

The Growth and Development of Non Carcass Organ's of Bali Cattle

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Abstract. This study aims to determine the pattern of growth and development of non carcass organs in Bali cattle males and females. And this research is expected to provide information to the public and farmers about biological phenomena organ growth and development of non carcass Bali cattle males and females, as well as basic data in making estimates, the production of non carcass organs as well as information for research selanjutnya. Samples of this research data is withheld Bali cattle (slaughter) in Slaughterhouse Kendari. Observations were carried out on cattle by 28 head with 2-3 years of age and body weight between 90-300 kg. The method used in this research is Huxley allometric equation $Y = ax^b$ transformed into logarithms log equation is $Y = \log a + b \log x$ and the real difference test with a test -student, the observed variables is slaughter weight, non carcass weight and the weight of the non carcass parts of Bali cattle male and female as the head, front legs, hind legs, skin, lungs, liver, intestines and stomach. The results showed that the coefficient of growth of non carcass organs (offal) Bali cattle male and female is as follows ($b = 0.25$ and 0.40). The coefficient of non carcass organ growth clearly different one ($p < 0.05$), which means non carcass weights have time to cook early development when compared to the overall body growth. While the pattern of growth and development of non-organ parts of Bali cattle carcass relative male and female alike, with the growth coefficient $b < 1$. The conclusion of this study is the growth of non carcass organs and parts non organ Bali cattle carcass of males and females have a pattern of rapid growth/early ripe with weight. It is advisable to do further research with a sample of cattle that more and consider cutting in series (serial slaughter) at certain ages.

Keywords: bali cattle, correlation, growth and development, non carcass organ's

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1. Introduction

The improvement of the community's economy, population and increase educational awareness, has stimulated public awareness of the significance and role of nutrition in food is protein content of 18.8%, water 66%, and 14% fat [1]. This situation resulted a shift in consumption patterns from food source to food source of vegetable protein animal protein which affects encourage increased demand for livestock products as one of the agricultural sector which specialized in providing food products with high nutritional value [2].

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Indonesian people's need for red meat is increasing. Red meat consumption society have focused on the production of beef, lamb and goat raises problems because production cannot yet meet domestic demand for red meat [3]. According Socheh, *et al.* say that the beef cattle livestock is one commodity that has an important role in providing animal protein from cattle. Beef demand in Indonesia is satisfied from the three main sources of farm people, livestock and meat imports [4].

Efforts to increase beef production to meet market demand, especially supermarkets, restaurants and other institutions carried out through the efforts of raising cattle. The implications of such maintenance is expected to produce cattle with large numbers so as to meet the demands of specific market segments [5-6].

Productivity of livestock affected by two main factors, namely genetic and environmental, In Southeast Sulawesi to date in addition to the fulfillment of the demand for meat there is also a demand for non carcass parts or ofal the internal organs such as the hall, Heart. lungs, kidneys, limla, large intestines and stomach, legs, and head. But the handling of meat and offal after cutting has not noticed technical principles are required. Though the quality or the quality of the meat and offal are complex both in terms of nutritional assessment and properties teknologi [7-9]

On the other hand, a biological phenomenon shows the rapid rate of growth of livestock in the womb, are born until the time of sexual maturity (puberty) and the attainment of the adult body varies greatly. Zajulie, *et al* say that in cattle (BX) shows that the age group of older cattle have a higher fat weight compared with young animals [10].

In general, cattle have the two parts of the body that carcass and non carcass. Carcass weight is the weight cut after deducting the contents of the viscera, viscera, head and kak [11]. According Elvanuddin, *et al*, that the share of non carcass (offals) consists of parts edible and not edible. In Indonesia, the nonkarkas edible parts such as skins, heads, tails and viscera (liver, heart, lung and gastrointestinal tract) is also of high economic value, because it is a preferred food community [12]. According Karno that some components of non carcass that was inedible but processed with high technology can provide great financial benefits [13].

Based on the description, then do research on the study of the development of the non carcass organs (offal) in Bali cattle male and female gender so that will be able to provide useful information in non carcass quality improvement of Bali cattle.

2. Materials and Methods

2.1. Study area and Materials

This research was conducted at the Kendari City Slaughterhouse. The material used is Bali cattle to be slaughtered, where observations were made on each of the 28 male and female cows aged

2-3 years with a body weight range of 200-300 kg. At the beginning of the study all the tools and materials are prepared prior to cutting the first weighing in weight then performed kosher slaughter. After slaughter incisors then made observations to determine the age. slaughter, barking, separation of the head and four legs traditionally. To obtain the data do non carcass weighing organs (offal).

2.2. Data Analysis

Furthermore, the process to obtain non carcass organs (offal) is as follows: cows rested; examination; slaughter; completion of blood; barking; abdominal evisceration; separation of non carcass organ and non carcass weighing organs[14]. Used to determine growth Huxley allometric equation $Y = ax^b$ which in use is first transformed into a logarithm equation form.

$$\text{Log } Y = \text{Log } a + b \text{ log } X \tag{1}$$

where Y = weight of non carcass components organ (offal) experienced growth; X = weight cut; a = intercept (constant); b = coefficient of relative growth.

Guidelines for the dependent variable (Y) with independent variables (X) are presented in Table 1.

Table 1. Guidelines for the Dependent Variable (Y) with Independent Variable (X)

No	Y	X
1	Non carcass weights	slaughter weight
2	The weight of the head	slaughter weight
3	The weight of the skin	slaughter weight
4	The weight of the front foot	slaughter weight
5	The weight of the hind legs	slaughter weight
6	The weight of the liver	slaughter weight
7	The weights of lung	slaughter weight
8	The weight of the spleen	slaughter weight
9	The weight of the heart	slaughter weight
10	The weight of the hull	slaughter weight
11	The weight of the intestine	slaughter weight

The parameters observed in the implementation of this research is:

1. Weight cut by weighing the cattle before slaughter
2. Determination of the age of cattle is done by looking at the turn of the incisors
3. Non carcass weighing organs (offal), such as: head, front legs, hind legs, lungs, liver, large intestine, small intestine and skin

Interpretation of the value of b stated Hafid are as follows: If the value of $b < 1$ mean: (1) the percentage of Y decreases with increasing value of X; (2) the relative growth rate of Y than X is small; (3) The development time is ripe early Y; and (4) the growth potential of the Y low or has stopped growing. If the value of $b = 1$ means: (1) the percentage of Y constant with increasing values of X; (2) the relative growth rate of Y than X are the same; (3) The development time is ripe medium Y: and (4) the growth potential of the Y being or growing constantly. If the value of

b>1 mean: (0) Y percentage will increase with increasing value of X; (2) the relative growth rate of Y than X is great; (3) the development time is a slowY; and (4) the growth potential of the Y is high or growing [14].

3. Results and Discussion

3.1. Non Carcass Organ Growth

Data growth non carcass organs (offal) can be seen in Table 2. Based on Table 2 shows that the coefficient of growth relative growth coefficient) non carcass weight (offal), non carcass weights of males and females are the same. The growth of the non carcass weight (b- 0.25 and 0.40) shows a significant difference (p<0,05) which means that the non carcass weight. This data shows that the non-carcass organs of cattle grow rapidly when compared to body weight or so-called fast adults. This is because the non-carcass part consists of vital organs which have to grow perfectly early to support the next livestock life as mentioned by Hafid [15], [16].

Table 2. The Coefficient of Growth of Non Carcass (Offal) Bali Cattle Male Female

Log Y	Gender	intercept	The coefficient of growth		the value of b	Rated r
			b	sb		
Non carcass weights	Male	1.20	0.25	0.25	b<1	0.54
	Female	0.84	0.40	0.25	b<1	0.71

Description: significant different (p <0.05)

3.2. Development of the Non Carcass Parts

Data growth non carcass parts on Bali cattle can be seen in Table 3. Based on Table 3 shows that the coefficient of growth (growth coefficient relati) head weight, skin weight, the weight of the hind legs, front legs weight, liver weight, the weight of the lungs, spleen weight, heart weight, bobo stomach and intestine weights of male and females are the same. According Roviki, *et al.*, amounted to 415.52 kg slaughter weight, carcass weight of 227.94 kg and carcass percentage of 54.86% [17]. Hamdani, *et al.* reported that the cow body weight of 110.5 ± 176.2 kg [18].

Against the weight of the head (b = 0.28 and 0.67) is different from the real one (p<0.05), which means that the weight of the head has the properties of growth and development of early ripe/mature rapidly with body weight or weight cut.

Against the weight of cattle leather for males and females (b = 0.34 and 0.61) is different from the real one (p<0.05), which means that the weight of the skin on the male and female animals have the nature of growth and development of early ripe/mature quickly with body weight.

Against the weight of the hind legs of male and female animals (b = 0.14 and 0.05) is different from the real one (p<0.05), which means that the weight of the hind legs in male and female animals have early growth patterns/cooking fast with body weight.

Against the weight of the front leg ($b = 0.27$ and 0.05) is different from the real one ($p < 0.05$), which means that the weight of the front legs have the nature of growth and development of early ripe/mature rapidly with body weight.

Against the weight of liver ($b = 0.31$ and 0.18) is different from the real one ($p < 0.05$), which means that the weight of the heart have the nature of growth fast cook/cook early with body weight.

Table 3. Coefficients Growth of Non Carcass Parts (Offal) Bali Cattle Male and Female

Log Y	Gender	intercept	The coefficient of growth		the value of b	Rated r
			b	sb		
The weight of the head	Male	0.39	0.28	0.49	b<1	0.43
	Female	-0.53	0.67	0.48	b<1	0.70
The weight of the skin	Male	0.52	0.34	0.21	b<1	0.43
	Female	-0.12	0.61	0.21	b<1	0.83
The weight of the hind legs	Male	-0.24	0.14	0.19	b<1	0.43
	Female	0.17	-0.05	0.04	b<1	-0.24
The weight of the front foot	Male	0.64	-0.27	0.03	b<1	-0.80
	Female	0.21	-0.05	0.05	b<1	-0.12
The weight of the liver	Male	-0.01	0.31	0.15	b<1	0.40
	Female	0.21	0.18	0.15	b<1	0.22
The weight of the lungs	Juantan	0.19	0.15	0.14	b<1	0.41
	Female	0.76	-0.12	0.13	b<1	-0.10
The weight of the spleen	Male	0.76	-0.32	0.04	b<1	-0.62
	Female	-0.12	0.09	0.05	b<1	0.11
The weight of the heart	Male	0.56	-0.22	0.05	b<1	-0.45
	Female	-0.15	0.14	0,00	b<1	0.12
The weight of the hull	Male	0.54	0.21	0.19	b<1	0.58
	Female	0.39	0.27	0.19	b<1	0.57
The weight of the intestine	Male	0.94	-0.06	0.17	b<1	-0.06
	Female	0.24	0.26	0.17	b<1	0.32

Description: significant different ($p < 0.05$)

Against the weight of lungs for livestock males and females ($b = 0.15$ and -0.12) is significantly different from the one ($p < 0.05$), which means that the weight of the lungs in male and female animals have the nature of the growth pattern rapid / early ripe with body weight.

Against the weight of the spleen ($b = -0.32$ and 0.09) is different from the real one ($p < 0.05$), which means that the weight of the spleen have the nature of growth and development of early ripe/mature rapidly with body weight.

Against the weight of the heart ($b = -0.22$ and 0.14) is different from the real one ($p < 0.05$), which means that the weight of the heart have the nature of growth and development of early ripe / mature rapidly with body weight.

Against the weight of the hull for livestock males and females ($b = 0.21$ and 0.27) is different from the real one ($p < 0.05$), which means that the weight of the stomach in male and female animals have the nature of the pattern of rapid growth/early ripe with weights body.

Against the weight of intestine ($b = -0.06$ and 0.26) is different from the real one ($p < 0.05$), which means that the weight of the gut have the nature of rapid growth or cook cooking early with body weight. Factors that affect the rate of growth and development, among others feed livestock, gender, hormones, genetics, environment and climate [16], [19], [20].

3.3. Logarithm Regression Equation of Growth and Development of Non Carcass (Offal)

Logarithm regression equation of growth and development of non carcass (offal) can be seen in Table 4.

Table 4. Coefficient of Regression Equation Logarithm of the Growth of Non Carcass (Offal) Bali Cattle Male and Female

Log Y	Log X	JK	The regression equation model	Rated r
Non carcass weights (BNK)	Body weight (BT)	Male	$\text{Log BNK} = 1.20 + 0.25 \log \text{BT}$	0.54
		Female	$\text{Log BNK} = -0.84 + 0.40 \log \text{BT}$	0.71

Based on Table 4 shows that the regression equation non carcass weight of males and females showed a close relationship between the dependent variable (Y) and the independent variable (X) with a correlation coefficient (r) between 54% and 71%.

3.4. Logarithm Regression Equation Growth of Non Carcass Parts (Offal)

Logarithm regression equation growth of non carcass parts of Bali cattle male and female can be seen in Table 5. Based on Table 5 shows that the regression equation head weight, skin weight, the weight of the hind legs. heart weight, the weight of the front legs, liver weight. lung weights, weight of stomach and intestinal weight on Bali cattle males and females showed a close relationship between the dependent variable (Y) and the independent variable (X) with a correlation coefficient that varies. Slaughter weight is the weight of the cattle slaughtered cattle shortly before the effect on carcass weight. Any increase in weight cut will be followed by the increase in the percentage of carcasses [21]. Basbeth, *et al.* reported that the measurement of the size of non carcass through the regression equation of body weight has a low level of deviation of 5% in goats [22].

The correlation coefficient between non carcass weight and organs of non carcass of this study does not indicate a close relationship (strong) by weight. This proves the foregoing discussion that in general non carcass parts are ripe or offal is premature or fully developed since still in the

womb until some time after birth. Vital organs such as the heart, lungs, intestines, spleen, liver and kidneys have a perfect growth at birth because it is very supportive of the beginning of life.

Table 5. Coefficient of Regression Equation Logarithm Growth of Non Carcass Parts (Offal) Bali Cattle Male and Female

Log Y	Log X	JK	The regression equation model	Rated r
The weight of the head (BK)	Body weight (BT)	Male	$\text{Log BK} = 0.39 + 0.24 \log \text{BT}$	0.43
		Female	$\text{Log BK} = -0.53 + 0.67 \log \text{BT}$	0.70
The weight of the skin (BK)	Body weight (BT)	Male	$\text{Log BK} = 0.52 + 0.34 \log \text{BT}$	0.43
		Female	$\text{Log BK} = -0.12 + 0.61 \log \text{BT}$	0.83
The weight of the hind legs (BKB)	Body weight (BT)	Male	$\text{Log BKB} = -0.24 + 0,14\text{Log BT}$	0.43
		Female	$\text{Log BKB} = 0.17 + -0,05\text{Log BT}$	-0.24
Weight of the foot front (BKD)	Body weight (BT)	Male	$\text{Log BKD} = 0.64 + 0.27 \log \text{BT}$	-0.80
		Female	$\text{Log BKD} = 0.21 + -0.05 \log \text{BT}$	-0.12
The weight of the heart (BH)	Body weight (BT)	Male	$\text{Log BH} = -0.01 + 0.31 \log \text{BT}$	0.40
		Female	$\text{Log BH} = 0.21 + -0.18 \log \text{BT}$	0.22
The weight of the lungs (BPP)	Body weight (BT)	Male	$\text{Log BPP} = 0.19 + 0.15 \log \text{BT}$	0.41
		Female	$\text{Log BPP} = 0.71 + -0.12 \log \text{BT}$	-0.10
Spleen weights (BL)	Body weight (BT)	Male	$\text{Log BL} = 0.78 + -0.32 \log \text{BT}$	-0.62
		Female	$\text{Log BL} = 0.12 + 0.09 \log \text{BT}$	0.11
The weight of the heart (BJ)	Body weight (BT)	Male	$\text{Log BJ} = 0.56 + -0.22 \log \text{BT}$	-0.45
		Female	$\text{Log BJ} = -0.15 + 0.14 \log \text{BT}$	0.12
The weight of the hull (BL)	Body weight (BT)	Male	$\text{Log BL} = 0.54 + 0.21 \log \text{BT}$	0.58
		Female	$\text{Log BL} = 0.39 + 0.27 \log \text{BT}$	0.57
The weight of the intestine (BU)	Body weight (BT)	Male	$\text{Log BU} = 0.94 + -0.06 \log \text{BT}$	-0.06
		Female	$\text{Log BU} = 0.24 + 0.26 \log \text{BT}$	0.32

4. Conclusions

Based on the results and discussion, it can be concluded that the growth pattern of non-carcass organs or internal organs of Bali cows, both male and female, grows and develops faster than the total body weight. It is necessary to do further research with a larger sample with a wider age range of cows.

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