Level of Biosecurity Adoption Practices in Beef Cattle Farmers in South Sulawesi, Indonesia

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Abstract. The aim of the this study was to determine the level of adoption of a range of standard biosecurity practices in beef cattle farmers in Soppeng Regency, South Sulawesi. Data were collected from 45 beef cattle farmers through observation and in-depth interview by using questionnaire. There was 26 questions which consisted of biosecurity practices: sanitation, isolation and traffic control. Data were analyzed descriptively using mean and percentage. The results showed that a level of partial adoption of biosecurity had been achieved by the beef cattle farmers. The implication is that beef cattle farmers could be motivated to enhance their level of biosecurity practices.

Keywords: adoption, biosecurity practices; beef cattle farmers

1. Introduction

Biosecurity is an important action taken by beef cattle farmers. The purpose of biosecurity measures is to prevent the transmission of disease from sick to healthy livestock, and as such, it is government policy in many countries. According to Government Regulation of the Republic of Indonesia No. 47 (June 12th, 2014), it was decided that biosafety and biosecurity must be applied at least in nurseries, cultivation, animal shelters, animal markets, animal slaughterhouses, animal transport equipment, animal health services, conservation units, and veterinary laboratories (Article 36). Cattle farms in Indonesia generally, and in South Sulawesi in particular, are maintained traditionally or semi-intensively. Feeding relies on field grass. Beef cattle are sometimes released during the day and impounded in the afternoon. This is one of the ways in which cattle can contract disease, and is difficult to control. The cattle population in the province of South Sulawesi decreased from 2,100,137 to 1,289,4442 animals from 2014 to 2015 [1]. South Sulawesi is a beef cattle supplier. The decline in the population was caused by several factors, one of them being the application of biosecurity that is not yet effective. The Soppeng district is one of the regencies in South Sulawesi. Even though the beef cattle population increased significantly from 2103 to 2015, by 51.64% [2], it should be noted that it is important to apply biosecurity in beef cattle farms in order to produce healthy meat. The purpose of

this study was to determine the level of biosecurity adoption in beef cattle farms in the district of Soppeng.

2. Methodology

This study was conducted in Soppeng Regency, South Sulawesi in 2019. The sample was chosen purposively, and totalled 45 beef cattle farmers. Data were collected through observation and in-depth interview using a questionnaire and checklist consisting of 30 biosecurity practices. A technical scoring system was developed from the biosecurity indicators (measures), ranging from 0 to 1. A biosecurity measure was coded as 1 if this measure was present (implemented), or 0 if the measure was absent (not implemented). To obtain the final score for each measure, all the values recorded on the farms (either 0 or 1 per farm) were summed. The measures were grouped into sections, each section corresponding to a biosecurity component (isolation, traffic control, and sanitation). Since each component was made up of several measures, the scores of the individual measures were added up to generate the mean score for the component, by dividing the total score by the total number of measures within a component. Data were analyzed descriptively, using means and percentages. To determine the level of adoption, a score was assigned for the adoption of each of the practices in the following way (**Table 1**):

Table 1. Scores for Adoption Patterns

Adoption Pattern	Score
Non-adoption	0
Partial adoption	1
Complete adoption	2

The adoption level of the respondents was measured by making use of the adoption index developed by Karthikeyan in [3].

$$Adoption\ index = \frac{Respondents'\ total\ score}{Total\ possible\ score} \times 100$$

Depending upon the extent of adoption of improved technologies, the respondents were categorized as follows:

1) Low adopters (up to 33%),
2) Partial adopters (34–66%); and
3) High adopters (67–100%).

3. Result and Discussion

Characteristics of the respondents

The characteristics of the respondents can be seen in **Table 2.**

Table 2. Characteristics of the Respondents

Characteristics	Minimum	Maximum	Mean	Percentage
a. Age (years)	17	65	43.56	
b. Education level				35.56
Elementary School				26.67
Junior High School				37.78
Senior High School				
c. Farm experience (years)	1	30	9.01	
d. Number of beef cattle (animals)	2	27	6.49	

Based on **Table 2**, the average age of the respondents was 43.55 years. This showed that the respondents were at a productive age. According to [4], there are three groups of age distributions – young (< 15 years old), productive (15–64 years old), and old (> 65 years old). This means that the respondents were still young and strong enough to manage their farms. On beef cattle farms, a strong

body is needed to clean the pen, to bathe the cattle, to look for grass, to feed and to provide drink. The age of the farmer is closely related to the ability of the farmer to receive or remember knowledge. This is in accordance with the opinion of [5], who stated that an increase in one's age can affect the increase in knowledge gained, but at certain ages, or before old age, the ability to accept or remember something will decrease.

In terms of the education level of the respondents, the majority had graduated from senior high school (37.78%). This indicates that the education level of the respondents was relatively high. Farmers with low levels of education have hampered knowledge. This is consistent with the opinion of [6], who stated that education is an activity or learning process for developing or improving certain abilities so that the educational goals can stand alone. The level of education also determines the ease with which someone absorbs and understands the knowledge they get. In general, the higher the education level of a person, the better their knowledge.

Table 2 shows that the average number of cattle was 6.49 animals. This suggests that these were small-scale beef cattle farmers. This is in accordance with the opinion of [7] who found that more than 90% of smallholder farms that had characteristics such as business scale that were relatively small, ranging from 1–8, meaning these were traditional household and maintenance businesses.

Level of Biosecurity Adoption

The aim of implementing biosecurity measures on cattle farms is: 1) to preserve high health status in the animals by protecting them from new and existing pathogens; and 2) to ensure the production of safe food. General biosecurity measures should be implemented in any farm, regardless of any specific problem [8]. The main components of biosecurity are isolation, traffic control and sanitation [9]. According to the diffusion of innovation theory, developed by Rogers in 1962 [10], is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Adoption means that a person does something differently than how they had previously done it (i.e., purchasing or using a new product, acquiring and performing a new behavior, etc.). The key to adoption is that the person must perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible.

Based on **Table 3**, the highest adoption index for biosecurity practices was sanitation (59.53). This is in agreement with [11]. On average, the level of biosecurity adoption practices was 54.10%, which was lower than [8] found, which was 61.7%. This means that only a view biosecurity practices had been adopted by the beef cattle farmers. This is similar to the finding of [12].

Among sanitation practices, 77.78% of the respondents used the same equipment to feed and clean the barn, or did not wash the equipment between uses. This means that the respondents' knowledge of sanitation was low.

The majority of respondents did not provide a clean area for the treatment and isolation of sick animals (82.22%). This indicates that the knowledge of the respondents concerning isolation was low. A majority of respondents (55.56%) cleaned their equipment and cleaned action already provided.

For the traffic control variable, the respondents mostly did not know the health history of the cattle purchased (71.11%); if they did know, this could prevent disease transmission. Records of every person visiting the cattle accommodations was adopted by 48.89%, which is a good start.

According to [13], 86.7% of biosecurity adoption was influenced by age, education, number of family and herd size (adjusted R^2); thus, 13.3% were influenced by other factors which were not involved in the model. Simultaneously, all variables affected significantly the level of biosecurity adoption ($P < 0.05$). Partially, education level and herd size affected significantly the level of biosecurity adoption in beef cattle farms ($P < 0.01$ and $P < 0.05$, respectively).

4. Conclusion

Based on the results, it can be concluded that the level of biosecurity adoption in beef cattle farmers in Soppeng regency can be categorized as 'partial adopter'.

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