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Carcass and Prime Cut of Brahman Cross Steers at Different Age Levels

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Abstract
This study aimed to evaluate the effect of age on carcass yield and prime cuts in steer Brahman Cross (BX) cattle. The research was conducted from September 2 to 22, 2015, at PT Cianjur Arta Makmur slaughterhouse, Cianjur Regency, West Java. A total of 68 steer BX cattle were used, divided into four age groups based on permanent incisor eruption: PI0 (<18 months, *n*=15), PI2 (18–24 months, *n*=19), PI4 (>24–36 months, *n*=21), and PI6 (>36–42 months, *n*=13). Measured variables included slaughter weight, hot carcass weight, cold carcass weight, carcass percentage, and prime cut yields (tenderloin, striploin, cube roll). Data were analyzed using one-way ANOVA. The results showed no significant differences ($p>0.05$) among age groups in terms of slaughter weight (507.07 ± 44.58 kg), hot carcass weight (287.97 ± 23.85 kg), cold carcass weight (273.31 ± 23.57 kg), carcass percentage (53.95 ± 1.92%), and prime cut weights: tenderloin (3.73 ± 0.39 kg), striploin (10.27 ± 1.28 kg), cube roll (5.01 ± 0.61 kg). Although age did not significantly affect carcass and cut yields, the highest retail sales value was observed in PI2 cattle at Rp23,110,648. These findings suggest that while age level does not significantly influence carcass or prime cut weights, economic returns may vary based on carcass composition and retail pricing.

INTRODUCTION

The beef cattle fattening industry in Indonesia primarily imports feeder cattle from Australia, including Brahman Cross (BX) and Australian Commercial Cross (ACC) breeds (Paramecwari, 2015; Agus & Widi, 2018). BX cattle are preferred due to their superior carcass weight, carcass percentage, and daily weight gain compared to local cattle (Twomey *et al.,* 2020; Ministry of Agriculture, 2023). Carcass yield is influenced by multiple factors, including age, live weight, breed, gender, the proportion of non-carcass components, and feed (Irshad *et al.,* 2013; Kusuma *et al.,* 2020; Burin *et al.,* 2021). Generally, older cattle have greater body weight, which leads to higher carcass yield (Pečiulaitienė *et al.,* 2015). As noted by Ikhlas *et a*l. (2020), carcass weight and its components are directly correlated with the live body weight of slaughtered animals.

After slaughter, carcasses are further divided into commercial cuts, consisting of primal (wholesale) and sub-primal (retail) parts (Maheswarappa *et al.,* 2022; Bagby, 2025). According to SNI 9226 (2023), meat cuts are classified into three grades: first-grade cuts include tenderloin, striploin/sirloin, and cube roll; second-grade cuts include rump, round, topside, silverside, eyeround, chuck tender, chuck, and blade; and third-grade cuts include shank, rib meat, thin flank, and brisket. Larger carcasses typically yield more commercial cuts (Ministry of

Agriculture, 2023). The distribution of muscle, fat, and bone significantly influences the composition and yield of these cuts (Zajulie *et al*., 2015).

In Indonesia, carcass grading systems have evolved in response to distinct market segments: the general market and the specialty market (Price, 2020; Wattie *et al.,* 2024). The latter—comprising restaurants, hotels, and high-end retailers—places greater emphasis on the quality of commercial cuts. This presents a substantial profit opportunity for producers, especially if commercial carcass cutting practices are extended beyond imported cattle to local cattle in traditional slaughterhouses. Meat value can be optimized by classifying and pricing cuts based on their grade as outlined in SNI 9226 (2023), since each cut serves distinct culinary purposes.

While it is understood that body weight influences carcass characteristics (Alnahhas *et al.,* 2016), the specific impact of age on carcass weight and the yield of prime cuts remains unclear. Variations in age can affect carcass yield, carcass percentage, and the weight of high-value cuts. Identifying the optimal slaughter age is crucial for maximizing carcass yield and economic return. Therefore, this study was conducted to evaluate carcass yield and commercial cuts particularly prime cuts of steer Brahman Cross cattle at different age levels.

RESEARCH METHODS

This study involved 68 steer Brahman Cross (BX) cattle, categorized into four age groups based on permanent incisor eruption as defined by SNI 7651 (2020):

No.	Age (Months)	Number of Cattle (n)
1.	PI0: < 18	15
2.	PI2: 18-24	19
3.	PI4: > 24 – 36	21
4.	PI6: > 34 – 42	13

The study was conducted from September 2 to 22, 2015, at the PT Cianjur Arta Makmur slaughterhouse, located in Mentengsari Village, Cikalongkulon, Cianjur Regency, West Java. The research design was a case study using purposive sampling to select the location, and cattle were selected randomly for slaughter. The equipment used included a digital livestock scale (1,000 kg capacity, ±0.5 kg accuracy), digital balance (100 kg capacity, 1 g accuracy), restraint cage, pneumatic stunning gun (4–12 bar pressure), carcass saw, brisket saw, boning and skinning knives.

The variables measured included:

1. Slaughter weight (kg): Weight of cattle before slaughter.
2. Hot carcass weight (kg): Carcass weight immediately after slaughter.
3. Cold carcass weight (kg): Carcass weight after chilling at 0–3°C for 24 hours.
4. Carcass percentage (%):

$$\text{Carcass percentage} = \frac{Live\ weight}{Cold\ carcass\ weight} \text{ x } 100\%$$

5. Prime cuts (kg):
    - Tenderloin
    - Striploin (sirloin)
    - Cube roll

Prime cuts were separated and weighed after chilling in accordance with AUS-MEAT standards (2018). Data were analyzed using one-way analysis of variance (ANOVA) to compare variables across the four age groups. When significant differences were found (p<0.05), a Least Significant Difference (LSD) post-hoc test was applied. The analysis followed a completely randomized design model.

RESULTS AND DISCUSSION

The average slaughter weight, hot carcass weight, cold carcass weight, and carcass percentage of steer Brahman Cross cattle at different age levels are presented in Table

Table 1. Average slaughter weight, carcass weight, and carcass percentage of steer Brahman Cross cattle.

No	Variable	Age Level	Rata-rata ± SD
1	Slaughter Weight (kg)	PI0: < 18	491,87 ± 31,58
		PI2: 18-24	512,32 ± 54,99
		PI4: > 24 – 36	512,48 ± 42,55
		PI6: > 34 – 42	511,62 ± 49,22
	Average		**507,07 ± 44,58**
2	Hot Carcass Weight (kg)	PI0: < 18	271,32 ± 20,99
		PI2: 18-24	282,87 ± 26,27
		PI4: > 24 – 36	279,20 ± 23,90
		PI6: > 34 – 42	282,50 ± 24,22
	Average		**278,97 ± 23,85**
3	Cold Carcass Weight (Kg)	PI0: < 18	265,90 ± 20,66
		PI2: 18-24	277,47 ± 25,71
		PI4: > 24 – 36	274,08 ± 23,32
		PI6: > 34 – 42	275,78 ± 24,58
	Average		**273,31 ± 23,57**
4	Carcass Percentage (%)	PI0: < 18	54,06 ± 1,76
		PI2: 18-24	54,16 ± 2,03
		PI4: > 24 – 36	53,48 ± 1,83
		PI6: > 34 – 42	53,90 ± 2,07
	Average		**53,95 ± 1,92**

Statistical analysis showed that the slaughter weights of Brahman Cross steers across the PI0, PI2, PI4, and PI6 age groups were not significantly different (p>0.05). This similarity is attributed to the company's slaughter policy, which selects steers that meet a specific live weight threshold—averaging 507.07 ± 44.58 kg. Animals that do not meet the targeted weight are withheld from slaughter and fattened further, resulting in a relatively uniform slaughter weight across age groups (Table 1). Maintaining a standard slaughter weight is essential, as

excessively heavy animals may yield carcasses with excessive subcutaneous fat, which must be trimmed and reduces carcass quality. According to Priyanto *et al.*, (2015), slaughtering overweight animals does not guarantee favorable carcass appearance if accompanied by high fat accumulation, while underweight animals result in inefficient meat production due to lower carcass yield.

Likewise, no significant differences were found in hot carcass weight or cold carcass weight among age groups. Hot carcass weight refers to the weight immediately post-slaughter, whereas cold carcass weight refers to the carcass weight after 24 hours of chilling at 0–3°C. The decrease in weight during chilling, also known as shrinkage, results from the evaporation of water and the release of fluids (drip loss) during the chilling process (Soeparno, 2016). Given the uniformity in slaughter weight, the carcass output remained statistically similar across groups. This aligns with Soeparno (2016), who emphasized that carcass weight and composition are strongly influenced by the animal's live weight, which is closely related to the stage of physiological growth at slaughter.Carcass percentage, calculated by dividing cold carcass weight by live weight and multiplying by 100% (AUS-MEAT, 2018), also showed no significant variation across age groups. Cold carcass weight was used for this calculation, as it represents the form in which the carcass is cut into commercial sections. The average carcass percentage across all groups was 53.95 ± 1.92%, which is consistent with findings by *Ikhlas et al*., (2021), who reported an average carcass percentage of 54.1 ± 2.6% for Brahman Cross steers. These findings further confirm that similar live weights result in similar carcass percentages, regardless of chronological age.

The average weights and percentages of prime cuts including tenderloin, striploin, and cube roll across age groups are presented in Table 2.

Table 2. Average weights and percentages of prime cuts from Brahman Cross steers.

No.	Variable	Age	Weight(kg) ± SD	Percentage(%)
1	Tenderloin	PI0: < 18	3,75 ± 0,41	1,41
		PI2: 18-24	3,68 ± 0,40	1,33
		PI4: > 24 – 36	3,77 ± 0,50	1,38
		PI6: > 34 – 42	3,70 ± 0,26	1,35
Average			**3,73 ± 0,39**	**1,37**
2	Striploin	PI0: < 18	9,99 ± 0,86	3,76
		PI2: 18-24	10,43 ± 1,79	3,75
		PI4: > 24 – 36	10,25 ± 1,38	3,73
		PI6: > 34 – 42	10,40 ± 1,11	3,77
Average			**10,27 ± 1,28**	**3,76**
3	Cube roll	PI0: < 18	4,99 ± 0,55	1,89
		PI2: 18-24	5,14 ± 0,57	1,86
		PI4: > 24 – 36	4,94 ± 0,70	1,81
		PI6: > 34 – 42	4,95 ± 0,63	1,79
Average			**5,01 ± 0,61**	**1,84**

Note: Percentages calculated as (cut weight / cold carcass weight) × 100%.

Statistical analysis revealed no significant differences (p>0.05) in prime cut weights across all age groups. This consistency reflects the similarity in carcass weight and carcass

percentage across groups, and suggests that chronological age alone does not significantly affect prime cut yield when steers are slaughtered at similar live weights.

These findings are supported by Kuswati *et a*l. (2022), who reported that differences in wholesale cut weights between Brahman Cross steers and heifers were more influenced by carcass weight than by age or sex. Although some cuts differ by sex—such as cube roll and chuck being heavier in steers—the tenderloin and chuck tender cuts were relatively stable across sexes. Given that the steers in this study were of uniform sex, age-related variation in prime cuts was minimal.

This further supports the conclusion that prime cut yields are more closely related to carcass weight than to animal age per se. Thus, managing slaughter timing based on live weight rather than age could be a more reliable strategy for optimizing prime cut output.

Retail cut percentage and profitability

The distribution of retail cuts varied slightly among age groups. The highest percentage of retail cuts was observed in PI0 steers for tenderloin, cube roll, blade, chuck tender, shank, brisket, topside, knuckle, and silverside. Meanwhile, the highest rump percentage was found in PI2, and the highest striploin and chuck percentages in PI6. These variations are attributed to differences in cold carcass weight; PI0 steers, having the lowest average cold carcass weight, exhibited relatively higher retail cut percentages. This is because retail cut percentage is inversely related to carcass weight when calculated as: Retail cut percentage Retail cut percentage=(Cold carcass weight/Cut weight x100%. This aligns with AUS-MEAT (2018), which defines retail cut yield as a function of cut weight to cold carcass weight ratio. Thus, lighter carcasses may produce higher cut percentages even if the absolute weight is lower.

Economic Analysis

The comparison between cold carcass sales and retail cut sales across age groups is presented in Table 3.

Table 3. Analysis economic result

No	Level Ages	Wilted carcasses (Kg)	Wilted Carcass Sales Results (Rp)(A)	Sales results *Retail cut* (Rp)(B)	Profit (Rp) =B–A
1	PI0: < 18	265,90	18,613,000	22,557,217	3,944,217
2	PI2: 18-24	277,47	19,422,900	23,110,648	3,687,747
3	PI4: > 24 – 36	274,08	19,185,600	22,828,997	3,643,397
4	PI6: > 34 – 42	275,78	19,304,600	22,873,590	3,568,990

The average sales values of cold carcasses and retail cuts from each age group (PI0, PI2, PI4, and PI6) are shown in Table 3. Among them, steers in the PI2 group generated the highest cold carcass sales value and retail cut sales value, owing to the highest average cold carcass weight of 277.47 kg.

Retail prices per kilogram for each cut were as follows: tenderloin (Rp231,000), striploin and cube roll (Rp143,000), blade, chuck tender, shank, chuck, and brisket (Rp100,000), rump, topside, knuckle, and silverside (Rp115,000), tendon (Rp45,000), mayang tendon (Rp50,000),

and fat (FQ 85 CL) (Rp73,000). Retail cut value was calculated by summing the total revenue from prime cuts, secondary cuts (forequarter and hindquarter), tendon, mayang tendon, fat, and bone. Each component was priced according to its classification and market category.

These findings support the concept that increased carcass weight generally leads to increased retail cut yield (Kuswati et al., 2013). However, although there were no statistically significant differences in average carcass and wholesale cut production across age groups, the economic return from retail sales showed real differences. This is because each carcass component contributes individually to total revenue based on market value.

Steers in the PI2 group produced the highest total retail sales (Rp23,110,648) due to their heavier carcasses. However, when comparing profit (retail cut value minus carcass value), the PI0 group generated the highest net profit (Rp3,944,217)**.** This suggests that younger steers may offer more favorable carcass composition particularly a higher muscle-to-fat and muscle-to-bone rasio which increases the proportion of valuable meat components.

This aligns with Astuti (2021), who emphasized that optimal carcasses should have a high muscle proportion, low fat content, and high meat-to-bone ratio. During puberty (approximately 2–4 years of age), fat deposition accelerates, which can reduce relative meat yield. According to Martin *et al*. (2021), muscle development precedes fat deposition, and young cattle typically exhibit a meat-to-bone ratio of 2:1, while well-finished steers (550–600 kg) can reach 3.5–4:1.From a business perspective, companies gain more from selling beef in retail cuts than selling whole cold carcasses. Retail prices are more stable and provide an average profit margin of Rp3,711,088 per head higher than cold carcass sales alone**.** Based on these results, producers should consider slaughtering steers at the PI2 age level to maximize production volume, or at PI0 to optimize net profit margin per animal.

CONCLUSION

The conclusions obtained from the results of this study are:

1. Brahman Cross steers at different age levels (PI0, PI2, PI4, PI6) produced similar carcass yields and prime cut weights. Age level did not significantly affect slaughter weight, carcass weight, carcass percentage, or the weight of tenderloin, striploin, and cube roll cuts (p>0.05).
2. Steers in the PI2 age group yielded the highest total retail carcass sales value (Rp23,110,648), attributed to their greater cold carcass weight.
3. Retail cut sales generated higher profits than cold carcass sales, with an average profit of Rp3,711,088 per head. The PI0 group recorded the highest net profit (Rp3,944,217), likely due to a superior meat-to-fat and meat-to-bone ratio.

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