The profit analysis of beef cattle farming in Tanah Laut District, South Borneo

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Abstract. The feasibility study of financial farming was needed to be analyzed by local farmers. This study was conducted purposively in Banua Tengah Village, Takisung Sub-District, Tanah Laut District, in July - September 2017. Respondents were selected by simple random sampling of 30 persons in the village sample. Data were collected in the form of primary data and secondary data. Tabulation analysis was needed to analyze the data on farmer’s household characteristics and housing management characteristics, also farmer’s household income and expense data. Financial feasibility analysis for calculating the feasibility of beef cattle breeding business investment was determined using the feasibility indicators namely: NPV, B/C Ratio and IRR, while the indicators of the feasibility of cattle fattening: BEP, ROI, and R/C. The result showed that (1) The business of beef cattle breeding using 5 females aged 1 year old in the fourth year (until bore 1 calf/head) was quite feasible to be developed cause it resulted in Gross B/C Ratio value of 1.23 (B/C > 1), NPV value of 21,500,194 (positive), and IRR value of 14.61% by Discount Rate of 10 %. (2) Fattening beef cattle business using 5 cattle/farmer (3 months raising period) will resulted benefit for farmers when the BEP selling price was above IDR 39,152/kg of live weight, and the total BEP of beef cattle weight gain after 3 months fattening period above 1,700 kg or above 340 kg/head, with ROI value of 31.09% (each cost incurred about IDR 1 will get a profit of IDR. 0.3109), and R/C value = 1.31 (quite feasible to be developed).

1. Introduction
Cattle farming is one kind of farming that has a major contribution to fulfill the needs of beef or animal protein source for people in South Borneo. Tanah Laut District is one of the beef cattle development center in South Borneo. About 40% of the beef needs in South Borneo are supplied from this area.

The pattern of raising beef cattle in South Borneo generally still traditional, where the number of cattle ownership is small with limited capital, skills, and knowledge about farming technology [1,2]. This is also the case in Tanah Laut District, although this area is the largest and the center of beef cattle farming in South Borneo. Based on BPS South Borneo (2016) the cattle population in Tanah Laut District in 2015 was 61,225 heads [3]. Compared to 2010, the beef cattle populations was decline about 81,594 heads. Therefore, the government is trying to push the growth of cattle populations in Tanah Laut District through the new cattle procurement, procurement of superior cattle breeds, insemination, etc. In addition, to increase the growth and the development of cattle farming agribusiness in this area, the local government also adopts various supportive policies such as the...
development of fodder forage, animal health services, the development of superior cattle, prevention and eradication of diseases, etc. This effort might increase the cattle population and farmer’s income. Furthermore, the beef cattle agribusiness has enormous potential to support the growth of the agriculture sector in general and provide strategic food sources all the time.

Beef consumption of the people in South Borneo in 2014 was about 7,670,886 kg, while the region’s ability to provide beef from beef cattle farming was only 7,355,311 kg, so about 315,575 kg was needed from outside of South Borneo Province. This case gives an opportunity for farmers in Tanah Laut District to increase the number of beef cattle developed population, so that not only the consumption needs of beef are fulfilled, but also will increase the income of farmers who work on it and increase PAD (Regional Original Income) if it is executed well. Kristianto and Wafiatiningsih (2003) stated that to achieve beef self-sufficiency requires improvement in cattle raising systems management appropriately at the farmer’s level [4]. The integration crop-livestock system is one of effort to resolve the feed problems which resulted in low productivity of livestock [5–7]. The results of this study are expected to be a consideration for investors (agribusiness actors) and farmers for developing beef cattle farming.

2. Method

This research was conducted in Banua Tengah Village, Takisung Subdistrict, Tanah Laut District, South Borneo Province. The research was conducted in July-September 2017. Beef cattle farmer were selected through simple random sampling amounted 30 persons. Data were collected in the form of primary and secondary data.

Ratio feasibility analysis was conducted to calculate the feasibility of beef cattle business investment using three feasibility indicators, those were NPV, B/C Ratio and IRR [8,9]. The feasibility models were formulated mathematically as follows:

Benefit Cost Ratio (B/C)

\[
B/C = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t}}
\]

(1)

Net Present Value (NPV)

\[
NPV = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t}
\]

(2)

Internal Rate of Return (IRR)

\[
IRR = i' + \left( \frac{NPV'}{NPV'} - i'' \right) (i'' - i')
\]

(3)

In which:

B_t = income in t-year

C_t = expense in t-year

i = interest rate

t = investment period

Decision making criteria whether beef cattle business were feasible to run, those were: (1) NPV> 0; (2) IRR> discount rate and (3) B/C ratio> 1.
3. Results and discussion

3.1. General description and potency of beef cattle
Tanah Laut District is an area about 3,729.30 km² or 9.94% of the South Borneo geographically [3]. Based on the survey result, the dominant sub-districts which developed beef cattle farming in Tanah Laut District were Takisung, Batakan, Panyipatan, and Pelaihari Sub-district. There were 1,450 groups of beef cattle farmers in Tanah Laut District which is spread in 11 sub-districts [10]. Contribution of Gross Regional Domestic Revenue (GRDP) of Tanah Laut district came from the agricultural sector as a center of food crops and plantations, and livestock and fisheries sectors. Much agricultural wastes were unutilized and natural grasses in the rainy season were abundant. The use of probiotics in cattle can increase weight gain which ultimately increases income [11]. Raising of beef cattle for 4 months using 2 beef cattle scale produced weight gain of 83.70 kg/head or 680 gram/head/day on average. The results of Amali et.al (2003) showed that cattle fed with fermented corncakes and bran with ratio of 2:1 resulted in weight gain of 345 gram/head/day [12], while the results from reference Rohaeni et.al (2008) showed that the cattle fed with fermented corn resulted in a higher weight gain than without the fermented corn addition about 500 gram/head/day [13].

The types of raised cattle were local beef cattle (Bali and Madura), Limousin, Brahman, Simetal, Ongole, PO (Peranakan Ongole). The beef cattle marketing was conducted from Tanah Laut District to all districts/cities in South and Central Borneo Province. Within one year, the number of distributed beef cattle of this district was about 10 thousand beef cattle on average. The produced meat from beef cattle in Tanah Laut District can supply the meat market in the South and Central Borneo as much as 40%. The effort to develop productivity is supported by the potential of natural resources that are still quite large such an extensive land and agricultural and agro-industrial waste that has not been optimally utilized as animal feed [14]. Nasrullah et al (2004) explained that the carrying capacity of livestock businesses is not only influenced by human resources but also land resources and cultivated and utilized plant commodities as a source of livestock feed [15]. According to Wiyanta (2002), the approach utilizing the diversity of natural resources is using the development of integrated farming [16].

3.2. Farmer characteristic
Based on the data obtained at the study location, the characteristics of beef cattle farmers in Tanah Laut District were shown in table 1.

3.3. The use of factor production in beef cattle farming
The cost of making a shed in 2017 with the size of 10m x 3m depends on the material used. The cost required to make cattle shed is about IDR 500,000 per m². If the area of the cattle shed is about 30 m², the overall price of the shed is IDR 15,000,000, with the endurance around 10–20 years as long as good maintenance. If the materials of cattle shed overall are made from ironwood, the price is even more expensive and reaching IDR 20,000,000, with longer endurance compared with the mixed material of the shed (> 20 years).

At the first 3 years, there was no significant maintenance of the cattle shed. The maintenance was occurred in the 4th year. Cattle shed maintenance included repairs the floor, feed storage and roof, with costs of IDR 417,000 - IDR 500,000 per year.

The cattle breeds were used for both combining or breeding, with varying prices according to the estimated body weight of the cattle. Each price of IDR 7,500,000–IDR 12,500,000/head or living weight of IDR 50,000–IDR 60,000/kg.

The total expenses for forage feed cost is IDR 2,250,000/year. Farmers also provide additional feed such as bran or cassava with cost of IDR 2,000/head/day or IDR 60,000/head/month or IDR
720,000/head/year. Other expenses are included the purchase of salt to increase the cattle's appetite IDR 5,000/head/month or IDR 60,000/head/year.

The total investment cost of beef cattle farming for breeding business using 5 female cattle were IDR 99,800,000. The largest investment cost was for purchasing the female calves about IDR 35,000,000 (35.07%) of the total investment cost, while the smallest was for purchasing the medicines of IDR 1,350,000 (1.35%) as shown in table 2.

**Table 1.** Characteristics of beef cattle farmers in Tanah Laut District, 2017

| Description                              | Score |
|------------------------------------------|-------|
| The average age of farmer (years)        | 47    |
| Main Occupation (%)                      |       |
| a. Beef cattle farmer                    | 56    |
| b. food crop/plantation farmer           | 32    |
| c. Civil Servant                         | 4     |
| d. Private                               | 8     |
| The dominant tribe                       | Javanese |
| Average length of stay in the village (years) | 25    |
| Formal education (%)                     |       |
| a. Less than 6 years                     | 14    |
| b. 6 years                               | 40    |
| c. 9 years                               | 43    |
| d. 13 years                              | 3     |
| The average family dependents (persons)  | 3     |
| The average family incomes / month (IDR) | 4,125,000 |
| The average family expenses / month (IDR) | 4,123,500 |
| The average experience of raising cattle (years) | 20    |

Source: Primary data (n = 30)

3.4. Estimated operational and raising costs

According to table 2, the total estimated cost of operational and raising beef cattle in the breeding business that give birth in the fourth year of raising period were IDR 47,550,000. The cost of feed was the largest cost of the total operational and raising costs about IDR 24,600,000 (51.74%), while the smallest is the cost of medicines (including artificial insemination) of IDR, 1,350,000 (2.84%).
Table 2. The investment costs for beef cattle breeding using business scale of 5 female cattle in the 4th year (until bore 1 calf/head) at Tanah Laut District in 2017

| Cost component                                                                 | Cost (IDR) | %     |
|--------------------------------------------------------------------------------|------------|-------|
| Breeds of female cattle aged 1 year old (5 cattle) @ IDR 7,000,000               | 35,000,000 | 35.07 |
| Medicine:                                                                       |            |       |
| Vitamin, helminthic: @ IDR 60,000/head/year                                     | 1,200,000  | 1.35  |
| Artificial Insemination in third year of raising period @ IDR 30,000/head        | 150,000    |       |
| Feed                                                                            |            |       |
| Forages (field grass and superior grass): @ IDR 180,000/month or IDR 2,160,000/year/5 heads | 8,640,000  | 24.65 |
| Additional feed (Bran or cassava): @ IDR 720,000/head/year                      | 14,400,000 |       |
| Salt: @ IDR 60,000/head/year                                                    | 1,200,000  |       |
| Superior grass fertilizer @ IDR 90,000/year (0.5 ha)                            | 360,000    |       |
| Cattle shed size 10 m x 3 m (@ IDR 500,000/m²)                                  | 15,000,000 | 15.03 |
| DepreciationCost of cattle shed in 2nd–4th year (5% per year from building cost of cattle shed @ IDR 750,000/year) | 2,250,000  | 2.25  |
| Labor cost (feeding, cleaning the cattle, shed and shed environment). Generally, labor used for raising the cattle is a part of family member. To simplify the calculation, the cost assumed of IDR 15,000/person/day or IDR 450,000/person/month (*) | 21,600,000 | 21.64 |
| Total                                                                           | 99,800,000 | 100   |

(*) Labor cost as family member if calculated according to applicable cost

Based on the results of research, the value of each financial analysis criteria using Discount Factor of 10% and 20% during the 4th year raising period shown in table 4 and table 5. The Gross B/C Ratio value was obtained by using present value in gross benefit flow and gross cost flow, the each of these flows was summed. If family member as labor included in cost calculation, there venue flow was about IDR 98,723,100 and the cost low of IDR 97,692,686 (table 4). Using 10% Discount Rate, the value of Gross B/C Ratio = 1.011. This value was greater than 1, means that beef cattle farming was quite feasible to run because it can provide the profit for the investment. Where as, if family member as labor didnt included in cost calculation, there venue flow would be greater, that was IDR 98,723,100 and the 77,222,906. Using 10% Discount Rate, the Gross B/C Ratio was 1.23. This value greater than 1 means that the business of beef cattle breeding was quite feasible because it can provide profits for the investment table 5.
**Table 3.** Estimated operational costs of beef cattle breeding using scale of 5 female cattle aged 1 year in the 4th year (until bore 1 calf/head) at Tanah Laut district in 2017

| Cost Component                              | Cost (IDR) | %   |
|---------------------------------------------|------------|-----|
| **Medicines:**                              |            |     |
| Vitamin, helminthic: @ IDR 60,000/head/year | 1,200,000  | 2.84|
| Artificial insemination on third year in raising period @ IDR 30,000/head | 150,000   |     |
| **Feed:**                                   |            |     |
| Forages (field grass and superior grass):   |            |     |
| Fuel IDR 180,000/month or IDR 2,160,000/year/5 heads | 8,640,000 | 51.74|
| Additional feed (Bran or cassava): @ IDR 720,000/head/year | 14,400,000 |     |
| Salt: @ IDR 60,000/head/year                | 1,200,000  |     |
| Superior grass fertilizer @IDR 90,000/year (0.5 ha) | 360,000   |     |
| **Labor cost (feeding, cleaning the cattle, shed and shed environment). Generally, labor used for raising the cattle is a part of family member. To simplify the calculation, the cost assumed of IDR 20,000/person/day or IDR 500,000/person/month(∗) | 21,600,000 | 45.43|

**Total** 47,550,000 100

(∗) Labor cost as family member if calculated according to applicable cost

**Table 4.** Details of investment feasibility for beef cattle breeding per shed (30m²) using scale of 5 female breeds of cattle aged 1 - 4 years old at Tanah Laut District in 2017 (by counting the family member as labor in cost calculations of breeding investment)

| Description                              | Total       | Criteria   | Value      |
|-------------------------------------------|-------------|------------|------------|
| Gross benefit (IDR)                       | 159,000,000 |            |            |
| Net benefit (IDR)                         | 39,340,000  |            |            |
| Cost (IDR)                                | 119,660,000 |            |            |
| Investment cost (IDR)                     | 99,800,000  |            |            |
| Operational & Raising cost (IDR)          | 47,550,000  |            |            |
| Net B/C (+) (IDR)                         | 98,723,100  | NPV        | 1,030,414  |
| Net B/C (-) (IDR)                         | 97,692,686  | IRR        | 10.25%     |
| Discount Factor 10%                       | 0.62        |            |            |
| NPV (10%)                                 | 1,030,414   |            |            |
| Discount Factor 20%                       | 0.1         |            |            |
| NPV (20%)                                 | -41,991,916 |            |            |
Table 5. Details of investment feasibility for beef cattle breeding per shed (30m²) using scale of 5 female breeds of cattle aged 1–4 years old at Tanah Laut District in 2017 (without counting the family member as labor in cost calculations of breeding investment)

| Description                      | Total     | Criteria  | Value  |
|----------------------------------|-----------|-----------|--------|
| Gross benefit (IDR)              | 159,000,000 |          |        |
| Net benefit (IDR)                | 66,340,000 |          |        |
| Cost (IDR)                       | 92,660,000 |          |        |
| Investment cost (IDR)            | 78,200,000 |          |        |
| Operational & Raising Cost (IDR)| 21,600,000 |          |        |
| Net B/C (+) (IDR)                | 77,222,906 |          |        |
| Net B/C (-) (IDR)                | 0.62      |          |        |
| Discount Factor 10%              | 21,500,194 |          |        |
| NPV (10%)                        | 0.1       |          |        |
| Discount Factor 20%              | -25,105,036 |          |        |
| NPV (20%)                        |           |          |        |

Table 5 showed that the breeding business of beef cattle was feasible to be developed because by using 5 female breeds aged 1 year old and interest rate of 10% during raising period of 4 years was obtained B/C value > 1, a positive Net Present Value, a smaller payback period (third year) of the raising period (four years).

3.5. The use of fattening beef cattle production factor

The investment costs of fattening beef cattle business were the initial capital used by farmers during the raising period. Investment cost included the cost of building the cattle shed and its equipment. Whereas the operational costs consist of fixed costs and variable costs. To build the cattle shed and its equipment sized of 10 m x 3 m (@ IDR 500,000/m²) with the capacity of 5 cattle spent the cost of IDR 15,000,000. If assumed the endurance was up to 10 years, then the depreciation cost of the cattle shed and its equipment was IDR 375,000 per month. So the total of depreciation investment cost for the cattle shed and its equipment in the fattening of 5 cattle for 3 months was IDR 1,125,000. If the price of male breed with the weight 250 kg/head was IDR 50,000/kg of live weight, then the price of male breed will be IDR 12,500,000 per head, so the total cost for purchasing 5 male breeds will be IDR 62,500,000. If the target of weight gain was 1 kg/day during raising period of 3 months, then the weight gain of breed cattle was estimated at 90 kg/head. So the total weight of cattle that ready for sale increase from 250 kg to 340 kg/head.

The feed cost spent for 5 cattle during 3 months were only for transporting the main feed (fuel cost) of IDR 180,000 per month and for purchasing urea fertilizer to increase land fertility for superior grass cultivation were about IDR 45,000/fattening period or IDR 15,000/month. Cost of additional feed (bran/cassava) and appetite enhancer (salt) of IDR 65,000/head or IDR 325,000/head/month. The total cost of feed for fattening 5 cattle were IDR 520,000/month or IDR 1,560,000/3 months during fattening period.

Based on table 6, the total estimated investment and operational costs of the beef cattle fattening business during the 3-month raising period using 5 Bali cattle with an initial weight of 250 kg/head was about IDR 66,560,000. If the calculation of total investment and operational costs without including family member as labor cost, then the cost was only IDR 65,210,000. If beef cattle were sold at IDR 50,000/kg live weight multiplied by 340 kg/head, then selling price of cattle would be IDR 17,450,000/head or total revenue for 5 cattle during 3 months were IDR 87,250,000.
Table 6. Investment and operational cost of fattening beef cattle business using a scale of 5 cattles (initial weight of 250 kg/cattle and weight gain of 1 kg/month) at Tanah Laut District in 2017

| Cost component                                      | Cost ( IDR)   | %  |
|-----------------------------------------------------|---------------|----|
| 5 Female cattle breeds aged 1 year old               | 62,000,000    | 93.90 |
| @ IDR 12,500,000                                     |               |     |
| Medicines:                                          |               |     |
| Helminthic: @ IDR 5,000/capsule/head                 | 25,000        | 0.04 |
| Feed:                                               |               |     |
| Forage (field grass and superior grass):            | 1,560,000     | 2.34 |
| Fuel for transporting the feed, fertilizer to increase the lan fertility of superior grass cultivation (urea fertilizer), additional feed (bran/ cassava) and appetite enhancer (salt) IDR 325,000 per 5 head/month | | |
| Shed construction sized 10 m x 3 m (@ IDR 500,000/m²) or IDR 15,000,000 and depreciation cost of shed per month: 3/120 x IDR 15,000,000 = IDR 375,000 | 1,125,000 | 1.69 |
| Labor for feeding and cleaning the cattle, cattle shed and shed environment. Generally, labor used for raising the cattle was a part of family member. To simplify the calculation, the cost assumed of IDR 15,000/person/day or IDR 450,000/person/month(*) | 1,350,000 | 2.03 |
| Total                                               | 66,560,000    | 100 |

(*) Labor cost as family member if calculated according to applicable cost

3.6. Financial feasibility analysis of beef cattle fattening

The profit obtained by farmers during the fattening period was a total revenue minus total investment and operational costs (cost incurred) was about IDR 20,690,000. BEP production price was a turning point based on the selling price obtained from the total cost incurred divided by the volume of production (total weight gain of cattle after 3 months fattening period), which was about IDR 39,152.94/kg. It means that with a total live weight of 5 cattles of 1,700 kg or 340 kg per cattle, then the capital point would be achieved if the cattle were sold at IDR 39,152 / kg live weight. ROI was the profit obtained based on one rupiah of cost incurred that obtained from the calculation of total profits divided by the total cost incurred multiplied by 100%, so the ROI was about 31.09%. ROI of 31.09% means that every IDR 1 spent, the profit obtained as much as IDR 0.3109.

The R/C ratio was obtained from the total revenue divided by the total cost incurred during the fattening period, which was about 1.31. If the R/C score was more than 1, it means that the fattening business using 5 Bali male cattles with an initial weight of 250 kg/head and cattle weight gain of 1 kg/day during 3 months raising period was quite feasible to develop.

3. Conclusion

The breeding business of beef cattle using the scale of 5 female cattle aged 1 year old in the 4th year raising (until giving birth to 1 calf / head) in Tanah Laut District, South Borneo Province was quite feasible to be developed, because with a Discount Rate of 10%, will be obtained Gross B/C Ratio = 1.23 (B/C > 1), NPV = 21,500,194 (positive), and IRR = 14.61%.

The fattening business of 5 cattles/farmer during 3 months raising period in Tanah Laut District, South Borneo Province, the farmer obtained the profit when the BEP of selling price was above IDR
39,152/kg of live weight and the total BEP of cattle weight gain after 3 months fattening period above 1,700 kg for 5 cattle or above 340 kg/head, with an ROI value of 31.09% (every IDR1 cost incurred will get a profit as much as IDR 0, 3109), and the value of R/C = 1.31 (quite feasible to be developed).

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