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A Look at Smallholder Cattle Farming in Payakumbuh, West Sumatra

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ABSTRACT

This study aimed to provide an overview of the characteristics of smallholder cattle farming in Payakumbuh. A survey was conducted in five sub-districts by interviewing 50 cattle farmers and conducting direct field observation. Farmers demographics, livestock management practices, and the reproductive performance of the cattle were evaluated. Smallholder farmers in Payakumbuh were typically an average of 45.02 years old, commonly senior high school graduates, occupied in the agricultural field with their own cattle ownership, experienced for 18.1 years, involved in cattle farming for additional income, and commonly focused on Simmental crossbred raising. Cattle management was mainly categorized as good, as represented by feeding management (application of routine forage and concentrate, twice daily feeding frequency, and ad libitum drinking water), rearing (intensive rearing and natural weaning), housing (permanent housing structure, individual housing system, and draw well water source), and health (regular deworming). Reproductive performance (20.4 months age at first mating, 1.55 service per conception, 14.63-month calving interval, and 3.96 months for re-mating after calving) is also close to the ideal standard. To sum up, the presence of smallholder farmers is significant and could serve as a reference for farmers in other areas of West Sumatra. Enhancing applied technology is necessary to upgrade their cattle farming scale.

Keywords: Breeding, Feeding, Health, Housing, Rearing

INTRODUCTION

Ruminants, including cattle, buffalo, goat, and sheep, are vital livestock species distributed globally. Among these, cattle are the most widely distributed and populous, significantly contributing to global meat and milk supplies. This dominance is likely due to a higher preference for cattle products over those of other ruminants. However, as noted by Felius et al. (2014), cattle breeds might vary in appearance, performance, and environmental adaptation.

Smallholder cattle farmers generally dominate cattle ownership in suburban and rural areas. With mostly single-digit herd sizes, smallholder farmers remain an essential group amidst the existence and growth of semi-professional cattle farmers. By utilizing natural feed sources found in surrounding areas, the most significant expenditure on feed can be reduced. Thus, smallholder cattle farming becomes a viable part-time job option for people living in suburban and rural areas, most of whom primarily work as agricultural farmers. Gayatri and Vaarst (2020) and Reswati and Putra (2023) highlighted that this farming segment is still a choice for many farmers due to its benefits, such as saving money and providing cash for urgent family needs. In fact, smallholder farmers are often vulnerable in the beef cattle industry; thus, their empowerment is necessary to address future challenges (Agus and Widi 2018).

Payakumbuh is one of the 19 cities/regencies in the Province of West Sumatra. This city is a vital livestock development area in the province. About 120 km from the provincial government center, where most meat consumers are, Payakumbuh continues to grow with its smallholder cattle farming. Characterized by intensive and semi-intensive farming systems, cattle farming in Payakumbuh is supported by forage availability and adequate livestock areas. Additionally, as Payakumbuh is located near the largest national cattle breeding center in Padang Mangateh, farmers' knowledge about breeding, feeding, fattening, and other related beef cattle attributes is indirectly improved. BPS Payakumbuh (2023) reported that the cattle population in Payakumbuh reached up to 4,182 heads in 2022. However, population growth and urban expansion are reducing the land availability for cattle farming, posing a challenge to the sector's sustainability.

Despite the significance of smallholder cattle farming in Payakumbuh, there is a lack of detailed studies on the potential and challenges faced by these farmers. Therefore, this study aims to fill this knowledge gap by examining demographics of smallholder cattle farmers, their farming management practices, and reproductive performance of their cattle. The data obtained from this research is noteworthy as basic information for developing future cattle farming in Payakumbuh.

MATERIAL AND METHODS

Location

This research was conducted in five sub-districts in Payakumbuh, West Sumatra: North Payakumbuh, South Payakumbuh, West Payakumbuh, East Payakumbuh, and Lampasi Tigo Nagari.

Method

This study was conducted using a survey method. A questionnaire was developed, printed, and distributed to meet the targeted number of respondents. Data were collected by randomly selecting and interviewing 50 cattle farmers using the questionnaire, and then by observing their livestock farming locations.

Parameters and data analysis

The parameters measured include 1) farmers demographics (such as age, education, main occupation, status, number of livestock owned, livestock farming experience, reason for raising cattle, and the type of cattle breed raised); 2) livestock management practices (including breeding/reproduction, feeding, housing, rearing, and health/disease); and 3) cattle reproductive performance (age of first calving, calving interval, and service per conception (S/C)). The age of first calving is the stage at which a female cattle gives birth for the first time (months). The calving interval is the average period between successive calvings (months). Service per conception is measured by counting the number of services (mating attempts), using artificial insemination (AI) or natural mating, required to achieve one pregnancy. The data were analyzed using descriptive statistical methods using the SPSS computer program.

RESULTS AND DISCUSSION

Farmers demographics

The demographics of cattle farmers can be seen in Table 1. Data showed that the average age of cattle farmers was 45.02 years old. Most of the farmers were senior high school graduates (40%), while the others were graduates from elementary school (32%), junior high school (20%), and bachelor (8%). Almost half of the farmers were primarily

engaged in agriculture (48%), while the rest were agricultural workers (16%), livestock farmers (14%), entrepreneurs in other fields (12%), merchants (8%), and civil servants (2%). On average, the farmers had 3.33 family members and 18 years of experience.

Table 1. Cattle farmers demographics in Payakumbuh

No	Parameters	Number	%	Average
1.	Age (year old)			45.02±10.55
2.	Education			
	a. Elementary School	16	32.00	
	b. Junior High School	10	20.00	
	c. Senior High School	20	40.00	
	d. Bachelor	4	8.00	
	Total	**50**	**100.00**	
3.	Main occupation			
	a. Livestock farmer	7	14.00	
	b. Agricultural workers	8	16.00	
	c. Agricultural farmer	24	48.00	
	d. Civil servant	1	2.00	
	e. Other entrepreneurship field	6	12.00	
	f. Merchant	4	8.00	
	Total	**50**	**100.00**	
4.	Number of family members (person)			3.33±1.31
5.	Livestock raising experience (years)			18.1±12.71
6.	Status and number of livestock ownership (heads):			
	a. Own	36	72.00	5.36±5.78
	b. Profit sharing	5	10.00	2.80±0.84
	c. Government aid	9	18.00	17.44±14.08
	Total	**50**	**100**	
7.	Reasons for raising cattle			
	a. Passed down from parents	6	12.00	
	b. Savings	11	22.00	
	c. Increase income	26	52.00	
	d. Primary income	7	14.00	
	Total	**50**	**100**	
8.	Type of cattle breed			
	a. Simmental crossbreed	42	84.00	
	b. Ongole crossbreed	3	6.00	
	c. Bali	1	2.00	
	d. Ongole crossbreed and Bali	1	2.00	
	e. Ongole crossbreed and Simmental Crossbreed	3	6.00	
	Total	**50**	**100**	

Almost three-fourths of cattle ownership (72%) was self-owned, while 18% and 10% were under profit sharing and government aid, respectively. The cattle provided by government aid were maintained by a group of farmers. The number of cattle raised was 5.36 head for self-ownership, 2.80 head for profit sharing, and 17.44 head for government aid. The primary reason for raising cattle was to increase income (52%), followed by savings (22%), primary income (14%), and inheritance from parents (12%). Among the cattle raised, Simmental crossbred was the predominant breed chosen (84%), followed by Ongole

crossbred (6%), Simmental crossbred x Ongole crossbred (6%), Bali (2%), and Ongole crossbred x Bali (2%).

As cattle farmers frequently have low formal education levels, they often possess varied knowledge of local cattle breed raising. In contrast, the challenges related to improved genetic breeds might vary among them (Herath and Mohammad 2009). Conversely, the education level of the farmers influences their decision to increase business capacity (Roessali et al. 2011; Reswati et al. 2014). Despite their limitations, their extended experience and interaction with other farmers enhance farmers' knowledge. This aligns with Sugiarto et al. (2018), who noted that farmers' experience is one of the essential factors in strengthening cattle farming competitiveness.

Similar to many areas in Indonesia, cattle farming is a side job of many people who primarily engage in agricultural farming (Handayani and Safrida 2023). In most practices, the farmers cared for their cattle in the morning before going to their agricultural land, mainly cleaning the cattle house and feeding the livestock. After finishing their work on the land, they will do the same things as handling their cattle in the afternoon.

Most cattle ownership belongs to them. All decisions in handling the cattle could be made directly by themselves. Moreover, the challenges are equal to the profit obtained. In contrast, Rohani et al. (2021) distinguish the participation of cattle farmers in the sharing system as related to the challenges of getting the money to fulfill family needs, capital limitation, enhanced social status, and easy implementation.

Most of the farmers select this business as additional income. Understandably, most farmers were involved in the agricultural field. Thus, their time should be shared and prioritized for their primary job. The profit from cattle farming could add to the family's total household income. In line with the explanation in the previous study, income obtained from cattle farming was lower than that of non-cattle income (Azmi et al. 2022). As detailed in another reference, by raising cattle, the cattle farmer could gain up to 40.9% of their household income (Wahyuningsih et al. 2021). Moreover, if the farmers increased their business scale and made cattle farming their primary occupation, they could focus on work to earn more significant profits.

Livestock management practices

Breed

Data on cattle breeding management in Payakumbuh is presented in Table 2. Cattle breeds for raise were bought by farmers themselves (52%), while the rest were from profit sharing (26%) and government aid (22%). Cattle bought by farmers were taken from livestock markets (76.92%) and brokers (23.08%). Before deciding to buy, the selection was conducted by farmers (52%), while the others were not (48%). By buying themselves, the cattle's price, breed, age, and size could fit with the farmers' finances. Indeed, this applied to the farmers who have enough capital. People who do not have enough money to buy are usually being a cattle keeper for the cattle owner. The profits will later be divided in half. Some cattle are provided by government aid, particularly for communal cattle farmers. The farmer who buys the cattle prefers to buy the cattle in a livestock market rather than the broker. In Payakumbuh, a traditional livestock market usually opens every Sunday in Payobasuang, which could be a location choice for buying cattle.

Before buying, the selection was conducted by some farmers to obtain cattle, mainly based on their performance as fitted with the price. The bargaining price farmers propose is generally determined by presumed weight, not by measuring the weight using a cattle scale. The farmers expected the weight of the cattle they would buy based on some selection criteria based on their long experience in this business.

For breeding, farmers preferred artificial insemination (97.30%). This method was parallel to the introduction and success of artificial insemination applications for an extended period to the farmers in this area. As stated by Kusumaningrum (2022), by looking at farmer perception, Indonesian farmers were in a good category related to their knowledge and awareness of artificial insemination.

Table 2. Cattle breeding management in Payakumbuh

No	Parameters	Data obtained
1.	Breed sources	
	a. Profit sharing	26.00%
	b. Government aid	22.00%
	c. Buy by farmer	52.00%
2.	Purchasing	
	a. broker	23.08%
	b. Livestock market	76.92%
3.	Mating system	
	a. Artificial insemination	97.30%
	b. Natural mating	2.70%
4.	Popular breed	
	a. Simmental	100%
	b. Other breeds	0%

In artificial insemination applications, most farmers (62.16%) asked for special requests for frozen semen from particular cattle breeds, while the rest did not (37.84%). Simmental was the favored breed for all farmers (100%) because it has become more popular among farmers in previous decades due to its good fattening performance. As Sutarno and Setyawan (2016) noted, the Simmental breed is widely crossbred by Indonesian farmers with local cattle.

The farmers preferred to apply such crossbreeding due to their bigger size and faster growth, particularly for male offspring. Besides, the pregnancy schedule could also be estimated. Payakumbuh is also popular with the spread of the Simmental breed population. High market opportunities and high selling prices were also reasons for Simmental breed preferences.

Simmental, an exotic cattle, is the most preferred breed among farmers (Widi et al. 2010) due to its high meat production (Putra et al. 2020). Moreover, semen from Simmental bull is also most favored by farmers (Agustine et al. 2019).

Feed

Data of cattle feeding management in Payakumbuh is shown in Table 3. In feeding, the given feed mostly provided consists of forage and concentrate routinely (38%), followed by only forage (24%), forage and rice straw (20%), forage and concentrate not routinely (12%), and only rice straw (6%). However, all farmers provided water for their cattle (100%), with the majority providing ad libitum (72%), while the others provided restricted times in the morning/afternoon (28%). Each day, the feed was mainly provided two times (68%), while some others provided it three times (26%) and one time (6%). More than half of the farmers have grassland (54%), while the rest do not (46%).

The farmers, who give forage and concentrate routinely on the cattle, propose their livestock business for fattening programs. Some others are also targeted at that, but in the application, they try to reduce production costs by utilizing feed sources with no or low costs,

like rice straw or other agricultural waste. After all, high-quality feed parallels increase cattle performance; thus, a shorter time to reach the ideal cattle weight for selling was obtained.

Table 3. Cattle feeding management in Payakumbuh

No	Parameters	Percentage
1.	Feed type	
	a. Only forage	24.00%
	b. Only Rice straw	6.00%
	c. Forage and rice straw	20.00%
	d. forage and concentrate (routine)	38.00%
	e. forage and concentrate (not routine)	12.00%
2.	Feeding frequency	
	a. one time	6.00%
	b. two times	68.00%
	c. three times	26.00%
3.	Drinking water provided	
	a. Adlibitum	72.00%
	b. Provided in the morning/afternoon	28.00%
4.	Grassland ownership	
	a. Have	54.00%
	b. No	46.00%

Unlike most local cattle that could provide accessible feed sources nearby and mostly forage feed type, paying more attention to the nutrient balance of the Simmental crossbred as the main breed raised by farmers is important to obtain targeted daily weight gain. However, as Sahara and Sidomulyo (2015) explained, besides the importance of food quality, subtropics cattle origin, including Simmental crossed, also required more feed due to their considerable body weight. Thus, some challenges related to feed cost, availability, and farmers' knowledge sometimes limit their livestock business.

Feeding frequency affects the performance of cattle. Higher feed intake was parallel with higher daily gain, mainly in feeding three times per day. However, one time per day might contribute to more significant profit margins and reduce labor (Schutz et al. 2011). Moreover, as commonly practiced by Indonesian farmers, feeding twice per day is a more rational choice considering feed quality, time availability, and farmers' attention to their cattle.

The ownership of land is vital to finding feed sources. It is mainly for cattle grazing and obtaining the cut-and-carry system for the cattle house. FAO (2007) highlighted the incredible difficulty faced by livestock farmers without land to supply feed sources. Ad libitum drinking water is usually parallel with feed intake. Feed containing high moisture, particularly from forage and agricultural waste, might not pointedly affect water consumption. But, ad libitum water might be more required to consume less moisture content feed such as various concentrate sources and mineral feeds. Schütz (2012) noted that drinking water, to some degree, might influence the feed intake and productivity of cattle. Moreover, Wagner and Engle (2021) highlighted the importance of ad libitum clean water for cattle drinking.

Rearing

Data of cattle rearing management in Payakumbuh is displayed in Table 4. Most farmers applied an intensive system for raising cattle (86%), while the rest raised cattle in a

semi-intensive system (14%). All calves were raised with their mothers until they reached weaning time (100%). The weaning time was obtained at 6.13 months old.

Table 4. Cattle rearing management in Payakumbuh

No	Parameters	Data Obtained
1.	Rearing system (%)	
	a. Intensive	86.00
	b. Semi-intensive	14.00
2.	Calf raising (%)	
	a. Raising together with the dam until weaning (natural weaning)	100.00
	b. Raising separately from the dam (early weaning)	0.00
3.	Age of calf weaning (months)	6.13±1.37

Most farmers applied intensive system representing high awareness of farmers to select cattle farming as a promising business. With intensive system, good farming practices are also easier to apply. Many aspects could be more controlled, including feed and health management, which are some of the most determining aspects influencing cattle performance. Despite it all, estrus symptoms are more easily detected in an intensive system, thus simplifying the time for mating. As Kusumaningrum (2022) highlighted, an intensive system benefits farmers in detecting estrus time more efficiently and applying artificial insemination.

Nevertheless, some farmers still apply semi-intensive systems that might be associated with limited cost and time. So, the cattle were released to grazing during the day to get the feed from the grazing area, and thus, the cost of feed and labor to collect the feed could be reduced. The feed is usually provided chiefly twice a day, but it is in lower quantity than an intensive system. By a semi-intensive system, the cattle farmers could still have more time to do other activities. Number of cattle raised by semi-intensive system is generally lower than that of intensive system.

In practice, all farmers led the calves with their dam to ensure they reached their weaning time. The age of weaning in this study is more extended than previously reported, which found 4.17 months of calf weaning in Simmental crossed (Desinawati and Isnaini 2010). This might be the farmers' effort to optimize the calves' growth and performance from an early age.

Housing

Data of cattle house management in Payakumbuh can be seen in Table 5. All of the farmers in Payakumbuh provided houses for their cattle. Four-fifths of farmers have semi-permanent housing for their cattle (80%), while the other one-fifth have permanent housing (20%). Individual cattle housing was the primary cattle house system (80%); the rest was group housing (20%). Most of all cattle housing was cleaned every day (96%), while the others were cleaned every two days (2%) and every one week (2%). More than half of farmers obtained the water to be supplied to cattle houses from a draw well (58%), followed by water from pipe water (26%), and a smaller percentage from river/ ditch (10%) and ponds (6%). Few farmers provide feces storage (16%), while most others are not (84%).

Permanent housing is an expensive cost to build. Due to farmers' limited capital money, most farmers prefer to build semi-permanent houses for the cattle. So they can prioritize their limited capital money to buy more cattle or use it as a cost reserve. Moreover, a semi-permanent house is usually equipped with some pillars and a roofs that is enough to cover the cattle from the extreme temperature. Since only a few communal farmers exist, they mainly house their cattle individually near, close to, or beside their homes.

Communal houses might be considered the best housing for rearing cattle (Muis 2015). The communal house generally applied for cattle from the government aid program. However, the simplicity of rearing as located to their house by rearing in individual houses was preferred by individual farmers.

Table 5. Cattle house management in Payakumbuh

No	Parameters	Percentage
1.	Cattle house ownership (%)	100.00
2.	Type of cattle house building (%)	
	a. Permanent	20.00
	b. Semi-permanent	80.00
3.	Cattle house system (%)	
	a. Individual	80.00
	b. Group	20.00
4	Cattle house cleaning frequency (%)	
	a. Everyday	96.00
	b. Every two days	2.00
	c. Every week	2.00
5	Water source (%)	
	a. River/ ditch	10.00
	b. Pipe water	26.00
	c. Draw well	58.00
	d. Pond	6.00

Water sources are essential to provide cattle with drinking water and clean the house. More than half of cattle farmers obtain the water from a draw well. As commonly practiced, water was taken from a draw well by pumping for the cattle and the farmer's family. Water for cattle was placed in a water tub near the cattle house. However, serious attention should be focused on feces storage. Since only a few farmers provide particular storage areas for feces, many flies might exist and create environmental problems.

Health

Data of cattle health management in Payakumbuh is provided in Table 6. All sample cattle in Payakumbuh were never get vaccination (100%). Conversely, the farmer's care in giving worm medicine was better (84%) compared to not giving it (16%). However, fewer farmers provided the vitamin for their cattle (8%), while most other farmers did not (92%). Diarrhea, flu, fever, paralysis, cursing, blood in urine, worms, scabies, and bloating were frequent diseases.

The existence of worms in cattle gastrointestinal might affect the performance and growth of the cattle. Cattle infected with worms commonly had limited weight gain per day, thus economically limiting farmers' income. Farmers' awareness of conducting deworming represents the farmers' knowledge of this helminth parasite. A report pointed out that Strongyle, *Capillaria sp*., *Trichuris sp*., and *Ascarids sp*. frequently infected cattle gastrointestinal (Nurcahyo et al. 2021). Thus, by increasing farmers' awareness of administering worm drugs, the health quality of cattle could be optimized, particularly for the fattening programs.

In contrast, less vitamin administration practices are not due to farmers' less knowledge of the positive effects of vitamins used. They are more associated with farmers' cost limitations. So, they pay more attention to the most essential things to run cattle raising.

Farmers with more awareness of the excellent performance of the cattle commonly still provide the cost for vitamin administration.

Table 6. Cattle health management in Payakumbuh

No	Parameters	Data obtained
1.	Vaccination: never	100%
2.	Worm drug administering	
	a. administering	84.00%
	b. Not administering	16.00%
3.	Vitamin administering	
	a. administering	8.00%
	b. Not administering	92.00%
4.	Diseases	
	Diarrhea, flu, fever, paralysis, cursing, blood in urine, worms, scabies, bloating	

Frequent diseases, as mentioned above, are usually associated with environmental factors. Cattle house cleanliness and weather were expected to be the main causative factors. However, genetic factors should also be controlled to prevent inbreeding cases that decrease livestock's health quality.

Cattle reproductive performance

Data of cattle reproductive performance in Payakumbuh can be seen in Table 7. On average, the age of first mating is 20.41 months old. The cattle typically had 1.55% serving per conception (SC), a 14.63-months calving interval, and re-mating after 3.9 months of calving.

First mating and re-mating after calving are associated with puberty time and successful estrus symptom detection (Reswati et al. 2021). Besides environmental factors, feeding might be significant in producing important mature hormones in cattle to get normal puberty age. As Day and Nogueira (Day and Nogueira 2013) pointed out, nutrition management in preweaning and between weaning and breeding season periods played a significant role in determining puberty age.

Table 7. Cattle Reproductive performance in Payakumbuh

No	Parameters	Data obtained
1.	Age at first mating (month)	20.41±7.38
2.	Service per conception	1.55±0.96
3.	Calving interval (month)	14.63±2.35
4.	Re-mating after calving (month)	3.96±1.62

Tend to mooing, riding other cows, staying quiet when mounted, red, swollen mucus-genital organs, and decreased appetite were some general observed estrus symptoms in cattle. Once the farmer detects the estrus symptom of the cattle, they can request artificial insemination or find an adult stud for natural mating. Moreover, time management to apply artificial insemination or natural mating is essential to the success of the mating and conception. Firmiaty et al. (2020) detailed that 24 hours after estrus onset is the optimum time to apply artificial insemination in Simmental crossbred.

Data of service per conception of the cattle raised by farmers in Payakumbuh was a good score. This means that almost half of the cattle might successfully get pregnant in one-time mating, while the other half percentage get pregnant mainly after two times matings. The score remarkably exceeds the standard range for cattle (1.6-2.0), as noted by Mutmainna et al. (2022).

The data on calving interval is more than one year, but it is still very close to the concept standard for the cattle. Moreover, mating after conception could still be optimized to make the cattle reach the ideal length for calving interval and indirectly gradually increase the cattle population raised by smallholder farmers in Payakumbuh. Iswoyo and Widiyaningrum (2008) noted that 12 months is an ideal calving interval, divided into nine months of pregnancy and three months of weaning. The mating period is meaningfully affecting the length of the calving interval (Paly 2019).

The result of the length of re-mating after calving might categorized as a very good score. It represents farmers' awareness of detecting estrus symptoms and conducting cattle mating by mostly requesting artificial insemination. As explained by Hidayati (2004), cattle rearing management, particularly the role of farmers to report the estrus condition to the artificial inseminator, substantially affects the length of re-mating after calving, including for Simmental x PO crossbred.

CONCLUSION

Smallholder cattle farming in Payakumbuh might considered as a promising business. Farmers manage their cattle well and achieve good reproductive performance. Their experience can be a valuable reference for other regions in West Sumatra. However, to improve the scale of their cattle farming, the farmers need to adopt more advanced technologies to earn more benefits. Future research could address the study limitations by expanding the sample size and including a broader range of parameters measured to provide deeper insights of livestock farming practices.

CONFLICT OF INTEREST

The authors have no conflicts of interest related to the discussed material, funding, or differences of opinion.

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