



Comparative Analysis of Physical Carcass Composition of Male and Female Bali Cattle

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ABSTRACT

Carcass meat is a highly nutritious livestock product recognized as a source of complete and balanced nutrition for humans, as it contains carbohydrates, proteins, fats, minerals, and vitamins essential for health. This study aims to analyze and compare the physical carcass composition of male and female Bali cattle. Bali cattle are a local Indonesian breed with significant potential in the livestock industry; however, information on the carcass composition of male and female Bali cattle remains limited. The study employs survey and interview methods, as well as a literature review. The research sample consists of 20 male and 20 female Bali cattle aged 2–3 years. The physical carcass composition variables include measurements of carcass weight, carcass percentage, and physical carcass components (meat, skin, and bone). The study results are expected to provide data on the physical composition of male and female Bali cattle carcasses, serving as a reference for the development of the Bali cattle livestock industry. Furthermore, this research aims to contribute to improving Bali beef quality and increasing farmers' income. Descriptive and comparative statistical analyses are used to identify differences in the physical composition of the carcass between male and female Bali cattle. The findings are presented in tables, graphs, and narrative descriptions and disseminated through scientific journals and national seminars.

Contribution to Sustainable Development Goals (SDGs):

SDG 2: Zero Hunger

SDG 8: Decent Work and Economic Growth

SDG 12: Responsible Consumption and Production

SDG 15: Life on Land

1. INTRODUCTION

1.1. Research Background

The Bali cattle is a local Indonesian breed of cattle that holds great potential in the livestock industry [1]. Bali cattle are known for their excellent adaptability to tropical environments and the delicious, nutritious quality of their meat.

According to data from the Ministry of Agriculture of the Republic of Indonesia, the Bali cattle population in Indonesia will reach 4.5 million head in 2020, with an annual beef production of

250,000 tons [2]. However, there remains a lack of information about the physical composition of male and female Bali cattle carcasses, necessitating this study.

Understanding the physical composition of Bali cattle carcasses is crucial, as it influences meat quality and the animal's economic value. Furthermore, data on this composition can serve as a reference for the development of the Bali cattle industry. The physical composition of the carcass comprises lean meat, fat, bone, and connective tissue; while lean meat is the primary component, fat, bone, and connective tissue are also significant constituents [3].



Male and female Bali cattle differ in their carcass physical composition. Males tend to have a higher percentage of meat and a lower percentage of fat compared to females. However, information on differences in the physical composition of the carcass between male and female Bali cattle remains limited.

The Bali cattle breed is a significant livestock commodity in Indonesia. Bali's beef production reaches 250,000 tons annually, with a production value of approximately IDR 10 trillion [4]. Meat constitutes the primary component of the carcass of a two-year-old male Bali steer. Research conducted by [5] indicates that the meat percentage in the carcass of a two-year-old male Bali steer is approximately 65.2%. This finding aligns with research by [6], which reported a meat percentage of around 66.1% for the same category of cattle. Bali cattle possess several advantages, including excellent adaptability to tropical environments and meat quality that is both delicious and nutritious.

This study aims to analyze the physical carcass composition of male and female Bali cattle and to compare the differences in physical carcass composition between the two sexes. The findings are expected to provide accurate information about the physical composition of male and female Bali cattle carcasses. Furthermore, the study is expected to contribute to the development of Bali cattle farming and enhance the quality of Bali beef. Consequently, this research could help increase the income of Bali cattle farmers and boost the industry's contribution to the Indonesian economy [7].

2. MATERIALS AND METHODS

2.1. Time and Location of the Study

The study was conducted at slaughterhouses located in Sesetan and Abiansemal. These slaughterhouses were selected using purposive sampling based on specific criteria.

2.2. Tools and Materials

This research can help improve the quality of Bali beef by determining the physical carcass composition of male and female Bali cattle. It enhances the economic value of Bali cattle. It supports the development of Bali cattle farming by providing accurate information on the carcass composition of male and female Bali cattle. It helps increase the income of Bali cattle farmers by providing accurate information on the physical carcass composition of male and female Bali cattle. It supports food security by boosting the production of high-quality Bali beef.

2.3. Research Procedures

The study was conducted at slaughterhouses located in Sesetan and Abiansemal. These slaughterhouses were selected using purposive sampling based on specific criteria. A questionnaire—a list of questions structured according to the research topic—served as the research instrument. A mixed-methods research design was employed, combining qualitative and quantitative methods within a single study. Mixed methods utilize data collection and analysis techniques from both approaches: quantitative (using numerical data, statistics, and objective analysis techniques) and qualitative (using textual data, images, and subjective analysis techniques).

The goal of the mixed-methods approach is to gain a more comprehensive and in-depth understanding of the phenomenon under study by combining the strengths of both approaches

3. RESULT AND DISCUSSION

3.1. Research Result

Carcass percentage has significant practical implications. Two cattle of the same body weight do not necessarily yield the same market value if the proportions of meat, fat, and bone within their carcasses differ. Livestock with a high meat percentage and a low bone proportion generally command higher market prices due to their superior meat production efficiency (Soeparno, 2005). Consequently, information on carcass characteristics is not merely an academic matter; it serves as a basis for economic decision-making—both for livestock farmers determining slaughter timing and strategies and for industry stakeholders establishing quality standards and setting selling prices.

Variations in carcass percentage were also observed across slaughterhouses, indicating that local factors—such as husbandry practices, pre-slaughter transport conditions, and handling practices at the facility—contribute to final carcass yield. Such variations demonstrate that data regarding carcass percentage cannot simply be generalized without considering the local context in which the livestock are raised and slaughtered.

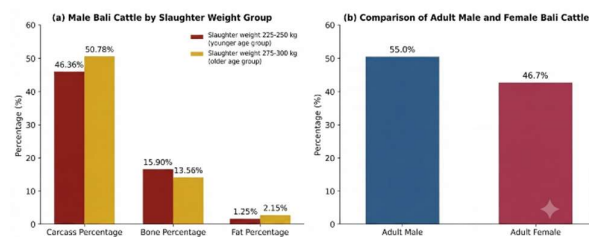


Figure 1. Bali Cattle Carcass Percentage Based on Age Group (Slaughter Weight) and Sex

The research results present a picture of ...which is generally consistent, despite reasonable variations in figures due to differences in location, slaughter weight, and husbandry conditions across studies. Aggregate data from [11] indicate that the carcass percentage of Bali cattle generally ranges from 55% to 57%—a range that serves as a common benchmark for many studies highlighting the advantages of Bali cattle over other local breeds.

A study [14] comparing Bali cattle with other local breeds in traditional markets recorded a carcass percentage of 50.39% and a total meat percentage of 72.23% for Bali cattle; these findings align with the general consensus that Bali cattle excel in meat production efficiency compared to Ongole-cross cattle or buffalo. Specifically regarding meat yield, the meat percentage in the carcasses of adult male Bali cattle aged approximately 2 years ranges from 65.2% to 66.1%—figures that underscore the superiority of male Bali cattle in meat production efficiency compared with many other local cattle breeds in Indonesia.

In general, carcass percentages for female Bali cattle are lower than those for males, a pattern consistently observed across various studies. Research [11] noted that female Bali cattle at the Mambal Slaughterhouse in Bali exhibited a carcass percentage of approximately 46.7 percent, with an average live weight of 247.00 kilograms and an average carcass weight of 115.43 kilograms. A study [14] at the Pesanggaran Public Slaughterhouse in Denpasar provided data on female Bali cattle carcass characteristics consistent with the findings of Damayanti et al., reinforcing the generalization that the pattern of difference in carcass percentage between males and females is not merely a coincidence specific to a single study location. Regarding meat percentage in female Bali cattle—although specific data in the literature is relatively limited compared to that for males—research [15] on the nutritional value and physical quality of Bali cattle meat based on sex and age confirms that sex significantly influences physical meat characteristics, consistent with hormonal mechanisms. Fat percentage in female Bali cattle is generally higher than in males, ranging from 21.5 to 22.1 percent in adult females; this figure reflects the influence of estrogen in promoting earlier and greater fat deposition compared to male cattle.

3.2. Discussion

Research [16] on the mineral and nutritional content of Bali cattle from various land types provides additional context regarding the general range of intramuscular fat content—specifically between 2% and 6.9%—with females tending to fall within the upper end of this range.

Findings regarding the tendency for higher fat content in females—as reported separately by studies in Bali and research on the growth hormone profiles of female Bali cattle across various rearing environments—further reinforce the view that this pattern is a consistent biological characteristic rather than merely an artifact of a single study. As an additional methodological note, some of the studies serving as sources for the female data synthesis tended to have smaller sample sizes compared to those focusing on males; consequently, the confidence intervals for estimates of female carcass component percentages generally reflect a relatively higher degree of uncertainty than those for male's.

Nevertheless, the consistency of the findings—specifically that females consistently exhibit lower carcass percentages and higher fat percentages than males across the synthesized studies—provides reasonable confidence in the validity of this general pattern, even though precise figures at specific decimal levels require further research for confirmation. For farmers managing mixed-sex herds, understanding this consistent pattern can facilitate better livestock allocation planning; for instance, non-productive females could be directed toward fat-based processing markets, while males are channeled into premium fresh meat segments. Data synthesis regarding bone percentage in female Bali cattle indicates a range of 11.2% to 11.5%—a figure proportionally similar to estimated bone proportions in males. Differences lie in the meat and fat components. The limited data available specifically for female Bali cattle, compared to that for males, reflects a general trend in beef cattle research that prioritizes males as primary subjects; this is because males are slaughtered for consumption more frequently than females, which are often retained as breeding stock due to policies restricting the slaughter of productive females. This situation

underscores the urgent need for future research to focus more systematically on collecting carcass composition data for female Bali cattle—particularly from culled females that are reproductively inactive yet legally slaughtered—thereby enriching a currently limited database.

A study [14] comparing Bali cattle with other local cattle breeds in traditional markets recorded a carcass percentage of 50.39% and a total meat percentage of 72.23% for Bali cattle—findings consistent with the general view that Bali cattle excel in meat production efficiency compared to Ongole-cross cattle or buffaloes.

Regarding the specific meat percentage, the meat yield in the carcasses of adult male Bali cattle aged approximately two years ranges from 65.2% to 66.1%—a figure that underscores the superiority of male Bali cattle in terms of meat production efficiency when compared to many other local cattle breeds in Indonesia.

Interestingly, when comparing data [14]—which records a carcass percentage of 50.39%—with data [13]—which notes a range of 46.36% to 50.78%—both studies demonstrate a good level of agreement within the medium-to-high slaughter weight range; this provides further confidence regarding the consistency of carcass percentage outcomes for male Bali cattle under relatively good rearing conditions.

Conversely, the figure at the lower end of the range from data [13]—specifically 46.36 per cent for the lowest slaughter weight group—reminds readers that a high carcass percentage in male Bali cattle is not automatically achieved but is the result of a combination of age, slaughter weight, and husbandry management. The carcass percentage data for male Bali cattle from the various studies outlined above confirm that the 55–57 per cent range often cited as the standard figure actually represents results obtained under optimal conditions; readers should understand that variations around this figure are to be expected.

For livestock farmers reading this synthesis, the practical takeaway is that achieving a carcass percentage at the upper end of the synthesized range requires a simultaneous combination of superior genetic stock, effective feed management, and the determination of the optimal slaughter age, rather than relying on any single factor. Meanwhile, data on bone percentage in male Bali cattle show a consistent downward trend as slaughter weight increases—as evidenced by [13], which records a drop from 15.90% to 13.56%—aligning with the principle of differential growth discussed in depth in chapters four and six. Furthermore, the synthesis of data on fat percentage in male Bali cattle reveals relatively low figures compared to other components, ranging from 1.25% in the lowest slaughter weight group to 2.15% in the highest, according to data [13]; this characteristic represents a distinct advantage for male Bali cattle from the perspective of consumer health, particularly for those prioritizing the consumption of low-fat meat.

Variations in figures across studies can be attributed to differences in local conditions—such as husbandry practices, feed quality, and the characteristics of Bali cattle populations in each study area—underscoring the importance of interpreting data within its specific context rather than generalizing a single figure as an absolute representation of the entire male Bali cattle population in Indonesia.

4. CONCLUSION

The carcass percentage is 55% for male Bali cattle and 47% for female Bali cattle. The average physical composition of male Bali cattle carcasses is: meat 66%, bone 12.4%, hide 19%, and fat 6%; for females, it is: meat 63%, bone 11.5%, hide 17%, and fat 12%. The carcass yield of male cattle is consistently higher than that of females. Regarding physical composition, the proportions of meat, bone, and hide in male Bali cattle carcasses are nearly identical to those in females, whereas the fat content is lower in males than in females.

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