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# COMPETITIVENESS AND PROFITABILITY OF BALI CATTLE FOR FARMERS IN THE SOUTHEAST SULAWESI DEVELOPMENT CENTER, INDONESIA

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**Abstract**

**Background:** Bali cattle have a significant role in supporting food security through providing meat and contributing to the economy by increasing farmers' income.
**Purpose:** This study aimed to analyze the competitiveness and profitability of the Bali cattle business in supporting animal food security and economic growth in Southeast Sulawesi Province.
**Design/methodology/approach:** The study was conducted from June to October 2024 in South Konawe and Muna Regencies, Southeast Sulawesi as centers for Bali cattle development. Data were collected from 240 Bali cattle farmers through direct interviews, focus group discussions, and secondary sources from various agencies. The analysis used in this study was the Policy Analysis Matrix (PAM).
**Findings/Result:** The results of competitiveness in South Konawe Regency were a private cost ratio (PCR) of 0.77 and domestic resource cost (DRC) of 0.82 with a private profitability (PP) of IDR 2.4 million per head per year and social profitability (SP) of IDR 1.9 million per head per year. The competitiveness results in Muna Regency are a private cost ratio (PCR) of 0.52 and domestic resource cost (DRC) of 0.60 with private profitability (PP) of IDR 5.7 million per head per year and social profitability (SP) of IDR 4.8 million per head per year.
**Conclusion:** These results state that the Bali cattle business in both regencies is efficient and has competitiveness both competitively and comparatively. Therefore, developing Bali cattle and farmers' access to input-output prices is crucial in government policies to meet national demand.
**Originality/value (State of the art):** Our research focuses on the competitiveness and profitability of smallholder Bali cattle farming. The study targets farmers utilizing semi-intensive systems (breeding and fattening) or intensive systems (fattening only) in two primary Bali cattle development areas: Konawe Selatan District, representing the mainland, and Muna District, representing the island region in Southeast Sulawesi Province.

**Keywords:** Bali cattle, development centers, competitiveness, profitability, PAM

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## INTRODUCTION

Livestock farming is an essential subsector in Indonesia that has provided society with various needs. These needs include meat, fiber, milk, eggs, and other products (Ding, 2021). On the other hand, livestock farming plays a significant role in ensuring food security (Ahmad et al. 2020), serving as a substantial source of protein (Siregar, 2021), raising awareness about nutrition (Santoso, 2020), increasing income (Ministry of Agriculture, 2019), developing the capacity of farming communities for self-sufficiency (Astiti et al. 2022), creating job opportunities (Food and Agriculture Organization, 2019), generating new employment (Razak et al. 2021), investing in the real sector and industrialization (Bappenas, 2020), alleviating poverty (Sihombing, 2019), contributing to future development (Widianingrum & Septio, 2023) and fostering national economic growth (Purnomo et al. 2022).

Beef cattle farming is a primary animal protein source and a sustainable food system (Moore et al. 2021). The development of beef cattle aimed at achieving self-sufficiency in meat has been carried out over three periods: 2000-2005, 2006-2010, and 2010-2014 (Rusdiana et al. 2018). In 2015, the Directorate General of Animal Husbandry formulated a master plan for livestock development, particularly beef cattle, across all provinces, as mandated by law (Government Regulation No. 48 of 2011; Ministerial Regulation No. 48/OT.140/9 of 2011). The government's latest initiative is the Sikomandan program, aimed at increasing the population and production of beef cattle and buffalo in Indonesia (Ministry of Agriculture, 2020).

According to the Directorate General of Animal Husbandry and Animal Health (2023), all programs are designed to enhance local beef cattle production. These programs are fully implemented by smallholder farmers, who typically raise 1-5 cattle as a side business and employ traditional farming methods. Over the past five years (2018-2022), the population continues to experience significant growth with an average yearly growth rate of 3.16%, and the production of local beef cattle also shows an average annual increase of 0.69%. Similarly, beef consumption has fluctuated but generally increased at an average of 1.64% yearly. The low growth in local beef cattle production and consumption can be attributed to a decline in 2020, coinciding with the COVID-19 pandemic in Indonesia. Conversely, the Center for Agricultural Data and Information Systems (2022) reported that import volumes during the same period ranged from 164,000 to 276,000 tons, increasing each year. Data from the Food and Agriculture Organization (2022) indicates that Indonesia imports an average of 134,000 tons of beef annually, contributing 1.95% to global imports. In 2024, beef imports are expected to be around 145,000 tons (CNBN Indonesia, 2024).

Considering that significant imports will drain foreign exchange reserves, estimated at around 800-900 million USD during 2021-2022 (Center for Agricultural Data and Information Systems, 2022), this affects national food security (Saajidah & Sukadana, 2020). Furthermore, beef imports create an imbalanced competition for local farmers, leading to declining local beef cattle production. On the other hand, Indonesia has abundant domestic resources, such as vast pasturelands for livestock feed, a prominent human workforce, and other resources supporting beef cattle production. Given the importance of meeting food needs by utilizing local resources, the government has taken various measures to enhance local beef production (Danasari et al. 2020). One of the centers for developing local cattle is Southeast Sulawesi, particularly in the districts of South Konawe and Muna (Ministry of Agriculture, 2016). The local breed being developed is Bali cattle, recognized as a genetic resource of Indonesia (Directorate General of Animal Husbandry and Animal Health, 2023).

The distribution of Bali cattle populations in South Konawe and Muna districts is 69,157 head (16.40%) and 74,386 head (17.64%), respectively, out of the total Bali cattle population in Southeast Sulawesi (Central Statistics Agency, 2024). This indicates that the population has been experiencing significant annual growth (2018-2022). According to the Directorate General of Animal Husbandry and Animal Health (2023), the contribution of Bali cattle in Southeast Sulawesi to national population needs over the past five years averages 1,887 head (0.52%). This means that 99.48% of the Bali cattle population in Southeast Sulawesi is used to meet local demands. The export of Bali cattle from Southeast Sulawesi to other provinces has increased, while imports have fluctuated (Directorate General of Animal Husbandry and Animal Health, 2023). On the one hand, the potential livestock feed available in Southeast Sulawesi is 1,938,433 tons

of dry matter annually, along with 494,467 tons per year of straw as livestock feed derived from agricultural waste (Aljumiati et al. 2021). This description indicates that the development of Bali cattle still faces challenges and obstacles.

An increase has not followed the increase in the population of Bali cattle in Southeast Sulawesi in the export of Bali cattle outside the Province. On the one hand, the demand for feeder cattle and beef outside the Province continues to rise. In contrast, the demand for Bali cattle in Southeast Sulawesi is not as high, as the in-province supply is still sufficient (Bureau of Economic Administration, 2022). One of the key questions that needs to be answered is whether the Bali cattle farming business in the development centers of Southeast Sulawesi has competitive and comparative advantages. Suppose Bali cattle in this region have such advantages. In that case, the increasing demand for cattle from outside (either in the form of beef or imported feeder cattle) should be met by increasing the supply of Bali cattle from Southeast Sulawesi. However, if these competitive advantages have not been achieved, efforts should be made to improve the competitiveness of Bali cattle farming in this region. With these efforts, it is hoped that the development of Bali cattle farming in the development centers of Southeast Sulawesi can achieve high competitiveness, both competitively and comparatively, as well as efficiency for operation. Ultimately, this region can independently meet the demand for beef while also contributing to fulfilling national beef needs. The study targets farmers utilizing semi-intensive systems (breeding and fattening) or intensive systems (fattening only) in two primary Bali cattle development areas: Konawe Selatan District, representing the mainland, and Muna District, representing the island region in Southeast Sulawesi Province.

Competitiveness refers to the ability of local beef cattle to compete with imported beef or feeder cattle. Conceptually, competitiveness can be analyzed at different levels, including microeconomic and macroeconomic levels. The concept of competitiveness in the literature on economics and business is more prevalent than the concept of comparative advantage. Commodities with comparative advantage can be said to have economic efficiency. One method used to analyze competitiveness and efficiency in the agricultural sector is the Policy Analysis Matrix (PAM) (Nurmalina et al. 2023). PAM is conceptually an economic analysis method used to assess efficiency, competitiveness, and policies related to the utilization of domestic resources in a sector, including the livestock sector.

According to the Central Statistics Agency (2023), from the production side, the agricultural (including livestock), forestry, and fisheries sectors contributed the most to Southeast Sulawesi's GDP in 2023, accounting for 23.02%. Therefore, this study aims to analyze the competitiveness and profitability of Bali cattle farming in supporting animal food security and economic growth in Southeast Sulawesi Province.

## METHODS

The study was conducted in the Southeast Sulawesi Province's Bali cattle development centers, specifically in South Konawe Regency and Muna Regency. These two regencies were selected through purposive sampling because they are key areas for Bali cattle development, with the majority of the cattle population concentrated in these regions experiencing significant annual growth. Data collection took place over four months, from June to October 2024. Both primary and secondary data were utilized in the study. Primary data were gathered directly from Bali cattle farmers using questionnaires and focus group discussions (FGD). Secondary data were obtained from relevant institutions, such as the Central Statistics Agency, the Department of Agriculture or Livestock, Agricultural Extension Centers, village-level livestock records, and other necessary sources.

The primary data collected from farmers covered characteristics and production factors, including input and output details, as follows:

1. Farm characteristics: gender, age, education, primary occupation, experience, status, and family size.
2. Maintenance practices: labor input, farming models, population scale, and ownership scale.
3. Business investments: facilities, including barns, wells, and equipment (such as hoes, shovels, sickles/machetes, sacks, and ropes).
4. Input usage and costs: quantity and price of inputs, including feeder cattle, forage, rice/corn straw, rice bran, tofu waste, water, salt, vitamins, traditional medicines, labour, and depreciation of barns and equipment over their economic lifespan. Other inputs include electricity, fuel, taxes, capital, and

slaughter fees.
5. Marketing Costs: expenses related to selling meat from slaughterhouses, transportation, handling, and other miscellaneous costs.
6. Sales Revenue: income from the sale of live cattle and manure.

The respondents in this study were Bali cattle farmers who raised their livestock using either an intensive fattening system or a semi-intensive breeding-fattening system. The Bali cattle kept by these farmers had to include at least one productive female or a minimum of three Bali cattle. The selection of districts was based on areas designated as Bali cattle development centers. In South Konawe Regency, the districts selected were Baito, Buke, Palangga, and Tinanggea, while in Muna Regency, the selected districts were Tongkuno, Parigi, Kabangka, and Napabalano (Ministry of Agriculture, 2016).

Each district was represented by three villages, determined using Slovin's formula, from 102 villages, with the selection based on those with the largest Bali cattle populations (data sourced from the Central Statistics Agency of each district). Thus, 24 sample villages were selected across the eight districts. From each village, 10 respondents were selected, resulting in a total sample size of 240 respondents. The respondents were chosen using purposive sampling, ensuring all farmers had an opportunity to be selected, provided they met the predetermined criteria. According to Guildford (1979), if the population is relatively large and homogeneous, a sample size of 30 respondents per district is appropriate, with each village contributing 10 respondents. Focus group discussions (FGD) were held in each regency, involving participants from the local government, livestock extension officers, Bali cattle farmers, and academics.

The method used to assess competitiveness in this study was the Policy Analysis Matrix (PAM). According to Priyanka et al. (2015); and Nurmalina et al. (2023), this approach evaluates the extent of competitive and comparative advantages by analyzing the use of domestic resources and tradable inputs. The steps involved in constructing the PAM table are as follows:
1. Identify the inputs and outputs used in Bali cattle farming in the study area;
2. Determine the shadow price of inputs and outputs of Bali cattle farming. Shadow prices are determined by removing distortions due to government policy or market failure. This study approximates the social price of traded commodities by the border price. Commodities that have been exported are used FOB (free on board) prices and imported commodities are used CIF (cost insurance freight) prices. The FOB price is the border price at the port of export minus transport and handling costs from the wholesaler to the port. While the CIF price is the limit price at the port of import, it is necessary to add transport and handling costs from the port to the research location;
   a. The shadow price of output is calculated from the price of imported output goods when the goods are received at the port and then converted into a shadow rupiah value and added with trade costs. In this study, the shadow price of output includes live cattle and feeder cattle.
   b. The shadow prices of inputs in this study are salt, vitamin fuel, and beef. The shadow price of salt is calculated from the price of imported goods when the goods are received at the port which is then converted into a shadow rupiah value and added to trade costs. The shadow price is calculated from the highest retail price (HRP) plus the price at wholesalers plus the handling price. The shadow price of petrol is calculated from the price of non-subsidized petrol plus the e-commerce price. Meanwhile, the shadow price of beef is calculated from the price of imported input goods when the goods are received at the port and then converted into a shadow rupiah value and added to the cost of trade.
3. Separating cost elements into tradable and domestic groups. This research uses the total approach in allocating tradable and domestic input costs;
4. Calculate revenue, cost, and profit of Bali cattle farming;
5. Calculate and analyse various indicators of competitiveness and profitability of Bali cattle farming.

The formulation of variables and calculation of Policy Analysis Matrix (PAM) indicators in Table 1. Figure 1 illustrates that community-based Bali cattle play a crucial role in food security by providing meat and contributing to the economy by increasing farmers' income. However, they face various challenges, such as import dependence, competition with imported meat, small-scale farming, traditional rearing systems, and limited knowledge and technological access. Meanwhile, abundant domestic resources and

government policy support, such as self-sufficiency programs and subsidies, can be optimized to enhance competitive advantage, comparative advantage, and business efficiency through the Policy Analysis Matrix (PAM) approach.

## RESULTS

### Characteristics of Farmers

Based on the total number of research respondents presented in Table 2, the dominant findings show that 78% of the participants in the South Konawe Regency and 84% in the Muna Regency are male. Regarding age, which was classified into generational categories, 88% of the respondents in South Konawe Regency and 92% in Muna Regency are between 26 and 65 years old. Regarding educational level, 56% of respondents in South Konawe Regency and 60% in Muna Regency have a moderate education level (junior to senior high school). Regarding primary occupation, 75% of respondents in South Konawe Regency and 66% in Muna Regency work as farmers. As for livestock farming experience, 35% of respondents in South Konawe Regency have been farming for over 10–20 years, while 43% in Muna Regency have been farming for more than 20 years. Based on farming status, 80% of respondents in South Konawe Regency and 87% in Muna Regency are heads of households. Lastly, regarding family size, 58% of respondents in South Konawe Regency and 63% in Muna Regency have 3–4 family members.

Table 1. Variables and calculations of the Policy Analysis Matrix (PAM) indicators

| Description | Revenue | Input Cost | | Profitability |
|---|---|---|---|---|
| | | Tradable | Non Tradable | |
| Privat Cost | A | B | C | D |
| Social Cost | E | F | G | H |
| Policy Impact | I | J | K | L |

Notes: Private Profitability (PP) or (D) = (A) - (B + C); Social Profitability (SP) or (H) = (E) - (F + G); Private Cost Ratio (PCR) = C / (A - B); Domestic Resource Cost (DRC) = G / (E - F)

Source: Nurmalina et al. (2023)

Table 2. Characteristics of Bali cattle farmers in the development centers of Southeast Sulawesi Province

| Farmer's Identity | Dominant Result | | | |
|---|---|---|---|---|
| | Konawe Selatan | Percentage (%) | Muna | Percentage (%) |
| Gender | Male | 78 | Male | 84 |
| Age | 26-65 Years | 88 | 26-65 Years | 92 |
| Education | Junior High School (JHS) - Senior High School (SHS) | 56 | Junior High School (JHS) - Senior High School (SHS) | 60 |
| Main Occupation | Farmer | 75 | Farmer | 66 |
| Experience | 10-20 Years | 35 | >20 Years | 43 |
| Marital Status | Head of Family | 80 | Head of Family | 87 |
| Family Members | 3-4 People | 58 | 3-4 People | 63 |

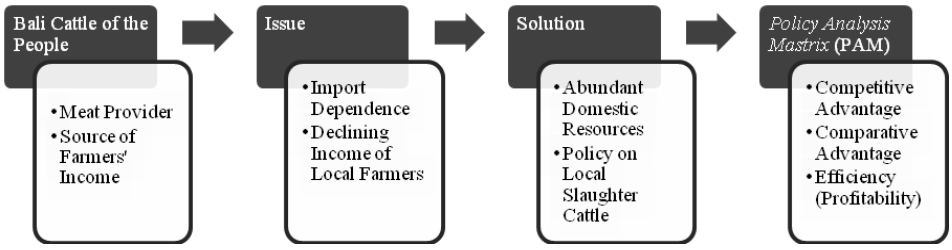


Figure 1. Framework of thought

Gender, age, education, primary occupation, experience, status, and family size influence productivity in Bali cattle farming. According to Idris et al. (2023), livestock farming is more commonly undertaken by men due to their greater physical strength than women, especially for tasks such as foraging for feed, providing food and water, cleaning barns, and administering medication or vitamins. Astati et al. (2024) state that age can affect productivity, as aging influences work behavior and cognitive abilities in completing tasks. Wiguna et al. (2021) add that the productive age range is between 15–56 years, while older individuals (57 years and above) may experience a decline in physical and mental capacity to work. Furthermore, Prabawa (2020) explains that education influences critical thinking skills and openness to new ideas, which are essential for developing Bali cattle farming businesses. Noija et al. (2024) found that in rural Indonesia, farmers whose primary occupation is agriculture often raise beef cattle as a side business or savings, which can be sold to meet urgent financial needs. Ibrahim et al. (2020) emphasize that a farmer's success is significantly influenced by experience involvement in livestock farming, which increases knowledge of the business and leads to better productivity. Additionally, Adeyeye et al. (2019) highlight that heads of households are more dominant than housewives in agricultural activities.

**Overview of Bali Cattle Farming**

Based on the total number of respondents in the study, the dominant Bali cattle farming model in South Konawe Regency shows that 71% of farmers use a semi-intensive system, with 64% following breeding combined with the fattening pattern. In Muna Regency, 70% also apply the semi-intensive system, with 74% adopting the same breeding-fattening pattern (Figure 2a). Regarding population distribution, in the South Konawe Regency, 25% of the cattle are male, 39% are adult females, and 36% are calves. Muna Regency's distribution is 34% male, 35% adult females, and 31% calves (Figure 2b). Regarding ownership scale, both regencies show a dominance of small-scale ownership. In South Konawe, 56% of farmers own 1–5 cattle, while in Muna Regency, 39% fall within the same ownership range (Figure 2c).

Nafiu (2018) states that Southeast Sulawesi is one of the key regions for Bali cattle development in Indonesia, where around 95% of the cattle population is managed by small-scale farmers in rural areas using semi-intensive farming systems. In the semi-intensive system, cattle are partly allowed to roam freely or graze, while at other times, they are kept in pens or enclosures. The Bali cattle farming model primarily focuses on calf production (breeding pattern). However, fattening is also practiced in certain areas, especially in transmigration zones (Saili, 2020) and regions with abundant non-forage feed supplies, such as agricultural by-products (Nafiu, 2018). Farmers in Southeast Sulawesi's cattle development centers tend to apply breeding and fattening patterns more frequently than fattening alone. This preference aligns with the dominance of semi-intensive systems, whereas pure fattening typically requires a more intensive management approach.

**Competitiveness of Bali Cattle**

The competitiveness of Bali cattle refers to the ability of this commodity, raised in Indonesia, to compete with imported meat and cattle for fattening, assessed from both competitive and comparative perspectives. Ilchenko et al. (2021) state that most researchers theoretically describe competitiveness as a multidimensional relative concept, often linking it to market mechanisms. Competitiveness can be analyzed at different levels, specifically at the microeconomic level (companies and households) and the macroeconomic level (national and regional) (Ireta-Paredes et al. 2015). At the microeconomic level, Bali cattle competitiveness challenges include enhancing Bali cattle farmers' welfare through improving operational efficiency associated with efforts to

increase the population of Bali cattle. Meanwhile, at the macroeconomic level, the challenge lies in strengthening national and regional food security, particularly in providing protein from animal sources, where imports remain the primary means to supply beef and cattle for domestic needs. One analytical tool to assess competitiveness in the agricultural sector, particularly in the Bali cattle subsector, is the Policy Analysis Matrix (PAM). The following presents the analysis results with PAM indicator calculations (Table 3) in the centre of development in Southeast Sulawesi Province.

**Private Profitability (PP) and Social Profitability (SP)**

Based on the data obtained, the combination of breeding and fattening has become a mainstay for Bali cattle farmers in the development center of Southeast Sulawesi Province. The community carries out this maintenance, with an average duration ranging from 6 to 12 months. This period depends on the age of the cattle purchased for breeding and fattening. If the cattle purchased are aged between 1 and 1.5 years, the average fattening period is 6 to 12 months. The profitability of maintaining Bali cattle in the development centers of Southeast Sulawesi Province can be explained using the Policy Analysis Matrix (PAM).

PAM is constructed based on a commodity's input and output cost data, with costs separated into tradable and domestic components. In managing Bali cattle farming in the development center of Southeast Sulawesi Province, several input cost components are required. These include investment costs for facilities such as housing, wells, and equipment (shovels, hoes, sickles, sacks, and ropes), the cost of young cattle, forage, rice/corn straw, rice bran, tofu pulp, water, salt, vitamins, traditional medicines, labor, depreciation, the economic lifespan of housing and equipment, electricity and lighting, fuel, taxes, capital, slaughtering costs, marketing expenses (for meat from slaughterhouses and transportation and handling costs), and other fees.

The price of young Bali cattle is still relatively low in the research locations, averaging IDR 6.1 million in South Konawe Regency and IDR 5.9 million in Muna Regency. This is because farmers in both regencies purchase young cattle from nearby farmers. The young cattle are not weighed but assessed based on appearance and size. These cattle are sourced from farmers in neighboring districts as well as from outside the regency. Subsequently, the young cattle are fattened for an average of 6 to 12 months. The results of the social and private profitability analysis for Bali cattle farming in the development center of Southeast Sulawesi Province are presented below (based on the results in Table 3).

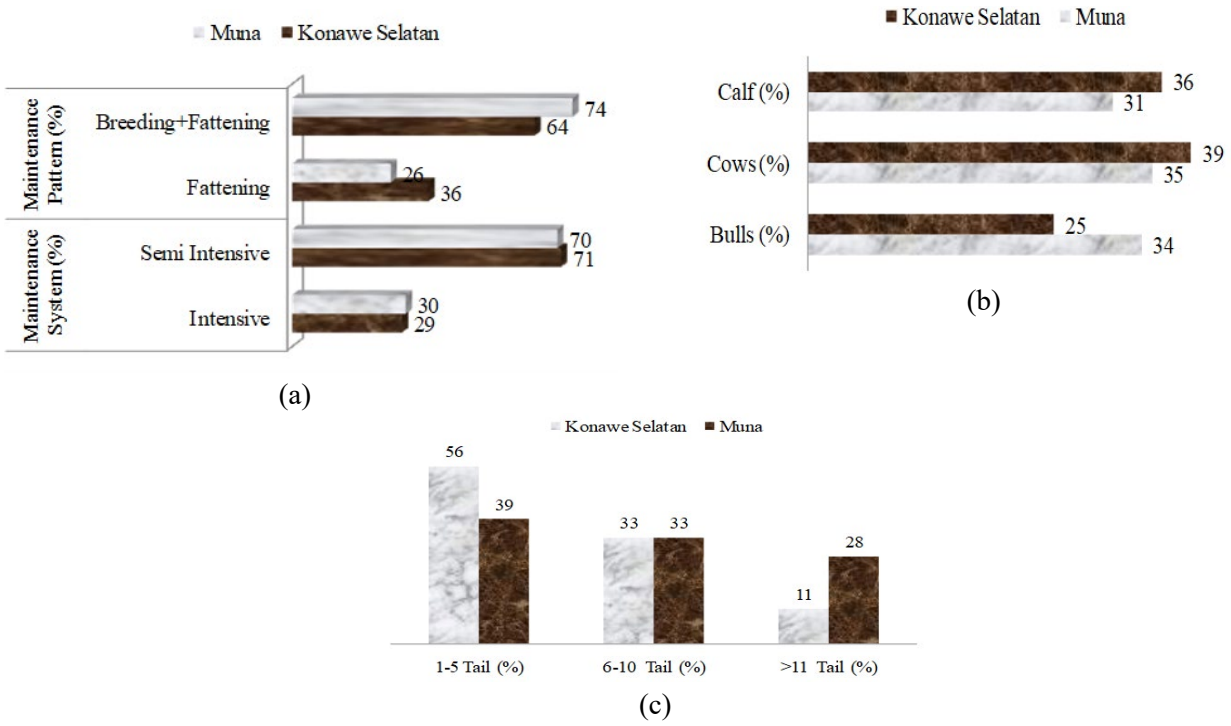


Figure 2. (a) Maintenance Model; (b) Distribution of Population Scale; (c) Distribution of Bali Cattle Ownership Scale in Development Center of Southeast Sulawesi Province

Table 3. Results of policy analysis matrix (PAM) indicator calculations for Bali Cattle Enterprises in Southeast Sulawesi Province's development center (million/head/year)

| Description | Regency | Revenue (million) | Input Cost (million) | | Profitability (million) |
|---|---|---|---|---|---|
| | | | Tradable | Non Tradable | |
| Privat Cost | Konawe Selatan | 12.5 | 1.9 | 8.2 | 2.4 |
| | Muna | 13.0 | 1.0 | 6.3 | 5.7 |
| Social Cost | Konawe Selatan | 19.0 | 8.4 | 8.7 | 1.9 |
| | Muna | 18.5 | 6.6 | 7.1 | 4.8 |
| Policy Impact | Konawe Selatan | -6.5 | -6.5 | -0.5 | 0.5 |
| | Muna | -5.4 | -5.6 | -0.8 | 1.0 |

Private profitability (PP) is the difference between the revenue obtained and the total costs based on private prices. Private prices refer to the actual market prices that farmers typically use in the Bali cattle farming operations in the development centre of Southeast Sulawesi Province, where these prices may have been influenced by government policies. Private profit is measured to assess the competitiveness of the commodity system and can be used for cost-benefit analysis at private price levels or actual prices (Priyanka et al. 2015). Figure 3 shows that the private profit (PP) is positive, amounting to IDR 2.4 million per cattle per year in South Konawe Regency and IDR 5.7 million per cattle per year in Muna Regency. If private profit is less than 0 (<0), the Bali cattle farming operation is incurring losses or is not feasible. Conversely, if it is greater than 0 (>0), Bali cattle farming is worthwhile as it yields above-normal profits (Nurmalina et al. 2023).
Social profitability (SP) is the difference between the revenue obtained and total costs at the social price level or efficiency, based on estimates from field observations regarding domestic market factors in rural areas. The goal is to determine the amount of output or income lost due to domestic factors used to produce its best alternative commodity (Makmur & Rizki, 2024). Figure 3 indicates that social profit (SP) is IDR 1.9 million per cattle per year in South Konawe Regency and IDR 4.8 million per cattle per year in Muna Regency. If social profit is less than 0 (<0), the Bali cattle farming operation is considered inefficient. Conversely, if social profit is greater than 0 (>0), the Bali cattle farming operation is efficient and has a high comparative advantage (Nurmalina et al. 2023). Overall, Muna Regency shows greater profits both privately and socially than South Konawe. However, both regencies demonstrate that Bali cattle farming is viable and efficient, providing positive private and social profits. Similarly, the profitability of the cattle farming business in Gorontalo Regency shows a private price profit of IDR 0.083 million and a social price profit of IDR 0.268 million per head per period (Rouf et al. 2019). Then, at the market price, which is lower than the social price, in West Nusa Tenggara, the price is IDR 6.1 million per head per period, and in East Nusa Tenggara, it is IDR 2.0 million per head per period (Nalle et al. 2017; Sudirman et al. 2017).

**Domestic Resources Cost (DRC) and Private Cost Ratio (PCR)**

To measure the competitiveness of Bali cattle, both competitive and comparative approaches are necessary. Each approach has indicators: domestic resource cost (DRC) and private cost ratio (PCR). The following presents the DRC and PCR indicators for Bali cattle farming in the development center of Southeast Sulawesi Province. Figure 4 shows that in the South Konawe Regency, the PCR is smaller than the DRC, both of which are below 1. This indicates that it is more beneficial to produce Bali cattle locally than importing them, thus demonstrating a comparative advantage and the ability to finance domestic factors at private prices, leading to competitive advantages. The same situation is observed in Muna Regency, where DRC and PCR values are less than 1.

The domestic resources cost (DRC) value indicates the ability to cultivate Bali cattle locally or to resort to imports. Additionally, the DRC reflects the capacity to finance domestic factors at social prices. If DRC > 1, indicates that the Bali cattle commodity system cannot produce locally and would be better off importing, thus wasting existing domestic resources without government intervention. Conversely, if DRC < 1, the Bali cattle commodity system possesses an advantage for local production over imports, making it more efficient and competitive (comparative advantage) while capable of developing without government intervention and having more excellent export opportunities.


Figure 3. Private Profit (PP) and Social Profit (SP) of Bali Cattle Farming in the Development Center of Southeast Sulawesi Province (million/head/year)

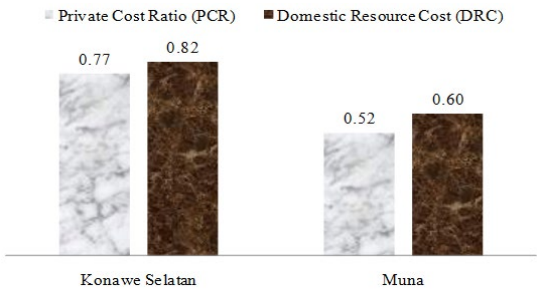


Figure 4. Domestic Resources Cost (DRC) and Private Cost Ratio (PCR) of Bali Cattle Farming in the Development Centers of Southeast Sulawesi Province

Figure 4 shows that the DRC value for Bali cattle farming in South Konawe Regency is 0.82, meaning that the cost to produce Bali cattle is 82 percent of the required import cost. This is due to the higher import prices than local prices, making locally sourced Bali cattle cheaper and more accessible. Since the DRC value is less than 1, this business is considered to have comparative competitiveness. Meanwhile, the DRC value for Bali cattle farming in Muna Regency is 0.60, indicating that the cost to produce Bali cattle is 60 percent of the required import cost. In summary, both South Konawe and Muna regencies show that Bali cattle farming is socially efficient and possesses comparative competitiveness.

The private cost ratio (PCR) value serves as an indicator that measures the ability of a business to generate output based on private costs (the costs directly incurred by the business operators, including input and output prices in the market). Figure 4 shows that the PCR value in South Konawe Regency is 0.77, while in Muna Regency, it is 0.52. This indicates that the private costs incurred to produce Bali cattle are lower than the generated income. Therefore, the business is efficient from a private perspective and can profitably produce its own Bali cattle. Overall, the Bali cattle farming operations in both South Konawe and Muna regencies are more capable of producing privately due to lower costs than the income generated. This is also attributed to the higher sales volume from the sale of whole cattle and the added value from selling Bali cattle manure.

Research in other regions has shown that beef cattle breeding in Tongkuno District, Muna Regency, possesses substantial competitive advantages and good efficiency (Lasahudu et al. 2017). Corn and cattle farming integration has also been found to be financially efficient and competitive (Marjaya, 2015). Bukifan et al. (2021) also confirmed that beef cattle fattening is profitable both privately and socially. In Plampang District, West Nusa Tenggara, Bali cattle farming shows a comparative advantage, with varying domestic resource cost (DRC) and private cost ratio (PCR) depending on the typology (Sudirman et al. 2018). However, beef cattle fattening in Bojonegoro Regency does not demonstrate competitiveness (Lestari et al. 2017), and the sector continues to face challenges regarding government input-output policies (Yulianti et al. 2024).

**Sensitivity Analysis**

Sensitivity analysis is complementary to the policy analysis matrix (PAM) to observe how various factors change if situations differ from the assumptions made in a particular policy. This approach is also supported by field observations showing that these factors often fluctuate due to price changes. Sensitivity analysis for Bali cattle businesses in the development center area of Southeast Sulawesi Province was conducted based on four changes in input and output variables, namely: (1) a 15% increase in the purchase price of Bali feeder cattle (input), (2) a 15% decrease in the selling price of live cattle (output), (3) a 15% increase in fuel prices (gasoline), and (4) a 15% increase in the rupiah exchange rate against the dollar. These changes are based on possible condition assumptions (Nurmalina et al. 2023). It also references numerous studies on the competitiveness of beef cattle, which apply assumptions of 5-25% changes (Yulianti et al. 2024; Bukifan et al. 2021; Sudirman et al. 2018; Lestari et al. 2017). Hence, this study uses a 15% assumption (the midpoint). Each

scenario assumes a change in one variable, with all other variables held constant (ceteris paribus). The following table presents the sensitivity analysis of each variable for Bali cattle businesses in the development center area of Southeast Sulawesi Province.

Sensitivity analysis can be conducted to understand changes in input and output prices affecting the competitiveness indicators of Bali cattle in the development center area of Southeast Sulawesi Province. Table 4 shows that a 15% decrease in the selling price of live cattle (output) reduces the DRC value to 1.12 in Konawe Selatan and 0.79 in Muna compared to the current DRC condition. Similarly, the PCR value decreases to 0.94 in Konawe Selatan and 0.63 in Muna. If the purchase price of Bali feeder cattle (input) increases by 15%, the DRC value changes to 0.88 in Konawe Selatan and 0.65 in Muna, while the PCR value shifts to 0.82 in Konawe Selatan and 0.55 in Muna. A 15% increase in fuel prices (input) lowers the DRC value to 0.83 in Konawe Selatan and 0.61 in Muna, while the PCR value decreases to 0.80 in Konawe Selatan and 0.54 in Muna. Meanwhile, a 15% increase in the exchange rate of the US dollar against the Rupiah enhances competitiveness indicators, particularly the DRC value, which drops to 0.65 in Konawe Selatan and 0.48 in Muna. However, the PCR value remains unchanged from the current condition.

These conditions show that even with an increase in input prices or a decrease in output prices, Bali cattle farmers in Southeast Sulawesi's development centre areas continue to maximize feed resource potential, primarily using forage and rice or corn straw available year-round. However, competitiveness generally declines, especially with a 15% decrease in the selling price of live cattle. In terms of cattle population, South Konawe farmers typically own an average of 7 Bali cattle, while Muna farmers own around 9, reflecting a high competitiveness level. This suggests that larger cattle populations correlate with higher competitiveness and vice versa. Regarding farming systems, most farmers employ a semi-intensive system, which has proven competitive. Further intensification could increase competitiveness, while extensive farming practices may reduce it. Concerning labor, most farmers rely on family labour (parents, spouses, children), which is sufficient to maintain competitiveness. Adding more labor may decrease competitiveness due to increased input costs, and the reverse is also true.

**Managerial Implications**

First, local and central governments can strengthen policies supporting Bali cattle farming, such as providing incentives for selling live cattle ready for slaughter, thereby enhancing competitiveness in the region. Second, increased support for the Bali cattle farming sector is necessary to maintain local competitiveness, mainly through policies that consistently promote domestic production and reduce reliance on imports. Third, given the potential increase in farmers' income, managerial and technical training programs must be strengthened to enable farmers to manage their businesses more professionally and with a long-term focus on profitability.

Table 4. Sensitivity Analysis of Competitiveness in Smallholder Bali Cattle Enterprises in the Development Centre of Southeast Sulawesi Province

| Scenario | Regency | Competitiveness Indicators | |
|---|---|---|---|
| | | Domestic Resources Cost (DRC) | Private Cost Ratio (PCR) |
| Current condition | Konawe Selatan | 0.82 | 0.77 |
| | Muna | 0.60 | 0.52 |
| Decrease in the selling price of live cattle by 15% | Konawe Selatan | 1.12 | 0.94 |
| | Muna | 0.79 | 0.63 |
| Increase in the purchase price of feeder cattle by 15% | Konawe Selatan | 0.88 | 0.82 |
| | Muna | 0.65 | 0.55 |
| Increase in gasoline fuel prices by 15% | Konawe Selatan | 0.83 | 0.80 |
| | Muna | 0.61 | 0.54 |
| Increase in the exchange rate by 15% | Konawe Selatan | 0.65 | 0.77 |
| | Muna | 0.48 | 0.52 |

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

The Bali cattle farming business in both districts, as a central development area in Southeast Sulawesi Province, demonstrates competitive (PCR < 1) and comparative (DRC < 1) advantages, indicating that local production is more efficient than imports. This finding supports the concept of economic comparative advantage and shows that the Bali cattle farming business can contribute to national food security. The Bali cattle farming business also shows efficiency in terms of private profitability (PP > 1) and social profitability (SP > 1), confirming the feasibility of this business. This strengthens the empirical evidence that the livestock sector can be a pillar of rural economic growth through increased farmer income.

### Recommendations

Therefore, efforts to develop Bali cattle and improve farmer access in both regencies to input and output prices are expected to remain a focus of government policy, particularly Bali cattle farming. This aims to ensure that Bali cattle production remains competitive, profitable, and capable of meeting the increasing national demand for beef. As development centers, Bali cattle in these two regencies, have the potential to strengthen food security and boost the economy of Southeast Sulawesi Province. Therefore, further research is necessary on the sustainability of Bali cattle development centers in Southeast Sulawesi.

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