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SOCIAL-CULTURAL VALUE AND DEVELOPMENT CONSTRAINS MOA BUFFALO FARMING IN MALUKU PROVINCE

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ABSTRACT
This study analyzes the factors that influence the socio-cultural value of the Moa buffalo and identifies the development constraints and solutions to overcome these constraints. The purposive sampling method was used to choose 261 buffalo farmer respondents in Maluku Province, Indonesia. Data were analyzed descriptively and by using multiple linear regressions. The results showed that the socio-cultural value of the Moa buffalo was included in the medium category, which means that the Moa buffalo has socio-cultural values and can be developed. The socio-cultural function of the Moa buffalo was strongly influenced by age, education period, motives for raising buffalo, and the number of buffalo ownership ($p<0.01$). The number of family members was not statistically significant. All factors together influence the socio-cultural function of the Moa buffalo ($R^2=0.684$). The constraints to the Moa buffalo development are the traditional maintenance system and simple technology, limited feed and water, low access to information and communication, minimal visiting of extension agents, and not being programmed.

Keywords: Buffalo Moa, social cultural values, development constrains

1. INTRODUCTION

Keeping livestock is part of the farming system for some rural communities in Indonesia. It functions as a source of income, family nutrition, labor, sources of fertilizer, and family savings. Indonesia has many local livestock resources that small farmers in rural areas can keep. Buffalo is one of the local livestock that has the adaptable advantage because it has been selected naturally. Local livestock are able to adapt to harsh environmental pressures, including hot, dry, or humid tropical climate conditions and severe disease and various other challenges (Kim *et al*, 2017).

One of the local buffaloes in Indonesia's endemic germplasm, which is developed in Maluku Province, is the Moa buffalo. The total population of Moa buffaloes in Maluku Province is 11,075, and 10,531 individuals (95.09%) are located on Moa Island (Maluku Barat Daya Regency in Figures, 2021). The tradition of keeping buffalo on the Moa Island has been passed down from generation to generation and supported by natural conditions with a natural pasture area of ± 20.000 ha (Matitaputty *et al*, 2017) or 20.84% of the total area of Moa Island

Moa Buffalo is a type of mud buffalo and is traditionally maintained. It has excellence because it is adaptable to dry and hot environments with limited feed, especially during the dry season. Climate data from 2014 to 2018 showed that Moa Island was included in the arid (dry) climate zone with an average rainfall of 155.60mm per year. This value includes to rainfall range for arid (dry) climate, namely 150 to 250mm per year (FAO, 2004).

Keeping buffalo is the leading business and primary source of income for Moa Island residents. They also used it as a medium of exchange (payment). Buffalo has historical value as socio-cultural livestock, which is used as traditional livestock for traditional ceremonies or traditional parties, dowry, and traditional sanction payments. These socio-cultural values and the availability of natural resources provide opportunities for buffalo to be kept.

On the other hand, many constraints need serious attention. Statistical data showed that there had been an average population decline of 5,02% per year in the period of 6 years (2017 to 2022). It impacted the decrease of ownership, production, income, and welfare. In addition, the external conditions with a long dry season (8 to 9 months) also cause the limited quantity, quality, and continuity of forage feed and water. The low quality of human resources and the restricted access to information and extension services impacted the limited application of buffalo culture innovation and technology. In contrast, information and communication are essential for effective technology transfer to increase agricultural production (Nwalieji *et al*, 2019). The reason for the low implementation of new cultivation practices is the lack of contact between farmers and extension agents (Gebrehiwo, 2017).

Extension contact frequency has a positive effect on the intensity of fertilizer use among small farmers (Iticha *et al*., 2021; Chinasa *et al*., 2022). Information dissemination of technological developments by extension can accelerate agricultural modernization (Gao *et al*., 2020). These constraints threaten the sustainability of the Moa buffalo development as local livestock in Indonesia.

The novelty of this research lies in the factors that influence the value of the Moa buffalo as a socio-cultural livestock and the constraints on its development as one of the germplasm of Maluku. Based on the explained background, this study aimed to analyze the factors that influence the Moa buffalo's socio-cultural value, identify the Moa buffalo development constraints, and propose the solutions to overcome these constraints as recommendations for the Moa buffalo development.

2. MATERIALS AND METHODS

This research was carried out on Moa Island, Maluku Province, Indonesia, as the center of the Moa buffalo development in Indonesia. Based on its geographical position, Moa Island has a boundary in the North with the Banda Sea, South with the Timor Sea, West with Letti Sea, and East with Lakor Island. The area of Moa Island is 955.68 km^2, located 583 km or 315 nautical miles from Ambon, the capital of Maluku Province, and can be reached by sea and air routes.

The research material was 261 Moa buffalo farmer respondents selected by purposive sampling method with a minimum keeping period of three years and still keeping buffalo. The farmer respondents were chosen from 6 of 7 Moa Island villages, namely Kaiwatu, Patti, Werwaru, Tounwawan, Klis, and Moain. The data was collected using the deep interview technique to farmers to obtain socio-cultural value data. Focus Group Discussions (FGD) and observations were used to identify the data of the development constraints. Research variables were composed of the respondent characteristics, the socio-cultural function of the Moa Buffalo, the indicators of feed carrying capacity, and the identification of constraints to the Moa buffalo development.

Descriptive analysis was presented in percentages and tables, which were obtained by using Microsoft Excel. Inferential analysis to determine the factors that influence socio-cultural values was performed using SPSS version 21. Socio-cultural analysis was performed using 11 statements with an ordinal measurement scale (Likert scale) (Kerlinger, 2000). Before being used, the validity and reliability tests of the questionnaire were carried out (Ghozali, 2011). The validity test on 12 statements of socio-cultural functions showed that 9 statements had $p<0.01$, 2 statements had $p<0.05$, and 1 statement was not valid. The reliability test with Cronbach's Alpha resulted in the reliability coefficient alpha value of 0.702 ($p<0.01$), valid. Before being analyzed further, the ordinal data was transformed to interval data using the STATCAL application with successive intervals method (MSI).

The factors that influence the socio-cultural value of the Moa buffalo were

analyzed using multiple linear regression equations according to Gujarati (1978).

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 D X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon}$$

Where:

Y = Socio-cultural Values (score)
β_0 = Intercept
β_1-β_5 = Regression coefficients associated with X1,X2 ...., X5 respectively
X_1 = Respondent age (years)
X_2 = Formal education (years of formal schooling)
D = *Dummy* purpose on raising buffalo (social = 1, others = 0)
X_3 = Number of buffalo (AU)
X_4 = Household size (number of persons in the household)
ε = error term

3. RESULTS AND DISCUSSION

3.1. The characteristic of respondents

Table 1 shows the characteristics of Moa Buffalo farmers. Most of the farmers were in productive age (96.55%), and the average age was 45.41 ± 10.50, so they were expected to have the good physical ability, strength and energy and the ability to make decisions in running a business. The arrangement in performing a livestock business was closely related to the age of the farmers, this was because a person's age affected the level of concern, productivity and mindset in making a decision (Mahmud *et al*, 2022). The productive age and the experience in maintaining buffalo of farmers affect the buffalo development because they have a better physique and tends to try new technologies (Abbulazeez, 2017)

Table 1. Characteristic of buffalo farmers

Characteristics	Value
Age (years):	
22 – 64 (productive) (%)	96,55
> 64 (unproductive) (%)	3,45
Average age (years)	45.41±10.50
Formal education (%)	
Elementary school	57,09
Junior high school	29,89
Senior high school	13,02
Average length of education (years)	6.87±2.39
Average *number of family dependents (heads)*	4.63±1.66
Average number of buffalo ownership (AU)	17.95±11.59

Source: Processed primary data, 2022

The research result showed that the average length of farmers' formal education was 6.87 ± 2.39 years. Compared to the formal education level in Indonesia, most farmers only attained primary school education. The average number of family dependents was 4.63±1.66 heads. The number of family dependents affects the family's economic burden because the cost of living will increase for food and education needs as the number of dependent families increases. On the other hand, the number of family members can be an asset for the availability of labor. The average number of buffalo ownership was 17.95 ± 11.59 AU. Male buffalo had a lower percentage than females because male buffalo is prioritized to be marketed and used for various traditional activities.

3.2. The socio-cultural value of buffalo

The socio-cultural value of the Moa buffalo in the medium category had the most significant percentage (Table 2). The medium category illustrates that farmers agree that buffalo are traditional livestock used in traditional ceremonies, rituals, traditional sanctions, and marriage dowries that must be maintained and preserved. It was found that 63.99% of farmers have a socio-cultural purpose (dowry, custom sanctions, and family events) with an average age of 46,00±11,04 years old, older than farmers with economic purpose. Younger farmers tend to have a stronger economic purpose in running the buffalo farming business. By raising buffalo, they can also cooperate, share experiences, and exchange information with fellow farmers. However, the function of buffalo cattle ownership related to the social status in the community had been lost.

Table 2. Presentation value of distribution of Moa buffalo socio-cultural function categories on Moa Island, Maluku Province

Category	Number	Precent
low	72	27.59
middle	127	48.66
high	62	23.75

Source: Processed primary data, 2022

This opinion differed from some previous studies that stated that Moa buffalo ownership could determine the social status (Matitaputty *et al*, 2017) or as in Toraja, Minangkabau, and North and South Lombok, where people consider buffalo closely related to social status. This difference is caused by the mindset alteration where economic goals became stronger than maintain the social position in the society.

3.3. The factors that influence the socio-cultural value of Moa Buffalo

The linear regression model (Table 3) showed a positive R^2 value of 0.684 and an F-Value of 31.823 ($p<0.01$). The socio-cultural function of the Moa buffalo was very significantly ($p\leq0.01$) influenced by the length of education, motives, and the number of buffalo. It was also significantly influenced ($p\leq0.05$) by age factors. The number of family members did not statistically show a significant effect. This analysis results showed that farmers with older age and lower education were more likely to keep buffalo because they regarded buffalo as traditional livestock, whereas younger and better-educated farmers generally had stronger economic motives than socio-cultural motives. Respondents with a high level of ownership more considered buffalo as a source of income than respondents with a low level of ownership.

Table 3. Factors Influence the socio-cultural Value of Buffalo Moa

Variable Independent	B	t-value	sig
age (X1)	0.130	2.215	.028**
Formal education (X2)	-0.153	-2.671	.008***
Motive (D)	0.532	10.584	.000***
Number of buffalo ownership (X4)	0.147	-2.774	.006***
Number of family dependents (X5)	0.054	-1.100	.272^{ns}
R^2	0.384		
F- Value (P<0,01)	31.823		

**** p≤0. 01;** p≤0. 05; ns = no significant*

3.4. The Constraints of The Moa Buffalo Development

Maintenance system of Moa Buffalo

Moa buffalo maintenance system was still traditional and used to accompany food crop farming. Feeding, breeding, and maintenance management are handed over to nature. There were two maintenance systems, namely semi-intensive and extensive. The semi-intensive system was applied in the rainy season. In this system, buffaloes were herded in the communal grazing lands (20 to 25 farmers) and put into "Lutur" in the afternoon. Lutur was a fence made of one metres height of limestone or wood, which functioned as a barrier for food crops, buffalo shed and pasture areas (Tatipikalawan *et al*, 2019) and can accommodate 500-800 buffaloes. This period was called "the shepherding season".

The advantage of communal grazing was that the farmers could exchange information and save labor. In the dry season, the buffalo was released freely and not put into lutur. In this condition, the buffalo was difficult to control, and the mortality rate was relatively high.

This system was still applied because most farmers were older farmers, so they applied traditional maintenance patterns derived from their predecessors. Besides that, there was another factor suspected to hamper the changes in maintenance patterns. It was the limited information that made the lack of knowledge regarding the use of technological innovations. Efforts are needed to change the farmer's behavior to increase their knowledge, have more positive attitudes towards change, accept innovation, and become skilled in carrying out their livestock business. In addition, intensive extension efforts that accompanied fostering farmer groups and encouragement to the whole community were also needed.

Feed and water availability

The analysis, which was based on Dry Material (DM) availability, resulted that feed carrying capacity index in the dry season was critical (deficiency) and in the rainy season was secure (available and excessive). Problems of feed carrying capacity occurred in the dry season. Natural pasture vegetation on Moa Island only grows during the rainy season for 3 to 4 months with low rainfall. In the dry season (8 to 9 months), all pools and forages dry up. To get fresh forage and water that is still available in the forest, buffalo must travel 5 to 7 km. In Argentina during the dry season livestock travel farther and spend less time resting in search of forage and water (Conegliano *et al*, 2022). The distances and walking times of cattle to forages and water in the dry and rainy seasons are significantly different (Maleko and Koipapi, 2015). Dry sessions have the potential to affect quantity, reliability of forage production, quality of forage (Thivierge *et al*, 2016), thermal stress on livestock and good water for livestock needs (Lecetera, 2019), structure and composition of forage (Yang *et al*. 2011; Lee, 2018).

The dominant forage types in a natural pasture on Moa Island were almost the same in every village. In Klis, Werwaru, and Kaiwatu villages, the dominant forage type was *Ischaemum Indicum* grass. In Patti and Moain villages, the dominant forage type was *Themeda arguens* grass. The dominance of *Hyparrhenis rufa* (Jaragua) grass was found in Taounwawan village. Other types of forage found were *Paspalum conyugatum* grass (paitan grass/buffalo grass), *Imperata sp* (alang-alang), *Eragrotis ambilis*, *Panicum repens*, and *Setaria ancepts* (setaria grass). Yoku *et al*. (2014) reported that natural pastures have a very high variety of forage types (vegetation).

Besides *Mimosa pudica* (Putri malu), the type of legume found in almost all pastures, especially during the rainy season, was *Desmodium triflorum*. This plant is found on a wide range of soils (Ren and Qiang, 2009; Gavalapu *et al*, 2013), Dry matter production 41,034 kg/ha (Suarna, 2017). This type of legume was almost not found in the natural

pasture on Moa Island in the dry season. Manu (2013) found the same thing in the natural pasture in East Timor. This condition may be happened because of the changes in the environmental growth conditions, where the temperature on Moa Island in the dry season reaches 29-33^{0}C and the rainfall is low (<155mm). This condition is thought to be the cause of *Desmodium triflorum* not surviving in extreme climatic pressures. *Desmodium triflorum* grows best in areas where annual daytime temperatures are in the 20-29°C range, with average annual rainfall in the 900-1500 mm range. More tolerant of soil sour and infertile (Sutrasno *et al*, 2009).

The fluctuations in the availability of natural forage in terms of quality, quantity, and continuity cause a decrease in buffalo body weight in the dry season because the buffalo nutrient requirements cannot be met. This condition was proven by the selling price of buffalo in the dry season, which was 9.44% lower than in the rainy season. Besides that, farmers tend to sell buffalo in the rainy season. The number of buffalo marketed in the rainy season was 37.14% higher than in the dry season because buffalo performance was better in the rainy season. The utilization of food crop waste as buffalo feed was still low (21.31%). This condition was caused by the lack of farmers' knowledge about feed utilization of agricultural waste. The ability and skills of farmers in processing local feed ingredients into good quality feed were still limited (Risna *et al*, 2017).

The effort that can be made is to increase the use of agricultural waste during the dry season with the intervention of related agencies, stakeholders, and academics. They need to disseminate information on feed technology and motivate farmers always to try to increase their capacity. It is also necessary to build ponds that can accommodate water during the rainy season and add irrigated artificial puddles as has been done in Syota hamlet, Tounwawan village.

Communication and information

Sources of information are types of information used by farmers related to management and buffalo selling prices. In the last three years, 91.95% of farmers stated that they only accessed information from fellow farmers, and only 8.05% said they obtained information from the extension process and the field school they attended. Information about agriculture is largely conveyed from farmers to farmers as the primary source of their technical information because of the trust they give to each other (Mujuni *et al*, 2012) This condition showed that farmers had deficient access to information. It was due to the limited information media available in the community. Observation results showed that even though all villages have been electrified, the level of blackouts was relatively high, and the farmers could not have electronic media such as television (TV) that must be equipped with a satellite dish. Inadequate basic infrastructure (electricity, telecommunications, roads, and transportation) was a significant constraint to delivering information services in rural areas in developing countries (Kamba, 2009). Farmers had a low percentage to prefer radio and television because of the procurement costs, electricity problems, broadcast time, and the fact that radio and television are less interactive because they are a one-way communication process (Adisa *et al*, 2019).

Visits of extension agents as a constraint

For the development of Moa buffalo, a Technical Implementation Unit (UPT) has been established with one incidental veterinarian. However, there was no independent extension agent programmed to visit farmers regularly. Academic institutions generally carried out extension activities and field schools that participated by farmers with limited frequency. This condition caused the increase of farmers' knowledge and skills to run slowly. Apart from that, the distance to the farm location is long and the limited transportation facilities provided by the government make it difficult for livestock officers to reach the buffalo farm location. This

condition is the same as that found by Hamidi *et al*. (2023), Contact between extension workers and farmers is rare because the facilities prepared by the government are inadequate while the distance and terrain are quite difficult.

The low contact level between farmers and extension workers caused no comparison in good and traditional management practices, so that farmers difficult to think rationally to implement better management. The low application of new management practices happened because of the lack of contact between farmers and extension agents (Gebrehiwot, 2017). Extension agents play an essential role in promoting agricultural technology adoption, and farmers will be more rational to compare the recommended practices with the traditional practices (Al-Zahrani *et al*, 2016; Muddasir *et al*, 2020). The role of agricultural extension workers will improve the quality of farmers nowadays, the benefits must be felt (Maulidiah *et al*, 2021)

4. Conclusion and Recommendation

4.1. Conclusion

The formal education, motivation, number of buffalo ownership, and number of family dependents very significantly influence the socio-cultural value of the Moa Buffalo, whereas age has a significant influence. Factors that constraint Moa Buffalo's development were traditional maintenance systems without technology absorption, limited feed and water, low access to information and communication, lack of visiting extension agents, and unprogrammed outreach activities.

4.2. Recommendation

Efforts should be made to disseminate information through extension agents so the change of farmers' behavior and activities in keeping buffalo can be more advanced. The Moa buffalo population can be increased while maintaining the role of Moa buffalo as socio-cultural livestock

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