

Performance Evaluation on Agricultural Counseling Agents in Palopo City and Luwu Regency, South Sulawesi, Indonesia

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Abstract. Having a key part in a nation's economy, agriculture has been striving with innovations for global needs. Competent agricultural counseling agents are among them as they function to modernize farmers in terms of knowledge, skill, and technology by transforming their ways of thinking, work ethics, attitudes, and behaviors. This study researched 117 respondents in Palopo City and Luwu Regency. Organized as per Likert scale, data was run through Structural Equation Modeling (SEM) by employing Smart-PLS application. The result on Hypothesis 1 came out with $t_{\text{Statistic}} 3.286 > t_{\text{Table}} 1.986$ with P value of $0.002 < 0.05$ – in other words, agricultural counseling agent's competence is positively and significantly influential towards agricultural counseling agent's performance. As of Hypothesis 2, the result was $t_{\text{Statistic}} 2.312 > t_{\text{Table}} 1.986$ with P value of $0.021 < 0.05$ – this indicates that agricultural counseling information system management is positively and significantly influential towards agricultural counseling agent's performance. It is therefore recommended to optimize both agricultural counseling agent's competence and agricultural counseling information system management to improve the performance of agricultural counseling agents in Palopo City and Luwu Regency.

Keywords: Advanced agriculture, counseling information system, counseling management, farmer's welfare

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1 Introduction

Having a key part in a nation's economy [1–3], agriculture has been striving with innovations for global needs [4–6] that calls for reliable individuals with quality expertise – agricultural counseling agents are among them [7, 8]. Study by Khairunnisa *et al.* [9] highlights the function of modernizing farmers in terms of knowledge, skill, and technology to be the responsibility an agricultural counseling agent is entrusted with by transforming their ways of thinking, work ethics, attitudes, and behaviors. Further, study by Listiana *et al.* [10] emphasizes – as cited in the Regulation no. 35/2020 issued by the Ministry of State Apparatus Utilization and Bureaucratic Reform – that an agricultural counseling agent (later is referred to as “agent”) is accountable for stocktaking and identifying regional potentials, distributing agricultural information, expanding accessibility towards technology and market, progressing farmer organizations, putting agricultural technology into action, developing local agricultural counseling posts, and extending self-subsistent counseling process.

A number of factors affect an agent's performance – internal aspects like age, educational background, motivation, experience, and competence are tied in with external ones such as environment, infrastructure, facilities, remuneration, government's policy, administration system, and information system [11, 12]. As a high level of competence enables an agent to function in the field more easily [13, 14], it is specifically principal in boosting performance. Study by Sapar *et al.* [15] underlines the significance of competence in counseling process for the regional potentials stocktaking and identifying purpose. It is therefore reasonable to deduce that competence allows an agent to carry out other aforementioned duties.

Informatics technology in agricultural counseling process has been eminent for agents' performance improvement [16–18]. Study by Purwatiningsih *et al.* [19] affirms that agricultural counseling information system as an applied technology is proven helpful for agents. A good system should be operative in various gadgets for timely data input, able to provide flexible details, easy to learn and operate, able to secure data despite sudden power outage, rarely crashed or unresponsive, easy to navigate due to visually-friendly layouts and concisely-presented information, equipped with reliable information, and protected from unauthorized users while, at the same time, its employment is both supported and endorsed by the government [20–22].

2 Materials and method

By utilizing the Slovin formula [23, 24], a sample size of 117 respondents was carefully chosen from the entire population of agents in Palopo City and Luwu Regency, South Sulawesi, Indonesia. To achieve this, a meticulously crafted set of questionnaires was employed. The quantitative approach, incorporating the Likert Scale for measurement, was coupled with Structural Equation Modeling (SEM) using the Smart-PLS 3.3 application for a comprehensive assessment. This methodological combination facilitated a systematic and statistically sound exploration of the relationships and variables under investigation. The selected sample size, determined through the Slovin formula, ensures a representative subset of the broader population, while the integration of SEM with the Likert Scale enhances the precision and depth of the analysis. This research methodology is designed to provide robust insights into the complex interplay of factors within the context of Palopo City and Luwu Regency, contributing to the overall validity and reliability of the study's findings.

2.1 Validity test

The Pearson correlation coefficient at $(n) = 15$ and a table r value of 0.514 were employed for assessing validity [25]. With 52 valid points [26] derived from the analysis, the

instruments were confirmed as valid for the research. Outer model evaluation, also known as model measurement, elucidates the correlations between latent variables and their respective indicators. The PLS Algorithm was utilized for this purpose, ensuring a comprehensive and accurate evaluation of the model. This approach contributes to the overall robustness of the research by establishing the validity of the measurement instruments and elucidating the relationships between latent constructs and their observed indicators.

2.2 Reliability test

A questionnaire acts as a reliable indicator when individuals consistently respond to questions or statements over time [27]. To ensure the reliability of the instruments used, a one-shot test on Cronbach Alpha, conducted through SPSS version 20.0 [28], was employed, with a criterion of $\alpha > 0.60$ for reliability [26]. The established Cronbach Alpha value, combined with 52 reliable data points [25], confirmed the validity of all instruments used in the research. Subsequently, to further scrutinize the internal reliability of variable indicators, the Structural Equation Model (SEM) underwent additional evaluation using both Cronbach's Alpha and Composite Reliability tests. These tests offer a comprehensive assessment of the consistency and stability of the questionnaire items, providing a more nuanced understanding of the reliability of the variables under consideration within the research framework.

2.3 Inner model

Inner model evaluation, alternatively termed structural evaluation, proves essential in validating the correlation between exogenous and endogenous constructs within hypothesized variables [20]. This assessment is crucial for confirming the structural integrity and relationships proposed in the model. The bootstrapping method, implemented using Smart PLS, serves as a robust technique for extracting values to evaluate the model's inner relationships and overall structural soundness. By employing bootstrapping, the analysis can generate reliable estimates, confidence intervals, and statistical significance for path coefficients, thereby providing a comprehensive understanding of the model's internal dynamics. This meticulous examination ensures that the hypothesized relationships between variables are not only theoretically grounded but also empirically supported, enhancing the credibility and validity of the structural model.

2.4 Statistical analysis

Statistical analysis is essential for understanding the influence of one variable on another. A *t* statistic value higher than the critical value from the *t* table indicates significant effects of a variable. Structural Equation Modeling (SEM) analysis was employed to determine *t* statistics and *P* values, crucial for assessing the significance of independent variables on the dependent one. Additionally, determinant analysis was conducted to evaluate the overall significance of all tested independent variables in relation to the dependent variable. This comprehensive approach allows for a thorough examination of the relationships between variables and provides valuable insights into the significance and impact of each independent variable on the dependent variable.

3 Result and discussion

3.1 Descriptive analysis

The results presented in Table 1 indicate that the majority of agents in the surveyed areas exhibit a medium level of performance, constituting 45.30 % of the total, followed by high performance at 34.19 %, and low performance at 20.51 %. The assessment was conducted on a scale of 1 to 5, where the overall performance averages 2.13. This distribution suggests a fairly balanced representation across the performance spectrum, with a slight skew towards the medium range. The findings imply that there is room for improvement in enhancing the performance of agents in these areas, as the mean falls below the midpoint of the scale. Understanding the factors contributing to the observed performance levels, particularly those leading to high and low performance, could provide valuable insights for targeted interventions and strategies. Further analysis, perhaps exploring the specific criteria used to assess performance and considering qualitative aspects, would contribute to a more comprehensive understanding of the dynamics influencing the performance levels among the agents in Palopo City and Luwu Regency, South Sulawesi, Indonesia.

Table 1. Performance of agricultural counseling agents.

Category (1 to 5 scale)	Frequency	%
Low (< 25)	24	20.51
Medium (26 to 30)	53	45.30
High (> 30)	40	34.19
Total	117	100.00
Mean		2.13

Table 2 illustrates the distribution of studied agents across different levels of intermediary competence, with 57.26 % classified as having intermediate competency, followed by 29.91 % at high competency and 12.82 % at low competency. The overall performance, reflected in the mean score of 2.27 on a 1 to 5 scale, suggests an intermediate level of effectiveness. This finding implies that a significant portion of the studied agents possesses a moderate level of competence, contributing to the observed intermediary performance. The variability in competence levels among the agents is crucial for understanding the dynamics of their performance. It emphasizes the need for targeted interventions and training programs tailored to enhance competencies, ultimately influencing the overall performance positively. Further investigation and strategic planning are recommended to address the specific needs and challenges associated with the diverse competence levels identified among the agents in the study.

Table 2. Competency of agricultural counseling agents.

Category (1 to 5 scale)	Frequency	%
Low (< 25)	15	12.82
Medium (26 to 30)	67	57.26
High (> 30)	35	29.91
Total	117	100.00
Mean		2.27

Table 3 provides insights into the information system management competencies of the studied agents. The majority, accounting for 57.26 %, exhibit a medium level of competence, while 27.35 % are categorized as low-level and 15.38 % as high-level in terms of information

system management. The overall assessment of their information system management capabilities, represented by a mean score of 1.90 on a 1 to 5 scale, indicates a performance leaning towards the lower end of the spectrum.

This distribution suggests that a significant proportion of the agents possesses a moderate competence in information system management. The prevalence of agents with a medium level of competency highlights the need for targeted interventions and capacity-building initiatives to enhance their information system management skills. Addressing the challenges associated with the lower competency levels and leveraging the strengths of those with higher competency can contribute to an overall improvement in information system management effectiveness among the studied agents. Further analysis and strategic measures are recommended to align the competencies of the agents with the demands and advancements in information system management.

Table 3. Agricultural counseling information system management.

Category (1 to 5 scale)	Frequency	%
Low (< 23)	32	27.35
Medium (23 to 29)	67	57.26
High (> 29)	18	15.38
Total	117	100.00
Mean		1.90

3.2 Outer Model Evaluation

3.2.1 Validity test

The outcome, as depicted in Figure 1, reveals that each indicator of every variable possesses an outer loading value equal to or greater than 0.7. This significant observation, surpassing the recommended threshold, indicates the validity of the variables in the structural model. The outer loading values represent the strength of the relationships between the observed indicators and their respective latent variables. A value of ≥ 0.7 signifies a robust and reliable connection, suggesting that the selected indicators effectively capture and measure the intended constructs. The validation of these variables in the outer model enhances the overall credibility of the structural equation model, reinforcing its capability to accurately depict the relationships between latent constructs. This finding instills confidence in the reliability and appropriateness of the indicators chosen for the study, contributing to the robustness of the subsequent analyses and interpretations within the framework of the proposed model [29–32].

3.2.2 Convergent validity (loading factor)

The outer model analysis has been validated with outer loading values exceeding 0.7 for each indicator of every variable [25, 26]. To further establish the validity of latent variables, the Average Variance Extracted (AVE) was calculated, with an expected value of more than 0.5 [33]. The results presented in Table 4 confirm that the AVE values for each studied variable are equal to or greater than 0.5, affirming the validity of all variables within the SEM models [33]. This comprehensive assessment ensures the reliability and validity of the measurement instruments, contributing to the overall robustness of the research by confirming the accuracy of latent variable constructs and their corresponding indicators.

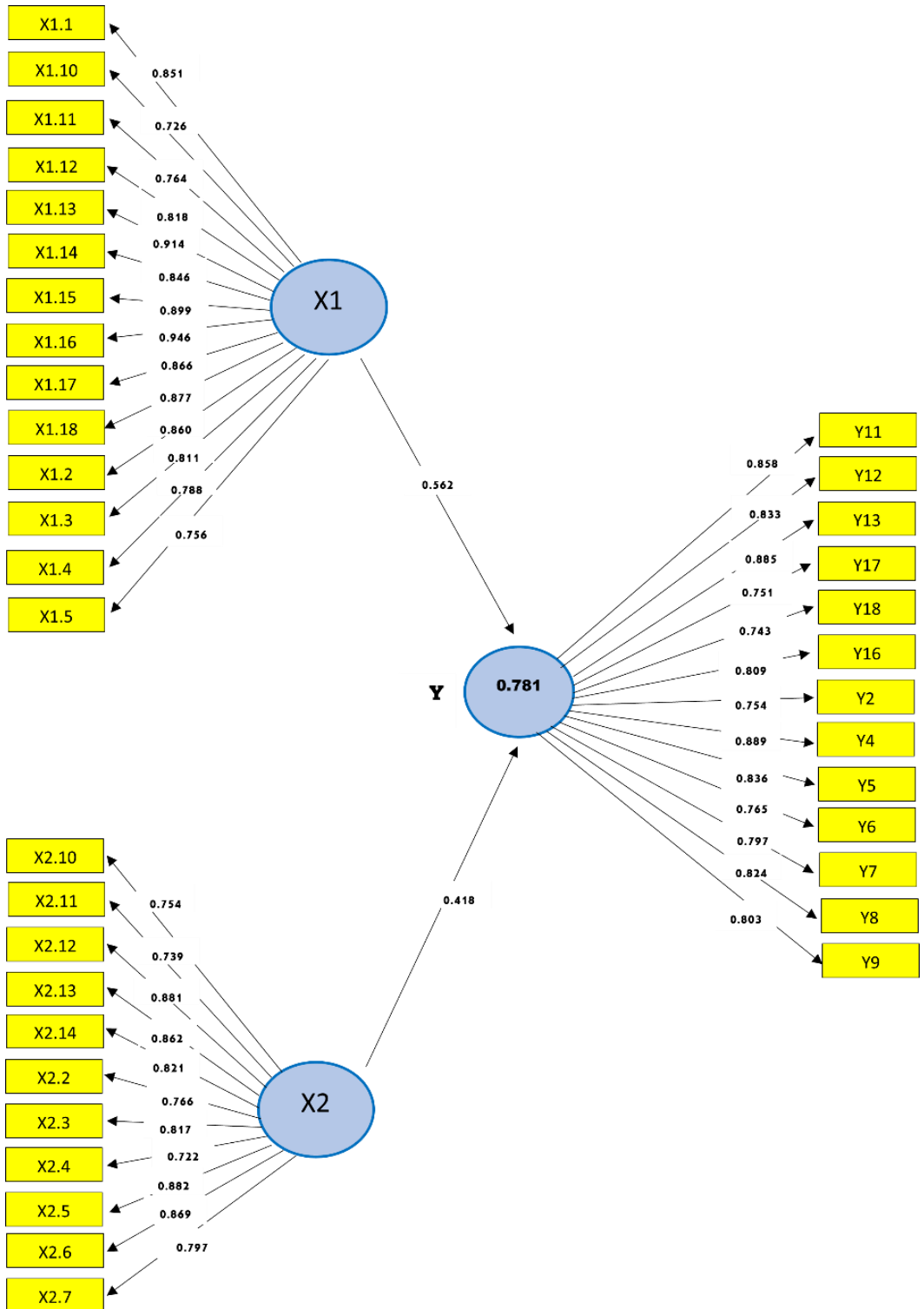


Fig. 1. SEM outer model (output Smart-PLS).

Table 4. Average Variance Extracted (AVE) values.

Variable	Average variance extracted (AVE)
Agricultural counseling agent's performance (Y)	0.66
Agricultural counseling agent's competence (X1)	0.71
Agricultural counseling information system management (X2)	0.66

3.2.3 Model reliability

The reliability assessment of the SEM model is confirmed by the values presented in Table 5, where both Cronbach's Alpha and Composite Reliability exceed the respective benchmarks of 0.6 and 0.7. According to these reliability metrics, the variables in the SEM model exhibit consistency and robustness in their measurement, further solidifying the reliability of the model. This outcome underscores the internal consistency and stability of the latent constructs and their indicators, providing a strong foundation for the subsequent analytical stages of the study.

Table 5. Cronbach's alpha and composite reliability values.

Variable	Cronbach's alpha	Composite reliability
Agricultural counseling agent's competence (X1)	0.967	0.971
Agricultural counseling information system management (X2)	0.948	0.955
Agricultural counseling agent's performance (Y)	0.957	0.962

3.3 Inner model evaluation

The graphical representation in Figure 2 illustrates a noteworthy finding: both agent's competence and agricultural counseling information system management exhibit a positive and statistically significant impact on agricultural counseling's performance. The significance value of 0.001, which is lower than the commonly accepted threshold of $\alpha = 0.05$, indicates the robustness and reliability of these relationships. This implies that as the competence of agents and the efficiency of information system management in agricultural counseling improve, there is a corresponding positive effect on the overall performance of agricultural counseling. The results portrayed in Figure 2 contribute valuable insights into the key factors that drive successful agricultural counseling, emphasizing the importance of competent agents and effective information system management in achieving optimal performance outcomes.

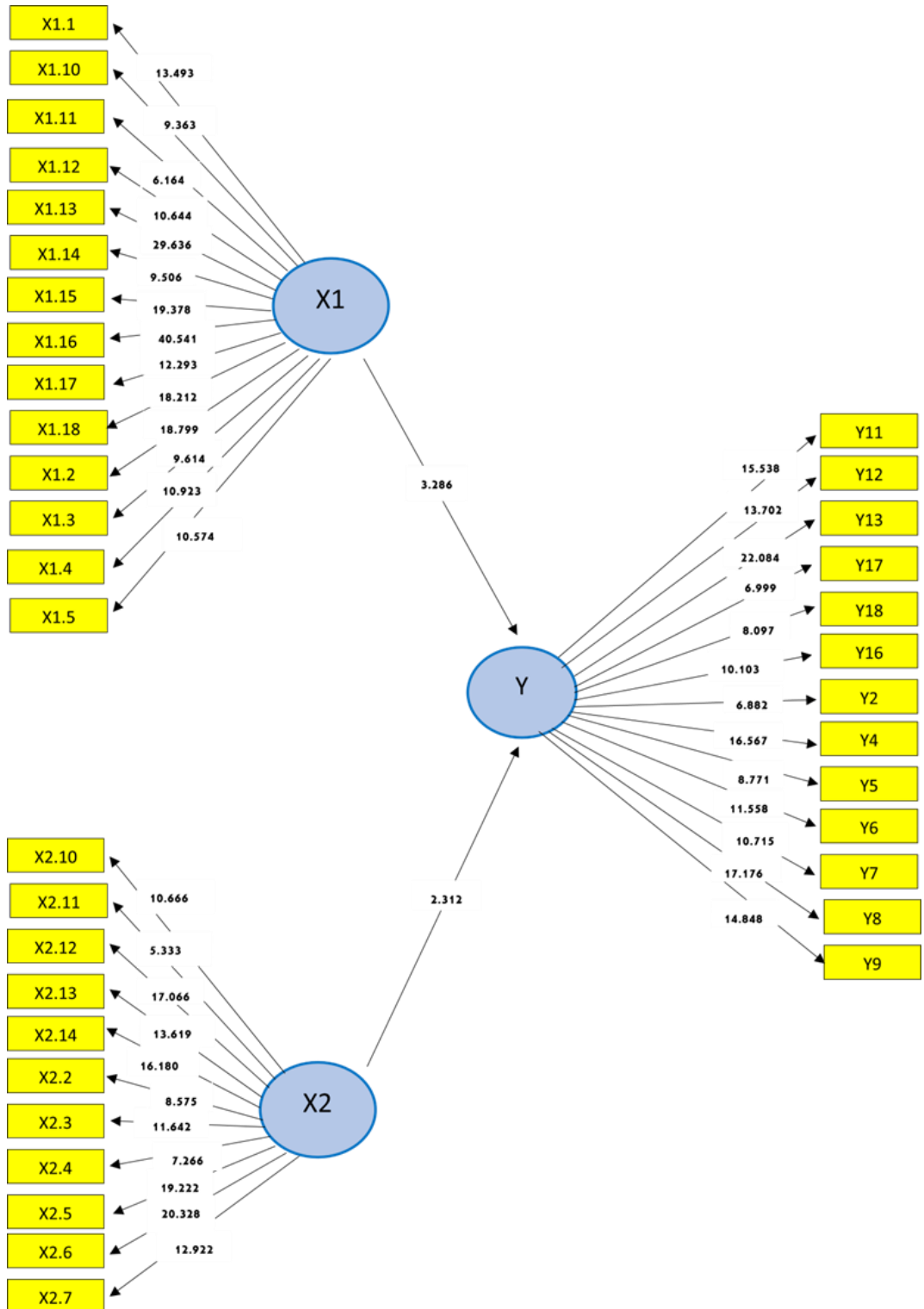


Fig. 2. SEM inner model.

Table 6. T value of independent variable towards dependent variable.

Variable	t statistic	t table	P value	Cut off P value
Agricultural counseling agent's competence ≥ agricultural counseling agent's performance	3.286	1.986	0.001	0.05
Agricultural counseling information system management ≥ agricultural counseling agent's performance	2.312	1.986	0.021	0.05

The findings presented in Table 6 offer a comprehensive evaluation of the hypothesized relationships with the endogenic variable. Firstly, Hypothesis 1 posits that agent's competence (X1) positively and significantly affects agent's performance (Y). The statistical analysis reveals a t statistic of 3.286, surpassing the critical t table value (1.986), and a P value of 0.001, which is below the significance threshold of 0.05. These results robustly support the acceptance of Hypothesis 1. Secondly, Hypothesis 2 proposes that agricultural counseling information system management (X2) positively and significantly influences agent's performance (Y). The statistical examination exhibits a t statistic of 2.312, exceeding the critical t table value (1.986), and a P value of 0.021, below the cut-off value of 0.05. Consequently, Hypothesis 2 is also substantiated and deemed acceptable. The conclusive evidence derived from these analyses underscores the significant and positive impacts of both agent's competence and agricultural counseling information system management on overall agent's performance.

3.4 Determinant analysis (R square)

The insights gleaned from Table 7 elucidate that agent's competence and agricultural counseling information system management collectively contribute to a 30.10 % influence on agent's performance. However, a substantial portion, amounting to 69.90 %, remains influenced by variables not scrutinized within the scope of this study. This indicates that while agent's competence and agricultural counseling information system management play crucial roles in shaping agent's performance, there are additional factors or variables outside the study's purview that significantly contribute to the overall performance outcomes. The need for future research endeavors to delve into these unexplored variables becomes apparent, as understanding the comprehensive spectrum of factors influencing agent's performance can provide more nuanced insights and aid in the development of targeted interventions for enhancing performance within the agricultural counseling context.

Table 7. Determinant analysis on the independent variable.

Dependent variable	R square	R square adjusted
Agricultural counseling's performance (Y)	0.781	0.764

3.5 The significance of competence in agricultural counseling agent's performance

Based on the analysis of responses regarding the competencies of agricultural extension agents in the cities of Palopo and Luwu Regency, it can be concluded that respondents generally provided low assessments of the competence levels of agents in both regions. This finding holds significant implications, especially when associated with the positive and significant influence of competence on the performance of agricultural extension agents ($0.001 < \alpha = 0.05$). In this context, these findings align with previous research, such as that

conducted by Omotesho *et al.* [14] and Sapar *et al.* [15], indicating a positive correlation between the level of competence and the performance of agricultural extension agents. The same thing was also conveyed by Basir *et al.* [2] stating that extension efficiency is influenced by the instructor's competency. Therefore, the results of the response analysis affirm that enhancing the competence of agents is a critical aspect that needs attention in efforts to improve their performance.

Furthermore, Structural Equation Modeling (SEM) analysis provides a more detailed understanding of the factors influencing the competencies of agricultural extension agents. It was found that the ability to inventory, identify, and recapitulate data in post-development local agricultural extension (X1.16) significantly contributes to the competence of agents, with a contribution percentage of 0.946 %. This underscores the importance of technical and analytical skills in managing information and data related to agriculture, providing a strong foundation for agents to deliver effective extension services. On the other hand, the ability to organize events for the improvement of farmer groups, combined farmer groups, and farmer economic institutions (X1.10) was identified as the competency factor with the smallest contribution, at 0.726 %. Despite its relatively small contribution, this aspect remains crucial as it pertains to the agents' ability to facilitate meetings, develop farmer groups, and support farmer economic institutions.

Therefore, the improvement and development of the competencies of agricultural extension agents in Palopo and Luwu can be focused on enhancing the skills of inventorying, identifying, and recapitulating data, which has been proven to make a significant contribution to competence. This may involve intensive training, the introduction of information technology, and updating work methods to enhance the technical and analytical skills of agents. Additionally, although the ability to organize events for the improvement of farmer groups, combined farmer groups, and farmer economic institutions has a smaller contribution, attention should still be given through training programs focusing on the development of interpersonal skills, leadership, and event management.

In the context of future research recommendations, studies can be directed towards evaluating the effectiveness of implementing training programs aimed at improving the competencies of agricultural extension agents in both regions. This research could involve monitoring and measuring changes in agent performance after participating in specific training and conducting a long-term impact analysis on the local agricultural sector. Furthermore, considering the dynamics of technological changes and agricultural needs, future research could explore the integration of innovative digital solutions to enhance the competencies of agricultural extension agents, particularly in terms of data and information management. Thus, the results of this research not only provide a deep understanding of the factors influencing agent competencies but also lay the foundation for the development of more effective and sustainable intervention strategies to enhance agricultural extension in this region.

3.6 The significance of agricultural counseling information system management in agricultural counseling agent's performance

The analysis of responses has yielded high evaluations regarding the management of information systems for agricultural extension in the cities of Palopo and Luwu Regency. This positive response is noteworthy, particularly as it aligns with the research finding that information system management has a positive and significant impact on performance ($0.021 < \alpha = 0.05$). These results support the findings of Purwatiningsih *et al.* [19] and Saleh *et al.* [20], who revealed that better information system management should enhance the performance of extension agents. The implications of these findings underscore the crucial

role played by an efficient information system in optimizing the effectiveness of agricultural extension services.

Further analysis using Structural Equation Modeling (SEM) has provided a more detailed understanding of the competencies associated with the management of agricultural extension information systems. It is concluded that a system that is easy to learn (X2.6) emerges as the dominant competency aspect, contributing significantly with a percentage of 0.862 %. This indicates the paramount importance of designing information systems that are user-friendly and accessible, allowing extension agents to quickly grasp and navigate through the system's features. On the other hand, the aspect of a system that is easy to understand (X2.4) is identified as the least prominent competency aspect, with a contribution of 0.722 %. While this aspect has a relatively smaller impact, it remains noteworthy, emphasizing the need for comprehensibility in information systems to ensure that agents can derive meaningful insights from the data presented.

The positive evaluations of the information system management in the context of agricultural extension services in Palopo and Luwu suggest a commendable foundation for further enhancement. To capitalize on these findings and improve the competencies associated with information system management, several strategic interventions can be considered. Firstly, focusing on the aspect of a system that is easy to learn, training programs can be implemented to familiarize extension agents with the features and functionalities of the information system. This may involve workshops, tutorials, or online training modules that cater to the diverse learning styles and preferences of the agents. Additionally, continuous support and resources should be provided to ensure that agents can adapt to any updates or changes in the system efficiently.

Addressing an aspect of a system that is easy to understand requires a more nuanced approach. This may involve user interface improvements, data visualization enhancements, and clear documentation of the information system's functionalities. Conducting usability testing with the participation of extension agents can offer valuable insights into areas that need improvement, ultimately contributing to a more comprehensible information system. User feedback mechanisms should be established to allow agents to provide continuous input on the system's usability and suggest refinements based on their practical experiences.

In the realm of future research recommendations, an in-depth investigation into the specific features and functionalities that contribute to the ease of learning and understanding the information system can provide valuable insights. This may involve qualitative research methods such as interviews and focus group discussions to gather detailed feedback from extension agents. Exploring the correlation between the usability of the information system and the overall performance of extension agents can also be a promising avenue for future studies. Additionally, assessing the long-term impact of improved information system management on the agricultural sector's development and the welfare of farmers would contribute to a comprehensive understanding of the system's effectiveness.

The high evaluations of information system management in agricultural extension services in Palopo and Luwu Regency provide a positive foundation for further enhancements. The identified competencies, particularly the emphasis on a system that is easy to learn, underscore the importance of user-friendly and accessible information systems for extension agents. Strategic interventions, including targeted training programs and system improvements, can further elevate the competencies associated with information system management [2]. Future research endeavors can delve deeper into specific aspects of information system usability, gathering qualitative insights and exploring the broader implications of enhanced information system management on the agricultural sector and the well-being of farmers.

4 Conclusion

An agricultural counseling agent's competence is positively and significantly influential towards their performance. Agricultural information system management is also positively and significantly influential towards the performance of an agricultural counseling agent. Improvement on agricultural counseling agent's competence in Palopo City and Luwu Regency is therefore recommended by maintaining and developing the existing agricultural information system management. Further research could also deepen understanding of the causal relationship between individual competence and the effectiveness of information systems in improving the performance of agricultural extension agents.

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