

PJN

ISSN 1680-5194

PAKISTAN JOURNAL OF
NUTRITION

ANSI*net*

308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Improving Carcass Quality of Indigenous Cattle of West Sumatera Fed Local Feed Resources

Khasrad and R.W.S. Ningrat
Faculty of Animal Sciences, Andalas University, Padang, Indonesia

Abstract: Lack of adequate nutrition all year round is one of the major causes of the low productivity of ruminants. An operational policy announced by the Indonesian government to achieve the target to be self sufficient on meat demand 2010 is to develop feed and ration for beef industry based on agricultural and industrial-wastes besides exploiting biodiversity that has not been fully implemented by the farmers. A feeding trial with 12 Pesisir cattle, indigenous cattle of West Sumatera weighed 120-150 kg aged 2-3 yrs old were carried out to investigate the effect of feeding local feed resources on their growth performance and carcass characteristics; dressing percentage, rib eye area, lean and fat percentage. Animals were divided into two equal groups of similar average body weight, assigned to Completely Randomized Design and were individually fed for 90 days. The first group was offered control feed as practiced by farmer and the second group was offered treatment diet based on ammoniated rice straw and chipped cassava. This feeding trial was followed by a slaughter experiment on one animal from each group to study of carcass traits. Cattle receiving a treatment diet performed better ($p < 0.05$) in all parameters measured, than those receiving control diets. There was significant difference ($p > 0.05$) observed between the two groups with regard to Average Total Body Weight Gain (ATG) and Average Daily Body Weight Gain (ADG) 0.20 kg/d to 0.68 kg/d respectively. Dressing percentage was significantly higher in treatment diet (52.59%) than in control diet (50.82%). The rib eye area, lean and fat percentage was significantly higher in treatment diet than in control diet. It was concluded that feeding improved low quality local feed resources could have a positive effects on growth performance and carcass traits of indigenous cattle.

Key words: Local feed resources, ammoniated straw, chipped cassava, indigenous cattle, carcass quality

INTRODUCTION

Population growth, increasing income, food and nutrition awareness and increased community outside the flow of tourists to Indonesia cause meat demand for domestic consumption continues to increase. The increased demand has yet to be met by increased productivity of meat-producing livestock. Increase livestock population, productivity and carcass quality should continue.

For this purpose livestock production methods should be directed to the improvement of meat quality criteria in accordance with international market requirements. These efforts may also result in foreign exchange savings if the result is used to substitute high-quality meat that had been imported. The problem is how to improve the quality of local beef, so that the local cattle farmers can receive the appropriate price. Fattening are the best effort in improving the productivity and quality of local beef, because the cattle can be fed to suit your needs, high energy and good quality feeds. Thus if the feed of cattle feed is improved by providing a high-protein and energy of the result will be better.

It is necessary to find alternative feed sources such as the utilization of agricultural and industrial waste. In this

case West Sumatra has a great potential, but not optimally used yet. Among the sources of feed materials which are often found in West Sumatra is rice bran, coconut cake, corn, sago, straw and others. Rice straw is an agricultural-product whose production is high and most are available throughout the year.

Response of livestock productivity and carcass and meat quality can vary within the same breeds, between breeds, genders and among environmental factors including diet and fattening period. Many of the local cattle in West Sumatra that can be used for the fattening including Sapi Pesisir, Bali cattle and Ongole. Of the three breeds of local cows is the most common and is genetic in West Sumatra is the Sapi Pesisir. With good feeding for fattening cattle are expected to be able to have higher productivity.

Based on the above issues it is necessary to put an effort to improve productivity and quality of beef carcass by farming intensively with different fattening period. Cattle are given protein concentrate and high energy and improved ammoniated rice straw amoniasi.

The research objective is to determine the effect of feeding level and duration of fattening on growth and characteristics of sapi pesisir.

Hypothesis in this research is the provision of different rations and long fattening period affects the rate of growth and carcass quality of Sapi Pesisir.

MATERIALS AND METHODS

Animals: Twelve male cattle aged 2-2.5 years were used in this study. Each cattle was placed in individual cages and having the adaptation period for 30 days.

Diets: Rations formulated based on the available material in the ratio of Concentrations (C) and Ammoniated Straw (AS) 50%: 50% for treatment A1 and 75% and 25% for the treatment of A2. Concentrate was composed of a combination of bran, corn, coconut oilcake, sago, minerals and salt. Composition of ration treatment and the composition can be seen in the Table 1.

Table 1: Composition of concentrate (% DM)

Ingredients	Percentage (%)
Rice bran	40
Corn	18
Coconut oil cake	30
Sago	10
Mineral	1
Salt	1
Total	100

Equipments: Equipments used in the study, including: livestock field scales, feed scales, a set of tools abatoir, carcass weight, back fat measurement and thick plastic sheets for measuring grid area of rib eye tendon.

Methods: This research was design using factorial randomized block design in 2 x 2 with 3 groups. The first factor (factor A) was the provision of 2 ration levels i.e: A1 = 50% concentrate + 50% ammoniated straw and A2 = 75% concentrate + 25% ammoniated straw. The second factor (factor B) was the long fattening period, B1 = 3 months and B2 = 4 month.

Statistical model used in accordance to Steel and Torrie (1993):

$$Y(ijk) = \mu + \alpha_i + \beta_j + \alpha\beta(ij) + r_k + e_{ijk}$$

Whereas:

Y (ijk) = The value of observations in treatment I and j, replications to k

μ = Value of the common

α_i = Effect of treatment to the cow I

β_j = Influence of the treatment to the long of fattening period

β_α (ij) = Interaction of treatment effect to the I and j

r_k = k influence the group

e_{ijk} = Experimental error

Parameters observed in this study were: Daily weight gain and carcass characteristics (carcass percentage, fat thick wide back and rib eye tendon).

Daily body weight gain: Calculated based on final body weight minus initial weight divided by the time (days) between the two weighing (kg).

Carcass weight percentage: Calculated based on the ratio between hot carcass weight (fresh) cut multiplied by 100%.

Back fat thickness: Determined by measuring the thickness of fat on length of approximately three-quarters of cross-sectional slices of tendon between the ribs, rib eye to the 12 and 13 (Soeparno, 1992).

Tendon rib eye area. Calculated by measuring tendon cross-sectional rib eye area (Longissimus dorsi) at the incision between the ribs 12 and 13 (Soeparno, 1992). Surface slices of rib eye tendon affixed with transparent plastic and then drawn with markers. Images of the tendon cross-sectional rib eye is read with a plastic grid.

RESULTS AND DISCUSSION

Animal growth: One way to see the growth of beef cattle is to measure the increase of body weight per unit of time. Increase average daily weight sapi pesisir intensively with different ration level and duration of fattening period can be seen in the following table.

Results of variety analysis show no interaction effect between the level of feeding and long fattening period to increase the daily weight Sapi Pesisir. Ration level was giving significant effect (p<0.05) to increase the daily body weight gain, while the long of fattening period show no significant effect (p>0.05).

From the table above, showed that the average daily body weight gain fed with A2 diet (75% concentrate + 25% ammoniated straw) had a higher effect (0.78 kg per cattle per day) compared with ration A (50% concentrate + 50% straw amoniasi) 0:58 kg per cattle per day. The higher increased of daily body weight gain when fed

Table 2: Chemical content of ingredients (% DM)

Ingredients	DM	CP	CF	Fat	Ash	NFE	TDN
Rice bran	85.89	12.58	14.18	5.69	6.92	60.63	62.90
Corn	89.33	10.23	3.98	3.94	3.04	78.81	80.80
Coconut oilcake	84.09	18.09	14.99	9.78	8.19	48.95	91.35
Sago	25.12	2.53	4.46	0.17	2.99	89.85	83.84
Mineral	96						
Salt	100						
Ammoniated straw	46.60	7.81	39.92	1.79	20.80	29.68	46.00

Table 3: Chemical composition of diets (%)

Components	Diets (Factor A)	
	A1 (50% conc + 50% Ammoniated straw)	A1 (75% conc + 25% Ammoniated straw)
Dry matter	63.37	71.75
Crude protein	10.06	11.36
Crude fibre	25.63	18.47
Fat	3.86	4.90
Ash	13.43	9.75
NFE	45.89	54.00
TDN	60.74	68.12

Table 4: Average daily body weight gain of Sapi Pesisir (kg/head/day)

Factor A (Ration level)	Factor B (Fattening period)		
	B1 (3 mth)	B2 (4 mth)	Average
A1 (50% C + 50% AS)	0.58	0.58	0.58 ^a
A2 (75% C + 25% AS)	0.80	0.77	0.78 ^b
Average	0.69	0.68	0.68

Notes: Different superscripts in the same row indicate significantly different effects (p<0.05)

rations A2 from A1 was closely related to composition of concentrates. The higher the percentage of concentrate in the ration means higher level of protein and energy rations, thus will result in the increase of body weight gain. This is in accordance with the opinion Soeparno (1992) that consumption of higher protein and energy would produce a growth rate faster. The influence of nutrients will be greater when the treatment started early period of growth. So the growth of cattle can be manipulated with different nutritional treatment. Ngadiono (1995) research results on Sumba Ongole Cattle (SO), Brahman Cross Cattle (BX) and the Australian Commercial Cross cattle (ACC), which are intensively for 4 months with feeding concentrate averaging 85% a daily body weight increase in cattle SO, BX and ACC each for 0.85, 0.78 and 0.82 kg/head/day accordingly.

The high increase of body weight Sapi Pesisir cattle fed concentrate feed (75% 25% ammoniated straw, compared with 50% concentrate + 50 ammoniated straw), possibly caused by feeding higher concentrations causes the higher protein digesting. Thus would lead to an increase of muscle meat or increased protein and fat accumulation in muscle. The rate of increase of body weight gain of Sapi Pesisir fed with different levels diets and fattening period can be seen in the following graph (Fig. 1).

An increase of body weight Sapi Pesisir fed high concentrate up to 75% due to cattle were still in the growth stage and had traditionally maintained without any concentrated diet. According to Tulloh (1978) in cattle production business, rapid growth and increase high body weight is needed, especially to achieve a certain weight with a relatively shorter time. Nitis and Lana (1984) mentioned that the supplement concentrates caused more efficient use of rations as a manifestation of higher digestion.

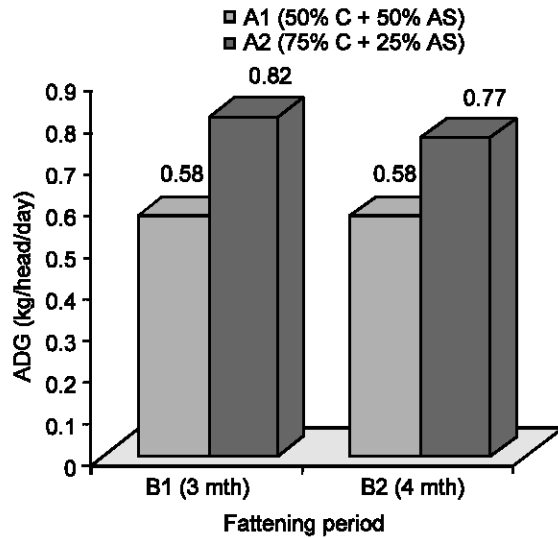


Fig. 1: Gambar 1. Histogram of average daily weight gain

Table 5: Average carcass percentage of Sapi Pesisir (%)

Factor A (Ration level)	Factor B (Fattening period)		
	B1 (3 mth)	B2 (4 mth)	Average
A1 (50% C + 50% AS)	51.92	52.77	52.34
A2 (75% C + 25% AS)	52.37	53.66	53.00
Average	52.13 ^a	53.21 ^b	52.67

Notes: Different superscripts in the same row indicate significantly different effects (p<0.05)

Carcass percentage: Percentage of Sapi Pesisir carcass kept intensively with different fattening period can be seen in Table 5.

The results showed that there was no interaction between the level of feeding with level of fattening period to the percentage of carcass (p>0.05). While longer fattening period showed a significantly different effect on the percentage of carcass (p<0.05) while the level of ration did not.

These differences indicated that the cow was still in productive age, so the longer fattening period the higher body weight gain as a result of increased fat deposition and muscle fiber expansion. From the data obtained in this study reaffirms the theory of growth that carcass weights increased with increasing age of cattle for growth or increase the weight of the tissues that make up the carcass (meat, bones and fat). After the animals reach mature body weight, the weight gain is decreasing (Berg and Butterfield, 1976). Adult body weight of Sapi Pesisir achieved at the age of 4 years and above (Saladin, 1984). Swatland (1984) states that after the age of puberty (at around age cows 2-3 years) development of carcass tissue components is more dominated by the development of fat, while musculus (muscle) develops slowly, whereas the bone relative to cease.

Table 6: Average back fat thickness of Sapi Pesisir (mm)

Factor A (Ration Level)	Factor B (Fattening period)		
	B1 (3 mth)	B2 (4 mth)	Average
A1 (50% C + 50% AS)	2.167	2.500	2.334 ^a
A2 (75% C + 25% AS)	2.500	3.333	2.916 ^b
Average	2.334 ^a	2.916 ^b	2.625

Notes: Different superscripts in the same row indicate significantly different effects (p<0.05)

Back fat thickness: Average back fat thickness of Sapi Pesisir kept intensively with different fattening periods, can be seen in Table 6.

The results of statistical analysis showed that there was no interaction effect between the level of feeding level, with fattening period on back fat thickness of Sapi Pesisir, while the influence of each factor shows the significant effects (p<0.05).

Feeding level on treatment A1 (50% concentrate + 50% ammoniated straw) with the average back fat thickness 2.334 mm is highly significant (p<0.05) to A2 (75% concentrate + 25% ammoniated straw) with average value of 2.916 mm. The higher average back-fat thickness due to A2 provided a higher concentrations than A1. The growing cattle fed high concentrations will deposit primarily body fat accumulation or subcutaneous fat. Back fat thickness is an indicator to determine the fatty body or carcass. The back fat thickness of Sapi Pesisir were lower than Sumba Onggole cattle. The research of Ngadiono (1995) on cows given 85% of feed concentrates for cattle 4 months results in back fat thickness of 0.09 inch. Maynard and Loosli (1969) as cited by Magdalena (1991) states that the age of cattle and food eaten by livestock affects the body fat. Nutrition is probably the most important environmental factors affecting carcass composition, especially the proportions of fat (Soeparno, 1992). In addition that nutrients affect and change the level of fatty carcass on a particular body weight. Improvement of feed energy level and energy consumption will increase carcass fat levels, provided that the protein is not a limiting factor. Increased energy rations will increase subcutaneous fat, the proportion of carcass fat and lower proportion of meat (Arthoud *et al.*, 1977).

The length of fattening period also gave a significant effect (p<0.05), where the 4-month period with average value of 2.916 mm was higher than at 3 months period with average value of 2.334 mm. This due to the accumulation of fat. According to Soeparno (1992) the growth rate occurs after the age of puberty from the fastest is fat, then musculus and relative bone has stopped respectively. Swatland (1984) states that the deposition of fat during fattening following 3 phases that are marbling in internal organs, kidneys and mesentery, then subcutan and intermuscular network, and the last is intramuscular fat (marbling).

Table 7: Average rib eye area of Sapi Pesisir (cm²)

Factor A (Ration Level)	Factor B (Fattening period)		
	B1 (3 mth)	B2 (4 mth)	Average
A1 (50% C + 50% AS)	66.33	68.50	67.42 ^a
A2 (75% C + 25% AS)	67.00	71.00	69.50 ^b
Average	67.17 ^a	69.75 ^b	68.46

Notes: Different superscripts in the same row indicate significantly different effects (p<0.05)

Rib eye area: The area of rib eye of Sapi Pesisir kept intensively under different fattening period was shown in Table 7.

Results of analysis showed that there was no interaction between factor A (ration level) and factor B (Fattening period) on the tendon rib eye area. While each factor rations level and duration of fattening showed a significant effect (p<0.05) against tendon rib eye area of Sapi Pesisir.

Rib eye area with level A1 rations (50% concentrate + 50% ammoniated straw) produced values averaging 67.42 cm², significantly different (p<0.05) with A2 (75% concentrate + 25% ammoniated straw) with values averaging 69.50 cm². The higher the level of concentrate in the rations, the rib eye area increased. The higher average tendon rib eye area given a higher concentrate (75%) led to increased accumulation of fat and protein in muscle meat. Increased tendon rib eye was also closely associated with increased carcass weight. With the increase in carcass weight means increased tendon wide rib eye. In accordance with the opinion Suwarno (1980) in Yusnayeti (1986) that there was of a positive relationship between the large tendon rib eye with the cow's carcass weights of cattle. Each increase of 1 cm² area of rib eye tendon causes the increase of carcass weight of 2.90 kg.

Fattening period also provide a high significant effect (p<0.05) against broad tendon rib eye of Sapi pesisir, which is fattening period up for 4 months with average 69.75 cm² had a larger rib eye tendon than the 3-month period (67,167 cm²). This due to the length of the fattening there will be increasing the size of muscle fibers. Besides also showed a tendency to an increase in fat in the muscle for longer fattening period. In accordance with the opinion of Romans and Ziegler (1974) that the size of the proportion of carcass tendon can be determined from the broad tendon rib eye. Arka (1984) reported the age of cattle provides a very real impact on tendon wide rib eye. With increasing age of the broad tendon rib eye also increases.

Conclusion:

- There was no interaction between the level of feeding rations to the length of fattening period on growth, carcass percentage, back fat thick and rib eye area of Sapi Pesisir (p>0.05).

- Factors of feeding level influenced significantly ($p < 0.05$) on the growth, back fat thickness and rib-eye tendon area. The higher the percentage of concentrate in the ration, the faster the growth, back fat and the thick rib eye tendon expanded.
- Carcass characteristics of fattened Sapi Pesisir cattle for 4 months was better than for 3 months, where the percentage of carcass, fat backs and wide tendon rib eye area also increased ($p < 0.05$).

REFERENCES

- Arka, I.B., 1984. Pengaruh Penggemukan Terhadap Kualitas Daging dan Karkas pada Sapi Bali. Disertasi Doktor. Universitas Padjadjaran, Bandung.
- Arthoud, V.H., R.W. Mandigo, R.M. Koch and A.W. Kotula, 1977. Carcass composition, quality and palatability attribute of bull and steers fed different energy levels and slaughtered at four ages. *J. Anim. Sci.*, 44: 53-64.
- Berg, R.T. and Dan R.M. Butterfield, 1976. *New Concepts of Cattle Growth*. Sidney University Press.
- Magdalena, 1991. Hubungan Antara Luas Udamaru dan Tebal Lemak Punggung Terhadap Persentase Karkas Kerbau Jantan. Fakultas Peternakan, Universitas Andalas.
- Maynard, L.A. and J.K. Loosli, 1969. *Animal Nutrition*, 6th ed. Tata McGraw-Hill Publishing Co. Ltd, New Delhi.
- Ngadiono, N., 1995. Pertumbuhan serta Sifat-Sifat Karkas dan Daging Sapi Sumba Ongole, Brahman Cross dan Australian Commercial Cross yang Dipelihara Secara Intensif pada Berbagai Bobot Potong. Disertasi, Institut Pertanian Bogor, Bogor.
- Nitis, I.M. and I.K. Lana, 1984. Effects of Replacing 30% of the Roughage with Concentrate on the Performance of Bali Steer. Udayana University, Denpasar.
- Romans, J.R. and P.T. Ziegler, 1974. *The Meat We Eat*. 10th Edn., The Interstate Printers and Publisher, Inc., Danville, Illinois.
- Saladin, R., 1984. *Pedoman Beternak Sapi Potong*. Fakultas Peternakan Universitas Andalas, Padang.
- Soeparno, 1992. *Ilmu dan Teknologi Daging*. Gajah Mada University Press. Yogyakarta.
- Steel, R.D.G. and J.T. Torrie, 1993. *Principles and Procedure of Statistics*. McGraw Hill Book Co. I.C. New York.
- Suwarno, 1980. Hubungan antara luas urat daging mata rusuk dengan bobot karkas pada sapi Peranakan Ongole, sapi Bali dan Kerbau. Fakultas Peternakan Institut Pertanian Bogor.
- Swatland, H.J., 1984. *Strukture and Development of Meat Animals*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- Tulloh, N.M., 1978. Growth, Development, Body Composition, Breeding and Management. In: *A Course Manual in Beef Cattle Management and Economics*. Bowker, W.A.T., R.G. Dumsday, J.E. Frisch, R.A. Swan and N.M. Tulloh (Eds.). Australian Vice Chancellors Committee. Academy Press. Pty. Ltd, Brishbane, pp: 59-91.
- Yusnayeti, 1986. Hubungan antara luas udamaru dan tebal lemak punggung terhadap persentase karkas sapi. Fakultas Peternakan, Universitas Andalas.