Smallholder planning for Bali cattle fattening in Barru Regency, South Sulawesi, Indonesia

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Abstract. This study aims to analyse enterprise budgeting and the factors that affect the smallholder Bali cattle fattening income in Barru Regency, South Sulawesi, Indonesia. The total respondents were 46 farmers include 11 farmers at Bali cattle fattening enterprise six-month period and 35 farmers at fattening enterprise nine-month period. Respondents were selected using a purposive method. The data of the research was collected using interviews with questionnaires. Analysis of economic potential as follows net income and return to labour and management used enterprise budgeting analysis. The factors that affect the income of farmers using multiple linear regression analysis. The results showed that the 6- and 9-month fattening period of the smallholder Bali cattle fattening have net income of IDR 23,122,086 /farmer/period and IDR 11,926,657 /farmer/period. In addition, it provides returns to labour and management of IDR 27,428,173 /farmer/period and IDR 15,111,982 /farmer/period. The number of feeder cattle and non-formal education dummy partially and significantly influence (P<0.01) income smallholders. Smallholder Bali cattle fattening enterprise is a potential business alternative to generate income for rural communities.

1. Introduction

Cattle fattening is a source of animal protein that plays an essential role in increasing food security, improving the household income of farmers, investment opportunities, and providing manure for agricultural sustainability [1]. Integration of technology and economy in production, health, and economic evaluation need to reduce problems with the low quality of the cattle fattening system at the farmer level, feed adequacy and low optimal bodyweight of cattle [2]. Economic constraints such as farmers are difficult to obtain the loan, and social conditions such as farmers do not understand the good management practice of Bali cattle fattening [3].

Barru Regency, as one area of the center of the population of Bali cattle, has the prospect to fulfill market demand for beef both inside and outside South Sulawesi province [4]. Although Bali cattle’s population has decreased in the last decade due to the high demand for local and national beef, the population has slightly increased. The Bali cattle population in South Sulawesi is only increasing by 2.3% per year [5]. Indeed, the supply of beef is still 90% dominated by smallholder households [6].
The type of enterprise beef cattle is divided into small, medium, and large scale farm cattle enterprises [7], but only small and medium scale cattle enterprises are in this area. The causes are a limited number of workers, lack of planted forages, low quality of crop residues, low cattle prices, and lack of funding or loan accessibility [8][9]. According to stated [10], farm development decisions are based on cultural and economic capital. Therefore, the smallholder Bali cattle farmers need to use production planning to estimate the baseline for production cost and decide on a type of profitable fattening cattle enterprise [11].

Enterprise budgeting is a measurement of input or production factors, changes in technology, inflation, and interest rates in the used forages that helps farmers make the right decision to develop business plans [12]. Therefore it is necessary to identify income include measuring input-output, capital and labor, and factors affecting farmer income. This study aims to determine enterprise budgeting and the factors that affect the smallholder Bali cattle fattening. It is helpful as a government strategy to increase Bali cattle farms' income and support the regional economy.

2. Materials and methods

2.1. Study area
The research was conducted from June to September 2019 in Tanete Riaja District, Barru Regency, South Sulawesi, Indonesia. The population in this study were all Bali cattle farmers obtained from the data of the Barru Regency Agriculture Service. Respondents were determined by the purposive sampling method with the most minimum criteria of having three bulls of Bali cattle as feeder cattle. The total respondents were 46 farmers, including 11 farmers fattening Bali cattle for six months per period and 35 farmers fattening cattle for nine months per period.

2.2. Data collection
Data were collected from the farmers, applying interviews with questionnaires. The interviews used open-ended questions focused on characteristics and the inputs and outputs of smallholder Bali cattle fattening. Farmers were asked to remember Bali cattle influx and off-take information for 12 months (one year). The revenue was the only selling bulls. The fixed cost included the depreciation of pens, rent forage land, and returns on loan. The variable cost included feeder cattle purchased, annual veterinary care, labor cost, and concentrate purchased. Data were calculated based on information for the previous year.

2.3. Data analysis
Enterprise budgeting (EB), stated by [12] and [13], is an analytical tool that can be used to analyze agricultural or livestock business income as a basis for developing more profitable business plans in the future. The enterprise budgeting of Bali cattle fattening was evaluated with:

\[
\text{Net income} = \text{TR} - \text{TC}
\]

\[
\text{TC} = \text{FC} + \text{VC}
\]

Where, TR = Total revenue (IDR / farmer / year), FC = Fixed cost (IDR / farmer / year), and VC = Variable cost (IDR / farmer / year)

\[
\text{Return to labor and management} = \text{Net income} + \text{Opportunity cost of family labor}
\]

Multiple regression quantitative analysis is used to determine the factors that affect the income of the Bali cattle fattening. In this research, the multiple regression model is written in the following equation:
Y = α + β1X1 + β2X2 + D1 + β3X3 + D2 + D3 + β4X4 + μ \quad (4)

Where,

Y = farmer’s income (IDR/farmer/year)
α = intercept
β1 … β4 = regression coefficient
X1 = the number of feeder cattle (heads)
X2 = formal education (score)
X3 = experience of cattle fattening enterprise (year)
X4 = number of family members (person)
D1 = dummy of non-formal education
D2 = dummy of length of fattening
D3 = dummy of land rent
μ = stochastic disturbance term

3. Results and discussion

3.1. Characteristics of respondents

Characteristics of respondents based on age were in the middle age group (average 40.36 and 48.49 years old), shown in Table 1. This age group indicates that farmers can work in cattle production for a more extended period. Older farmers are often more experienced, which enables them to assess innovations’ characteristics better than younger ones [14]. There is 36.36% and 40.00% of respondents having an education level at a senior high school. In this study, respondents with education levels up to college were more likely to choose the Bali cattle fattening enterprise for six months. The number of family members of respondents was an average of 4 members, representing the typical family size of Indonesia. Of the 46 respondents, most of them are occupations as farmers in which farmers in rural areas have more land than others.

Non-formal education that farmers participate in includes training for preservation and processing of feed, cattle production management, and cattle marketing. In the fattening period of 6 months, 45.45% of farmers participate in non-formal education [15]. This percentage is getting lower in 9 months fattening period, which is only 17.14%. Fewer than 20% of farmers rent land in either the 6 and 9 month fattening period. They rent the land to plant forage feed (Elephant grass). Others decide to use part of their agricultural land as feed land or utilize food crops residues, such as rice, corn straw, or peanut straw.
Table 1. Characteristics of respondents in Bali cattle fattening enterprise.

| No. | Characteristics                          | Six months | Nine months |
|-----|-----------------------------------------|------------|-------------|
| 1   | Age (years)                             | 40.36      | 48.49       |
| 2   | Level of education (%)                  |            |             |
|     | - No school                             | 0          | 5.71        |
|     | - Elementary school                     | 18.18      | 34.29       |
|     | - Junior high school                    | 18.18      | 17.14       |
|     | - Senior high school                    | 36.36      | 40.00       |
|     | - College                               | 27.27      | 0           |
| 3   | Number of family members (person)       | 4.55       | 3.83        |
| 4   | Fattening experience (years)            | 8.91       | 13.71       |
| 5   | Occupation (%)                          |            |             |
|     | - Farmer                                | 72.73      | 97.14       |
|     | - Teacher                               | 18.18      | 2.86        |
|     | - Entrepreneur                          | 9.09       | 0           |
| 6   | Non formal education (%)                |            |             |
|     | - Follow                                | 45.45      | 17.14       |
|     | - Unfollow                              | 54.55      | 82.86       |
| 7   | Number of feeder cattle (heads)         | 8          | 3           |
| 8   | Land rent (%)                           |            |             |
|     | - Land rent                             | 18.18      | 17.14       |
|     | - No land rend                          | 81.82      | 82.86       |

3.2. Enterprise budget for Bali cattle fattening

Bali cattle fattening enterprise's technical and economic parameters are used as the basis for enterprise budgeting analysis. In general, it can be said that Bali cattle fattening can be alternative as in a rural business so that all costs and revenues must be taken into account.

Bali cattle that have a production performance of more than 180 kg per head are sold for IDR 11,477,273 have obtained a one-year profit of IDR 89,295,455 and IDR 35,627,143 per farmer. Table 2 also shows the net farm income a year of IDR 23,122,086 / farmer for six months and IDR 11,926,657 / farmer for nine months of fattening. The most significant cost component is the purchase of feeder cattle, which [1] argues that the cost is approximately 73% of the total production cost. The field survey results show that farmers rarely purchase forage feed for Bali cattle, so costs are assessed based on the use of labor allocated to cut and carry forage [16]. The limited production of natural grass and food crop residue or the narrow agricultural land is the cause of farmers renting land. In addition, adding forage land by renting land, also maintaining an increase in the ideal body weight of cattle, and allowing farmers to increase the number of feeder cattle kept. Apart from limited investment capital, either due to the lack of own asset or no loan, it also makes the farmers inability to supply adequate forage. Meanwhile, the length of time required for fattening cattle in Bali indicates a problem with the low quantity and quality of feed [17].

Calculation from the return to labor and management of IDR 27,428,173 /farmer/year for six months fattening and IDR 15,111,982/farmer/year for nine months length of fattening period. Bali cattle fattening income can be increased by improving technical parameters, especially the average daily gain (ADG), so Bali cattle's selling weight increases. On the other hand, the return on capital with an interest rate of 7% is one of the production costs, which causes a decrease in income. Farmers use a loan from the bank to buy feeder cattle. Thus, government policy is needed to strengthen farmers' capital through credit support with low-interest rates and an easy collateral requirement [18].
Table 2. Enterprise budgeting of Bali cattle fattening enterprise.

| Item                              | The average of technical and economic parameter | 6 months (IDR/farmer/year) | 9 months (IDR/farmer/year) |
|-----------------------------------|-------------------------------------------------|----------------------------|-----------------------------|
| Revenue                           |                                                 |                            |                             |
| - Selling bulls                   | Bulls selling price: IDR 11,477,273/head         | 89,295,455                 | 35,627,143                  |
|                                    | Selling weight: 182.44 kg/head                  |                            |                             |
| Total revenue (A)                 |                                                 | 89,295,455                 | 35,627,143                  |
| Fixed cost                        |                                                 |                            |                             |
| - Depreciation of pens            | Long life: 60 months                            | 521,365                    | 137,343                     |
|                                    | Cost of pens: IDR 5,168,182                     |                            |                             |
| - Rent land                       | IDR 750,000 / year                             | 750,000                    | 0                           |
| - Returns on loan                 | Interest 7% / year                             | 9,985,455                  | 0                           |
| Total fixed costs (B)             |                                                 | 11,256,819                 | 137,343                     |
| Variable cost                     |                                                 |                            |                             |
| - Feeder cattle                   | Price of feeder cattle: IDR 6,000,000/head      | 47,677,419                 | 19,666,667                  |
| - Veterinary                      | 1 packet of vitamins & deworming                | 1,661,812                  | 58,257                      |
| - Labor (C)                       | The cost of cut and carry forage: 2,86 hours x 365 day | 4,306,087                  | 3,185,325                   |
|                                    | Man days: 8 hour/day, number of Labor: 2 persons |                            |                             |
|                                    | Fee: IDR 33,000 /day                           |                            |                             |
| - Concentrate                     | The cost of rice bran: IDR 1,500/kg             | 1,271,232                  | 652,894                     |
|                                    | Requirements: 4.90 kg/head/day                  |                            |                             |
| Total variable costs (D)          |                                                 | 54,916,550                 | 23,563,143                  |
| Total cost E = B + D              |                                                 | 66,173,369                 | 23,700,486                  |
| - Estimated net income (F) = A-E  |                                                 | 23,122,086                 | 11,926,657                  |
| - Estimated return to labor and management (G) = F + C | | 27,428,173 | 15,111,982 |

3.3. Factors that affect the income of farmers

The regression analysis results related to the factors that affect the farmer's income are shown in Table 3. The factors that affect the income of smallholder Bali cattle fattening was obtained as follows:

\[ Y = -4887467 + 5383597 X_1 + 3316439 X_2 + 21518096 D_1 - 220970.7 X_3 - 617494.4 D_2 - 7298211 D_3 - 1123449 X_4 \]

Table 3 shows that the independent variables simultaneously significantly affected income (return to family labor and management), with P < 0.01 and Adjusted R² = 0.7548. It means that 75.48% of the independent variables simultaneously have a significant effect on Bali cattle farmers' income. However, partially and significantly influence the income of farmers is the number of feeder cattle (X1) and non-formal education dummy (D1). The increase in the number of feeder cattle by one head increases the income (return to family labor and management) of IDR 5,383,597 / head. The greater
the amount of the number of Bali cattle, the higher production costs are needed so that a policy of obtaining credit is needed [19].

Table 3. The results of the regression analysis of the factors that affect the income of farmers.

| Independent variable                      | Coefficient | Std. Error | t-Statistic | Prob    |
|------------------------------------------|-------------|------------|-------------|---------|
| Constanta                                | -4887467    | 10388858   | -0.470453   | 0.64    |
| The number of cattle (X₁)                | 5383597     | 668538.6   | 8.052783*** | 0.00    |
| Formal education (X₂)                    | 3316439     | 2159490.   | 1.535751    | 0.13    |
| Dummy of non-formal education (D₁)       | 21518096    | 6191992.   | 3.475149*** | 0.00    |
| Experience of cattle fattening (X₃)      | -220970.7   | 316612.5   | -0.697922   | 0.49    |
| Dummy of length of fattening (D₂)        | -617494.4   | 6018006.   | -0.102608   | 0.92    |
| Dummy of rent forage land (D₃)           | -729821.1   | 5857929.   | -1.245869   | 0.22    |
| The number of family members (X₄)        | -112344.9   | 1319429.   | -0.851466   | 0.40    |

| R-squared                               | 0.7548      |            |             |         |
| Adjusted R-squared                      | 0.7396      |            |             |         |
| F-statistic                             | 49.705      |            |             |         |
| Prob (F-statistic)                      | 0.000       |            |             |         |

Bali cattle fattening enterprise is an alternative business that can generate income to be developed in rural communities. Income from beef cattle fattening is usually lower than the regional minimum wage [20][21]. Instead, farmers' income of fattening Bali cattle six months was above the provincial minimum wage of South Sulawesi in 2020, which was IDR 3,103,800 per month. The low output of fattening cattle must be increased through extension activities and the adoption of new technology [22]. Therefore, it is necessary to provide periodic counseling by the livestock service and educational institutions to improve production parameters to increase the average of daily gain (ADG), feeding practice, and fattening management.

4. Conclusions
The analysis of enterprise budgeting from the return to labor and management a year generates IDR 27,428,173 /farmer in a fattening period of 6 months and IDR 15,111,982 /farmer in a fattening period of 9 months. The study confirms that fattening cattle for six months is more profitable than that for nine months. Meanwhile, the number of feeder cattle and non-formal education variables partially and significantly influence income. Research on optimizing local forage-based feeding, increasing the number of feeder cattle, and pricing strategy of bulls for this enterprise could support its further development. The smallholder Bali cattle need socialization and extension of the Agriculture service to improve fattening production management, socialize the enterprise budget calculation based on the most profit of the Bali cattle fattening period, and support farmers with lower loan interest and easy collateral requirements.

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