Effect of fasting time before slaughtering on body weight loss and carcass percentage of Bali cattle

H Hafid1, Hasnudi2*, H A Bain1, F Nasiu1, Inderawati1, P Patriani2 and S H Ananda3

1Faculty of Animal Science, Halu Oleo University, Jl. H.E.A Mokodompit Kampus Anduonohu, Kendari 93232, South East Sulawesi, Indonesia
2Department of Animal Science, Universitas Sumatera Utara, Prof A. Sofyan No.3 Medan, Indonesia Republic
3Nutrition Study Program, STIKES Karya Kesehatan, Kampus Anduonohu, Kendari 93232 Southeast Sulawesi, Indonesia

E-mail: *hasnudi@usu.ac.id

Abstract. The study aimed to examine the effect of fasting on weight loss and percentage of carcasses of Bali cattle. The study was designed in a randomized block design, where the prededuction is consisted of without fasting (P0), fasting 12 hours (P1), fasting time 18 hours (P2), and fasting time 24 hours (P3). Life weight grouping. The results showed that: 1) fasting time before cutting significantly affected the weight loss of Bali cattle. The longer the fasting time, the greater the weight loss of life, (2) the fasting time to 24 hours does not affect the percentage of carcass and percentage of carcass. It can be concluded that the longer the fasting time of Bali cattle, the greater the decrease in life weight, but no significant effect on the percentage of carcass and percentage of carcass.

1. Introduction
Livestock development is the part of agricultural development especially, and generally is part of national development which is necessary to make an excellent planning to reach the purpose and could be conducted optimally. Livestock development is prioritized to increase animal populations and meat to fulfil the self-sufficient of food from animal protein, providing raw material for the industry, and export, and to increase the standard of living of farmers.

Meat is one of the main food products of animal which could be causing specific satisfaction for people consuming it because of its complete nutrition so that balance of nutrition of people life could be fulfilled. Meat demand increases as fast as people awareness on importance of good nutrition and people income increasing both in developing country and developed country. One of popular livestock in Indonesia for producing meat is Bali cattle. Meat is used after converted and then to be meat [1, 2]. Carcass is the main product that produced after animal slaughtered. Carcass quality and quantity produced from livestock is affected significantly by on farm factor such as using of livestock breed and feed technology, transportation, feed and water drink providing during transportation and before slaughtering, animal resting and handling before slaughtering, and fasting form feed before slaughtering.
The lack of livestock handling before slaughtering is the stimulating factors of stress which finally could decrease the quality and quantity of produced carcass.

Conditions must be fulfilled on animal slaughtering were health and unproductive. Beside, livestock was not in exhaust condition or in resting time after laboured. The purpose of animal rested before slaughtering is to make animal in good condition so that blood could be released as much as possible when animal is slaughtering and to keep energy sufficiently to perfectly rigormortis [3].

Basically, there were two ways to resting animal before slaughtered, that is by fasting and without fasting. The aim of fasting before slaughtering is to gain an empty body weight that is body weight after eliminating digestive organ content, bladder content, and to make the slaughtering process easily, especially to the aggressive and wild animal, could be calmer because of slaughtered [4]. Resting time before slaughtering depends on clime, distant between source of animal and slaughtering house, treatment during transportation, type of transportation, health condition, and animal durability [5]. This research aimed to understand the value of body weight loss percentage and percentage of carcass of Bali cattle treated different fasting time.

2. Materials and methods
This research was conducted in slaughtering house of Kendari City South East Sulawesi Provence for three months since January to March 2013 by using male Bali cattle as many 24 cattle slaughtered in slaughtering house of Kendari City as samples, and had been investigating for animal healthy and properly for slaughtering. Materials used were cattle scales, hanging scales, slaughtering knife, and stationery.

2.1 Research procedure
Data collecting was done through two phases included interview with the owner of the cattle and slaughterer and direct observation to the cattle slaughtering process. Direct interview with the owner of the cattle and slaughterer was done to know where the cattle came from, distant of transportation, the origin of raising method, number of cattle in once transporting, time of transportation, type of used vehicle, cattle density and position during transportation. Direct observation was done to understand the sex, age, breed, body weight, physical characteristic, carcass weight and parts of it. Data was taken from the same slaughterer to avoid the large variation because of the different method in separating parts of carcass. Diagram of animal slaughtering process is according to [1, 2] as showed in Figure 1.
Verification of data was done by using secondary data obtained from slaughtering house be in the form of monthly report of cattle slaughtering in last two years. Chronologically, cattle slaughtering and applying of treatments were as follows:

1. Healthy investigation of cattle before treatment to ensure the appropriateness of cattle to be slaughtered (*ante mortem* investigation)
2. Randomize of cattle for treatments.
3. Scales of initial body weight of cattle before fasting treatment.
4. Time of initial body weight scaling was done in the determined time to ensure that time range in a moment after scaling to a moment before slaughtering could fulfill one treatment of fasting time.
5. Fasting in this research meant that cattle did not get feed for certain time but still get unlimited drinking water.
6. On the treatment of 12 hours of fasting, time of initial weight scaling was done at 2 pm because of slaughtering will be done at 2 am. For 18 and 24 hours of fasting time, initial weight scaling was done at 8 am and 2 am each. Experiment samples of non fasted and non rested animals were controlled samples as many 6 cattle.
7. Cattle scaling before slaughtering was done to gain cattle weight data before slaughtered. Cattle was slaughtered traditionally by tiding all legs and slamming it. After the cattle fall down, then slaughtered
8. Slaughtering process was done according to Islamic method by using sharp knife, cutting the *vena jugulars, artery carotis, oesophagus* and *trachea*.
9. Further were barking, evisceration, and dressing.
10. Carcass data was obtained from the total of parts of carcass include blade and shin/shank, cube roll, sirloin, fillet, and rump, flank, brisket, back bone, rib meat, spare rib, back rib, and short rib, chuck, and neck bone.

### 2.2 Design of research

This research used randomized block design with three block [6]. Basic of live weight grouping were live weight 200 – 220 kg (K1), live weight 221 – 240 kg (K2), and live weight 241 – 265 kg (K3).

Applied treatment was fasting time before slaughtering but still given unlimited drink water. Period of fasting before slaughtering consists of controlling without fasting time (P0), 12 hours of fasting time (P1), 18 hours of fasting time (P2), 24 hours of fasting time (P3). Linear model of the design as follows:

\[ Y_{ijk} = \mu + \tau_i + \beta_j + \epsilon_{ijk} \]

- \( Y_{ijk} \) = Percentage of carcass weight on observation at k from slaughtered weight group at j treated fasting time at-i.
- \( \mu \) = Common middle value (real average) from percentage of carcass weight.
- \( \tau_i \) = Effect of treatment of fasting time at -i
- \( \beta_j \) = Effect of slaughtered weight at -j
- \( \epsilon_{ij} \) = Effect of experimental error of slaughtered weight group at -j treated fasting time at - i.

Obtained data would be analysed by using Analysis of Variance. Difference among treatments were tested by using real honest different test according to [6].

### 2.3 Observed variables

Variables that would be observed were:

1. Initial weight is cattle body weight before fasting treatment
2. Final weight is cattle body weight after fasting treatment before slaughtering
3. Weight loss is value of reduction between initial weight and final weight then divided with initial weight then multiplied with 100%.
4. Carcass weight was obtained from value of addition of parts of carcass scaling
5. Percentage of carcass weight is carcass weight obtained through scaling process then divided live weight then multiplied 100%.
6. Parts of carcass weight was gained from value of parts of carcass scaling
   - Front thigh was gained from scaling value of left and right front thigh
   - Hind thigh was gained from scaling value of left and right hind thigh
   - Weight of neck + chest + back was gained from scaling value of parts of neck, chest, and back
   - Abdominal weight was obtained from scaling value of part of abdomen
7. Percentage of parts of carcass was obtained from division of parts of carcass with carcass weight then multiplied 100%

3. Results and Discussion

3.1. Weight loss of Bali cattle
Average of weight loss of Bali cattle during fasting treatment could be seen in Table 1.

| Weight Live Grouping (kg) | Fasting Time (12 hours) | (18 hours) | (24 hours) |
|--------------------------|-------------------------|------------|------------|
| 200 – 220 B1             | 0.98                    | 2.01       | 3.50       |
| 221 - 240 B2             | 1.36                    | 2.28       | 3.30       |
| 241 - 265 B3             | 1.23                    | 2.34       | 3.28       |
|                          | 1.30                    | 2.64       | 2.84       |
|                          | 1.56                    | 1.60       | 2.99       |
|                          | 1.51                    | 1.91       | 3.21       |
| Average                  | 1.32±0.21               | 2.13±0.37  | 3.18±0.24  |

Result of analysis of variance showed that fasting time treatment has very real effect on weight loss of Bali cattle (P<0.01). It meant that fasting time could generate the weight loss on all group of experimental samples. Weight lost on 24 hours of fasting time as much 3.18% was higher significantly (P<0.05) compared with weight loss on 18 and 12 hours of fasting time as much 2.13% and 1.32% of each. This data showed that there was tendency the longer fasting time applied to an animal the larger of weight loss of slaughtered animal.

Live weight loss of Bali cattle in fasting treatment was hypothesized due to decreasing of digestive tract content and bladder, and was not caused by decreasing of body tissue weight. Percentage of digestive tract content could reach 30% of a cattle live weight [2]. It meant that decreasing of cattle live weight as much 3.18% was included weight of digestive tract content and bladder. [7] stated that live weight of an animal consists of body tissue weight added digestive tract content and bladder, so if they were decreased would decrease animal live weight. Live weight loss was affected by the long time of fasting period (without drinking water or feed) [7].

There was a tendency that the longer of fasting period applied to animal the larger of live weight decreasing due to the more urination and defecation which finally implicated to the more of live weight decreasing. On the longer resting period, weight of digestive tract content was lower than the shorter period of resting period. It meant that the longer of fasting period could generate the more of urination and defecation process, so the live weight was more decreased [7].

3.2. Carcass percentage of Bali cattle
Average of carcass weight percentage treated different period of fasting could be seen at Table 2. Percentage of carcass weight is proportion between carcass weight to slaughtering weight then
multiplied 100% [8, 9]. Result of analysis of variance showed that fasting treatment has no real effect on carcass weight percentage of Bali cattle (P>0.05). It meant that fasting period 12 hours to 24 hours applied to experiment samples has not significant on decreasing of carcass weight percentage. These results indicate that decreasing of live weight of Bali cattle only caused by decreasing of weight of digestive tract content. Live weight loss and carcass weight was affected by the length of fasting period (without drink water or feed) [7].

Table 2. Average of carcass weight percentage of Bali cattle in different period of fasting

| Group of live weight (kg) | Fasting period |
|--------------------------|----------------|
|                          | Without fasting | 12 hours | 18 hours | 24 hours |
| 200 – 220 (B1)           | 53.73           | 51.48    | 58.85    | 48.84    |
| 221 - 240 (B2)           | 52.67           | 57.00    | 52.35    | 52.30    |
| 241 - 265 (B3)           | 57.16           | 60.31    | 55.69    | 60.81    |
| Average                  | 55.32±2.36      | 55.59±5.02 | 57.08±2.92 | 54.85±4.37 |

Fasting period up to 24 hours allowed animal for digesting and feed retention. It meant that fasting time for 24 hours could not cause decay or tissue degradation in real so, could not generate decreasing of carcass weight percentage of experimental Bali cattle. Body tissue degradation to fulfil the energy requirement pressure for body activity could occur when supply energy from digested feed was out. Feed that digested by animal will be converted to materials glycogen formed deposited in muscles and liver. Glycogen is main form of reserve carbohydrates in the body synthesized from glucose and other precursors through glycogenesis and gluconeogenesis pathways. Glucose itself is the main fuel, rich of energy, quickly gained from preserve glycogen when cells require the energy [10].

If animal did not gain supplied feed in certain time, supplied substances to form glycogen will be reduced or stopped. While animal needs energy every time, particularly for body maintenance, so animal will use energy source deposited as glycogen in muscle and liver. It meant that degradation of body tissue particularly muscles will occur, and if this process occur continuously without supply process of glycogen formed substances and other nutrition, will generate degradation of body tissue in real. It could be known from the decreasing of carcass weight percentage particularly on muscles percentage of Bali cattle.

Result of this research indicated that fasting period up to 24 hours could not generate decreasing of carcass weight percentage significantly yet because in 24 hours, animal still digesting food in digestive tract functioning as glycogen formed substance. It meant that degradation of body tissue that occurred was still being balanced by supplying of glycogen formed substances from digested feed.

Feed nutrition was used for body function such as body maintenance and reproductive function. Body maintenance requires nutrient used for survival. These maintenance activities include body temperature maintenance, energy for normally activities and proteins and minerals for exchanging of damaged body tissue. Almost one third or half of nutrient in feed are used for body maintenance and treatment [11].

Glycogen deficiency was occurred if stressed animal, as exhausted, exercised, fasted, and uneasy or slaughtered directly before properly rested or to recover its muscle glycogen preserve [12]. Even though the effect of length of fasting time on carcass percentage was not significant, obtained data indicated that experimental samples fasted for 12 hours has the highest carcass percentage among other treatments (55.59%). While the lowest of carcass percentage was occurred in samples fasted for 18 hours (52.72%).
Samples fasted at the longest fasting time for 24 hours showed an optimal carcass percentage as much 54.85%.

Furthermore obtained data was also showed that carcass percentage of fasted experimental samples was higher than samples without fasting treatment. An accurate method in determining carcass weight was according to empty abdomen, content of abdomen was counted from difference between fully content of abdomen and empty abdomen [13, 14].

Other factors that also affected carcass percentage were feed volume and drink water filled digestive tract. It meant that the less of feed and drink water in digestive tract and bladder the higher of carcass percentage [15, 2]. In this research, feeding was stopped, but drinking water was still given unlimited, so digestive tract was still filled by water which indicated that they were involved in affecting the carcass percentage of experimental cattle, so effect of fasting time for 24 hours was not significant.

Result of this research showed that fasting cattle for 24 hours could not generate decreasing of carcass percentage. Yet, carcass percentage of fasted cattle was higher than non-fasted cattle. It could be occurred because of non-fasted cattle did not undergo the decreasing of live weight, so carcass percentage that resulted was lower. Content of abdomen is part of live weight used to reduce animal live weight to gain net percentage, and content of abdomen that be in the form of water and feed could increase live selling weight, even though the final result was lower [11].

3.3. Parts of carcass percentage of Bali cattle
Carcass of Bali cattle consists of front thigh, hind thigh, neck, chest, back, and abdomen. Carcass percentage is value of division of parts of carcass weight to total carcass weight then multiplied 100%.

Average of parts of carcass percentage of Bali cattle treated different fasting time could be seen in Table 3.

| Part of carcass       | Non Fasting | 12 hours | 18 hours | 24 hours |
|-----------------------|-------------|----------|----------|----------|
| Chuck                 | 21.78±1.16  | 22.06±1.81| 22.00±1.19| 20.95±1.41|
| Leg                   | 33.83±1.13  | 32.71±2.19| 33.38±1.72| 33.40±2.19|
| Neck + chest + back   | 40.33±2.07  | 41.31±3.20| 40.59±1.73| 41.39±2.81|
| flank                 | 4.02±0.14   | 4.01±0.33 | 4.00±0.38 | 4.15±0.34 |

Result of analysis of variance showed that length of fasting time has no real effect on parts of carcass percentage of Bali cattle (P>0.05) in chuck, leg, neck, chest, back and flank. It showed that parts of cattle carcass percentage were similar although treated different length of fasting time. This result was similar with [16] reported that there was no difference on parts of carcass weight of male Bali cattle although fasted between 24 to 72 hours and unlimited drinking water. Interested information from this research was that carcass was distributed on chuck (20-22%), leg (33-36%), neck, chest, and back (40-41%),and flank (4%). This fact affected significantly both in practical and meat quality because consumer could consider buying meat based on parts of carcass [17, 18].

4. Conclusions
Fasting time has a significant effect on the depreciation of Bali’s live weight. The longer Bali cattle are fasted the greater the weight loss. Fasting time up to 24 hours does not significantly affect the percentage of carcass and percentage of carcass parts of Bali cattle. The percentage values of carcasses and carcass parts of Bali cattle from this study are as follows: carcass 53-56%, chuck 21-22%, leg 33-37%, neck, chest and back 41% and abdomen 4%.
References

[1] Hafid H 1998 Production performance of Australian cattle commercial cross raised in feedlot with different stocker condition and time of fattening [Thesis] (Bogor: Institut Pertanian Bogor)

[2] Hafid H 2005 Analysis of growth and distribution of meat and estimation of carcass cattle productivity from fattening program [PhD Thesis] (Bogor: Institut Pertanian Bogor)

[3] Hafid H 2006 Animal handling before slaughtering and beef quality Proceeding National of Livestock (Kupang: University of Nusa Cendana, Nusa Tenggara Timur)

[4] Payne W J A 1993 Introduction to Livestock in Tropical Area (Yogyakarta: Gadjah Mada University Press)

[5] Chambers P and Gradin W 2001 Introduction to Handling, Shipping, and Slaughtering Animal Humanly. RAP Publication 2001/4 Permission of HIS (Bali: Yudistira)

[6] Steel R G D and Torrie J H 1995 Statistic Principal and Procedural (Jakarta: A Biometrical Approach. PT. Gramedia Pustaka Utama)

[7] Shorthose W R and Whytes J R 1988 Transport of sheep and cattle Proceedings of 34th International Congress of Meat Science and Technology Brisbane Australia pp 122-9

[8] Dewi S H C 1998 Effect of sugar, insulin, and resting time before slaughtering of sheep after shipping on meat quality [Dissertation] (Bogor: Institut Pertanian Bogor)

[9] Hafid H, Gurnadi R E, Priyanto R and Saefuddin A 2007 Identification of carcass characteristics for estimating composition of beef carcass Journal of the Indonesian Tropical Animal Agriculture 35 pp 22–6

[10] Hafid H and Rugayah N 2009 Carcass percentage of Bali cattle in various weight and fasting time before slaughtering Proceeding of National Seminar of Livestock Technology and Veterinary (Bogor: Center of Livestock Research, Agricultural Department of Indonesia)

[11] Tilman A D, Hartadi H, Reksohadiprodjo S, Prawirokusumo S and Lebdosokejo S 1982 Basic Animal Food Science (Yogyakarta: Gadjah Mada University Press)

[12] Blakely J, and Bade DH 1994. Animal Science 4th Ed (Yogyakarta: Gadjah Mada University Press)

[13] Aberle DE, Forrest JC, Gerrard DE and Mills EW 2001 Principles of Meat Science 4th Ed (USA: WH Freeman and Company)

[14] Hafid H 2011 Introduction to Carcass Evaluation (Kendari: Unhalu Press)

[15] Hafid H and Syam A 2002 Study of carcass characteristic of local goat from traditional raising method (Kendari: Research Institution of Halu Oleo University Kendari)

[16] Saka I K, Tullohdan N M and Budianto G K 1990 Effect of fasting time and drinking water treatment during resting time before slaughtering on yield and carcass quality of male Bali cattle. Proceeding of National Seminar of Bali Cattle (Denpasar: Agriculture Faculty of Udayana University)

[17] Hafid H and Priyanto R 2006 Effect of Butt shape conformation on carcass characteristic of Brahman Cross cattle on several sex classification Med. Petern. 29 3

[18] Hafid H, Nuraini , Tasse A M, Inderawati and Hasdar M 2014 Characteristic of Bali cattle carcass on different body condition National Proceeding of Livestock (Semarang: Animal and Agricultural Science Faculty, Diponegoro University)