



## Economic Values on Carcass and Non-Carcass of Beef Cattle Based on Sex at the Manokwari Slaughterhouse, West Papua, Indonesia

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**Abstract** | Preventing slaughtering productive cows and bulls would reduce cattle population as gen bank of population in Manokwari as center of Balinese cattle in West Papua. The aim of this study was to analyze the economic value of carcass and non-carcass as parts of beef cattle based on sex at the slaughterhouse in Manokwari Regency, West Papua, Indonesia. Samples were randomly collected at private slaughterhouses in Kampung Bugis, Pasar Wosi, and Taman Ria Wosi. The location and sampling of livestock was carried out purposively for 10 days in three slaughterhouse sites so that 30 cattle used consisting of 14 cows and 16 bulls were slaughtered. Data analysis was conducted using the Independent Samples T-Test and descriptive analysis. The normality test was carried out with Kolmogorov-Smirnov assuming that if the value of  $Asymp.Sig > 0,05$  then the data was normally distributed. The results showed that the carcass weight of bulls was higher than cows. The carcass percentage of bulls 66.38% was higher than cows, which 66.20%. The meat percentage of bulls (51.35%) was higher than cows (50.97%). The Independent Samples T-Test showed significant differences in carcass products such as meat, shank, and tail, while non-carcass results showed differences in the liver, intestines, head, skin, and brain. Meat had the highest value-added component of the carcass in cows (75.79%) and bulls (76.43%). The average selling price of cows at the farmer level was lower than that of bulls, with a difference of IDR 1,844,642.86 per head, but the value-added of cows at the beef trader level (IDR 4,826,642.52) was higher than bulls (IDR 4,226,317.38). These findings indicate the importance of considering all components of beef cattle in economic value calculations to maximize profits. Policies should be implemented to control the slaughtering of productive cows to preserve genetic resources and maintain livestock population balance. Improved management and feeding practices are also needed to maximize the economic value of beef cattle.

**Keywords** | Added value, Beef cattle, Carcass, Economic value, Non-carcass, Sex

**Received** | July 30, 2024; **Accepted** | October 19, 2024; **Published** | December 30, 2024

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**Citation** | Sumpe I, Suhartanto B, Andarwati S, Kusumastuti TA (2025). Economic values on carcass and non-carcass of beef cattle based on sex at the manokwari slaughterhouse, west papua, Indonesia. Adv. Anim. Vet. Sci. 13(1): 157-165.

**DOI** | <https://dx.doi.org/10.17582/journal.aavs/2025/13.1.157.165>

**ISSN (Online)** | 2307-8316; **ISSN (Print)** | 2309-3331



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The high slaughter of productive cows at the slaughterhouse Manokwari Regency has an impact on the sustainability of beef cattle germplasm. The productivity of beef livestock based on economic aspects is largely determined by carcass weight, carcass percentage, quantity and quality of meat produced, as well as carcass cuts that can be sold (Nakitari 2021; Johnson and Ball 1989; Agustina *et al.*, 2017). Beef cattle are one of the beef livestock resources in Manokwari Regency and have great potential to be developed as a source of income for livestock farmers (Iqubal *et al.*, 2021; Sesay *et al.*, 2022). According to Department of Agriculture and Food Security of Manokwari Regency in 2023 this area had potential local forage resource because they are supported by 3,458 hectares of food crop land that can generate agricultural waste as a source of livestock feed.

The center for beef cattle development in Manokwari Regency is located on agricultural areas that including the plantation, food crop agriculture, and “agropolitan” subsectors covering the Warmare, Prafi, Masni, and Sidey regions. Beef cattle farming business in Manokwari Regency is generally smallholder farming conducted by farmers in addition to their agricultural activities. Characteristics of this farming include a small number of livestock, labor generally from the farmer’s family, low technological input, and low income (Herawati and Anwarudin, 2023; Purba and Sitinjak, 2023). The beef cattle rearing system in this area varies from traditional (extensive) to semi-intensive (Iyai and Yaku, 2015). According to Widayati *et al.* (2018), it is also possible to develop beef cattle in Bintuni Regency, one of the regencies in West Papua Province, by enhancing land characteristics and raising community awareness of cow breeding. The beef cattle kept in Manokwari Regency are mostly Balinese cattle and a small number have undergone cross-breeding through the artificial insemination program (Labatar and Aswandi, 2017). It is possible to create the shepherd-based beef cattle ranching method in Indonesia (Amam and Harsita, 2021). The study on evaluating the economic potential of Acehnese cattle from the perspective of stock farmers, traders, and consumers was the high selling prices and easy maintenance (Sofyan *et al.*, 2020).

The production and productivity of beef cattle in Manokwari Regency can be increased by controlling the slaughter of bulls, which is crucial for population growth and the sustainability of beef cattle genetic resources. One way to achieve this is by understanding the differences in livestock productivity based on sex, which is related to the economic value of live cattle, carcass, and non-carcass parts. The economic value of beef cattle is largely determined by the carcass percentage 50–60% (Soeparno, 2015). Carcass is the body weight of beef cattle after slaughter minus the head, blood, internal organs, feet, and hide. Meat is the main

component of the carcass, consisting of tissue fat adipose, bones, cartilage, connective tissue, and tendons. Beef cattle are considered to have high economic value if the carcass production is also high. The result of slaughtering livestock can be separated into two parts: carcass and non-carcass.

Non-carcass part (offal) consists of edible and non-edible components. In Indonesia, edible non-carcass parts such as hide, head, tail, and viscera (liver, heart, lungs, and digestive tract) also have high economic value. These parts can be processed into various Indonesian foods such as “konro,” “coto Makassar,” and “kari.” Some non-edible non-carcass components can be processed with advanced technology to provide significant financial benefits (Soeparno, 2015). The economic value of local cattle and buffalo increases significantly when processed into carcass and non-carcass components (Fatonah *et al.*, 2023). However, few thorough economic studies examine the expenses of the meat industry such as live animals and carcasses.

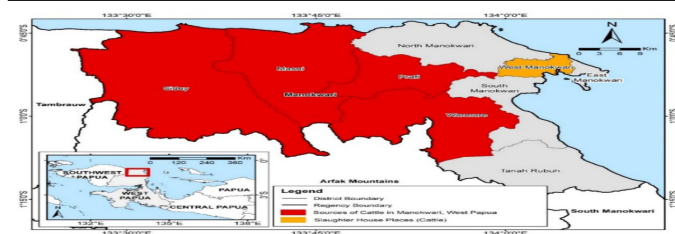
The objective of this study was to determine the economic values of beef cattle based on the sex of the slaughtered livestock at the Manokwari Regency slaughterhouses. The novelty of this research lies in its comprehensive analysis of economic values associated with carcass and non-carcass characteristics of beef cattle slaughtered based on livestock sex in Manokwari Regency, West Papua, Indonesia. These findings have theoretical implications for understanding the economic drivers of beef production and practical implications for stakeholders involved in the beef industry in the region.

The scope of this study includes random sampling at private slaughterhouses such as Kampung Bugis, Pasar Wosi, and Taman Ria Wosi in Manokwari Regency as well as evaluating the economic value based on the selling prices of carcass and non-carcass products and comparing the economic added values of bulls and cows.

## MATERIALS AND METHODS

### SAMPLES AND LOCATION

The study was conducted 30 days located at privately slaughterhouses in Manokwari Regency, namely Kampung Bugis, Pasar Wosi, and Tamanria Wosi. Samples were obtained from 30 Balinese cattle, consisting of 14 cows and 16 bulls originating from several districts, such as Warmare, Prafi, Masni and Sidey areas (Figure 1). The cattle were 3–5 years old. The selection of the slaughterhouse was carried out with the limitation of the minimum business length of 5 years, livestock were measured based on slaughter carried out at each slaughterhouse for 10 days so that 30 samples were obtained. Due to limitation number of slaughtering cattle per day and insufficient record of time schedule of these slaughtering houses, as much as 30 cattle were recorded and observed.



**Figure 1:** Maps of field research. Red areas shows four districts, such as Sidey, Masni, Prafi and Warmare where cattle origin for slaughtering. Yellow areas shown places of slaughtering houses in west manokwari district.

## DATA COLLECTION TECHNIQUE

Data collection techniques were carried out using a survey method through structured interviews and observations. An in-depth interview was done with livestock butchers who also act as final traders. Interviews were also conducted to obtain information on the prevailing market prices based on the purchase of live livestock and selling prices based on carcass and non-carcass components. Weighing of beef cattle products based on carcass and non-carcass sold at the slaughterhouse. Livestock sampling method done by employing purposive sampling based on the slaughter of beef cattle carried out at the slaughterhouse.

## MEASUREMENT VARIABLES

Measurement variables consisted of estimated live livestock weight (kg), including the carcass beef cattle percentage 50-60% (Soeparno, 2015); Bali cattle carcass percentage: 51-56% (Suryanto *et al.*, 2014; Hafid *et al.*, 2018; Prasetya *et al.*, 2021). The live weight of beef cattle was approximately 50-60%. The weight of the carcass and non-carcass parts were calculated based on the products sold (kg). The percentage of carcass weight was determined based on the ratio of the carcass weight to the total weight of carcass and non-carcass parts multiplied by 100% (Prihandini *et al.*, 2020).

$$\% \text{ carcass weight} = \frac{\text{Carcass Weight (kg)}}{\text{Total of Carcass and Non Carcass (kg)}} \times 100\%$$

The type and quantity (kg) of carcass and non-carcass beef cattle parts were classified based on classification and weighing of the type of product produced (kg) (Priyanto *et al.*, 2019; Prihandini *et al.*, 2020).

The economic values of beef cattle products were determined based on Total Revenue (TR) from the quantity of

carcass and non-carcass parts (Q) multiplied by the price (P) of each cattle product (Fakhira *et al.*, 2020; Astiti, 2022).

$$TR = P \times Q$$

The value-added of beef cattle based on changes in form utility is the difference between the revenue from carcass and non-carcass parts at the cattle trader level and the price of live cattle at the farmer level formulated as follows (Astiti, 2022):

$$\text{Value added} = \text{Price at the Butcher (Pr)} - \text{Price at the breeder level (PF)}$$

## STATISTICAL ANALYSIS

The data obtained was analyzed using descriptive and inferential statistics. Descriptive statistical data is presented in the form of means, percentages and standard deviations. The inferential statistics included the Independent Samples T-Test to determine the differences in beef cattle product components based on sex with the IBM SPSS Statistics version 25. The normality test was carried out with Kolmogorov-Smirnov assuming that if the value of Asymp. Sig > 0,05 then the data was normally distributed.

## RESULTS AND DISCUSSION

Live weight of bulls ranged between 168.98 to 202.77 kg, while bulls had a higher live weight ranging from 184.19 to 221.03 kg. This difference in live weight suggests that bulls have a larger body mass compared to cows. This result is the same with (Hafid, 2020) study that average of bull body weight of Bali cattle on slaughterhouse in South-east Sulawesi Indonesia was 191.30 kg, and cows 181.98 kg. In another study, the live weight of male Bali cattle in non-people breeding station Bone Regency South Sulawesi Indonesia is 187,17±21,67 kg and 198.85±5.32 kg (Garantjang *et al.*, 2020). The live weight of beef cattle at the Manokwari slaughterhouse was lower than that of traditionally raised Bali bulls without fortified feed, which weigh approximately 260.67±15.31 kg (Tahuk *et al.*, 2018) (Table 1). This condition indicates a significant difference due to differences in rearing systems and feed management. The low live weight is also likely to affect livestock productivity, particularly the carcass products produced. Several studies suggest low live weight results in low carcass weight (Diwyanto *et al.*, 2010; Hilmianti, 2019).

**Table 1:** Estimated live weight, carcass and non-carcass weight of beef cattle based on sex at slaughterhouses manokwari.

| Sex  | Live Weight (kg) | Carcass Weight (kg) | Carcass (%) | Non-Carcass Weight(kg) | Non- Carcass (%) | Total Weight (kg) | Total (%) |
|------|------------------|---------------------|-------------|------------------------|------------------|-------------------|-----------|
| Cow  | 168.98 - 202.77  | 101.39              | 66.20       | 51.76                  | 33.80            | 153.15            | 100       |
| Bull | 184.19 - 221.03  | 110.52              | 66.38       | 55.98                  | 33.62            | 166.50            | 100       |

Source: Suryanto *et al.*, (2014); Soeparno (2015).

The extensive to semi-intensive rearing systems used in cattle management have been noted by [Pangelly and Lisson \(2003\)](#) and [Molina-Flores et al. \(2012\)](#), which also contributed to the low live weight of these beef cattle. Extensive rearing system is a system of keeping livestock looking for their own food in pastures, while semi-intensive system is a rearing system where the farmer provides feed and the livestock are looking for their own grass in the pasture. The provision of varied and limited feed without supplementary feed also significantly affects the live weight of beef cattle ([Oosting et al., 2014](#); [Priyanto et al., 2015](#); [Bain et al., 2016](#); [Henry et al., 2018](#)). The feed given to cattle is forage in the form of local grasses, including *paspalum conjugatum* and *panicum maximum*, legumes such as *mimosa pudica*, *centrosema pubescens*, and *desmanthus leptophyllus*, while the type of grass most often given is elephant grass (*pennisetum purpureum*). The variation in the live weight of beef cattle at slaughterhouse can be caused by several factors such as extensive to semi-intensive maintenance systems such as forage feed without concentrates, reproductive management and livestock health management. This is in accordance with the study of ([Garantjang et al., 2020](#); [Lamy et al., 2012](#)) where some aspects that affect livestock production are climate, feed, and health. Other study has also reported that parasitic disease such as the incidence of gastrointestinal nematode infection is higher in the traditional rearing system ([Purwaningsih et al., 2020](#)).

The study results show that both carcass and non-carcass components were different. The carcass weight of cow is 110.52 kg (66.38%) higher than bulls, which is 101.39 kg (66.20%). Bali cattle carcass weight is 123.64 kg and carcass percentage are 54.07% ([Tahuk et al., 2018](#)). The non-carcass weight of bull is 51.76 kg (33.80%), while cows have a non-carcass weight of 55.98 kg (33.62%). Although the percentage of non-carcass is similar for bulls and cows, bulls have a higher absolute weight. The current rearing and feed management systems are not optimal for increasing the live weight and carcass weight of beef cattle at the Manokwari slaughterhouse. To increase livestock productivity, especially in terms of carcass weight, improvements in rearing systems and the provision of more quality and adequate feed are necessary. The implementation of fortified feed is a solution to increase the live weight of beef cattle ([Tahuk et al., 2018](#)). The availability of quality and quantity feed is a prerequisite for increasing livestock productivity ([Oosting et al., 2014](#); [Priyanto et al., 2015](#); [Bain et al., 2016](#); [Henry et al., 2018](#)).

The differences in weight, carcass percentage, and non-carcass components of cows and bulls have significant economic implications. Bulls with the higher carcass weight have the potential for higher market value than cows. This analysis helps determine rearing and slaughtering strategies for beef cattle to maximize economic profits. Efforts to

increase the productivity and economic values of beef cattle can be achieved by improving feed quality and rearing management, especially for cows with lower live weight. Controlling the slaughter of productive cows is crucial to preserving the genetic resources of beef cattle in Manokwari Regency.

The carcass components of beef cattle include meat, rib, vertebrae, shank, and tail. Bulls and cow product are meat, which the bulls higher than cows, respectively  $85.50 \pm 7.60$  kg (51.35%) and  $78.06 \pm 9.69$  kg (50.97%). The study found that other products such as rib, vertebrae, shank, and tail are also higher for bulls than cows.

Non-carcass components include liver, lungs, intestines, tripe, head, feet, hide, heart, Brain, and Swallow. Generally, bulls produce more non-carcass components than cows; for instance, the average head weight of bulls is  $11.74 \pm 1.02$  kg (7.05%), while cows are  $11.03 \pm 0.72$  kg (7.20%). Bulls have heavier non-carcass components and the potential to generate higher economic value even though the difference in live weight is not very significant.

Each country has its own standards for selling carcass and non-carcass products ([Adricli et al., 2018](#)). According to EUROP Carcass Classification System especially within the European Union, standardization of carcass classification is based on conformation and fat cover. This system helps justify ranges for carcass percentage because it aligns dressing percentages with marketable meat yield. The categories are stated for E as excellent, namely lean meat content above 60%, followed by U for very good (55-60%), R for good (50-55%), O for fairly good (45-50%) and P for poor (less than 45%).

In various regions of Indonesia, including Manokwari, almost all non-carcass parts are used in delicious dishes and favorite menus with fairly high selling values. Products from cattle slaughter are sold in 15 components, including carcass parts such as meat, rib, vertebrae, shank, and tail, while non-carcass parts include head, feet, hide, liver, lungs, intestines, heart, brain, tripe and swallow ([Figure 2](#)).

The average product weight of bulls is  $166.50 \pm 11.98$  kg, higher than that of cows which is  $153.15 \pm 12.56$  kg. The highest percentage of beef cattle products is meat. In cows, the meat produced is 50.97% and bulls are 51.35%. The lowest percentage of beef cattle products is the brain, with cows producing  $0.26 \pm 0.07$  kg (0.17%) and bulls producing  $0.33 \pm 0.07$  kg (0.20%). The type and amount of beef cattle products based on various sex ([Table 2](#)). These data highlight the importance of all beef cattle components (both carcass and non-carcass) in economic value calculations. Meat traders can maximize profits by selling various parts of cattle products. Understanding the differences in

product components based on sex helps farmers and traders make strategic decisions regarding livestock rearing and slaughtering.

**Table 2:** Components of beef cattle products based on changes in form at the manokwari slaughterhouses.

| Product            | Cow (kg)       | %      | Bull (kg)      | %      |
|--------------------|----------------|--------|----------------|--------|
| <b>Carcass</b>     |                |        |                |        |
| Meat               | 78.06 ± 9.69   | 50.97  | 85.50 ± 7.60   | 51.35  |
| Rib                | 8.06 ± 0.83    | 5.26   | 8.49 ± 0.65    | 5.10   |
| Vertebrae          | 9.27 ± 0.77    | 6.06   | 9.72 ± 0.63    | 5.84   |
| Shank              | 4.71 ± 0.61    | 3.08   | 5.31 ± 0.69    | 3.19   |
| Tail               | 1.29 ± 0.20    | 0.84   | 1.51 ± 0.23    | 0.90   |
| <b>Non-Carcass</b> |                |        |                |        |
| Liver              | 2.81 ± 0.40    | 1.83   | 3.19 ± 0.57    | 1.92   |
| Lung               | 3.30 ± 0.52    | 2.15   | 3.59 ± 0.58    | 2.15   |
| Intestine          | 2.50 ± 0.44    | 1.63   | 3.11 ± 0.65    | 1.87   |
| Tripe              | 3.98 ± 0.45    | 2.60   | 4.32 ± 0.46    | 2.59   |
| Head               | 11.03 ± 0.72   | 7.20   | 11.74 ± 1.02   | 7.05   |
| Legs               | 5.46 ± 0.66    | 3.57   | 5.76 ± 1.09    | 3.46   |
| Hide               | 15.41 ± 1.25   | 10.07  | 16.68 ± 1.88   | 10.02  |
| Heart              | 2.24 ± 0.53    | 1.46   | 2.10 ± 0.90    | 1.26   |
| Brain              | 0.26 ± 0.07    | 0.17   | 0.33 ± 0.07    | 0.20   |
| Swallow            | 4.76 ± 0.60    | 3.11   | 5.16 ± 0.62    | 3.10   |
| Total              | 153.15 ± 12.56 | 100.00 | 166.50 ± 11.98 | 100.00 |

Non-carcass components such as liver, lungs, intestines and tripe have significant economic value. In Indonesia, these parts are used in various traditional dishes like “coto Makassar,” “rawon,” and “gulai.” The utilization of these non-carcass components adds economic value to beef cattle overall, even though their selling price per kilogram is lower than that of meat.

The economic value of cows can be increased through improved management practices and feed provision. Additionally, controlling the slaughter of productive cows is crucial for maintaining the sustainability of the livestock population.

The results of the analysis show significant differences in several carcass and non-carcass product components based on the sex of the livestock (Table 3). The research results showed that significant differences ( $P < 0.05$ ). This means that bulls have higher amounts than cows in meat ( $P = 0.031$ ), shank ( $P = 0.023$ ), and tail (0.012). There were significant differences in non-carcass products ( $P < 0.01$ ), indicating that bulls had a greater number of intestines, while significant differences ( $P < 0.05$ ) were found in the head ( $P = 0.046$ ), skin ( $P = 0.049$ ), liver ( $P = 0.049$ ), intestine ( $P = 0.007$ ), and brain ( $P = 0.016$ ). Other components such as rib, vertebrae bones, lungs, tripe, feet, and swallow show no

significant differences between bulls and cows. These differences are influenced by different hormone levels in each sex (Irshad *et al.*, 2013; Irshad and Sharma, 2015; Samur and Kunharjanti, 2023). Androgens are bulls sex hormones that function as growth stimulants (Owens *et al.*, 2014). One of the androgen steroids is testosterone, produced by the testes. The higher the secretion of testosterone hormone, the higher the secretion of androgens (Setiyabudi *et al.*, 2016; Nindhia *et al.*, 2021; Samur and Kunharjanti, 2023). This causes bulls to grow faster than cows, especially after puberty (Musa *et al.*, 2006; Mekonnen *et al.*, 2012; Tavirimirwa *et al.*, 2013; Nurtini *et al.*, 2018).

**Table 3:** Comparative test of carcass and non-carcass products of beef cattle based on sex in manokwari, west papua.

| Product            | F      | Sig.  | T      | Sig. (2-tailed) |
|--------------------|--------|-------|--------|-----------------|
| <b>Carcass</b>     |        |       |        |                 |
| Meat               | 0.111  | 0.742 | -2.274 | 0.031*          |
| Rib                | 1.004  | 0.325 | -1.523 | 0.139           |
| Vertebrae Bones    | 0.098  | 0.757 | -1.683 | 0.103           |
| Shank              | 0.226  | 0.638 | 2.028  | 0.023*          |
| Tail               | 0.348  | 0.560 | -2.689 | 0.012*          |
| <b>Non-Carcass</b> |        |       |        |                 |
| Liver              | 1.537  | 0.225 | -2.057 | 0.049*          |
| Lungs              | 1.295  | 0.265 | -1.374 | 0.180           |
| Intestines         | 0.264  | 0.612 | -2.890 | 0.007**         |
| Tripe              | 0.466  | 0.500 | -1.983 | 0.057           |
| Head               | 2.241  | 0.146 | -2.088 | 0.046*          |
| Legs               | 5.736  | 0.024 | -0.844 | 0.406           |
| Hide               | 2.134  | 0.155 | -2.057 | 0.049*          |
| Heart              | 13.559 | 0.001 | 0.468  | 0.643           |
| Brain              | 0.201  | 0.657 | -2.568 | 0.016*          |
| Swallow            | 0.012  | 0.915 | -1.731 | 0.095           |

\*Significant at the 0.05 level; \*\* Significant at the 0.01 level.

Meat is the primary carcass component that determines the economic value of cattle because it has the highest weight and selling price among other products at IDR140,000 per kg. Bulls and cows produced meat with the largest economic value, comprising 76.43% and 75.79% of total revenue, respectively. Additionally, other components like rib, vertebrae bones, shank and tail also contribute more to bulls than cows. The higher to percentage of meat caused the greater the profit obtained (Priyanto *et al.*, 2015; Iyai, 2016; Prihandini *et al.*, 2020; Islam *et al.*, 2022).

Brain is the non-carcass product sold at the lowest price among other products, ranging from IDR10,000.00 to IDR15,000.00 per package. Bulls have a higher economic value of certain non-carcass components than cows (for example, the liver of bulls has an economic value of Rp.

**Table 5:** Analysis of economic value added of beef cattle based on sex in manokwari, west papua.

| Sex  | Live Price (IDR/Head) | Sale (IDR)/Head |              |               | Value Added (IDR) |
|------|-----------------------|-----------------|--------------|---------------|-------------------|
|      |                       | Carcass         | Non-Carcass  | Total         |                   |
| Cow  | 9,592,857.14          | 12,499,366.67   | 1,920,133.00 | 14,419,499.67 | 4,826,642.53      |
| Bull | 11,437,500.00         | 13,611,767.71   | 2,049,049.67 | 15,660,817.38 | 4,223,317.38      |

319,375.00, while that of cows is Rp. 280,928.57), while the heart of a cow is higher than that of a bull (223,57.43 vs. 210,312.50). The shank, tail, feet, hide, and brain parts have the same economic value.

These results showed that economic value of bull product components is higher than that of cows. Bulls, which produced more high-value products, can be prioritized for slaughter if the primary goal is to maximize meat production and other products. Traders gain more profit from the slaughter and sale of cows. However, for the sustainability of the beef cattle industry, it is essential to control the slaughter of productive cows as production machines to maintain the sustainability of genetic resources. From the result of this study, it can be conducted that the importance of skill of making carcass and non-carcass pieces so that it will increase the adde value of beef cattle.

Strict control policies on the sale of productive cows should be enforced to maintain the sustainability of genetic resources and the balance of beef cattle populations in Manokwari. Additionally, improving the quality and quantity of feed and rearing management helps maximize the economic value of beef cattle.

The average live price of bulls is higher than for cows at the farmer level, with a difference of IDR 1,844,642.86 (Table 5). This indicates that bulls have higher overall economic value. The price of beef cattle is determined based on the estimated weight of meat (Boujenane, 2015; Irshad and Sharma, 2015; Musa *et al.*, 2021) because meat has the highest economic value among other components (Table 4).

One important factor in determining economic value-added is the specialized skill of the butcher in estimating the carcass weight of meat from live cattle. Studies show that a good understanding of live weight to carcass weight conversion is crucial for maximizing economic value. Skilled butchers accurately estimate meat weight, which in turn affects the selling price and economic value-added. This skill helps in setting fair prices and optimizing profits from each cattle slaughtered.

Price agreement is achieved through price negotiations to reach consensus. Farmers' bargaining power is influenced by their economic conditions. Generally, livestock prices are lower during urgent needs, especially for children's

school needs, while prices are relatively higher during religious celebrations. The selling price of bulls is higher than cows at the farmer level, but the value-added based on the form change of cow sales is higher, amounting to IDR 4,826,642.52 versus bulls at IDR 4,226,317.38. This shows that the bargaining position of farmers in selling cows is lower than for selling bulls (Iyai *et al.*, 2021).

**Table 4:** Economic value of beef cattle products based on sex in manokwari regency.

| Product            | Cow (IDR)     | %      | Bull (IDR)    | %      |
|--------------------|---------------|--------|---------------|--------|
| <b>Carcass</b>     |               |        |               |        |
| Meat               | 10,928,000.00 | 75.79  | 11,970,000.00 | 76.43  |
| Rib                | 671,547.62    | 4.66   | 707,083.33    | 4.51   |
| Vertebrae Bones    | 726,485.71    | 5.04   | 761,351.04    | 4.86   |
| Shank              | 100,000.00    | 0.69   | 100,000.00    | 0.64   |
| Tail               | 73,333.33     | 0.51   | 73,333.33     | 0.47   |
| <b>Non-Carcass</b> |               |        |               |        |
| Liver              | 280,928.57    | 1.95   | 319,375.00    | 2.04   |
| Lungs              | 352,000.00    | 2.44   | 382,666.67    | 2.44   |
| Intestines         | 133,371.43    | 0.92   | 166,000.00    | 1.06   |
| Tripe              | 238,714.29    | 1.66   | 259,237.50    | 1.66   |
| Head               | 300,000.00    | 2.08   | 300,000.00    | 1.92   |
| Feet               | 110,000.00    | 0.76   | 110,000.00    | 0.70   |
| Skin               | 30,000.00     | 0.21   | 30,000.00     | 0.19   |
| Heart              | 223,571.43    | 1.55   | 210,312.50    | 1.34   |
| Brain              | 13,333.00     | 0.09   | 13,333.00     | 0.09   |
| Swallow            | 238,214.29    | 1.65   | 258,125.00    | 1.65   |
| Total              | 14,419,499.67 | 100.00 | 15,660,817.38 | 100.00 |

These findings indicate traders gain more profit from the slaughter and sale of cows than from bulls. This encourages traders to prefer slaughtering cows, although this can negatively impact the population of productive cows. Therefore, strict control policies on the slaughter of productive cows are needed to ensure the sustainability of the livestock population and the conservation of beef cattle genetic resources in Manokwari Regency.

The high rate of productive cow slaughter at slaughterhouses affects the sustainability of beef cattle (Ayob and Kabul, 2009; Bernues *et al.*, 2011; Veyssset *et al.*, 2014; Cortner *et al.*, 2019; Visser *et al.*, 2020) because productive cows are the production machines (Nardone *et al.*, 2004; Serey *et al.*, 2014; Shirsath *et al.*, 2017; Sekaran *et al.*, 2021).

The slaughter of productive cows at slaughterhouses is often due to the lower price of cows than that of bulls and the inconsistent enforcement of Law Number 18 of 2009 concerning Livestock and Animal Health Article 18 paragraph (2) regarding the prohibition of slaughtering productive cows.

of genetic resources and balance of livestock populations. Additionally, improving the quality and quantity of feed and better management practices could help maximize the economic value of beef cattle, both cows and bulls.

## ACKNOWLEDGMENTS

The authors would like to thank all participants, including farmers, slaughterhouse staff, and district officials, for their invaluable assistance and guidance.

## NOVELTY STATEMENT

The novelty of this research is a source of information on comparing the economic value of livestock at the breeder into added value based on changes in form including carcass and non-carcass sold at the cattle trader level based on sex, so that it becomes a consideration for breeders to maintain cattle livestock as production machines in the context of maintain the continuity of beef cattle germplasm in Manokwari District.

## AUTHOR'S CONTRIBUTIONS

The research concept was developed by Iriani Sumpe, Bambang Suhartanto, Siti Andarwati and Tri Anggraeni Kusumastuti. Iriani Sumpe conducted the field research project and created thematic maps. Iriani Sumpe, Bambang Suhartanto, Siti Andarwati and Tri Anggraeni Kusumastuti analyzed the field data and wrote the final draft of the manuscript.

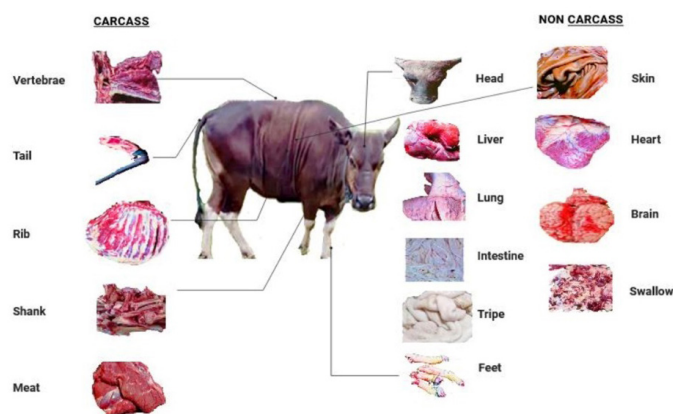
## CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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**Bali Cattle Products**



**Figure 2:** Live Cattle and form changes based on carcass and non-carcass components sold at the slaughterhouse.

This information helps farmers in making strategic decisions regarding livestock sales. The government is an institution that must play an active role in assisting the management of cattle rearing, sales age, price determination based on meat carcass weight and laws regarding the prohibition of slaughtering productive cows. Productive cows should be maintained for reproduction to preserve the population and genetic resources. Farmers may need to consider the higher potential economic value added from cows when deciding to sell their livestock. Additionally, improving management and feed provision can help maximize the economic value of beef cattle, both cows and bulls.

## CONCLUSIONS AND RECOMMENDATIONS

This study revealed significant differences in the economic value between bulls and cows beef cattle in Manokwari Regency, West Papua. Bulls had higher live weight, carcass weight, and non-carcass components than cows, leading to higher selling prices at the farmer level. However, the economic value added from cows at the beef trader level was higher than that of bulls, despite the lower live price of cows at the farmer level. These findings highlighted the importance of considering all components of beef cattle (carcass and non-carcass) in economic value calculations to maximize profits. For the sustainability of the beef cattle industry in Manokwari, it was recommended for the local government to implement strict control policies on the slaughter of productive cow to ensure the preservation

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