, with the sampling technique used being *stratified purposive random sampling*. *The stratified purposive random sampling* method is a sampling process by dividing the population into strata, selecting a simple random sample from each stratum, and combining them into a sample to be used in estimating population parameters.

The types of data collected in this study consist of primary and secondary data. Primary data is data obtained from the results of interviews with agricultural extension workers using a list of statements (questionnaires) that have been prepared beforehand. A questionnaire is a data collection technique carried out by providing a set of written questions or statements to respondents to answer ( Sugiyono, 2018) . Meanwhile, secondary data, is supporting data obtained from literature studies and data from various related agencies/institutions, for example the Cirebon Regency Agriculture Service. In this study, polygon data was obtained from spatial data available at the Cirebon Regency Agriculture Service, which was previously created using *Google Earth*.

In summary, this study uses a series of statistical tests to ensure data quality and the accuracy of the analysis model, which includes validity tests, reliability, classical assumptions, regression analysis, and hypothesis testing ( Ghozali, 2013) . The validity of the instrument was tested through the correlation between item scores and total scores by comparing the calculated r and r table values, while the reliability of the questionnaire was determined based on the Cronbach Alpha value (>0.6). The feasibility of the data was analyzed through classical assumption tests, specifically the normality test using Kolmogorov–Smirnov and the linearity test to ensure a linear relationship between variables ( Sugiyono, 2018) . The main analysis was carried out using multiple linear regression to determine the effect of independent variables on the dependent variable, which was complemented by measuring the coefficient of determination ($R^2$) to assess the model's ability to explain variations in the dependent variable. In addition, descriptive analysis was used to describe the characteristics of the data, while hypothesis testing through the t test and F test was carried out to examine the effect of variables partially or simultaneously on the dependent variable ( Sugiyono, 2018) .

## RESULT AND DISCUSSION

The study used 64 respondents, so the rtable value can be obtained. Where to obtain the rtable using the calculation df = n - 2 = 30 - 2 = 28. So the degree of freedom (df) = 28 and alpha 0.05. Based on the *product moment correlation coefficient table*, rtable = 0.361 is obtained. Based on the results of the validity test, it is known that each statement is declared valid. This is indicated by the calculated r value for each statement item which is greater than or equal to the r table value of 0.361. So it can be concluded that each statement item is able to measure the variables studied precisely and consistently.

**Table 2. Reliability Test Results**

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .972 | 54 |

Source: IBM SPSS Statistics 24 Output Results

From the calculation results above, it can be seen that all variables in this study have *Crochbach alpha* > 0.60, namely 0.972, which means that all variables are reliable.

**Table 3. Results of the Smirnov Test for Normality**

**One-Sample Kolmogorov-Smirnov Test**

| | | Unstandardized Residual |
|---|---|---|
| N | | 64 |
| Normal Parameters a,b | Mean | -.3279050 |
| | Standard Deviation | 7.97629692 |
| Most Extreme Differences | Absolute | .089 |
| | Positive | .086 |
| | Negative | -.089 |
| Test Statistics | | .089 |

| 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. | |

Source: IBM SPSS Statistics 24 Output Results

Based on the results of the normality test using *the One-Sample Kolmogorov–Smirnov Test* on the *Unstandardized Residual value* , a significance value ( *Asymp. Sig. 2-tailed* ) of 0.200 was obtained. This value is greater than the significance level of 0.05, so it can be concluded that the residual data is normally distributed.

**Table 4. Multicollinearity Test Results**

| Coefficients [a] | | | |
|---|---|---|---|
| | | Collinearity Statistics | |
| Model | | Tolerance | VIF |
| 1 | X1 | .442 | 2,262 |
| | X2 | .383 | 2,613 |
| | X3 | .295 | 3,392 |
| | X4 | .375 | 2,667 |
| a. Dependent Variable: Ytotal | | | |

Source: IBM Statistics 24 Output Results

Based on the results of the classical assumption test in the Coefficients table, *the Variance Inflation Factor* (VIF) values for the Technical (X1), Functional (X2), Analytical (X3), and Benefit (X4) variables are 2.262; 2.613; 3.392; and 2.667, respectively. All of these values are less than 10, and the *Tolerance value* is above 0.1. Thus, it can be concluded that this regression model is free from multicollinearity problems, so that the influence of each independent variable on extension activities can be detected accurately.

**Table 5. F Test Results**

| ANOVA [a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 2643.505 | 4 | 660,876 | 25,012 | .000 [b] |
| | Residual | 1558,895 | 59 | 26,422 | | |
| | Total | 4202.400 | 63 | | | |
| a. Dependent Variable: y | | | | | | |
| b. Predictors: (Constant), X4, X1, X2, X3 | | | | | | |

Source: IBM Statistic 24 Output Results

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

1. The Influence of Technical Aspects (X1) on Extension Activities (Y)
   Based on the Coefficients table, variable X1 has a t-value of 0.931 with a significance level of 0.356. Since the value of 0.356 > 0.05, it can be concluded that partially the technical

aspect does not have a significant influence on extension activities. This indicates that the technical ease of the system is not a major driving factor in the performance of extension workers at the research site.

2. The Influence of Functional Aspects (X2) on Extension Activities (Y)
   Variable X2 has a t-value of 1.380 with a significance level of 0.173. Since 0.173 > 0.05, the functional aspect does not have a significant partial effect on extension activities. This indicates that the completeness of the system's basic features has not had a significant impact on the frequency or quality of extension activities.
3. The Influence of Analytical Aspects (X3) on Extension Activities (Y)
   Variable X3 has a t-value of 3.544 with a significance level of 0.001. Since the value of 0.001 < 0.05, it can be concluded that the Analytical Aspect has a positive and significant effect on extension activities. The regression coefficient value of 1.462 indicates that every one unit increase in GIS analytical ability will increase extension activities by 1.462 units.
4. The Influence of the Benefit Aspect (X4) on Extension Activities (Y)
   Variable X4 has a t-value of 0.477 with a significance level of 0.635. Because 0.635 > 0.05, the general usefulness aspect does not significantly influence extension activities. Perceptions of general usefulness will not improve extension worker performance if not accompanied by specific data analysis skills (X3).

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 the use of a polygon-based geographic information system with sub-variables including technical (X1), functional (X2), analytical (X3), benefits and impacts (X4), while the dependent variable is agricultural extension activities (Y). The effect of the use of a polygon-based geographic information system on agricultural extension activities can be seen through the results of data processing using the IBM SPSS 24 *for Windows program* as follows:

**Table 6. Results of Multiple Regression Analysis Test**

| Coefficients [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| Model | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 64,758 | 6,187 | | 10,466 | .000 | | |
| | X1 | .298 | .320 | .111 | .931 | .356 | .442 | 2,262 |
| | X2 | .550 | .398 | .177 | 1,380 | .173 | .383 | 2,613 |
| | X3 | 1,462 | .412 | .518 | 3,544 | .001 | .295 | 3,392 |
| | X4 | .178 | .373 | .062 | .477 | .635 | .375 | 2,667 |
| a. Dependent Variable: y | | | | | | | | |

Source: IBM SPSS Statistics 24 Output Results

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

$$\hat{Y} = a + b1x1 + b2x2 + b3\,x3 + b4x4 + b5x5 + b6x6$$

$$\hat{Y} = 64{,}758 + 0{,}298X1 + 0{,}550X2 + 1{,}462X3 + 0{,}178X4$$

This equation shows the direction of each independent variable towards the dependent variable which can be described as follows:

1. The constant is 64.758
   This means that if all independent variables, namely Technical (X1), Functional (X2), Analytical (X3), and Benefits (X4) have a value of zero, then the value of the Extension Activities variable (Y) is 64.758 units.
2. The regression coefficient of the technical sub-variable (X1) is 0.298
   This means that X1 has a positive but insignificant effect on Y (Sig. 0.356 > 0.05). This indicates that although the system is technically adequate, it has not provided a statistically significant contribution to improving extension activities.
3. Functional Sub-Variable Regression Coefficient (X2) is 0.550
   This means that X2 has a positive but insignificant effect on Y (Sig. 0.173 > 0.05). This means that the completeness of the functions in the Polygon GIS has not been statistically proven to be able to influence the intensity of extension activities independently.
4. The regression coefficient of the analytical sub-variable (X3) is 1.462
   This means that X3 has a positive and significant effect on Y (Sig. 0.001 < 0.05). Every 1 unit increase in the Analytical aspect will increase the Extension Activities variable by 1.462 units. This variable has the strongest influence and is the main factor that drives the effectiveness of extension in the field.
5. The regression coefficient of the Benefit Sub-Variable (X4) is 0.178
   This means that X4 has a positive but insignificant effect on Y (Sig. 0.635 > 0.05). This indicates that the perception of the general benefits of the system has not significantly influenced the output of extension activities if it is not accompanied by in-depth data analysis capabilities.
6. The coefficient of determination aims to measure how much influence the use of a polygon-based geographic information system has on agricultural extension activities, with the results being as follows:

Table 7. Results of the Determination Coefficient Test

| Model Summary [b] | | | | | |
|---|---|---|---|---|---|
| **Model** | **R** | **R Square** | **Adjusted R Square** | **Standard Error of the Estimate** | **Durbin-Watson** |
| 1 | .793 [a] | .629 | .604 | 5.14023 | 2,218 |
| a. Predictors: (Constant), X4, X1, X2, X3 | | | | | |
| b. Dependent Variable: y | | | | | |

Source: IBM SPSS Statistics 24 Output Results

The coefficient of determination (R *Square*) of 0.629 indicates that the independent variables together are able to explain 62.9% of the variation in changes in the dependent variable (Y). This means that most of the changes in extension activities are influenced by the variables of the use of Polygon GIS contained in the research model. Meanwhile, another

37.1% of the variation is influenced by other factors outside the model that were not examined in this study.

*Adjusted R Square* value of 0.604 indicates that after adjusting for the number of independent variables and sample size (64 respondents), the model was able to explain 60.4% of the variation in the dependent variable. This value provides a more accurate picture of the model's ability in the population because it corrects for potential bias resulting from the use of four predictors in the study.

The results of multiple linear regression analysis indicate that the simultaneous use of polygon-based GIS has a strong influence on agricultural extension activities in Cirebon Regency. This is reflected in the correlation coefficient (R) of 0.793 and the coefficient of determination ($R^2$) of 0.629. This means that 62.9% of the variation in agricultural extension activities can be explained by technical, functional, and analytical variables, as well as the benefits and impacts of polygon-based GIS use. The remaining 37.1% is influenced by other factors outside the research model.

This finding aligns with the Geographic Information System concept proposed by Star and Ester (1990) and Burrough and McDonnell (1998), who stated that GIS is an integrated system for spatial data management that supports analysis and decision-making. In the context of agricultural extension, GIS's ability to present farmer group spatial data in a visual and structured manner is an important basis for planning and implementing extension activities.

The technical sub-variables showed a positive but insignificant influence on agricultural extension activities. This indicates that the availability of hardware, software, and basic GIS operational skills have not directly improved the quality or intensity of extension activities.

Theoretically, technical aspects are a prerequisite for GIS implementation. However, this study shows that technology alone is not sufficient to produce tangible changes in extension activities. This situation may be due to GIS being used primarily for administrative purposes, or limited to basic mapping, and not being optimally utilized as an analytical tool for extension decision-making.

Functional sub-variables also showed a positive but insignificant effect. This indicates that the completeness of GIS functions, such as data storage, map visualization, and information access, has not independently had a significant impact on improving extension activities.

These results indicate that although polygon-based GIS has adequate features, these functions have not been fully integrated into the agricultural extension cycle. In other words, GIS functions are only used as a supporting tool, not as a primary instrument in the planning, implementation, and evaluation of extension activities.

Unlike other sub-variables, the analytical aspect showed a positive and significant influence on agricultural extension activities. The largest regression coefficient value indicates that spatial analysis skills are a key factor in increasing extension effectiveness.

These results align with the theory of Naspendra & Setiawati (2020) , who stated that the data manipulation and analysis stages are the core of GIS utilization. In the context of agricultural extension, GIS analytical capabilities enable extension workers to plan activities more precisely, overlay areas, identify the distribution of farmer groups, determine priority development locations, and develop extension materials tailored to specific regional conditions. These findings align with research by Siska et al. (2022) and Wahab & Kurniawan (2023) , which states that the use of GIS analysis can produce accurate information and support data-driven decision-making.

The benefits and impacts sub-variables showed a positive but insignificant effect. This indicates that respondents' perceptions of the general benefits of GIS have not been directly reflected in increased outreach activities.

This situation can be interpreted as meaning that the benefits of GIS are only being felt conceptually and have not yet been fully realized in operational extension practices. The benefits and impacts of GIS use will be more pronounced if accompanied by increased capacity of extension workers to utilize spatial analysis results sustainably.

Overall, the results of this study confirm that the use of polygon-based GIS plays a strategic role in supporting agricultural extension activities, particularly through analytical aspects. These findings reinforce the view that digital transformation in agricultural extension depends not only on the availability of technology but also on the ability of human resources to process and analyze spatial data.

The significant influence of GIS analytical aspects on extension activities is also in line with the agricultural extension implementation policy as stipulated in Ministerial Regulation Number 03/Permentan/SM.200/1/2018, which emphasizes the importance of data-based planning and specific regional needs. With the support of polygon-based GIS, extension workers can improve the quality of extension planning, field activity implementation, strengthen farmer group institutions, and achieve more tangible extension impacts for farmers.

Overall, the results of this study confirm that optimizing the use of polygon-based GIS, particularly in spatial data analysis, is key to improving the effectiveness of agricultural extension activities in Cirebon Regency. These findings are expected to form the basis for policy recommendations for the Department of Agriculture in developing the capacity of extension workers and the sustainable use of GIS technology.

## CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the use of a polygon-based Geographic Information System (GIS) has a strong simultaneous influence on agricultural extension activities in Cirebon Regency, particularly through analytical aspects, which have been proven to have a positive and significant effect in increasing the effectiveness of planning, implementation, and determination of priority areas for extension based on spatial analysis. Meanwhile, the technical, functional, and benefits and impact aspects show a positive but not yet significant influence. This finding confirms that the success of GIS implementation in agricultural extension is not solely determined by the availability of technology but also by the ability of extension workers to utilize GIS as a tool for analysis and decision-making based on spatial data. Therefore, it is recommended that the Cirebon Regency Agriculture Office prioritize enhancing the analytical capacity of extension workers, that agricultural extension workers optimize the use of GIS for regionally contextual decision-making, and that future researchers include additional variables such as policy support, institutional capacity, and the level of farmer technology adoption to obtain a more comprehensive understanding of the effectiveness of GIS-based agricultural extension.

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