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Abstract. The purpose of this research was to know factors affecting to the application of biosecurity practices on beef cattle farms. The research was conducted in Bone Regency, South Sulawesi Province. The total sample was 51 beef cattle farmers, which was chosen through purposive sampling. Data consisted of primary and secondary data. Data were collected through observation and interview by using a questionnaire. A multiple regression model was used in this research. The dependent variable was biosecurity practices, while the independent variables were age, gender, education level, household size, farm experience, and flock size. Guttman scale was used to know whether biosecurity practices were applied or not. The results revealed that R^2 was 0.923. Simultaneously, all independent variables were significant in applying biosecurity practices on beef cattle farms ($P < 0.01$). Partially, only the age of respondents and education level were significant ($P < 0.01$).

1. Introduction

Demand for meat in Indonesia increases year by year. According to the Ministry of Agriculture, the demand for meat is 700,000 tonnes in 2020, but domestic meat production fulfills only 400,000 tonnes [1]. As a result, Indonesia should import meat and live beef cattle from other countries such as Australia and New Zealand.

Beef cattle productivity in Indonesia is still low. Several factors cause this; one of them is diseases. The Indonesian Government is releasing a program called biosecurity to overcome the spread of diseases. The application of biosafety and biosecurity must be carried out at least in nurseries, cultivation, Animal shelters, Animal markets, Animal slaughterhouses, Animal transportation means, Animal health services, conservation units, and Veterinary Laboratories [2].

According to [3], biosecurity can be described as a strategic and systematic approach to risk analysis and management in the areas of food safety, animal and plant life and health, and bio-safety. It offers a policy and regulatory structure to enhance cooperation and take advantage of sector-wide synergies, strengthen the protection of human, animal, and plant life and health, and promote trade. Reference [4] noted that the three key components of biosecurity measures are separating livestock from the outside world and controlling livestock traffic and sanitation.

The prevention and control within and between farms of endemic pathogens also depends on the implementation of best management practices. However, farmers do not consistently take the prescribed steps or are not enrolled in voluntary programs to control diseases [5]. Reference [6] stated that there

are no studies have considered the introduction of biosecurity steps in the everyday management of livestock farms in Belgium. According to [7, 8, 9], the implementation of biosecurity in many Regencies in South Sulawesi Province was medium-level, meaning that not all biosecurity activities were adopted.

The most populous beef cattle in South Sulawesi Province is in Bone Regency amounted to 470 thousand in 2017. However, there was an Anthrax disease in 2018 [10]. Therefore, the objective of this research was to know factors affecting biosecurity practices on beef cattle farms in Bone Regency, South Sulawesi Province.

2. Research methods

This research was conducted in the province of Bone Regency, South Sulawesi. A sample of 51 beef cattle farmers was selected by purposeful sampling. The data was composed of primary and secondary information. Data were collected using questionnaires through observation and in-depth interviews. Biosecurity procedures were composed of 34 questions as a dependent variable.

A technical scoring system was developed from the biosecurity indicators (measures), ranging from 0 to 1. A biosecurity measure was coded as 1 if (implemented) this measure is present or 0 if (not implemented) the measure is absent [11]. All the values registered on farms (either 0 or 1 per farm) have been added up to obtain the final score for each metric. The measures were grouped into parts, each corresponding to biosecurity components (isolation, control of traffic, and sanitation). Since the component consists of several measures, to produce the mean score for the component, the individual measures' scores were applied by dividing the average score by the total number of measures within the component.

Age, gender, education level, household size, farm experience and herd size were independent factors. The multiple regression model was used in this analysis to explain variables influencing the implementation of biosecurity practices on beef cattle farms.

Data were analyzed using the SPSS statistical package (version 23.0, SPSS Inc., USA), and the significance level was fixed as 5%.

The model can be expressed as follows:

$$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + e$$

Where:

Y	= biosecurity practices (Y = 1 – apply biosecurity practices; 0 - no apply biosecurity practices)
a	= constant
b1, b2, b3, b4, b5, b6	= coeficient regression for X1, X2, X3, X4, X5, X6
X1	= gender (men = 1, women = 0)
X2	= age (years)
X3	= education level (years)
X4	= household size (person)
X5	= farm experience (years)
X6	= herd size (heads)
e	= error

3. Results and discussion

3.1. Characteristics of respondents

Based on table 1, it can be seen that based on gender, most of the respondents consisted of more women rather than men, 58.82% and 41.18%, respectively. Based on average age, respondents were in productive age (46.51 years) with the length of education was 9.51 years. Meaning that respondents graduated from Junior High School. Household size on average was 4.33 person. Farm experience of respondents on average was 9.75 years, with herd size on average was 3.47 heads.

Table 1. Characteristics of respondents.

Variables	Mean	Min	Max
Gender (men = 41.18%, women = 58.82%)			
Age (years)	46.51	19	75
Education level (years)	9.51	6	16
Household size (person)	4.33	1	10
Farm experiences (years)	9.75	2	25
Herd size (heads)	3.47	1	7

3.2. Application of biosecurity practices

The application of biosecurity practices can be seen in table 2.

Table 2. Application of biosecurity practices.

Variables	Number of questions	Frequency	Percentage
Isolation	2	66.00	18.49
Sanitation	3	110.00	30.81
Traffic control	2	28.00	7.84
Total	7	204.00	57.14

As shown in table 2, the total percentage of the application of biosecurity was 57.14, and this indicated that respondents were categorized as partial adopters. Sanitation was the highest percentage (30.81%), followed by isolation (18.49%) and traffic control (7.84%), respectively. To increase the percentage of traffic control, it was forbidden for people and other animals to enter the farms by putting the fences.

3.3. Multiple Regression Analysis

As shown in table 3, the Coefficient regression for gender was negative 0.679 and was not significant. This was agreed with that of [12], who stated that gender did not affect the level of biosecurity. The coefficient regression of age was positive 0.574 and significant at $P < 0.01$. Meaning that every increases the age of respondents by one year, the level of biosecurity practices will increase by 0.504. This research was in line with that of [13], who reported that the age of farmers remained significant predictors of a good biosecurity score.

Table 3. Multiple regression analysis.

Variables	Coefficient of regression	t-test	P-value
Gender	-0.679	-0.150	0.882^{ns}
Age	0.574	4.710	0.000*
Education level	2.118	3.822	0.000*
Farm experience	0.003	0.008	0.994^{ns}
Household size	-0.707	-0.721	0.475^{ns}
Herd size	1.743	1.266	0.212^{ns}
R^2 : 0.923			
R. : 0.931			
F-test : 110.441			
P-value : 0.000			

*significant at $P < 0.01$, and ^{ns} not significant.

The coefficient of education level was positive 2.118 and significant at $P < 0.01$. Meaning that every increase in one year of education period will affect the level of biosecurity practices by 2.118. This research agrees with that of [14], who stated that education level significantly affected the level of biosecurity adoption in beef cattle farms ($P < 0.01$). However, this was in contrast with that of [12], who argued that education did not affect the level of biosecurity.

Farm experience coefficient regression was positive 0.003 and not significant. This result is contra with that of [15], who found that farm experience had a positive effect on the use of biosecurity measures (*$P \leq 0.05$). Household size coefficient regression was negative 0.707 and not significant. This research was supported by [14]. The number of herd size coefficient regression was positive at 1.743 and not significant. This agrees with that of [12], who stated that herd size did not affect the level of biosecurity. This contrasts with that of [14], who pointed out that herd size significantly affected the level of biosecurity adoption in beef cattle farms. Reference [13] found that the scale of farms significantly influenced the degree of implementation of biosecurity in pig farms.

R^2 was 0.923, meaning that 92.3% of the independent variables used in this model determined dependent variable biosecurity practices, while 7.7% was influenced by other variables not included in this model. Based on F-test, the value was 110.441, and it was significant at $P < 0.01$.

4. Conclusion

Based on the results, it can be concluded that 92.3% percent of the model can be determined by gender, age, education level, farm experience, household size, and herd size. Simultaneously, biosecurity practices were influenced by gender, age, education level, farm experience, household size, and herd size. Partially, only the age and education level of beef cattle farmers influenced biosecurity practices.

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