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The profile of buffalo farming in Matur District, Agam Regency, West Sumatra

Reswati Reswati[1]* and Aronal Arief Putra[2]

[1]Department of Technology of Animal Production, Faculty of Animal Science, Universitas Andalas, Kampus Payakumbuh, West Sumatra, 26218, Indonesia
[2]Department of Technology of Animal Products, Faculty of Animal Science, Universitas Andalas, Kampus Limau Manis, Padang, West Sumatra, 25163, Indonesia
*Corresponding author: reswati@ansci.unand.ac.id

ABSTRACT

This research aimed to overview the buffalo farming business profile in Matur District and analyze its development problems. Data were obtained using the snowball sampling method by interviewing 148 buffalo farmers and by observing their farming. The parameters measured were: 1) farmer demographics, 2) profile of buffalo farming business, and 3) buffalo farming practice. The results showed that the buffalo farming business in Matur District was 58.78% managed by farmers aged 25-54 years, and most of their education was elementary school (54.05%). The farmers were quite experienced in raising buffaloes (18.46 years), but the average ownership was low (1.80 heads or 0.81 Livestock Units). Buffaloes' business system was dominated by a profit-sharing system (57.43%). The feed given to buffaloes was mostly natural grass (78.38%), the rearing system was carried out semi-intensively (69.59%) and intensively (30.41%), and only 54.73% of farmers provided buffalo houses. The main constraint in the buffalo farming business development in Matur District was poor farming practices, shown by the low level of technical aspects implementation (38.60%). Most buffalo mating system was natural system (96.39%). Stud limitation availability was the main constraint in buffalo reproductive management, which affected high mating costs (reached IDR 20,000-300,000/conception) and inbreeding cases (15%). Farmers' knowledge about diseases was low, and routine vaccination has not been applied. In conclusion, the buffalo management system in Matur District was low, and thus improvement is necessary to be conducted.

Keywords: buffalo productivity, raising management, technical aspects

INTRODUCTION

Swamp buffalo is potential livestock as meat and milk producers and significant as a working animal to help farmers work. This livestock species can survive in low natural resources conditions and have substantial contributions as a nutrition source and society income worldwide (Rehman et al. 2021). Due to its relatively equivalent nutritional content to beef, buffalo meat can substitute beef for society's demand (Ash'ari et al. 2020). In Indonesia, the role of swamp buffalo as a meat producer contributes significantly to meeting the demand for meat and achieving national meat self-sufficiency (Elizabeth 2017). Swamp buffalo is also significant in supplying buffalo milk to produce local Indonesian dairy products, including dadih, a Minangkabau fermented milk, particularly found in West Sumatra (Putra et al. 2011). However, the declining population over the years is the main problem faced in buffalo development in Indonesia (Reswati et al. 2021).

BPS (2022a) reported decreasing the buffalo population in Indonesia by 2.45% per year between 2001-2021. The province of West Sumatra, ranked the sixth largest buffalo population in Indonesia, has also decreased by 3.07% annually. Matur, an important district among 16

districts in the Regency of Agam, is a well-known area with the highest buffalo population in West Sumatra. Environmental conditions in this area are sufficient to support the buffalo breeding business due to its cool ambient temperature and supported by the large area of agriculture. The agriculture waste itself is a significant source of buffalo feed. Communities in this area have raised buffalo as working animals in the sugarcane refining process (Sari and Ekasari 2018). However, a declining buffalo population during 2017-2022, up to 59.06% (or equal to 11.81% per year) was also reported (BPS 2018; BPS 2019; BPS 2020; BPS 2021; BPS 2022b; BPS 2023).

The low productivity of buffalo might contribute to a significant decline in the buffalo population (Marawali 2017; Reswati et al. 2021). Several factors might be associated with this phenomenon, including the low technical implementation of buffalo raising (Sari et al. 2015) and simple-traditional raising techniques (Aprinaldi et al. 2021; Rusli and Syahidin 2021). Such low productivity was performed by their low growth and weight gain, delayed puberty and age at first mating, long postpartum anestrus, less visible signs of estrus, low pregnancy rates, and long calving intervals (Perera 2011).

Abdurrahman (2017) stated that declining in the buffalo population is due to its slow growth rate, limited superior breed, high levels of inbreeding, low quality of feed, the uncomfortable environment in which buffalo are kept, and negative public perceptions of buffalo. Ikun (2018) stated that fluctuations in the buffalo population might be associated with limited human resources, limited grazing land that mainly leads to difficulty in finding feed sources during the dry season, limited males, low reproductive performance of females, slaughtering of productive female, and lack of government support and development of buffalo livestock. When such conditions keep continues, a worse buffalo population problem that is gradually going to extinction might occur. Therefore, efforts to increase the buffalo population are urgent; it could make an important contribution to meeting the national demand for meat. Based on these conditions, it is necessary to obtain an overview of the business profile of buffalo farming in the Matur District, one of the buffalo centers in West Sumatra.

The goals of this study were to obtain an overview of the buffalo farming business profile in Matur District, Agam Regency, and to analyze the problems encountered in its development effort. The results of this study are expected to give detailed information to the government and stakeholders that can be considered when preparing buffalo livestock development programs in Matur District and the Province of West Sumatra.

MATERIAL AND METHODS

This research was conducted using a survey method in Matur District, Agam Regency, Province of West Sumatra. Data was collected by interviewing the respondents using a questionnaire and by direct observation to the location of such buffalo farming businesses. A total of 148 farmers were interviewed; the respondent number was determined using the Slovin formula (Tejada and Punzalan 2012).

Parameters measured consisted of 1) farmer demographics (age, education, and experience in raising buffalo), 2) profile of buffalo farming business (buffalo population, structure of buffalo population, average ownership, and ownership status of buffalo), and 3) buffalo farming practice (breed/reproduction, feed, rearing system, housing, and disease/health management). The management of buffalo rearing carried out by farmers is assessed and evaluated for the application of technical aspects using the standard identification guideline of technical buffalo farming by the Directorate General of Animal Husbandry (DITJENNAK 1992). Obtained scores were compared with the standard score, and then the percentage of technical aspects of buffalo farming was acquired. Furthermore, scores are categorized into good (> 80-100%), moderate (60-80%), and low (< 60%).

RESULTS AND DISCUSSION

Farmer demographics

The demographics of buffalo farmers in Matur District can be seen in Table 1. The age of buffalo farmers in Matur District is dominated by the age group of 25-54 years (87.00%), while the smallest group is in the age group <25 years (1.00%). The lower percentage of farmers from the age group <25 years was expected due to the people being in their education period or still in single status, so their interest in raising livestock, including buffalo, was still low. Meanwhile, the 25-54 age group is the productive age group who already have family (married), and thus they had responsibilities to gain income for their family life; and then choose to raise buffalo. Makatita (2021) stated that age has no effect on a person's behavior, but Lumbantoruan et al. (2014) highlighted that the farmer's age has a positive effect on the farmer's income. Moreover, a person's learning ability decreases after the age of 55-60 years, which affects his productivity (Padmowihardjo 1978).

Table 1. Demographics of buffalo farmers in Matur District

No.	Variables	Total (person)	Percentage (%)	Average
1.	Age (years)			50.47±12.93
	a. <25	1	0.68	
	b. 25-54	87	58.78	
	c. ≥55	60	40.54	
	Total	148	100.00	
2.	Education			
	a. Elementary school	80	54.05	
	b. Junior high school	38	25.68	
	c. Senior high school	27	18.24	
	d. Diploma	2	1.35	
	e. University	1	0.68	
	Total	148	100.00	
3.	Farming experience (years)			18.46±13.52
	<5	30	20.27	
	5-10	27	18.24	
	11-20	40	27.03	
	>20 years	51.00	34.46	
	Total	148	100.00	

The education level of buffalo farmers in the Matur District was dominated by graduates from elementary school (54.05%). This result is similar to the report of Makatita (2021), which found that most farmers in Buru Regency (51.02%) were elementary school graduates. Furthermore, 1.35% of farmers in the study area had a diploma, and 0.68% had a bachelor's degree. This data showed that diploma and bachelor graduates have less interest in raising buffalo. They generally choose other jobs or migrate to big cities.

The level of education influences a person's ability to manage a business (Riyanti 2003), maintain its sustainability, and overcome problems encountered (Alma 2010). The results of Lumbantoruan et al. (2014) showed that education length affects the farmers' income. Makatita (2021) stated that the education level of the farmer had an effect ($P<0.05$) on their behavior. The behavior of farmers in applying farming practices will increase with increasing education levels. This is related to the ability of farmers to absorb innovation and technology. Comparable to such previous studies, the low education of farmers in the Matur District might cause the low ability of farmers to manage their buffalo farming business and impact their low income.

In general, raising buffalo is a business that has been carried out by the parents of farmers in the Matur District for a long time, in which buffalo is used to transport and refine sugarcane. The length of experience of buffalo farmers in Matur District ranged from one to 60 years, with an average of 18.46 ± 13.52 years. As shown in Table 1, as many as 34.46% of farmers had enough experience, with more than 20 years of experience. However, Makatita (2021) underlined that farming experience does not much affect income. In general, raising buffalo is a business that has been carried out by the parents of farmers in the Matur District for a long time, in which buffalo is used to transport and refine sugarcane.

Profile of buffalo farm business

Buffalo ownership status at the study site was 42.57% owned by themselves, while 57.43% were profit-sharing system. Buffaloes reared using the profit-sharing system are purchased by their owners and raised by farmers for breeding or fattening. The results obtained in the form of buffalo calf or body weight gain will be valued in rupiah or profit-sharing, viz 50% to the farmer and 50% to the owner. Moreover, the greater number of buffaloes kept by the profit-sharing system was noticed due to the need for more capital for farmers to buy buffaloes. Santoso (2015) reported that the profit obtained by a buffalo farmer with a profit-sharing system is IDR 10,049,012 for one period (2 years) with two rearing heads.

The types of buffalo kept by farmers in Matur District, Agam Regency is swamp buffalo (100%) with its typical grayish black color, as seen in Figure 1. The population of buffalo kept by respondents was 268 heads or 186.75 Livestock Units (LU). The business scale or average ownership of buffaloes in Matur District is 1.81 ± 0.92 heads or 0.81 ± 0.56 LU. Buffalo ownership in this present study was lower than that of buffalo ownership in Lombok, West Nusa Tenggara Province, with 3.27 heads per farmer (Rusdiana 2014) and in Padang Pariaman Regency, West Sumatra Province, with 3.3 heads per farmer (Putra et al. 2021). The results of Lumbantoruan et al. (2014) showed that business scale positively affects farmer income. The low ownership of buffalo in the Matur District is because raising buffalo is only a side job for the respondents. Farmers who are generally sugarcane-, secondary crops-, and food crops-farmers prioritize their agricultural business because the results can be harvested in a shorter time than raising buffalo.

Figure 1. Swamp Buffalo in Matur District

Buffalo Farming Practice

The evaluation score of buffalo farming practices in Matur District based on the standard identification guideline of technical buffalo farming by the Directorate General of Animal Husbandry (DITJENNAK 1992) can be seen in Figure 2. The average score for the buffalo farming practice in the Matur District is "low," which is less than 60% (38.60%). This score represents poor buffalo farming practices in this area and thus needs to be improved to increase buffalo productivity. The result of this study is similar to obtained data in Gayo Lues Regency (40.16%) (Sari et al. 2015) and in Kuantan Singingi Regency (53.92) (Rizki 2022), with both in the “low” category. Some of the technical factors for raising buffalo in the Matur District are as follows:

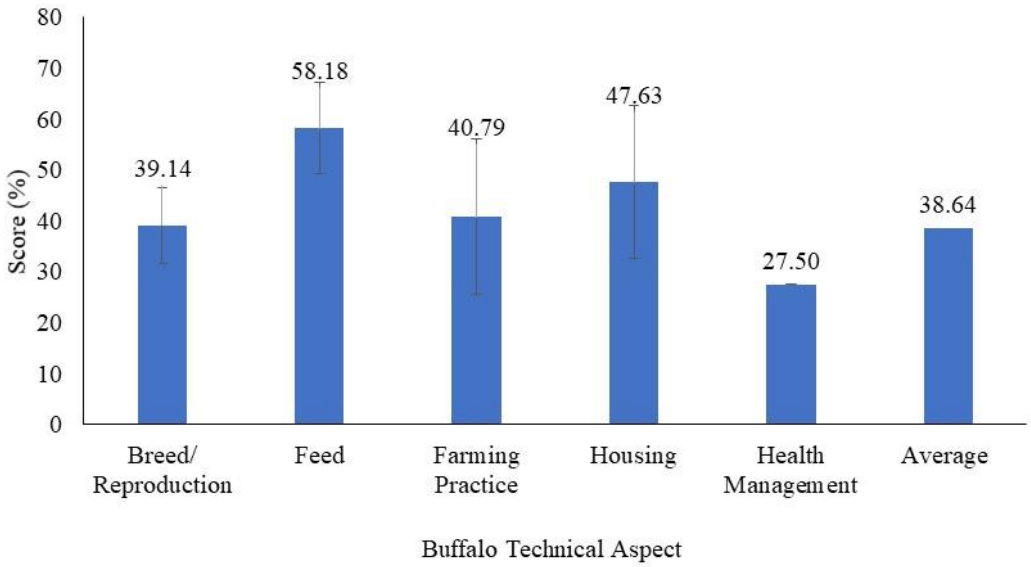

Figure 2. Assessment score of buffalo farming practice in Matur District

Breed/Reproduction

Breed quality is one of the factors that affect buffalo productivity. Good buffalo breed quality and supported by good farming practices would optimally increase productivity. In buying buffaloes, farmers make selections to get good quality buffalo breeds. Selection made by breeders is generally based on physical characteristics, but selection based on progeny can only be done by farmers who buy breeds directly from other farmers. Farmers sometimes need help to make a direct selection of the buffalo. This happened to farmers who raised buffalo with a profit-sharing system. As previously explained, 57.43% of farmers raise buffaloes with a profit-sharing system, and 60% receive buffaloes directly from their owners, so they cannot make selections. Lucky farmers will get good buffalo breeds, so that the buffalo can grow optimally. However, the buffalo breeds received by farmers only sometimes meet the criteria for good buffalo breeds, thus showing sub-optimal growth and development.

Reproductive management is a factor that must get attention to achieve optimal buffalo productivity. With good reproductive management, buffalo can reproduce properly. A total of 96.39% of the buffalo mating system in Matur District was carried out naturally using males, while 3.61% was carried out by artificial insemination (AI). The farmers explained that they preferred to mate the buffalo naturally because of the lack of estrus signs shown by the buffalo, making it difficult to determine the right time for AI.

As 86.25% of farmers do not have a stud, buffalo farmers had problems with natural mating. They must borrow a stud from other farmers to mate with their female buffalo. The number of adult studs owned by respondents in the Matur District was quite a lot, i.e. 22.7% compared to the number of adult female buffaloes and heifers. However, the breeding locations

are far apart, and not all owner farmers allow their male buffalo to be used as the stud. Farmers who generally raised male buffalo for fattening programs assume the mating will impact the decrease of buffalo body weight. When some farmers allow using their studs for mating, they are subject to high rates of up to IDR 300,000 per pregnancy. This value is quite costly for farmers who have limited funds. Thus, some farmers postpone mating their female buffalo until the next estrous cycle is noticed or until they have funds to pay for mating. The limited number of stud can be one of the reasons for the sub-optimal reproductive performance of buffaloes. This is in accordance with the opinion of Talib et al. (2017), which states that traditional raised buffaloes have low reproductive rates due to the unavailability of males suitable for mating.

Difficulty in finding stud triggered 15.00% of inbreeding cases between children and fathers or siblings. Inbreeding has an impact on reducing livestock productivity (Mirhabibi et al. 2007). This is related to the decline in livestock's health, survival, vitality, and fertility (Paige 2010). The group of livestock with inbreeding cases undergoes a decrease in population due to a lower survival rate than that of no inbreeding issues (Bezdíček et al. 2007).

Feeding

Balanced nutrition supported by good farming practices can increase productivity (Habib et al. 2017), including buffalo reproductive performance (Hussein and Abdel-Raheem 2013; Deka et al. 2019; Sharma and Bhatta 2019). The nutrition the buffalo receives from birth to adulthood impacts the subsequent continuation of the reproduction quality of the livestock (Mberato et al. 2016; Deka et al. 2019). Bhatti *et al.* (2007) stated that protein and energy are the most important nutrients that affect body weight and the attainment of puberty in heifers, without neglecting the importance of vitamins and minerals. Moreover, fat, mineral, and vitamin supplementation in feed can increase livestock reproductive efficiency (Deka et al. 2019).

Most farmers in Matur District (78.38%) only use forage as their buffalo feed source, while the rest provide forage plus additional feed (21.62%). The forage provided is in the form of a mixture of natural grasses and superior grasses, such as elephant grass (*Pennisetum purpureum*), king grass (*Pennisetum purpupoides*), and Bengal grass (*Panicum maximum*), which grow on the edges of gardens or rice fields. Additional feed was usually given by farmers, i.e. rice bran, salt, minerals, sugar cane juice, and brown sugar. However, these additional feeds were given priority to male buffalo, which were raised for fattening. Farmers do not provide additional feed to female buffaloes due to their economic limitations.

Hussein and Abdel-Raheem (2013) reported that buffalo receiving quality feed had better reproductive activity than those given limited feed. Another study, as reported by Mane et al. (2016), noted that buffaloes supplemented with Ca and P for seven days before and after calving required a shorter time for uterine involution and postpartum estrus than those of did not receive supplementation. Research by Khanum et al. (2012) highlighted that buffalo fed with grass reached puberty at 35.8 months, while buffalo fed forage with additional concentrates (1-1.5 kg per day) reached puberty at 23 months. The result of this study indicates that quality feed provides better reproductive performance. Seventri et al. (2018) stated that natural grass or field grass that grows on grasslands in the tropics generally has low quality and production. Thus, it cannot meet the needs of livestock for optimal productivity.

Rearing system

Related to the buffalo rearing system in Matur District, 30.41% of farmers applied an intensive system and 69.59% semi-intensive system, as seen in Table 2. Intensive system was usually applied on male buffalo for a fattening program, which was kept in cages for 24 hours. A semi-intensive system was applied for other buffaloes, which were reared for breeding purposes. These buffaloes were usually tethered at night in the garden/rice field (88.89%) or at

the back side of the house (11.11%), far from the main road, to prevent livestock theft. Buffalo tethers were moved to grazing areas during the day.

Table 2. Profile of buffalo farming in Matur District

No.	Variables	Total	%	Average
1.	Buffalo ownership status			
	a. owner	63	42.57	
	b. Profit sharing	85	57.43	
2.	Population (head)	268		
3.	Business scale (head)			1.81±092
4.	Rearing system			
	a. Intensive	45	30.41	
	b. Semi-intensive	103	69.59	

Buffaloes are livestock that readily undergoes heat stress and even cause death if they do not get shelter when exposed to the sun's scorching heat (Bhakat 2020). So, buffalo need shelter or a place to cool their bodies during hot days. Shelters or places to cool down the bodies of buffaloes in Matur District include under trees (46.62%), mud wallow (39.10%), rivers (7.52%), ponds (1.5%), and cages (5.26%). Aggarwal and Singh (2010) stated that the cooling system for wallowing in ponds is better than the shower system, which can be seen from the lower concentration of cortisol, higher concentration of thyroxine, and higher feed intake of buffalo. However, there were few ponds or rivers for bathing at this research location. Therefore, there were more places to cool off for the buffalo under the trees. Matur District is located in the highlands, with temperatures during the day ranging from 19.48 - 30.97 °C which is relatively more comfortable for buffaloes than temperatures in the lowlands, i.e. 25.42 - 33.99 °C (Reswati et al. 2021).

Housing

Buffaloes need housing to prevent livestock from adverse environmental factors and help farmers apply good farming practices. Housing availability also facilitates the implementation of AI or the administration of medicine/vitamins when a restraining pen is unavailable. A total of 54.73% of farmers in Matur District provide housing, while the rest, 45.27%, do not provide housing. However, farmers prioritize housing for fattening male buffaloes rather than females.

Farmers who do not provide buffalo housing due to the low economic condition also stated that buffalo do not need cages. The unavailability of housing causes farming practices could not be carried out optimally, including providing feed, drinking, and maintaining the health of the buffalo. Without a house, buffalo are also easier exposed to sunlight and bad weather, which negatively affects the health of livestock. This is due to their dark skin and few sweat glands, making it difficult to regulate their body temperature in hot and humid environments (Ibrahim and Hussin 2017). The availability of cages is essential to protect buffaloes from bad weather and led farming practices easier to be applied.

Health Management

Knowing the causes, symptoms, and ways to deal with the disease will help farmers keep their livestock healthy; thus, their productivity is not interfered with. Poor knowledge of farmers in this present study related to the causes, symptoms, and methods of treating several infectious diseases, such as anthrax, Septicemia epizootic, foot and mouth disease, and brucellosis, was noticed. This is probably due to the rare occurrence of these diseases, so farmers do not know about them.

In general, farmers in Matur District recognize several diseases that have attacked their buffaloes. Based on interviews with farmers, several diseases that have attacked their buffalo include boils (0.68%), intestinal worms (2.03%), fever (2.70%), diarrhea (3.38%), and bloating (0.68%). However, most buffalo never get the disease (89.86%). This represented that the buffalo is quite resistant to the diseases. Farmers usually provide traditional medicines from plants or report them to veterinary officers for treatment. Animal husbandry extension is needed to provide information and knowledge to farmers. Farmers are expected to have a better understanding of the symptoms and how to handle diseases; so that the health of their livestock is controlled and their productivity is optimized. All respondent farmers also stated that they had never vaccinated their buffalo.

CONCLUSION

Buffalo farming in Matur District was dominantly conducted by 25-54 years old farmers and elementary school graduates. Even though they mostly had enough experience in buffalo farming, the average ownership was low because most of them obtained earnings from profit-sharing systems. Poor buffalo farming practice, as represented by the low implementation of technical aspects, was noticed. By applying the natural mating system as the main breeding system, difficulty in finding stud triggered high mating costs and inbreeding cases. The buffalo were mostly reared using semi-intensive, with natural grass as the main feed source; while housing was only applied for male fattening goals. Farmers' knowledge of buffalo disease is limited; at the same time, routine vaccination has not been applied.

CONFLICT OF INTEREST

There is no conflict of interest with any party regarding the material discussed in the article, funding, and differences of opinion between the authors.

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