Meat Production from Cull Bali Cows as Compared to Ongole Cows

I. Gusti N. Jelantik [a*], Imanuel Benu [a] and Gemini E. M. Malelak [a]

[a] Faculty of Animal Science, Universitas Nusa Cendana, Kupang, 85148, NTT, Indonesia.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: The need for beef in the cattle production centers in Indonesia is mostly met by slaughtering of culled cows. However, the quality of culled female's beef is often lower than that of fattened bulls. Until now, the quality of meat and processed products of culled Bali and Ongole cows is unknown. This research was carried out to to compare the carcass and beef production of culled Bali and Ongole cows.
Materials and Methods: A total of 6 culled cows, 3 each from Bali and Ongole cows, were slaughtered for evaluation of meat production and qualities. The percentage of carcass and carcass parts were determined after being removed from the non-carcass parts. The carcass parts were dissected to separate the meat and bones. Meat samples were taken to determine the chemical composition of the meat from the main meat parts. The organoleptic qualities of the meat including color, smell, and cooking loss were compared between the two breeds.
Results: The results showed that carcass production was higher ($P<0.05$) in Bali cows as compared to cull Ongole cows. The weight of carcass parts having good meat quality with high economic value was higher in culled Bali cows compared to Ongole cows.
Conclusion: It can be concluded that at the similar body condition and age, culled Bali cows produces more meat and carcass parts having higher quality meat.

*Corresponding author: E-mail: igustingurahjelantik@staf.undana.ac.id;

1. INTRODUCTION

The Indonesian government through various programs seeks to boost the national cattle production in order to reduce the imports in the form of feeder cattle and meat, which in recent years has continued to increase. Efforts made by the government are to increase the population and productivity of cattle in all Provinces of Indonesia, especially in the areas of cattle production centers, including the Province of East Nusa Tenggara (ENT). With a current population of more than 1.0 million heads [1], this area ranks the 5th largest cattle population in Indonesia after East Java, Central Java, South Sulawesi and West Nusa Tenggara. However, ENT's contribution to the fulfillment of national meat and the improvement of community welfare has not been optimal due to the low productivity of cattle in this area. Jelantik [2] reported that only 9-12% of the population can be transported to Jawa and slaughtered to meet the need for national beef demand.

One of the factors that contributes the highest to the low productivity of cattle in this area is the high proportion of culled (old) cows more than 8 years old that are still in the population. Approximately 32% of the adult female population on smallholder farms was reported more than 8 years old [2]. The impact of the presence of these culled cows is a decrease in the calving rate [2,3] and an increase in the calf mortality rate [4,5]. The factor that causes culled cows to remain in the population is the preference for slaughtering productive females to meet local meat needs. This is because culled cows produce low-quality meat. However, until now there has been no study comparing the carcass and beef production from culled cows among several local cattle breeds. Likewise, information on the quality of processed meat products such as meatballs and se'i meat, which are processed meats typical of ENT made from different breeds of cattle, is still very limited. This experiment was conducted to investigate carcass and meat production from cull Bali and Ongole cows.

2. MATERIALS AND METHODS

Location, Research Materials and Experimental Design. This research was conducted using 6 culled Bali and Ongole cows, each of which was 3 cows with almost similar age and body condition scores. The animals were purchased from the Undana's Livestock Laboratory and from the Lili livestock market. The cows were placed in concrete floored individual cages equipped with food manger and plastic bucket for water at the Animal Husbandry Laboratory of the Integrated Field Laboratory/PUI on Archipelago Dry Land. The experimental animals were given feed in the form of rice straw and concentrate with a ratio of 60:40% for 1 month before being slaughtered. The concentrate consisted of cornmeal (55%), rice bran (35%), fishmeal (9%) and mineral mix (1%) and it contained 14.27% crude protein and 17.76 MJ Gross Energy for every kg dry matter. It was offered to the animals at about 1% LW twice a day before rice straw. The total amount of feed offered was approximately 3% LW on dry matter bases. Water was available at all time in a plastic bucket for every cow.

The study was carried out following a completely randomized design (CRD) with 2 treatments and 3 cows as replicates. The treatments tested in this study were different breeds of cows: Bali and Ongole cows. Slaughter of cows was done after the animals were fed for one month.

Data Collection and Calculation. Variables measured *viz.* slaughter weight, carcass yields and carcass parts. Slaughter weight (kg) was obtained from the results of weighing cattle before slaughter using a live cattle scale with a capacity of 2000 kg. Cattle were fasted for 12 hours before being weighed and slaughtered. The procedure of slaughtering, carcass measurement and dissection were partly following the procedure of Apple [6]. At the time of slaughtering, the blood was collected by placing a large plastic bucket under the head until all the blood was drained. Blood was immediately weighed and recorded. The cows were then hulled and the skins were weighed and further processed. Furthermore, the non-carcass part *viz.* blood, skin, head, forelegs, hind legs, fluck (lungs, heart, liver, spleen, pancreas gland), and the digestive tract were weighed. The forelegs were cut at the metacarpal bones, while the hind legs were cut at the tarsal joints. The digestive tract was lifted and immediately weighed while the digesta was still in it. The digesta was then removed and the digestive tract was cleaned with tap water and re-weighed. The liver, lungs, kidneys and gallbladder were removed and weighed. Similarly, the

reproductive organs were also taken and weighed.

Carcass weight (kg) was obtained by weighing the carcass separated from the non-carcass parts. Furthermore, the percentage of carcass and non-carcass was calculated relative to live weight before slaughter. The carcass percentage or Dressing Percentage was calculated by the formula: Carcass percentage= (carcass weight)/(live weight) x 100% [7]

The carcass was then cut into several parts, namely the forelegs, skin, ribs, and back. Each part was weighed and the total amount was determined as the total weight of the carcass. Each part of the carcass was then dissected to separate the meat, fat and bones. The meat, fat and bone from each part of the carcass were then weighed. All data were expressed as percentage of live weight.

After the carcass was weighed, the meat was separated from the bone and subcutaneous fat and weighed to obtain the weight of the meat. The percentage of edible meat was calculated using the following formula:

1. Percentage of meat production (% LW) = (weight of meat)/(weight of live weight) x 100%
2. Percentage of Edible meat (% carcass weight)= (weight of meat)/(weight of carcass) x 100%

Statistical Analysis. Data collected were statistically analyzed utilizing T test using SPSS release 23 [8]. P-value <0.05 is declared as statistically significant and <0.05<P<0.1 as a tendency to be significant.

3. RESULTS AND DISCUSSION

Fulfilling the need for beef both nationally and regionally has always been a priority for the Indonesian government because of its enormous influence on the inflation rate which in turn will affect people's purchasing power and economy. The government is trying to maintain the national supply of meat to keep the inflation rate from varying much. In cattle-producing areas in Indonesia, the supply of beef mostly comes from slaughtering female cattle. The slaughter rate for female cattle in Indonesia can reach 72 to 92% [9,10]. Most of the slaughtered female cattle are still productive. The slaughter rate for productive female cattle can reach 81.7% [11] or even reach 90% [9] of the slaughtered female cattle. This is one of the main causes of the slow development or even decline in cattle populations in various regions. Thus, to prevent the negative impact of slaughtering to productive female cattle, it is necessary to encourage the slaughter of culled cows in order to fulfil the beef demand.

The success of the efforts to encourage the slaughter of cull cows is highly dependent on the capacity of these cows to produce meat relative to other classes of cattle (productive females and males). This can be seen from the carcass percentage (dressing percentage) of cows slaughtered. The percentages and carcass composition of the two breeds of cows being slaughtered in this study are shown in Table 1 and the weight of the carcass components is shown in Table 2. The results showed that at similar slaughter weight and body condition culled Bali cows had a higher dressing percentage or carcass percentage (P<0. 05) compared to culled Ongole cows (58.04 vs 49.31%). The results of this study are in line with the results of other studies comparing the carcass production of the two breeds of cattle, although the majority of these studies used bulls. Yosita *et al.* [12] reported that the carcass percentage of Bali cattle was higher than that of Ongole cattle. In their study, they recorded the carcass percentage of Bali cattle was 53.26%, and PO cattle 46.9%. In previous studies, the percentage of male Ongole cattle carcass could reach 51.42% at a body weight of around 200-250 kg [13]. Tahuk *et al.* [14] also reported that the percentage of fattened male Bali cattle carcasses reached 55.6%.

It also appears from this study that the carcass production of cull cows was comparable or even more than their male counterparts for both breeds. Cull cows were considered to have lower dressing percentage as well as quality, thereby the local butchers prefer to slaughter productive cows than old cull cows [11].

The higher carcass percentage in culled Bali cows indicates that this breed has a higher potential for meat production compared to Ongole cattle. The percentage and total meat production in this study were higher (P<0.05) in Bali cattle compared to Ongole cattle. The meat produced also appears to be of higher quality due to the higher proportion of meat produced in carcass parts which commonly known to have higher quality of meat. In this case, the carcass weight of the hind thighs was significantly higher (P<0.05) in Bali cattle compared to Ongole cattle (Table 2).

Table 1. Percentage of carcass of bali cattle and cull female ongole

Percent of Live Weight (LW)	Breeds		SEM	P-*value*
	Bali	**Ongole**		
Live weight at slaughter (kg)	223.3	233.3	10.47	0.393
Carcass	58.04[a]	49.31[b]	1.202	0.002
Lean meat	40.12[a]	33.35[b]	1.366	0.008
Fat	1.85	1.75	0.627	0.973
Bone	16.07	14.73	0.997	0.271

[a,b]*values followed by different superscripts indicate significant differences (P<0.05)*

Table 2. Composition of Carcass and Non Carcass of cull Bali and Ongole cows

Weight of the fractions of Carcass and non-carcass (Kg)	Breed		SEM	P-*value*
	Bali	**Ongole**		
Live weight	223.3	233.3	10.47	0.393
Non carcass :	59.86	64.34	6.096	0.501
Skin	20.00[a]	17.00[b]	1.344	0.089
Blood	8.97	6.86	2.614	0.466
Fluck	6.79	8.03	1.019	0.291
Digestive tract	12.60[a]	21.24[b]	1.378	0.003
Head	11.50	11.23	1.378	0.854
Carcass	129.63	115.14	7.318	0.112
Forelegs	25.63	22.56	1.759	0.156
Hindlegs	40.70[a]	34.31[b]	2.040	0.035
Ribs	25.70	22.30	2.121	0.184
Back	37.60	35.97	4.616	0.742

[a,b]*values followed by different superscripts indicate significant differences (P<0.05) or tend to be significant (0.05<P<0.1)*

Table 3. Meat produced from different parts of carcass of cull Bali and Ongole cows

Weight (Kg)	Breed		SEM	P-*value*
	Bali	**Ongole**		
Total meat	89.63[a]	77.85[b]	5.448	0.097
Forelegs	18.13	18.38	1.621	0.888
Hindlegs	33.93[a]	22.22[b]	3.149	0.020
Ribs	14.63	13.55	2.554	0.964
Loin	22.93	23.71	1.339	0.742
Fat	4.10	4.15	1.481	0.973
Bone	35.90	34.60	3.393	0.722
Forelegs	7.80[a]	6.27[b]	0.643	0.076
Hindlegs	6.47	5.72	1.178	0.561
Ribs	6.93	7.44	1.608	0.770
Back	14.70	15.17	1.033	0.672

[a,b]*values followed by different superscripts indicate significant differences (P<0.05) or tend to be significant (0.05<P<0.1)*

Differences in carcass percentage were generally due to differences in non-carcass components [15]. Some studies revealed that the non-carcass component is higher in Ongole cattle compared to Bali cattle [16]. However, the percentage of non-carcass in this study did not differ between the two breeds of cattle (P>0.05). Thus, the clearest difference between the two breeds of cattle is the rumen content which indicates the capacity of the cattle to consume feed. In addition, the weight of offal including the rumen in this study was also higher (P<0.05) in Ongole cattle than Bali cattle (Table 2). Thus, the results of this study indicate that the rumen capacity of Ongole cattle is greater than that of Bali cattle. The large rumen capacity gives a

comparative advantage of Ongole cattle over Bali cattle, especially when the quality of feed in pasture is low. With a large rumen capacity allows the flow rate of feed out of the rumen to be slower [17] so that, it will increase the digestibility of low-quality feed [18]. These advantages will be lost if the livestock is given feed of sufficient quality.

Following the trend of carcass production, meat production either expressed as total meat production in kg (Table 3) or as a percentage of slaughter weight (see Table 1) was significantly higher (P<0.05) in cull Bali cows compared to Ongole cows. The difference was mainly due to the higher meat produced from hindlegs or hindquarter. The meat from this parts (sirloin, tenderloin, and round) is consider to have a better quality and preference over meat from hindquarter (chuck, brisket and foreshank) [19]. Thus, cull Bali cows have beef cuts that produce a higher quality meat than that of cull Ongole cows. Carcass fats and bone, on the other hand, were comparable between the two indigenous Indonesian cattle.

4. CONCLUSION

Culled Bali cows have higher dressing percentage and beef production than culled Ongole cows when slaughtered at similar live weight and body condition. Culled Bali cows also produced more beef from the hindquarter, which is considered to have a higher beef quality and with higher economic value than other carcass parts, compared to Ongole cows.

ETHICAL APPROVAL

All authors hereby declare that "Principles of laboratory animal care" (NIH publication No. 85-23, revised 1985) were followed, as well as specific national laws where applicable. All experiments have been examined and approved by the appropriate ethics committee

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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