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## THE ECONOMIC VALUE OF FEEDING NATURAL GRASS SILAGE AND CONCENTRATE TO FATTENED BEEF CATTLE

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### ABSTRACT

This study aims to determine the effect of natural grass silage and concentrate on the economic value of fattening male Bali cows. Twelve male Bali cows with initial body weight ranging from 132-149 kg were used in this study following a completely randomized design with 3 treatments and 4 replications. The animals were randomly allocated to one of the three dietary treatments ( $T_1$  = natural grass silage;  $T_2$  =  $T_1$  + concentrate 1000 grams/head/day;  $T_3$  =  $T_1$  + concentrate 2000 grams/head/day). Data obtained in this study were analyzed using SAS procedure of ANOVA. Average feed costs (IDR/day):  $T_1$  5188 ± 239.36,  $T_2$  7625 ± 520.42, and  $T_3$  7750 ± 645.50. Average body weight gain (kg/cow/day):  $T_1$  0.31 ± 0.03,  $T_2$  0.43 ± 0.04, and  $T_3$  0.52 ± 0.03. Average income (IDR/day):  $T_1$  10230 ± 967,250,  $T_2$  14190 ± 1484,837, and  $T_3$  17160 ± 1073,448. Average Income Over Feed Cost (IDR):  $T_1$  5042 ± 967,250,  $T_2$  6565 ± 1484,837, and  $T_3$  9410 ± 1073,448. The results of statistical analysis showed that the use of natural grass silage with and without concentrate at different levels had a significant effect on  $P < 0.01$  on the economic value of fattening Bali cattle. In conclusion, feeding natural grass silage and concentrate at different levels to fattened Bali cattle results in an increase of the economic values of fattened beef cattle.

### KEY WORDS

Male Bali cattle, natural grass silage, concentrate, economic value, income, feed cost.

Animal husbandry is a business sector that still plays an important role in national development, specifically in providing animal protein to fulfil the needs of the Indonesian people, as a source of income for the community and region, and providing job opportunity for new entrepreneurs. Beef cattle is still one of the livestock business sectors that plays an important role in the provision of national meat, from the beef cattle population in 2019 of 17,118 million, it is the second largest contributor to national production after beef chickens (Dirjen PKH Ministry of Agriculture, 2019) However, beef cattle business is still dominated by community farms with extensive patterns that still rely on forage, so that their productivity is still low both technically and economically (Sobang, 2005; Sobang et al. 2019; 2020; 2021; Fattah et al; 2019; Maranatha et al. 2019; 2020). Feed is a production input that greatly affects the productivity and income of beef cattle, especially in the fattening business.

Providing feed concentrate in the ration of cattle is an effort to increase both production and the economic value of the business. The economic calculation of feed utilization in beef cattle business is an important factor to provide efficiency and benefits for breeders. Economic calculation of beef cattle business is still limited to the income and does not take into account for the feed cost (Mayulu et al., 2009). Feed cost in cattle business, however, is about 70% of the total cost production (Prawirokusumo, 1990). The value of income over feed costs (IOFC) is the difference between income and feed costs, which determine the economic value of feed on the income of beef cattle farmers (Prawirokusumo, 1990). In addition, IOFC is a business concept of economic analysis as well as an early indicator of beef cattle fattening activities in the short term, due to feed costs range from 60-80% of total production costs (Astutik et al., 2002) and change of feed affects IOFC and farmers' income (Priyanti et al., 2012; Thanh and Suksombat, 2015). Therefore, this study aims to determine the economics value of feeding natural grass silage and concentrate to fattened Bali cattle.



## METHODS OF RESEARCH

The present study was conducted at Oeletsala Village, Taebenu District, Kupang Regency, East Nusa Tenggara Province, Indonesia for 3 months (June - September 2020).

Twelve male fattening Bali cows with initial body weight ranging from 132-149 kg were used in this study. The experimental design was a completely randomized design with 3 treatments and 4 replications. The study was divided to two periods with 2 weeks adjustment period followed by 10 weeks collection period. The animals were randomly allocated to one of the three dietary treatments as follows: T1 = natural grass silage (*ad libitum*); T2 = T1 + concentrate 1000 grams/head/day; T3 = T1 + concentrate 2000 grams/ head/day. The animals were fed natural grass silage as basal diet and concentrate consisted of 50% rice bran, 27% corn flour, 15% *Gliricidia sepium* leaf flour, 3% fish meal, 2% mineral mix, 2.5% urea, and 0.5% starbio (Table 1).

Table 1 – Chemical composition of the experimental diets

Diet	% DM	OM	CP	EE	CF	CHO	NFE	Energy	
								MJ/kg DM	Kcal/kg DM
Natural grass silage	82,13	80,62	12,88	2,02	21,32	65,72	44,4	15,18	3.614,39
Concentrate	81,36	80,36	18,71	3,54	17,44	58,11	40,67	15,8	3.760,83

The data used in this study consisted of primary data and secondary data, both qualitative and quantitative data. Primary data obtained through direct observation. Secondary data is obtained through records or historical records that have been compiled in archives (documents) obtained from agencies and various sources of literature related to this research.

The parameters measured in this study were:

**Feed Costs.** Feed costs cover 70-80% of total production costs. The cost of feed can be determined by the following formula:

$$\text{Feed Cost} = \text{Total ration consumption} \times \text{ration prices}$$

**Daily Body Weight Gain:**

$$PBBH = \frac{w_2 - w_1}{t_2 - t_1}$$

Where:  $w_1$  = Initial Body Weight (Kg);  $w_2$  = Final Body Weight (Kg);  $t_1$  = Initial Observation Time (Day);  $t_2$  = Final Observation Time (Day).

**Income.** Income is the difference between revenue and expenses. This parameter is calculated according to the instructions of Soekartawi (2003) with the formula:

$$\text{Income} = \text{Total Revenue} - \text{Total Expenses}$$

**Income Over Feed Cost (IOFC).** Income Over Feed Cost is an important variable that can economically describe the amount of profit obtained from each treatment. According to Bailey et al., (2009), IOFC can be calculated using the formula:

$$IOFC = BBHS (\text{IDR/Kg}) \times PBBH(\text{Kg}) - BPH (\text{IDR/Cow})$$

Where: IOFC = Income Over Feed Cost (IDR/Cow/Day); BBHS = Cattle Live Weight Cost (IDR/Kg); PBBH = Daily Weight Gain (Kg); BPH = Daily Feed Cost (IDR/Cow).

Data obtained from this study were statistically analysed using analysis of variance (ANOVA) (SAS Institute; Cody and Smith, 1997).

## RESULTS AND DISCUSSION

The voluntary feed intake and nutrient digestibility of fattened Bali cattle fed natural grass silage alone or with increasing level of concentrate is presented in Table 2. Bali cattle



fed natural grass silage and addition of concentrate had greater feed intake and nutrient digestibility compared to the animals fed only natural grass silage alone. As inclusion of concentrate increased, the total dry matter intake (DMI), total organic matter (OMI) intake, total crude protein (CP) intake and energy intake of Bali cattle increased with Bali cattle in the T<sub>3</sub> treatment having the higher intake. Similarly, increasing inclusion rate of concentrate in the diet of Bali cattle caused an increase in the dry matter digestibility (DMD), organic matter digestibility (OMD), crude protein digestibility (CPD) and energy digestibility (ED) compared with Bali cattle fed natural grass silage alone (T<sub>1</sub>) or natural grass silage and 1000 grams/h/d of concentrate (T<sub>2</sub>).

Table 2 – Mean nutrient intake and digestibility of fattening Bali cattle randomly allocated to one of three dietary treatments with increasing inclusion rates of concentrate

Parameters	Treatment		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Total DMI (g/h/d)	3.577,90	4.143,40	4.830,80
Total OMI (g/h/d)	3.202,84	3.452,58	3.986,68
Total CP intake (g/h/d)	512,91	704,82	880,32
Total Energy intake (Kcal/h/d)	10.289,04	13.875,99	16.804,91
Nutrient digestibility (%)			
DMD (%)	68,36	77,84	78,95
OMD (%)	63,20	76,40	76,65
CPD (%)	70,27	78,46	79,60
ED (%)	67,63	75,14	76,20

*Effect of Treatment on Cost of Cow Feed.* The cost of feed is the total cost allocated by the farmer for Bali cattle feed in a certain period of time. Most of the feed expense is used for the purchase of concentrate. This is because forage is obtained by grazing so that feed costs can be minimized. Otampi et al., (2017) stated that the cost of feed is the biggest cost in beef cattle business.

Table 3 shows that the highest cost of feed was obtained by Bali cows that received T<sub>3</sub> treatment (IDR 7,750), followed by T<sub>2</sub> (IDR 7,625), and the lowest was T<sub>1</sub> (IDR 5,188). For more details about the cost of feed for fattening male Bali cattle, see the following bar chart model:

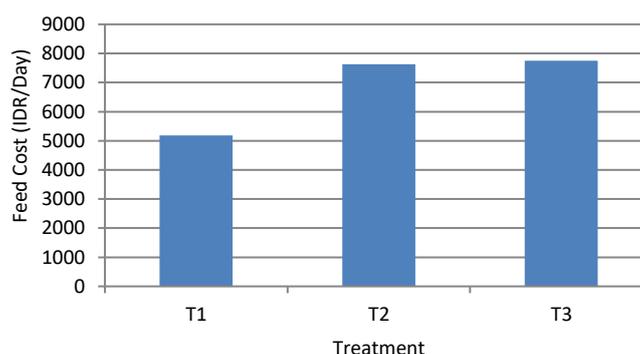


Figure 1 – Feed Cost

The results of the analysis of variety showed that silage application of natural grass with and without concentrate had a significant ( $P < 0.01$ ) effect on feed costs. The low cost of feed in the T<sub>1</sub> treatment was due to the fact that the treatment only used natural grass silage without using concentrate. If seen in Table 4, the cost of feed has increased with the increase in the level of concentrate in the ration. This is because the concentrate is a feed ingredient with a high concentration of nutrients so that the price is expensive. Where in this study the ingredients for the concentrate consist of a mixture of rice bran, corn flour, gamal leaf flour, fish meal, mineral mix, urea, and starbio. This is why the addition of concentrate



feed in the ration can increase expenses for feed costs. Even though the cost of feed for  $T_2$  and  $T_3$  treatments is high, giving the concentrate will result in high body weight gain and greater benefits than feed costs.

*Effect of Treatment on Daily Weight Gain of Cows.* Weight gain is one of the criteria used to measure growth. The body weight gain is calculated based on the difference from the final body weight weighing minus the initial body weight. Cattle need adequate nutritional intake to increase their body weight during growth. One of them is by increasing consumption.

Table 3 – Mean  $\pm$  SD feed costs, daily weight gain, income, and income over feed cost (IOFC) of fattened Bali cattle fed randomly allocated to one of three dietary treatments with increasing inclusion rates of concentrate

Parameters	Treatment			P-value
	T1 $\pm$ SD	T2 $\pm$ SD	T3 $\pm$ SD	
Feed Cost (IDR/Day)	5188 $\pm$ 239.36	7625 $\pm$ 520.42	7750 $\pm$ 645.50	6.66481E-05
Body Weight Gain (Kg/Cow/Day)	0.31 $\pm$ 0.03	0.43 $\pm$ 0.04	0.52 $\pm$ 0.03	6.54719E-05
Income (IDR/Day)	10230 $\pm$ 967.250	14190 $\pm$ 1484.837	17160 $\pm$ 1073.448	6.54719E-05
Income Over Feed Cost/IOFC (IDR)	5042 $\pm$ 967.250	6565 $\pm$ 1484.837	9410 $\pm$ 1073.448	0.003943957

Note: *tn* has significant effect ( $P < 0.01$ ).

Table 3 shows that the highest daily body weight gain was obtained by Bali cows that received  $T_3$  (0.52) treatment followed by  $T_2$  (0.43) and the lowest was  $T_1$  (0.31). For more details about the weight gain of fattening male Bali cows, it can be seen in the following bar chart model:

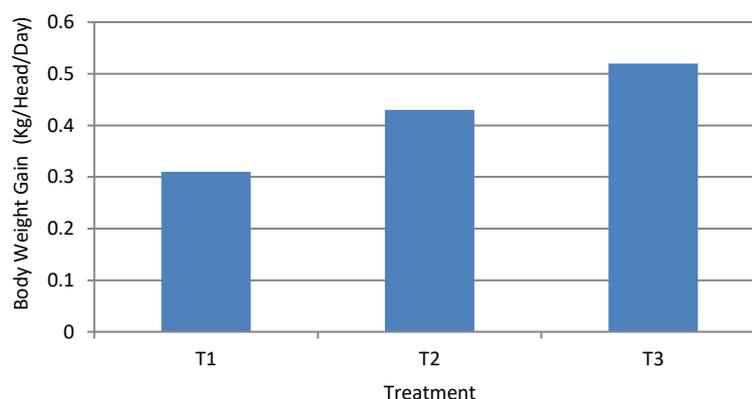


Figure 2 – Body Weight Gain

The results of the analysis of variance showed that the provision of natural grass silage and concentrate had a significant effect ( $P < 0.01$ ) on the weight gain of fattening cows. The increase in body weight in the  $T_2$  and  $T_3$  treatments was due to additional feed in the form of concentrates of 1000 grams and 2000 grams, respectively. This is in accordance with the opinion of Nurwahidah et al., (2016) which states that the weight gain of cows will be higher with a shorter fattening time if the cows are given rations consisting of forage and concentrate. Furthermore, Astuti et al., (2015) stated that the weight gain of livestock will be greater if the provision of forage is accompanied by the provision of concentrate.

The difference in average body weight gain in each treatment has something to do with the amount of consumption and digestibility of the ration, can be seen in Tables 2 and 3. The higher the ration consumption the better the resulting body weight gain, because livestock body weight is always directly proportional to the ration consumption. This is in accordance with the opinion of Imran, et al., (2012) which states that the performance of cows is strongly influenced by the amount and quality of feed consumed, the level of ration consumption is closely related to growth, the more rations consumed the higher the body weight gain is



produced. Tillman et al. (1998) added that the higher the dry matter consumption, the more food substances consumed will be used for basic life growth and production so that it can have an effect on increasing body weight of livestock. Furthermore, Purwanti et al., (2014) stated that one of the factors that influence livestock body weight gain is the quality of feed in terms of nutrition.

*Effect of Treatment on Cattle Income.* Income shows the success of a business. The higher the income indicates that the business is more successful, the income is obtained from the reduction between revenue and costs. The term income is intended for people's livestock businesses, namely by using the cash flow method, which is an analysis method that only takes into account the costs that are actually spent (cash). According to Darmawi (2011) Net farm income or net farm income is the difference between total farm expenditure and gross farm income. Likewise, farm net cash flow or cash income is the difference between livestock business cash expenses and livestock business cash receipts.

Table 3 shows that the highest income was obtained by Bali cows receiving  $T_3$  treatment (IDR 17160,-), followed by  $T_2$  (IDR 14.190), and the lowest was  $T_1$  (IDR 10.230). For more details on the income of fattening Bali bulls, see the following bar chart model:

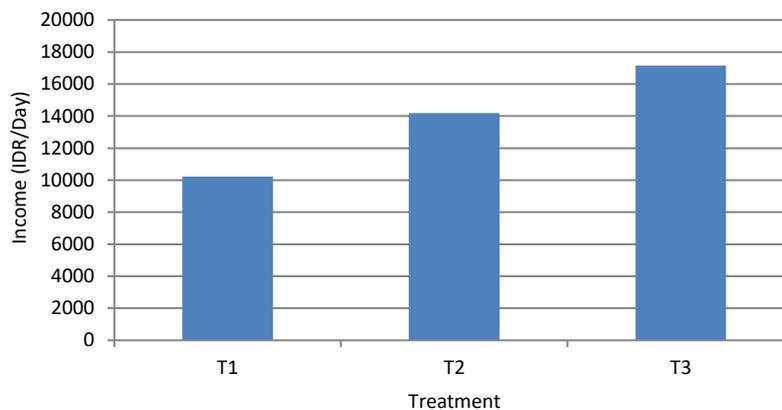


Figure 3 – Income

This difference was due to differences in the dry matter digestibility of the ration where in this study the lowest dry matter digestibility (BK) was obtained by  $T_1$  treatment (68.36%), followed by  $T_2$  treatment (77.84%), and the highest was  $T_3$  treatment (78.95%), can be seen in Table 3. The high income of  $T_2$  and  $T_3$  treatments was caused by the addition of concentrates of 1000 grams and 2000 grams respectively in the rations. This causes cows that receive  $T_2$  and  $T_3$  treatment to have a higher body weight than  $T_1$  treatment which results in higher income. This is in accordance with the opinion of Purwanti et al., (2014) which states that one of the factors that influence livestock body weight gain is the quality of feed in terms of nutrition. Furthermore, Safitri et al., (2019) stated that the increasing daily body weight growth of livestock will also affect the income to be received.

The results of the analysis of variance showed that the provision of natural grass silage with and without concentrate had a significant ( $P < 0.01$ ) effect on the income of fattening Bali cows. This indicates that silage application of natural grass with and without concentrate at different levels produces different income. This is in accordance with the opinion of Triana et al., (2007) which states that the difference in income obtained from each treatment is due to the size of the different income from each treatment seen from the amount of production produced and the price of the product.

*Effect of Treatment on Cattle Income Over Feed Cost.* Income over feed cost (IOFC) is the difference between revenue and feed costs (Mayulu et al., 2009). Revenue is the multiplication of livestock production or Daily Weight Gain (PBBH) with the selling price, while the cost of feed is the cost incurred to produce livestock body weight gain (Prasetyo, 2013). IOFC is a concept to determine business analysis as an early indicator of beef cattle



fattening in the short term (Muyasaroh et al., 2015). IOFC calculations are carried out to determine the economic value of feed on beef cattle income. IOFC is carried out because the cost of feed ranges from 60-80% of the total product cost (Astutik et al., 2002).

Table 4 shows the IOFC value of each treatment given to fattening Bali cattle. From Table 5, it is known that the highest IOFC value was achieved by T<sub>3</sub> treatment (IDR 9.410), followed by T<sub>2</sub> (IDR 6.565), and the lowest was T<sub>1</sub> (IDR 5.042). IOFC values were sought to determine which rations were effective at increasing livestock productivity at the lowest price. For more details about the IOFC value of fattening male Bali cattle, see the following bar chart model:

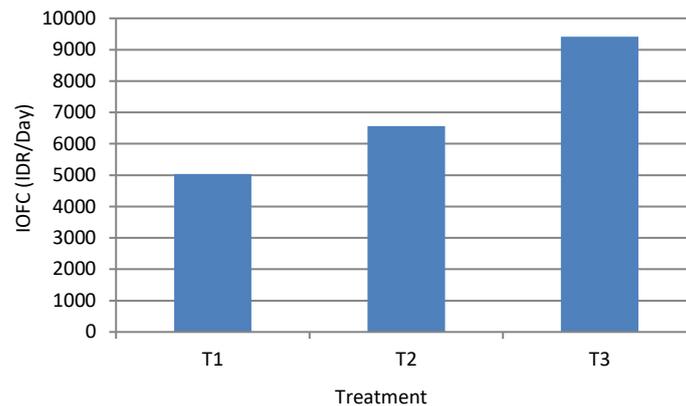


Figure 4 – IOFC

The results of the analysis of variance showed that silage application of natural grass with and without concentrate had a significant ( $P < 0.01$ ) effect on the IOFC value. This causes the resulting IOFC value to be different in each treatment. The numerical IOFC value increases with the level of addition of concentrate in the feed which causes the price of the family to increase. Furthermore, Zakiatulyaqin et al., (2017) stated that IOFC is calculated because  $\geq 70\%$  of production costs come from feed so it can be seen whether the ration used is economic enough or not. The concentrate feed used in this study is a mixture of rice bran, corn flour, gamal leaf flour, fish meal, mineral mix, urea, and starbio. In this study, the higher the cost of feed, the better the quality of the ration and if the quality of the ration was good, the body weight gain of the livestock would also increase. This is what causes the Income Over Feed Cost in this study to increase. This is in accordance with the opinion of Ardiansyah et al (2013) which states that IOFC is strongly influenced by ration consumption, final weight, ration price and selling price.

## CONCLUSION

Feeding natural grass silage and concentrate at different levels to fattened Bali cattle results in an increase of the economic values of cattle business.

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