Optimizing Performance of Madura Cattle in Smallholder Farms in Bangkalan Madura

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Abstract. Bangkalan Regency is located on Madura Island, which is one of the districts that has a population of 1,047,783 Madura cattle or around 21.7% and 5.99% of the national cattle population. Madura cattle are evenly distributed on Madura Island. Forages that are often used as feed are field grass and agricultural waste. In Vivo research uses concentrate to support the growth of beef cattle in Bangkalan Regency. The concentrate feed ingredients used consist of cassava waste, palm kernel cake, copra meal and tofu waste. The treatment given to Madura cattle consisted of four treatments.The feed treatments consisted of T1 (cassava waste 40% + copra meal 28% + palm kernel cake 30% + tofu waste 2%), T2 (cassava waste 42% + copra meal 36% + palm kernel cake 19% + tofu waste 3%), T3 (cassava waste 38% + copra meal 31% + palm kernel cake 27% + tofu waste 4%), and T4 (cassava waste 41% + copra meal 33% + palm kernel cake 21% + tofu waste 5%). Data on nutrient content and nutrients feed intake were analyzed using a randomized block design (RBD). The results show that local feed ingredients in Bangkalan Regency can influence nutrient content and nutrients feed intake.

1 Introduction

Bangkalan Regency has an area of 1,260 km2, this area has quite barren land, so there is a need for a strategy in developing local feed. Apart from that, there is alternative animal feed during the dry season, such as making hay, so with this, Bangkalan Regency has the potential to develop the beef cattle business. The productivity of beef cattle in Tanah Merah is still low, so it cannot meet the demand for meat in this area. In 2019, the population of Madurese cattle was 1,004,226 in Bangkalan, Sampang, Pamekasan and Sumenep Regencies [5] or around 5.8% of the national cattle population. Based on data from [1], the Madura cattle population in 2020 reached 1,047,783 heads or around 21.7% and 5.99% of the national cattle population.

Cattle rearing in Tanah Merah is generally still traditional with limited capital, technology and human resources, and is carried out on a small scale to meet household needs. In general, farmers raise livestock part-time and generally for breeding or very little for fattening. In an effort to meet the need for meat, there is an increase in cattle productivity through fattening patterns by providing additional feed such as concentrate. Apart from that, efforts are being

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made to improve feed compost with high nutritional value using ingredients from local resources.

Feed ingredients for cows consist of forage, a source of fiber, energy and protein. Feed ingredients as a source of fiber include grasses, agricultural waste (peanut straw, rice straw, etc). Sources of energy for cattle feed include rice bran, cassava, corn, molasses, etc., while protein sources of feed ingredients can be obtained from fish meal, tofu waste, palm kernel cake, etc. Nutrient requirements for livestock are very dependent on physiological status, gender, and the suitability between consumption and body weight of livestock. For example, the amount of feed in dry matter required by heifers will be different from that of fattening cows even though the initial body weight of both cows is the same. The aim of this research is to determine the potential of local feed ingredients to improve the performance of Madura cattle.

2 Materials and Method

2.1 Location and Time

This research was conducted in Dumajah Village, Tanah Merah District, Bangkalan Regency and the Animal Nutrition and Forage Laboratory, Faculty of Animal Husbandry, Universitas of Brawijaya.

2.2 Research Materials

The livestock used were 20 male Madura and Madrasin cattle aged 1.5-2.5 years with an initial weight of 250-300 kg. The feed used in this research was concentrate (cassava waste, copra meal, palm kernel cake, and tofu waste) and forage. The equipment used is a traditional pen, feed and water troughs, feed scales, brooms, hoes and plastic.

2.3 Research Methods

The research method used in this research is an in vivo experimental method which consists of four treatments with five block. The concentrate feed treatment in this study was as follows: of T1 (cassava waste 40% + copra meal 28% + palm kernel cake 30% + tofu waste 2%), T2 (cassava waste 42% + copra meal 36% + palm kernel cake 19% + tofu waste 3%), T3 (cassava waste 38% + copra meal 31% + palm kernel cake 27% + tofu waste 4%), and T4 (cassava waste 41% + copra meal 33% + palm kernel cake 21% + tofu waste 5%).

2.4 Statistical Analysis

The data obtained were tabulated using Microsoft Excel then analyzed using analysis of variance (ANOVA) with a Randomized Block Design (RBD) to evaluate the effect of the treatments on observed indicators. The mathematical model used, according to [11], is as follows:

$$Yij = \mu + ti + \beta j + eij \quad (1)$$

Where Yij: value of observation on treatment-i and replication-j, μ: general mean, ti: effect of treatment-i, ßj:effect of group-j, eij: experimental error, i: treatment (0,1,2,3,4,5,6), and j group (1,2,3). If the data on the ANOVA showed differences in treatments, then it was continued with Duncan's Multiple Range Test.

3 Results and Discussion

3.1 Nutrient Content of Feed Ingredients

The nutritional content of feed ingredients is influenced by the type of feed, variety, harvest time, and pretreatment applied before feeding [3]. The nutrient content of feed ingredients used in the research based on the results of proximate analysis can be seen in table 1.

Table 1. Nutrient content

Nutrients (%DM)	Field Grass	Concentrate			
		T1	T2	T3	T4
DM	88.46	77.84	73.55	69.95	65.91
OM	89.45	88.58	87.81	88.67	88.23
CP	4.98	12.01	12.26	12.56	12.41
EE	0.32	3.66	3.00	3.69	3.43
CF	34.87	18.50	18.40	18.67	18.57

Based on data from analysis of the nutrient content of feed ingredients, the nutrient value of feed for beef cattle refers to the crude protein (CP) and crude fiber (CF) content. The CP content in feed is a reference for feed quality. The results of feed nutrition analysis on concentrates have a fairly good CP content, namely T1 of 12.01%; T2 of 12.26%; T3 of 12.56%, and T4 of 12.41%. This is in accordance with a previous statement [4] that the crude protein requirement for cattle is 12-14% of the dry matter requirement. Apart from that, the crude fiber content in the concentrate is quite low, namely T1 of 18.50%; T2 of 18.40%; T3 of 18.67%; and T4 of 18.57%. Based on the Indonesian National Standard (SNI), the crude fiber content of cattle concentrate feed ranges from 30-35%,.

The crude protein value in field grass is 4.98%. The low protein is due to the botanical composition of the forage being mostly grass, a small portion of non-fodder forage, and the absence of legumes. Research by [12] stated that pasture conditions will have an impact on low livestock productivity because the minimum CP requirement for ruminant livestock of 8% is not fulfilled. The crude protein content in field grass can be influenced by erratic seasonal changes. This is supported by research by [7] that the protein content of natural grass in Timor will increase to 8-10% in the rainy season, where the cell wall content of natural grass (cellulose, hemicellulose and lignin) is 65% and will increase to 85% in the rainy season drought.

This reduction in nutrient content in forage can be caused by the type of forage, harvesting process, type of contaminant, growing location, type of care, and so on. The water content in field grass is around 77.39%. The DM value of field grass is 88.46%, indicating that the dry matter content is high compared to research by Nawangsari and Hendrati (2021) where the DM content of field grass is 27.99%. Research conducted by [10] shows that the dry matter content in field grass samples in animal feed Paspalum conjugatum shows that the dry matter content ranges from 22.99- 44.13%.

The ash content of field grass from the research results was 89.45%. This ash content is an inorganic material in the feed obtained which is influenced by contamination from the soil where it is grown [8]. The high ash content can be seen from the high mineral content of the grass needed by livestock and the high content of contaminants in the grass which can be in the form of soil, sticky clay and sand.

The crude fat content of field grass is 0.32%. According to [6] crude fat in savanna grasslands was 1.14%, so in this study the LK content in field grasses was quite low. Research conducted by [10] various field grasses have a higher CF content in kusa grass compared to badot grass ($P<0.05$) but not significantly different compared to the other seven species.

3.2 Consumption DM, DO, and CP

The results of statistical analysis showed that treatment had a significant effect (P<0.05) on consumption of DM, OM and CP. This shows that the level of palatability of all treated feeds is the same. The ratio of forage and concentrate is 40:60. The concentrate raw materials consist of cassava waste, copra cake, palm kernel cake and tofu waste. The highest DM consumption value in treatment T2 was 84.71 g/kgBW$^{0.75}$/day and the lowest DM consumption value in treatment T4 was 80.87% 84.71 g/kgBW$^{0.75}$/day. Feed consumption depends on the CP content of the feed ingredients, and feed palatability depends on the texture, color, taste, smell and form of the feed provided [2]. A high CP content means that the quality of the feed is quite good and can be digested by the animal's body optimally.

Table 2. Consumption of DM, OM, and CP

Consumption of Nutrients (g/kgBW$^{0.75}$/day)	Treatments			
	TI	T2	T3	T4
DM	83.60±7.69^{a}	84.71±2.34^{a}	84.25±2.20^{a}	80.87±4.40^{b}
OM	82.31±5.13^{a}	76.96±4.63^{b}	81.13±3.33^{a}	73.85±4.05^{c}
CP	6.57 ± 0.72^{a}	5.91±0.47^{c}	6.25±0.35^{b}	5.59±0.29^{c}

The OM consumption value has a significant effect (P<0.05), OM consumption will increase as the supplementation level increases. Organic matter is part of the dry matter, so if DM consumption increases, OM consumption will also increase. The highest OM consumption in treatment T1 was 82.31 g/kgBW$^{0.75}$/day followed by T3 (81.13 g/kgBW$^{0.75}$/day), T2 (76.96 g/kgBW$^{0.75}$/day), and T4 (73.85 g/kgBW$^{0.75}$/day). Increased feed consumption can be influenced by the provision of increasing amounts of forage which can increase the amount of feed consumed by livestock.

4 Conclusion

Based on the result of this study, it can be concluded that the use of concentrate improved DM, OM and CP consumptions and their effect on feed consumption was highest (OMI and CPI) in cattle fed field grass supplemented with concentrate of T1.

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