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COMPETENCE AND PERFORMANCE OF AGRICULTURAL EXTENSION AGENTS IN INCREASING PIG FARMERS' PERFORMANCE IN TIMOR-LESTE

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ABSTRACT: *This research aims to identify the competence and performance of agricultural extension workers to improve the performance of pig farmers and analyze the factors that affect the competence and performance of agricultural extension workers in Timor-Leste. The research started from January to October 2019 in seven districts in Timor-Leste. Total respondents in this research consisted of 135 agricultural extension workers using simple random sampling and 340 pig farmers determined by the purposive sampling method. Data were analyzed using descriptive statistics to identify the characteristics of agricultural extensions and Structural Equation Modeling (SEM) analysis to determine the influence between variables and their supporting factors. The results showed that the characteristics of the extensions (t = 2.69; α = 0.05), competence (t = 3.11; α = 0.05), the motivation (t = 2.11; α = 0.05), and self-reliance, (t = 2.51; α = 0.05) had a significant effect on agricultural extensions' performance. Characteristics of the extensions (t = 0.35, α = 0.05), competence (t = 0.35; α = 0.05), motivation (t = 0.35, α = 0.05), and self-reliance (t = 0.35, α = 0.05) has an indirect effect on pig farmers' performance. Meanwhile, agricultural extension performance directly affects farmers' performance (t=3.74, =0.05). This research concluded that the competence and performance of the agricultural extensions affected pig farmers' performance in Timor-Leste.*
KEYWORDS*:* competence, extension, performance, pig farmers

INTRODUCTION

Pigs in the Asia Pacific region play an important role for rural and sub-urban households especially in Timor-Leste as an additional household income and cultural purposes (McWilliam, 2011; Almeida *et al.*, 2021; Hunter *et al.*, 2021). Local pigs on the cultural side serve as gifts of exchange in life cycle ceremonies and ancestral rituals, as well as for dispute resolutions. The pig is symbolically a "female" gift and is usually exchanged for a buffalo, cow, or horse which is symbolical "male" (McWilliam, 2011). While, on the economic side, local pigs

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in several decades have the potential to be developed because they can adapt, are scattered in various regions (Gomes and Mali Code, 2020a), and are kept by more than 70% of households in Timor-Leste (Smith *et al.*, 2019). Increasing the productivity of pigs on small farms is recognized as a necessary strategy to improve financial and food security in the region due to the high rates of poverty and malnutrition (Thu and Judge, 2017; Almeida *et al.*, 2021).

Pig farming in Timor-Leste was carried out using extensive traditional methods with less attention to feeding procedures, both quantity, and quality and without proper reproductive handling (Gomes and Mali Code, 2020a; Morais *et al.*, 2020). An empirical study by Almeida *et al.* (2021) shows that most pigs consume the same sources as humans such as kitchen waste and plantation crops. This implies that pig nutrition remains the main constraint of pig productivity in Timor-Leste (Almeida *et al.*, 2021). The reason farmers maintain their subsystem production system is due to a lack of capital to finance the modern production system activities or incentives (Gomes, 2021). In addition, pigs have still been considered a less profitable business among other agricultural activities (Morais *et al.*, 2020; Almeida *et al.*, 2021; Gomes, 2021). Farmers are also less known about how to use modern production systems and can convince them of affordable management costs. This causes the pig low production performance, where achieving the ideal slaughter weight takes about 2-3 years. This length of time also has an impact on the high levels of local pork fats which is less desirable for consumption (Gomes and Mali Code, 2020a).

Inadequate management conditions exacerbating by the spread of the African Swine Fever (ASF) outbreak that has occurred in Asia since late 2018 which poses a significant threat to endemic pig species and socioeconomic security. Sawford *et al.* (2015) reported that ASF is a main constraint to pig production in Timor-Leste. This outbreak caused almost 100% of the deaths in domestic pigs and free-living Eurasian wild boars in Asia or the equivalent of more than 100 million cases which had an unprecedented economic impact on the global pork industry (Luskin *et al.*, 2020). Efforts to prevent more serious impacts are needed to overcome these problems (Gomes and Code, 2020a), for example by improving livestock health, veterinary support, education on pig rearing management, providing needed nutritional sources (Almeida *et al.*, 2021), animal reproduction and animal welfare (Gomes and Code, 2020b) by utilizing the role of agricultural extensions (Kondylis *et al.*, 2017).

Extension agents are defined as the whole set of organizations that support and facilitate people involved in agricultural production by solve their problems and acquire information, skills, and technology to improve their livelihoods and well-being (Birner *et al.*, 2009). According to Kondylis *et al.* (2017); Pham *et al.* (2021), the adoption rate of farmers who received direct training from extension agents was higher than fellow farmers. Moore *et al.* (2014); Pham *et*

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al. (2021) added it is possible for extension agents who are directly involved with farmers to have a better understanding of local practices and perspectives for agricultural sustainability to enable better identification and prioritization of future development interventions, by developing programs that meet the needs of farmers and avoid the difficulties experienced to date.

Livestock productivity could be increased through various policies and programs issued by the government, but extension agents have great influence to help farmers in adopting the established technology or program. According to Hailu *et al.* (2020), in Ethiopia, even though the government provides a large investment and a large ratio of extension agents, Ethiopia has not been able to achieve the desired goals for agricultural progress due to the lack of competence and performance of extension agents in the decision-making process with farmers. Meanwhile, in Africa (Msuya *et al.*, 2017), extension agents play an important role in the development process by bringing the information to the community to develop new technologies that they can adopt to increase productivity, incomes, and living standards. Based on the research conducted, the involvement of extension workers is important to help increase the livestock productivity, especially local pig farms in Timor-Leste. Unfortunately, only few studies results available on examining the factors affecting the competence and performance of the extension services, so further research is required. By knowing the various factors affecting the competence and performance of extension agents, it is hoped to design all the necessary needs in order to increase the performance of local pig production which can produce high quality pig products in a short period of time (Gomes and Code, 2020a).

Theoretical Background and Hypotheses Development

The main focus of the agricultural extension system is human resource development to increase the capacity of medium and small farmers so they can solve their problems and respond to the new opportunities (Afrad *et al.*, 2019). The performance quality of agricultural extension helping farmers to manage their farms which is strongly related to the competence of the extension workers in carrying out the main tasks and responsibilities which are influenced by their characteristics (Bahua, 2013; Agustina *et al.*, 2017; Listiana *et al.*, 2019), motivation (Bahua, 2013; Agustina *et al.*, 2017) and self-reliance (Bahua, 2013). Characteristics of extension agents such as age, experience, gender, education, training, motivation, and self-reliance have a significant influence on behavioral abilities in livestock activities. This shows that these variables play a role in determining the ability of farmers to behave positively (Bahua, 2013; Agustina *et al.*, 2017; Listiana *et al.*, 2019). A similar statement by Noga *et al.* (2018) that the credibility of the extension agent can ensure the success of the implementation of the extension. The performance of agricultural extension agents is a reflection of the work motivation to encourage the enthusiasm and creativity of the farmers. Competence and work motivation help extension

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agents become self-reliant and try to help farmers according to their abilities, in making the farmers more independent and not rely on others (Bahua, 2013).

Agricultural development by a country is not only relies on programs and policies set by the government. Various stakeholders in the production process must be involved and carry out tasks according to their roles. Based on Hailu *et al.* (2020), that if only relying on the quantity of investment and the number of extension agents, the goal of advancing agriculture cannot be optimized. In Ethiopia as an example, until 2020 has not been able to achieve the desired goals for agricultural progress due to the lack of competence and performance of extension agents. Similar conditions also occur in Nigeria where the implementation of the duties of the extension agents has not been effective. Several obstacles to the implementation of extension include inadequate vehicles for transportation, poor office accommodation, poor remuneration, poor funding, majority of farmers' are illiteracy, and insufficient motivation of extension agents among others (Nwalieji and Nnabueze, 2018).

Meanwhile, in Africa and Indonesia, apart from getting support from the government, the competence and good performance of extension agents (Msuya *et al.,* 2017; Rusliyadi *et al.*,2018) play an important role because it can bring information to the farming community about new technologies that can be adopted by farmers to increase their productivity, income, and well-being. According to Issahaku (2014), competencies are skills, personal characteristics, or motives exhibited by various behaviors that contribute to outstanding performance in a job. Spencer and Spencer (1993) *cit.* Shim (2008) defines competence as a fundamental characteristic of an individual related to the criteria of effective or superior performance in a job or situation. The main characteristics that underlie competence are enduring parts of a person's personality and can predict behavior in various situations and job tasks. Competence can assume wheatear the tasks have been well executed or otherwise which is measured against certain criteria or standards.

Extension agents who are directly involved with farmers must meet at least 10 basic competencies to be able to carry out their duties well, there are program planning, program implementation, resource mobilization, technical knowledge, coordination skills, professionalism, strengthening linkages in extension research, communication, leadership skills and managerial, as well as information and communication technology (Ghimire and Suwedi, 2017). Knowledge of the job as a whole is reported to have a significant and positive relationship with job performance (Anesukanjanakul *et al.,* 2019). Based on Kassem *et al.* (2021), farmer satisfaction with agricultural extension services quality is very important to develop extension programs that are following farmers' need and agro-ecological conditions. Farmers assess the quality of

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extension services with nine main indicators, such as availability, accessibility, diversity, relevance, and effectiveness as following:

H1: Extensions agent characteristics affecting agricultural extensions performance
H2: Extension agent competence affecting agricultural extensions performance
H3: Extension agent motivation affecting agricultural extensions performance
H4: Extension agent self-reliance affecting agricultural extensions performance
H5: Extensions agent characteristics affecting pig farmers' performance
H6: Extension agent competence affecting pig farmers' performance
H7: Extension agent motivation affecting pig farmers' performance
H8: Extension agent self-reliance affecting pig farmers' performance
H9: Agricultural extensions performance affecting pig farmers' performance

MATERIALS AND METHODOLOGY

Location

The research conducted in seven districts in Timor-Leste from January to October 2019. Timor-Leste is a rural country where agriculture plays an important role in livelihoods and food security. Especially in the livestock sub-sector, the number of chickens, pigs, cows, and buffaloes has increased significantly, reaching 20-37% since 2010 (Benzo and Bonis-Profumo, 2019). The seven districts which are also the center of pig production consisted of: Baucau, Bobonaro, Covalima, Liquiçá, Manatuto, Manufahi and Viqueque.

Data Collection Methods

Respondents in this research consisted of 135 agricultural extension workers and 340 pig farmers (Table 1) who were determined by applying the Slovin formula (Tupamahu and Ivakdalam, 2020) and a behaviour monitoring tool (Pandey *et al.* 2021):

$$n = \frac{N}{1 + n(d)^{2}}$$

Notes:
N = number of samples
n = number of population
d = 90% precision value
The number of extension samples in this research is:

$$n = \frac{N}{1 + n(d)^2} = \frac{265}{1 + 265(0.1)^2} = \frac{265}{3.65} = 72.60 = 73$$

The number of farmers samples in this research is:

$$n = \frac{N}{1 + n(d)^2} = \frac{96{,}847}{1 + 96{,}847(0.1)^2} = \frac{96{,}847}{969.47} = 99.89 = 100$$

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Table 1. Total of respondent research

Number	District	Extensions		Farmers	
		Population (N)	Sample (n)	Population (N)	Sample (n)
1	Baucau	46	23	22.976	85
2	Bobonaro	49	25	17.635	65
3	Manufahi	35	18	9.023	34
4	Covalima	41	21	12.564	47
5	Manatuto	31	16	7.467	28
6	Lautém	21	17	11.885	45
7	Viqueque	42	21	15.297	57
	Total	265	135	96.847	340

The extensions agents determined as respondents were all agricultural extension agents in seven districts by up lying Simple Random Sampling Method. Meanwhile, the farmers in this research were selected using the purposive sampling method with criteria's such as the number of pigs owned minimum 4 and the farmers had more than 5 years of experience in raising pigs. The data was collected through observation and by distributing semi-structured questionnaires to collect the data of characteristics, competence, motivation, self-reliance, performance, and competence of agricultural extension agents and farmers.

Data Analysis

The data collected were analyzed using the descriptive statistical methods to identify the characteristics of agricultural extension workers. Meanwhile, the empirical model of the relationship between change and it's supporting factors was analyzed by using Structural Equation Modeling (SEM). SEM is a set of statistical techniques that allows a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete to be examined (Ullman and Bentler, 2011).

RESULTS AND DISCUSSIONS

Results

The first hypothesis shows that the extension agent characteristics directly affect their performance and is supported by the results with a value of $t=2.69$; $\alpha=0.05$, therefore the first hypothesis is accepted. Characteristics of agricultural extension agents such as formal education level, work experience, and attending courses may determine the quality of pig farmers' performance in Timor-Leste. The influence of characteristics can be seen in their performance in preparing the extension materials according to community needs, planning activities,

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preparing training and visit schedules, making evaluation reports and activity results, and disseminating appropriate technology (Table 2).

Table 2. Structural Model Result

Hypothesis			Affect		t-value
			Direct	Indirect	
Extension characteristics	→	Extension performance	0.95	-	2.69
Extension competency	→	Extension performance	0.70	-	3.11
Extension motivation	→	Extension performance	0.49	-	2.11
Extension self-reliance	→	Extension performance	0.56	-	2.51
Extensions characteristics	→	Farmers performance	-	0.02	0.35
Extension competency	→	Farmers performance	-	0.01	0.35
Extension motivation	→	Farmers performance	-	0.35	0.35
Extension self-reliance	→	Farmers performance	-	0.10	0.35
Extension performance	→	Farmers performance	1.11	-	3.74

The second hypothesis states that the competence of agricultural agents directly affects their performance and the research results support this statement with a value of t=3.11; α=0.05, therefore the second hypothesis is accepted. The results also support the third and fourth hypotheses, they are motivation and independence of extension both directly affecting their performance (t=2.11; α=0.05 and t=2.51; α=0.05), therefore the third and fourth hypotheses are accepted. The motivation possessed by the extension agents consists of the desire to attend formal education at a higher level, to send their children to college, to be respected in the workplace or living environment, and to become an outstanding instructor. Meanwhile, self-reliance can be seen from the ability of extension agents to make decisions to solve the problems, build relationships with other parties, overcome fatalistic attitudes, develop adaptation strategies following existing conditions and farmers' resources (Table 2).

The fifth hypothesis shows the extension's characteristics indirectly affecting pig performance and is supported by the results (t=0.35; α=0.05). The competence of agricultural instructors has an indirect effect on research performance in the sixth hypothesis, supported by the results of the research (t=0.35; α=0.05). The competence of the extension agent affecting farmers' performance consists of extension agents' ability to prepare training schedules and visits, the material before conducting extension activities, seasons program, annual program, and identify area resources before conducting extension activities. The motivation and self-reliance of agricultural extension in the seventh and eighth hypotheses

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also indirectly affecting pig farmers' performance, respectively with t=0.35; α=0.05 and t=0.35; α=0.05. While the ninth hypothesis shows that the performance of the extension agents directly affects pig farmers' performance and is supported by the results of the research with a value of t=3.74; α=0.05 (Table 2).

DISCUSSIONS

Farmers in other countries have been able to change the low production management to semi-intensive or intensive management. Meanwhile, in Timor-Leste, the motivation and capacity of farmers to increase livestock productivity through feed and management is still lacking, due to low economic development and markets availability. It is also important to mention that specific market selling pork are still not available in Timor-Leste. Therefore, it is noticed that the main purpose of raising pigs is to fulfill religious ceremonies and family needs.

Meat consumption in rural areas is considerably low and the demand for pork is generally seasonal from ceremonial events that include fasting and sacrifices. The selling price of pig is determined based on the availability of the meat as well as its size or quality. In this situation, the high price of pigs is related to household income.

The average number of pigs owned is 2-3 heads or equivalent with more than USD 1,000. This is a significant asset considering that the GDP per capita in Timor-Leste in 2019 was USD 1,294 and more than 70% of the population lives on less than USD 3.20 per day. Therefore, the motivation to invest into a better pig farm may stem from the desire to keep the pigs alive and available all year round rather than making them grow faster (Hunter *et al.*, 2021).

The welfare of the population is generally related to the performance of the agricultural sector and the strength of the sector to overcome challenges stemming from increasing population, growth and changing demand for food and agricultural products, increasing resource scarcity, intensifying climate change, and increasing production uncertainty. To control productivity problems, the government is obliged to find ways and means to make agriculture more competitive through the policies and measures that are following incentives for transforming this sector to sustainable agricultural development, food security, and poverty alleviation (Afrad *et al.*, 2019). In developing agriculture, the role of extension agents is needed because it provides support and facilitates farmers in agricultural production (Birner *et al.*, 2009). The direct involvement of extension agents with farmers is possible to have a better understanding in identifying the problems and setting priorities for agricultural

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development interventions through various programs according to their need (Birner *et al.*, 2009; Moore *et al.*, 2014; Pham *et al.*, 2021).

The success of reaching the program objectives is related to the competence and performance of the extension agents. Extension agents without sufficient competence and performance such as empirical studies in Ethiopia, India and Bangladesh are reported to have not achieved agricultural development goals (Msuya *et al.*, 2017; Rusliyadi *et al.*, 2018; Afrad *et al.*, 2019). According to Afrad *et al.* (2019), some efforts to help improve the competence and performance of agricultural agents are by issuing supporting programs such as conducting courses, comparative studies, providing opportunities for continuing education, providing facilities for implementing extension services, expanding work areas, and rewards. All extension agents must have confidence in their ability to solve the problems, work with different farmers of different nature, and collaborate with other agencies or individuals. This is because the methods used in delivering the extension, the problems in livestock, and the available resources differ from one farm to another. Farmers who can improve the quality of competence and performance are expected to achieve the desired agricultural development goals (Msuya *et al.*, 2017).

CONCLUSIONS AND RECOMMENDATION

Extension characteristics, competency, motivation, and self-reliance directly affects their performance. Extension characteristics, competency, motivation, and self-reliance indirectly affect farmers' performance. Meanwhile, extension performance directly affects the farmers' performance. It is recommended that the government should improve the ability of extension workers to serve farmers in the process of improving the performance of pig's production in the future. It can also be suggested to further researchers to explore in more detail the problem of not increasing pig production in East-Timor.

Conflict Interest

The authors declare that no conflicts interest regarding the publication of this article

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