

Determinants Affecting on Smallholder Madura Cattle Farming at Pamekasan Regency, East Java, Indonesia

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Abstract

Study was case study at Pamekasan Regency of Madura Island, East Java, Indonesia. The research aimed to examine income of smallholder beef cattle farming and its influencing factors. The research used 30 members of the *Pancong Jaya* group farmer that obtained by purposive sampling method. Research regarded descriptive analysis using economic formulation and multiple regression technique. Results found that R^2 Adjusted obtained 73.70% and F-calculation (12.625) indicated significant ($P < 0.000$). Partial analysis confirmed that five out of nine variables have effected on the beef cattle farming income. Farmer's experience in raising cattle and their education revealed a positive and high significant ($P < 0.000$ and $P < 0.005$, respectively), associated with the farm earning. Farmer's age, the number of household members, and purchasing breeding stock appeared a negative and significant ($P < 0.05$) and ($P < 0.1$, accordingly) influence on farmer's income. This study concluded that producing per AU cattle required capital approximately IDR 16,861,718 (structured by 59.99% of fixed and 40.01 % of working capital) and IDR 6,745,512 of production costs (composed by 57.47% of feeder cattle procurement, 17.78% of feed concentrate and 14.48 % of forage expenses) to obtain IDR 8,834 of revenue and IDR 2,089,512 of income. The efficient beef cattle farming also existed in corresponding with 1.31 of R/C Ratio. Farmers' education and experience in handling cattle strongly influenced on increasing income. However, the contrast view come from farmers' age, the number of family members, and purchasing feeder cattle in which these seemed to reduce farmers' income.

1. Introduction

Pamekasan regency of Madura Island was notoriously with two culture festivals namely "Karapan Sapi" (Bull race) and "Sapi Sonok" (female cattle contest), however feedlot cattle still emerged as the favourable venture among smallholder farmers. Besides natural mating, applying technology of Artificial Insemination might become useful in reducing feeder calves price [1] since both the feed and breeding stock required approximately 92% expenses [2]. The "Karapan Sapi" (Bull race) and "Sapi Sonok" (female cattle contest) preferred male and female best grade calves, respectively, while the rest calves with the multi quality went to fattening cattle farming. Even though, beef farming has diverse magnitudes, the profit motive as the ultimate purpose in order to contribute in fulfilling household needs [3]. However, [4] discovered that cattle traders have obtained more share margin approximately 0.61 in comparison with 0.39 those of farmers. The beef cattle income has remained low because of the less bargaining power in livestock marketing [5].

However, [4] discovered that cattle traders have obtained more share margin approximately 0.61 in comparison with 0.39 those of farmers. It means that farmers received only 39% of price



share, while intermediary trader had the large proportion about 61% of those. Therefore, beef cattle farmers' income has remained low because of the less bargaining power in livestock marketing [5].

The governance in beef cattle marketing as well as empowering beef cattle farmers will be essential factors to encounter these obstacles including limited access to market-related information and lack of capital. [6] recognised the market value chain system to access to market information involving production systems, prices, value chains, competitors, and consumer preferences might require to enhance farmer's participation in beef marketing system. In addition, the existence of the decentralization of cattle marketing information centre and the involvement of communal farmers in the dissemination of information plays a critical role in improving farmer's access to formal market [7]. [1] suggested the importance of risk management toward forward pricing strategy to reduce grain feed and fed cattle price and results in cheaper feeder cattle price and increase the beef cattle price. [8] emphasised on the importance of production quality to access formal beef cattle market. Moreover, coordination and marketing information indicated a dominant factor that supports the strategy in beef cattle marketing [9] [10]. Hence, it becomes urgent to analyse the smallholder beef cattle farming in terms of income and its influence factors. [1] suggested the importance of risk management toward procurement pricing strategy to reduce grain feed and fed cattle price and results in cheaper feeder cattle price and increase the beef cattle price.

2. Materials and Methods

Case Study of small scale beef cattle farming located at East Waru Village, Waru Sub-District, Pamekasan Regency of East Java Province which selected by purposive method. This research area employed three motives cattle farming namely "Karapan Sapi" (Bull race), "Sapi Sonok" (Cow cattle contest), and feedlot cattle. Natural mating and Artificial Insemination (AI) methods also appeared more prevalent in producing calves to supply breeding stock for developing beef cattle farming.

Multistage sampling method aimed to reach 30 farmers who had at least five years' experience in rearing beef cattle and they also participated in *Pancong Jaya* group farmer. Survey method employed a structured questionnaire to obtain primary data, for instance production cost, revenue, etc. Secondary data were available in *Pancong Jaya* group farmer and the related institutions. Descriptive analysis was technique to delineate farmer's income, while exploring the determinants influencing on farmer's profit used regression analysis. The income in beef cattle farming is function of the internal and external variables of the model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon_i$$

Where:

Y : income in smallholder beef cattle farming per farm (IDR /year),

X₁ : farmer's age (year),

X₂ : farmer's education (year),

X₃ : Number of household members (person),

X₄ : farmer's experience in raising beef cattle farming (year),

X₅ : Purchasing feeder calf (IDR / year),

X₆ : Forage feed cost (IDR//year),

X₇ : Rice bran cost (IDR/year),

X₈ : the number of beef cattle (AU/year),

X₉ : farming motives (0= Breeding farm; 1= mixing between breeding stock and fattening)

β₀ : constant

β₁..... β₉: estimation parameter

ε : error

3. Results and Discussion

3.1. Beef Cattle farmers' characteristics

Majority farmers (57%) aged between 51-60 years old, while only 43% of them were aged less than 51 year in which structured with 33% and 10% of youth farmers aged 41-50 years and 31-40 years, respectively. Majority (57%) older farmers (aged between 51-60 years old) might prefer to apply simple technology as those usually presence among smallholder farmers. This circumstance therefore, effected on the quite low beef cattle productivity and hence decreased the farming profit.

Mostly older farmers (aged between 51-60 years old) might prefer to apply simple technology in raising their livestock which usually emerged among smallholder farming. This management practice therefore, effected on the quite low beef cattle productivity, and hence decreased the farming profit .

Mostly (40%) farmers have already obtained high education (High school). It means that farmers have the thinking pattern and ability to address better management practice in rearing beef cattle farming. It is evidence that 7% of farmers has graduated from university in that they have capability in access knowledge and adopting technology in developing beef cattle farming. Similarly, education has positively influenced on the farmers way thinking and measures in increasing productivity [11] [12]. Similarly, farmer's education attainment has a positive impact in achieving optimal yields and enhancing their beef cattle farms.

Majority farmers (43%) have possessed longer experience ranging 7-9 years in raising beef cattle farming. They might possess a better ability than those with low experience in encountering problem and making appropriate solution in carrying out the beef cattle farming. Likewise, the experience will effect on the behaviour including knowledge, attitude, and skill [12]. So, the longer experience in engaging beef cattle farming might associate with the better knowledge and ability in operating their farm.to acquire the inclining the farm production and obtaining optimal earning.

The high proportion (60%) of farmers comes from the large family member with 3-4 persons than those from the small household members (40%) with 1-2 persons. The allocation time of family labour can reduce the hired worker expenses and hence, reducing production costs. [13] stated that the more household members might be useful in helping daily farming operation in one side, whereas they become burden in fulfilling the family needs in other side. Hence, as the number of household members increase, a greater amount of time may be devoted in beef cattle farming to achieve high production and more farm income.

3.2. The structure of beef cattle faming

The composition of beef cattle plays an important role in determining the farm performance. It is not only gauged the production ability, but also established the farm income.

The structure of total beef cattle that owned by 30 smallholder farmers appear in table 1.

Table 1. Beef cattle structure for 30 farmers in year 2014

Livestock	Number (head)	Animal Unit (AU)	Percentage (%)
Calf	12	3	7.2
Young cattle	27	13,5	32.5
Mature cattle	25	25	60.3
Total	64	41,5	100
Average		1,38	

Beef cattle farming consisted more with mature cattle (60.3%) than those of smallest number of calf (7.2%). It was interesting that contribution of young cattle was about one third (32.5%) out of total beef cattle. Farmers were running their farm with 1.38 AU, and therefore they constituted as smallholder farming. This farming has characteristic with rearing small number of cattle, little capital, lack of information and using simple management. It is evidence that the number cattle indicated relatively constant by the year because of economic reasons.

3.3. Factors influencing on smallholder beef cattle farming income

The results of regression analysis showed that coefficient determination (R^2 Adjusted) were about 73.70% (Table 2). F-calculation (12.625) was significant ($P < 0.000$). It implied that the nine determinants namely farmer's age (X_1), farmer's education (X_2), the number of household members (X_3), and farmer's experience in raising beef cattle (X_4), purchasing feeder calf (X_5), forage feed cost (X_6), and rice bran cost (X_7), the number of beef cattle (X_8), and farming motives (0= breeding stock; 1= mixing between breeding stock and fattening) (X_9).

Partial analysis however clarified that five out of nine variables have effected on the beef cattle farming income. Farmer's experience in raising beef cattle farming (X_4) exhibited a positive and high significant ($P < 0.000$) association with the return of beef cattle farming. Similarly, the smallholder beef cattle profit was positively and significantly ($P < 0.005$) related to farmer's education (X_2). The three predictor variables including farmer's age (X_1), the number of household members (X_3), and purchasing breeding stock (X_5) appeared a negative and significant ($P < 0.05$) and ($P < 0.1$, respectively) influence on the income of smallholder beef cattle farming. The relationships between profit in smallholder beef cattle farming and the predictor's variable can be formulated as:

$$Y = 1,229,877 - 0.25 X_1 + 0.204 X_2 - 0.143 X_3 + 0.644 X_4 - 0.278 X_5$$

where:

Y : income in smallholder beef cattle farming per farm (IDR /year),

X_1 : farmer's age (year),

X_2 : farmer's education (year),

X_3 : Number of household members (person),

X_4 : farmer's experience in raising beef cattle farming (year),

X_5 : Purchasing breeding stock (IDR / year).

3.4. Farmer's education

This variable significantly ($P < 0.05$) and positively associated with smallholder beef cattle farming income. The high education might link with increase in the management livestock farming operation. It means that a 10% increase of the farmer's education would result on the 2.04% improvement in the smallholder beef cattle farming income. The finding has accepted hypothesis 1: "It is predicted that farmer's education has positive affected on small scale beef cattle farming profit" as when controlling all other variables. The strong relationship between those variables indicated that the higher education attainment, the great productivity, and result in the beef cattle farming income improvement.

The discovery reported that farmer's education play an important role in determining livestock income. This finding was similar to [11] [12] in that education has positively influenced on the farmers way thinking and measures in increasing productivity. Likewise, the study demonstrated that the accruing farmer's education influenced the great income in beef cattle farming. Mostly (40%) farmers have already obtained high education (High school) and it influenced on their thinking pattern and ability to address better management practice in rearing beef cattle farming. It is evidence that 7% of farmers has graduated from university in which they might capable in access knowledge and adopting technology to pursue beef cattle farming development.

3.5. Farmer's experience in raising beef cattle

Farmer's experience in rearing beef cattle revealed highly significant ($P < 0.000$) and positive influenced in the profit of the smallholder beef cattle farming. This variable has a dominant contribution in the livestock farming practices. The study delineated that a 10% increase of the farmer's education would effect on the 6.44% enhancement in the livestock farming income. The sturdy relationship between those variables implied that the longer experience increased in their capability to encounter problem and the skill in making appropriate solution in operating the beef cattle farming. Hence, it had a positive impact in the great productivity, and result in the inclining farm profit. Likewise, the experience will effect on the behaviour including knowledge, attitude, and skill [12]. [13] clarified that experience in rearing livestock become foundation in developing farming which has higher influence in shaping successful farmer. Farmers 'experiences in raising beef cattle provide a good understanding for their attempt in supporting beef cattle management, and therefore influenced on their behaviour in engaging their farming. The finding suggest that the longer experience in engaging beef cattle farming have impact on the better knowledge and ability in operating their farm.to acquire the inclining the farm production. Mostly (43%) farmers had 7- 9 years' experience in rearing beef cattle which allow them to possess a better ability in engaging the farming. They become capable to encounter problem and competent in making appropriate solution in operating the beef cattle farming. It might be represented in the beef cattle farming productivity, and result in the income improvement in beef cattle farming.

Table 2. Determinants influencing in smallholder beef cattle farming income

Explanation	Regression Coefficients
Constant	1,229,877
X1 :Farmer's Age	-0.25***)
X2: Farmer's Education	0.204**)
X3:Household's members	-0.143**)
X4: Experience in raising beef cattle Farming	0.644****)
X5: Feeder calf expenses	-0.278*)
X6: Forage Feed cost	0.64
X7: Rice bran cost	0.162
X8: Number of beef cattle	0.143
X9: The purpose in raising beef cattle	0.04
R2 Adjusted = 73.70%	
R Square =80.10%	
n = 30	
Fcalculation = 12.625	

*) P . 0.1; **) P < 0.05; ***) P < 0.005; ****) P < 0.000

3.6. Feeder calf expenses

Purchasing cattle stock was significant ($P < 0.1$) and negative (-0.278) associated with the income of smallholder beef farming. This invention accepted hypothesis 2 in that: "It is predicted that feeder calf expenses have reduced the income of small scale beef cattle farming. It means that a 10% improvement of the breeding stock expenses would have a corresponding 2.78% reduction in the profit of smallholder beef cattle farming, if other factors are assumed constant. Breeding stock procurement has the reverse trend with the accruing profit of the small-scale beef cattle farming. It is fact that variable costs composed the highest proportion (90.69 %) with the greatest being purchase feeder calf (54.47%), followed by concentrate feed (17.78%) and forage expenses (14,48%). The high expenses in the procurement of feeder calf have an impact on high production cost and reducing the farm profit. Study of [2] added that 92% both the feed and breeding stock expenses indicated quite sensitive in which a bit decrease (6%) in the beef cattle price has effected on the zero of farming income. It is important to use technology in beef cattle breeding in order to reduce feeder calves price [1], and improving the availability of feeder cattle [14].

3.7. Farmer's age

Farmer's age reported moderately significant ($P < 0.05$) and had a negative impact on the profit of the small-scale beef cattle farming. The 10% increase in the farmer's age would reduce about 2.78% decrease in the profit of smallholder beef cattle farming, if other factors were kept constant. Study suggested that predominantly (57%) farmers aged between 51-60 years old were unlikely to adopt technology in farming practice that impact on low productivity and hence decreasing farm profit. Alternatively, youth farmers (aged less than 50 years) were more likely to access the technology in operating the livestock farming and may lead to high farm productivity and the optimal profit. The young people reveals enthusiastic about high curiosity, and hence they easy to accept the change and adopt technology [15]. Similarly, young farmers have tendency to try something new as the effort to increase knowledge and skill in operating livestock farming, and impacting on better beef cattle productivity as well as improving the farming profit.

3.8. Number of household members

This variable appeared sufficient significant ($P < 0.05$) and negative associated in the income of the smallholder farming. The number of family members has on average contribution in the livestock farming practice. It means that a 10% improvement of the number of family members would have a corresponding 1.43% decline in the cattle farming earning, if other factors are held constant. The large number of household members might relate to more labour allocation in operating beef cattle farming in which reduced hired labour expenses and hence, save production costs. However, allocating a greater amount time in operating beef cattle farming tasks might effect on the less time devoted in others earning activities in fulfilling the family needs [13]. This study confirms that small household (1-2 people) were more likely to obtain more income from beef cattle farming because they considered beef cattle farming as secondary livelihood. The discovering offers insight into the improvement of beef cattle productivity and a better income through more allocating the household members in running this farm.

4. Conclusion

Study on smallholder beef cattle farming at provided the following conclusions:

1. Beef cattle farming required capital of IDR 16,861,718 per Animal Unit which structured by 59.99% of fixed capital and 40.01% of working capital.
2. This farming constituted a profitable venture with IDR 2,089,512 of income, IDR 6,745,512 of production costs (composed by 57.47% of feeder cattle procurement, 17.78% of feed concentrate and 14.48 % of forage expenses) and IDR 8,834 of revenue in producing one AU in yearly basis.
3. The efficient beef cattle farming were also more likely to be reached in corresponding with 1.31 of R/C Ratio.
4. Farmers' education and experience in handling cattle strongly influenced on their income to be increase. However, the adverse view came from farmers' age, the number of family members, and purchasing cost of feeder cattle in which these seemed to reduce farmers' income.

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