Performance of Agricultural Extension Workers: The Impact of Internal and External Factors

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ABSTRACT

This study aims to describe the internal and external characteristics of agricultural extension workers and analyze their influence on extension performance in North Central Timor Regency. A quantitative approach was employed using a survey method involving all 126 active agricultural extension workers, supplemented by qualitative data through Focus Group Discussions (FGDs) using a snowball sampling technique. Structural Equation Modeling-Partial Least Squares (SEM-PLS) was used to analyze the collected data. The results show that internal factors such as productive age, very high formal education, long working experience, high work motivation, and high income positively contribute to extension performance, while areas of expertise and training still require improvement. External factors such as the availability of facilities and access to agricultural technology were categorized as high, whereas media consumption, farmer participation, land potential, and the reward system were relatively low. The research model revealed that internal and external factors together explain 81.5% of the variance in extension performance ($R^2 = 0.815$), with an overall model fit of 96.3% ($Q^2 = 0.963$). These findings highlight the importance of enhancing areas of expertise and increasing media information consumption to strengthen agricultural extension performance in the future.

1. INTRODUCTION

The implementation of extension activities is currently expected to be able to bridge the phenomena that occur in the agricultural environment with the development of science, both temporary and permanent (Dwi, 2024; Ikhwana *et al*., 2024). Agricultural extension workers are the spearhead in the service process and are expected to provide services in response to what the farming community requires, adjusted to the existing geographical conditions. In providing services, extension workers act as conveyors or implementers of national and regional programs so that they can be followed and applied by farmers, so that the program is well organized (Abdullah *et al*., 2023; Levis, 2024).

The progress in agriculture are closely tied to the cooperation between extension workers, the community, and related institutions. Agricultural advisors play a crucial part in determining the success of agricultural development in meeting people's food needs, especially in transferring agricultural technology to farmers (Aini *et al*., 2022; Darmawan & Mardikaningsih, 2021). The effectiveness of agricultural extension workers depends on their ability to fulfill their core responsibilities based on established performance standards. These duties and functions are outlined in the Agricultural, Fisheries and Forestry Extension System Law (UUS-P3K) Number 16 of 2006 (Jamil *et al*., 2023; Rosmalah *et al*., 2023; Titiheru *et al*., 2021).

Previous research by Syafruddin *et al.* (2013), examined personal factors in terms of ability, experience, motive, and perception, as well as situational factors in terms of work facilities and education variables. Analysis results

demonstrated that personal factors and situational factors showed a considerable impact on the communication behavior among agricultural extension personnel. Similar findings were also reported by Suhanda *et al.* (2008).

The performance of extension services can be seen from two factors, namely: (1) performance as a function of individual or personal characteristics of extension workers; these characteristics include age, tenure, number of dependents, cosmopolitan level, experience, perception, health, and socioeconomic conditions (Bahua *et al.*, 2010; Mulieng *et al.*, 2018); and (2) performance as a situational influence, including differences in management of extension implementation, value systems, land potential, human resources, programs, community participation, funding, and facilities and infrastructure support (Ardita *et al.*, 2017; Jafri *et al.*, 2015; Prayoga, 2018).

Other studies (Amin *et al.*, 2023; Gani *et al.*, 2020; McEvoy & Cascio, 1989), also confirm that individual characteristics such as age, gender, marital status, length of service, work experience, education level, training, and number of dependents affect a person's performance. This is reinforced by the theory of assessment of indicators relevant to work behavior.

While many previous studies have highlighted individual and contextual elements that influence the performance of agricultural extension agents, most have focused on regions with different geographic and socioeconomic characteristics. In addition, there are still few studies that combine these two factors to measure their simultaneous influence on extension worker performance using a quantitative approach based on structural models, so there is a need to fill this gap with more structured and representative data. Therefore, a study is needed that assesses how internal traits and external influences jointly contribute to the effectiveness of agricultural outreach efforts, so that the results can be the basis for formulating policies to improve the capacity and effectiveness of extension services in the future.

This study aims to describe the internal and external characteristics of agricultural extension workers, and analyze the influence of internal factors including age, formal education, tenure, number of family dependents, employment status, work motivation, field of expertise, training, and income, as well as external factors including availability of infrastructure, media consumption, number of fostered groups, access to agricultural technology, reward system, farmer participation, land potential, distance to fostered locations, and value system how well agricultural extension activities are carried out. Through this approach, it is expected that a comprehensive understanding of the factors that determine extension success can be obtained, so that it can be the basis for efforts to strengthen the impact of agricultural outreach programs going forward.

2. METHODS

2.1. Location and Sample Size

This study took place in North Central Timor (NCT) Regency, spanning from February to August 2022. A quantitative method was primarily applied using a survey approach, complemented by qualitative data. The quantitative design enabled an objective assessment of the link between internal and external variables and the performance of agricultural extension personnel. Meanwhile, qualitative insights were gathered to deepen the analysis through Focus Group Discussions (FGDs) and in-depth interviews.

The study population consisted of all agricultural extension personnel assigned to the respective agricultural service offices, totalling 126 people. The sampling technique used the census method, where all members of the population were used as research samples. In addition, for qualitative data, the snowball sampling method was used, involving community leaders, heads of farmer groups, heads of agricultural offices, and religious leaders as additional informants.

2.2. Data Collection

The data utilized in this research were gathered from two main sources: primary data, which refers to information obtained firsthand from respondents through questionnaires and FGDs, and secondary data, namely data obtained from official documents of related agencies, annual reports, and relevant literature sources. Data collection techniques in this study include: (1) Distribution of structured questionnaires to all agricultural extension workers, (2) Conducting

detailed interviews with selected informants, (3) Holding Focus Group Discussions (FGDs) to gather additional information from the extension community and the farming community.

2.3. Research Instruments

The research instrument was a structured questionnaire employing the Likert rating scale for gauging internal and external factors and extension worker performance. The questionnaire has undergone validity and reliability tests before being used for research.

2.4. Data Analysis Techniques

Quantitative data were processed using the Structural Equation Modeling with Partial Least Squares (SEM-PLS) approach to examine the associations among latent constructs. The SEM-PLS technique was selected due to its capability to manage complex models even when sample sizes are relatively small. The analysis included
- Outer Model: to examine the accuracy and consistency of the constructs. To be considered valid, the factor loading value and AVE value are more than 0.5. As for reliability, the CR value must exceed 0.7.
- Inner Model: to test the relationship between constructs based on the path coefficient value.
- Goodness of Fit test: by examining the R-squared and Q-Square values to measure the overall strength of the model.

    Qualitative data were analyzed using descriptive techniques to strengthen and add depth to the interpretation of quantitative results.

3. RESULTS AND DISCUSSION

3.1. Characteristics Internal Factors of Instructors in North Central Timor Regency

Table 1 presents the findings on the internal factors influencing extension workers in North Central Timor Regency.

3.1.1. Age

Descriptive analysis results indicate the distribution of respondents' ages is in the range of 29 to 58 years. The average age of respondents in NCT Regency is 47.5 years. Based on age productivity, as in BPS (2021), a person's age is classified as productive if it is between 15 years to 64 years then generally, extension workers in NCT Regency are classified as productive age.

3.1.2. Formal education

Descriptive analysis indicates that most respondents held a Bachelor's degree (S1), namely 86 percent. Another small portion of the distribution is among high school graduates (Vocational Schools for Agriculture and Vocational Schools for Animal Husbandry) at 7 percent. The results of the education distribution show that the education level of the majority of instructors is in the very high category.

3.1.3. Working Time

An overview of the respondents' work period shows that most respondents have carried out extension activities for more than 10 years, namely 98 percent. Based on the data distribution, the respondent's work period shows that the respondent has had a long work period in carrying out extension activities. This indicates that most of the agricultural instructors in NCT Regency have worked long, so they have communicated a lot with the public and have demonstrated their level as government officials, coaches, mentors, and assistants to farmers.

3.1.4. Number of Family Dependents

Findings from the descriptive analysis show that the distribution of the number of family dependents is mostly in the low category (52%). Some of the distributions are in very low and high categories. The presence of this number of family dependents can influence the amount of respondents' expenditure in meeting the family's living needs, thereby also influencing the quality of the instructor's work in accomplishing their duties.

3.1.5. Employment Status

Descriptive analysis shows that the distribution of respondents' employment status is mostly in the high category, namely 71% have civil servant status and only 29% have P3K status. This means that the performance of agricultural instructors has been able to meet expectations and improve their performance by applicable regulations.

Table 1. Internal Factors Extension Agriculture

Internal Factors	Category	Number of Respondent	Percentage (%)	Mean
Age (Years)	Young (< 42 years)	33	26	
	Adult (42-55)	72	57	47.5
	Old (> 55 years)	21	17	
Total		126	100	
Education	Very low (< 13 years)	7	5	
	Low (13-14 years)	0	0	15.7
	High (15 years)	11	9	
	Very High (≥ 16 years)	108	86	
Total		126	100	
Tenure	Very low (< 12 years)	12	10	
	Low (12-19 years)	67	53	19
	High (20-27 years)	17	13	
	Very High (> 27 years)	30	24	
Total		126	100	
Number of family responsibilities	Very low (< 3 people)	30	24	
	Low (3-4 people)	65	52	3.6
	High (5-6 people)	28	22	
	Very high (> 6 people)	3	2	
Total		126	100	
Employment status	Low (1.P3K)	37	29	
	High (2. PNS)	89	71	1.7
Total		126	100	
Area of Expertise	Very Low (<2)	17	13	
	Low (2-3)	102	81	2.3
	High (4-5)	7	6	
	Very High (>6)	0	0	
Total		126	100	
Training	Very Low (<1)	30	24	
	Low (1-2)	78	62	1.3
	High (3-4)	16	13	
	Very High (>4)	2	1	
Total		126	100	
Work Motivation	Very Low (<6)	4	3	
	Low (6-10)	2	2	15.3
	High (11-15)	61	48	
	Very High (>15)	59	47	
Total		126	100	
Income	Very Low (<3,000,000)	7	6	
	Low (3,000,000-3,800,000)	62	49	3862631
	High (3,900,000-4,600,000)	21	17	
	Very High (>4,600,000)	36	28	
Total		126	100	

3.1.6. Areas of Expertise

The results of the descriptive analysis show that the distribution of respondents' areas of expertise is in the range of 2-

3, which is relatively low. Namely, 81 percent are in the areas of expertise of supervisors and young experts. This means that it is necessary to increase the field of expertise of extension workers through scientific publication activities and other advanced training.

3.1.7. Training

The research results showed that respondents had attended training at intervals of 1 - 2 times during the last two years. The low participation in training is due to the minimal budget managed by the Agricultural Service institution, so agricultural instructors rarely participate in training.

3.1.8. Work Motivation

The interview results showed that most respondents' motivation in helping farmers, ensuring career security, and changing farmers' mindsets and behavior was in the high category at 48 percent and the very high category at 47 percent. The instructor's work motivation is expected to be able to direct positive behavior so that it impacts the results received by farmers. The data distribution shows that most instructors' work motivation in NCT Regency is more inclined towards helping farmers and ensuring career security.

3.1.9. Income

The results of the descriptive analysis show that the income distribution of respondents is predominantly in the low category in the range between IDR 3,000,000- IDR 3,800,000/month. If we look at the average income of respondents in NCT Regency, it is IDR 3,862,631/month. In this regard, the existence of the respondent's income dramatically influences the performance of extension workers in services to farmers.

3.2. External Factors of Field Agricultural Instructors in North Central Timor Regency

Table 1 presents the findings on the external factors influencing extension workers in North Central Timor Regency.

3.2.1. Infrastructure Availability

According to the results, 45% of respondents were concentrated in the 23.75 to 31.25 score range, while the overall infrastructure availability scores ranged between 13 and 52. The average score for infrastructure availability in NCT Regency is 34.5. This means that the availability of infrastructure in the performance of respondent services in NCT Regency is high or available. This shows that, in general, extension workers feel that the number and type of facilities and infrastructure needed for farming are available.

3.2.2. Media Consumption

The analysis reveals that 66 percent of respondents were concentrated in the 5 to 9 range regarding media consumption, with scores in this category varying between 4 and 16. The average score for infrastructure availability in NCT Regency is 9.2. This means that media consumption in respondents' service performance in NCT Regency is low. Extension workers generally do not consume enough media available in extension activities. However, in this digital era, instructors must constantly update information so that all extension activities must be based on available information.

3.2.3. Number of Assisted Groups

Analysis results show that respondents generally have a majority of 6-12 farmer groups or 75% with an average of 8.6, means that respondents have a big responsibility towards farmers they support in carrying out their primary duties.

3.2.4. Distance to Construction Location

The results of the descriptive analysis in this research show that the distance to the majority of target locations is in the range < 20.25 km, as much as 92%. The average value of respondents to the target location is 11.5 km). This means that extension workers can still reach the average distance between the typical distance from the respondent's home to the farmers' operational area, which does not hinder their performance.

3.2.5. Access Agricultural Technology

Based on descriptive analysis, it shows that respondents generally have a majority of their assisted groups in the greatly

Table 2. External factors influencing performance of extension agriculture workers

External Factors	Category	Number of Respondent	Percentage (%)	Mean
Availability of Infrastructure	Very Low (<23.75)	15	12	**34.5**
	Low (23.75-31.25)	39	31	
	High (31.26-38.76)	57	45	
	Very High (>38.76)	15	12	
Total		126	100	
Media Consumption	Very Low (≤4)	2	2	9.2
	Low (5-9)	83	66	
	High (10-14)	37	29	
	Very High (>14)	4	3	
Total		126	100	
Number of Assisted Groups	Very Low (<6)	22	17	8.6
	Low (6-12)	94	75	
	High (13-19)	2	2	
	Very High (>19)	8	6	
Total		126	100	
Distance to Construction Location	Very Low (<20.25)	110	87	11.5
	Low (20.25-40.5)	4	3	
	High (40.6-60.75)	6	5	
	Very High (>60.75)	6	5	
Total		126	100	
Access Agricultural Technology	Very Low (<7.5)	2	2	24.2
	Low (7.5-15)	6	5	
	High (16-22.5)	23	18	
	Very High (>22.5)	95	75	
Total		126	100	
Rewards System	Very Low (0 kali)	89	71	0.5
	Low (1 kali)	8	6	
	High (2 kali)	22	17	
	Very High (3 kali)	7	6	
Total		126	100	
Farmer Participation	Very Low (<6.1)	24	19	9.0
	Low (6.1-9.1)	64	51	
	High (9.2-12.1)	29	23	
	Very High (>12.1)	9	7	
Total		126	100	
Land Potential	Very Low (<23.75)	5	4	32.5
	Low (23.75-31.25)	69	55	
	High (31.26-38.76)	46	36	
	Very High (>38.76)	6	5	
Total		126	100	
Value System	Very Low (<5.25)	6	5	9.6
	Low (5.25-7.5)	7	6	
	High (7.6-9.85)	36	28	
	Very High (>9.85)	77	61	
Total		126	100	

Source: Data Processed, 2022

high category, in the range of >22.5 or 80% with an average of 24.2. This means that respondents have a big responsibility towards their assisted farmers in terms of access to agricultural technology for the implementation of their main tasks.

3.2.6. Rewards System

According to the results of the descriptive analysis in this research, the award system is dominantly in the very low category (have not received an award), with as many as 71 percent or 89 people out of 126 respondents.

3.2.7. Farmer Participation

The research results show that the dominant respondents are in the low category in the range between 6.1-9.1, as much as 51 percent, with the range of achievement scores in farmer participation ranging from 4 to 16. If you look at the average score for farmer participation in NCT Regency, it is 9.0. This means that farmer participation in respondent service performance in NCT Regency is relatively low.

3.2.8. Land Potential

The descriptive analysis reveals that most respondents involved in extension activities fall under the low category of land potential assisted by farmers, within the 23.75–31.25 range, totaling 55%. The average land potential score in TTU Regency stands at 31.5, indicating that the level of land potential associated with extension worker performance in the region is considered relatively low.

3.3. Overview of the Performance of Agricultural Extension Workers

3.3.1. Preparation

The result is at point 13.7, which means it is relatively high. This shows that research extension preparation activities show that the respondent's performance in preparation for extension most or dominant is in the high category in the range 12.6-15 (51%), and the score distribution ranged between the preparation for extension activities in NCT Regency is 4 and 16.

3.3.2. Implementation of Extension

The research results show that respondents' performance in implementing counseling is mostly or predominantly in the low category of 17-20.5 (66 %), with achievement scores spanning in Extension Evaluation in NCT Regency is

Table 3. Proportion in accordance with the agricultural instructors' performance among farmers in North Central Timor, 2022

Extension Agriculture Performance	Category	Number of Respondent	Percentage (%)	Mean
Extension Preparation	Very Low (<10)	2	2	
	Low (10-12.5)	54	43	
	High (12.6-15)	65	51	13,7
	Very High (>15)	5	4	
Total		126	100	
Implementation of Extension	Very Low (<17)	34	27	
	Low (17-20.5)	83	66	17,7
	High (20.6-22.5)	4	3	
	Very High (>22.5)	5	4	
Total		126	100	
Extension Evaluation	Very Low (<2)	2	2	
	Low (2-3.5)	82	65	
	High (3.6-5.1)	30	24	3,6
	Very High (≥5.1)	12	9	
Total		126	100	

Source: Data Processed, 2022

between 6 and 24. If you look at the average score, it is at 17.7, which means it is relatively low.

3.3.3. Extension Evaluation

The findings of the study indicate that the respondent's performance in evaluating extension most or predominantly is classified as low, falling within the range of 2-3.5 (65 %), and the achievement score range is within Extension Evaluation in NCT Regency, which is between 2 and 8. If you look at the average score, it is at 3.6, which means it is relatively high.

3.3.4. Measurement Model *(Outer model / Construct Reliability Validity)*

The outer model represents the output derived from calculations using the PLS software. This stage applies Confirmatory Factor Analysis (CFA), which serves to verify whether the indicators used are capable of adequately representing a construct.

Referring to Table 4, it is evident that all reflective indicators have loading factor values ≥ 0.50, indicating validity. Additionally, the AVE values are also ≥ 0.50, confirming that the indicators are valid. Reliability testing results show that the Composite Reliability (CR) values are ≥ 0.70, meaning they are reliable. Therefore, it can be concluded that each latent variable is measured by indicators that are valid and reliable. Further explanation regarding the most dominant indicators contributing to each latent construct is provided below.

1. The most representative indicator for the Internal Factor Support variable (X1) is X1.7 (Field of Expertise), which has the highest factor loading value of 0.947. Therefore, if efforts are to be made to enhance the value of the Internal Factor Support variable, statistical analysis suggests that priority should be given to improving indicator X1.7 (Field of Expertise)

2. The indicator that best represents the External Factor Support variable (X2) is X2.2 (Media consumption) with the highest loading factor of 0.945. Therefore, to enhance the value of the External Factor Support variable (X2), it is statistically advised that improvement efforts focus on indicator X2.2 (Media Consumption), as it should be prioritized for development.

Table 4. Outer Model

Variable		Outer Loading	Desc.		AVE	Desc.	Composite Reliability	Desc.
Internal Factors (X1)	X1.1	0.879	Valid	6	0.766	Valid	0.967	Reliabel
	X1.2	0.790	Valid	8				
	X1.3	0.890	Valid	5				
	X1.4	0.925	Valid	3				
	X1.5	0.871	Valid	7				
	X1.6	0.708	Valid	9				
	X1.7	**0.947**	**Valid**	**1**				
	X1.8	0.907	Valid	4				
	X1.9	0.934	Valid	2				
External Factors (X2)	X2.1	0.943	Valid	2	0.735	Valid	0.961	Reliabel
	X2.2	**0.945**	**Valid**	**1**				
	X2.3	0.913	Valid	4				
	X2.4	0.621	Valid	9				
	X2.5	0.874	Valid	5				
	X2.6	0.798	Valid	7				
	X2.7	0.864	Valid	6				
	X2.8	0.924	Valid	3				
	X2.9	0.783	Valid	8				
Extension Agriculture Performance (Y)	Y1.1	0.902	Valid	2	0.832	Valid	0.937	Reliabel
	Y1.2	0.901	Valid	3				
	Y1.3	**0.933**	**Valid**	**1**				

Source: Data Processed, 2022

3. The most influential indicator reflecting the Performance of Agricultural Extension variable (Y1) is Y1.3 (Evaluation and Reporting of Agricultural Extension), which has the highest factor loading of 0.933. Accordingly, if management aims to improve the value of this variable, statistical analysis recommends prioritizing improvements to indicator Y1.3 (Evaluation and Reporting of Agricultural Extension).

3.3.5. Structural Model Evaluation (Inner Model)

The R-Square results from PLS reflect the proportion of construct variance explained by the model. A higher R-Square value indicates a greater percentage of variance accounted for (Kase, 2020). The analysis of the coefficient of determination (R^2) reveals that internal factor support (X1) and external factor support (X2) collectively explain 81.5% of the variation in agricultural extension performance (Y), with an R^2 value of 0.815. The remaining 18.5% is attributed to other variables not included in the model.

To evaluate the model's goodness of fit, the total coefficient of determination (Q^2) is used. This metric indicates how well the path model represents the observed data. The Q^2 value ranges from 0.0 to 100.0%, where higher values suggest a better model fit. The total determination coefficient was calculated as follows (Hair *et al.*, 2021).

$$Q^2 = 1 - \left(1 - R_1^2\right) \times \left(1 - R_2^2\right) \tag{1}$$

$$Q^2 = 1 - (1 - 0.815) \times (1 - 0.798) = 0.963 = 96.3\%$$

The total coefficient of determination (Q^2) resulting from the structural model is 0.963, meaning that 96.3% of the data held can be explained by the path model formed, and other factors outside the research explain the remaining 3.7%.

Based on the strength level of the structural model (global optimization) by Hair Jr *et al.* (2016), global optimization information tests how strong the confirmation of theory is based on the model constructed. It is known that the total coefficient of determination is 0.963, this value falls within the 0.700 to 1.000 range. According to the standard R^2 evaluation criteria, the developed model is categorized as strong in terms of theoretical confirmation. As a result, the use of this structural path model is considered suitable and valid for testing hypotheses.

3.3.6. Hypothesis Testing

The Internal Factor Support variable (X1) is shown to have a positive effect on Agricultural Extension Performance (Y1). This implies that an increase in Internal Factor Support (X1) corresponds with an increase in the Agricultural Extension Performance (Y1). The path coefficient is 0.554, with a t-statistic of 6.152. Because the t-value exceeds the critical threshold (6.152 > 1.96), the statistical test supports the acceptance of hypothesis H1, indicating that Internal Factor Support (X1) significantly influences Agricultural Extension Performance (Y1).

Table 5. Summary testing of hypotheses

Relationship			H	Path Coeff	t-value	p-value	Description
Internal Factors (X1)	→	Extension Agriculture Performance (Y1)	H_1	0,554	6,152	0,000	Significant (H1 accepted)
External Factors (X2)	→	Extension Agriculture Performance (Y1)	H_2	0,385	4,111	0,000	Significant (H2 accepted)

Source: Data Processed, 2022.

The External Factor Support variable (X2) is found to have a positive impact on Agricultural Extension Performance (Y1). This indicates that an increase in External Factor Support (X2) leads to a corresponding increase in the performance of agricultural extension (Y1). The analysis produced a path coefficient of 0.385 and a t-value of 4.111. Since this t-value exceeds the critical threshold (4.111 > 1.96), the statistical test supports the acceptance of hypothesis H2, confirming that External Factor Support (X2) significantly influences Agricultural Extension Performance (Y1).

4. CONCLUSION

This study shows that internal and external conditions significantly influence the effectiveness of agricultural extension personnel in North Central Timor District. The most dominant internal factors include productive age, a very high level of education, a long tenure (more than 10 years), and high work motivation and income. However, areas of expertise and training are still relatively low, which is an area that needs to be improved. On the other hand, external factors such as the availability of infrastructure and access to agricultural technology are in the high category, while media consumption, farmer participation, land potential, and the reward system are low to very low. The value system was rated very high, indicating a good work culture in extension.

The results of structural model testing (SEM-PLS) show that internal factors have the strongest positive influence on extension performance with a path coefficient of 0.554, followed by external factors with a coefficient of 0.385. The R^2 value of 0.815 indicates that 81.5% regarding differences in extension worker performance can be explained by these two factors, and the Q^2 value of 0.963 indicates that the model used is very strong and relevant. Overall, increasing extension workers' expertise and the intensity of information media consumption are the main proposed actions for improving the effectiveness of agricultural extension in the future.

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