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Income Over Feed Cost and Efficiency Protein Ratio (PER) BoerPE Goats Through Different Content of Crude Protein Levels

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ABSTRAK

Penerapan teknologi pakan yang saat ini terus diterapkan dan mutlak diperlukan dalam rangka meningkatkan efisiensi produksi, terutama pada kambing boePE. Tujuan penelitian ini adalah untuk menganalisis pengaruh tingkat kandungan protein pada pakan lengkap terhadap kinerja produksi, nilai ekonomi dan rasio efisiensi protein. Materi yang digunakan dalam penelitian ini adalah 9 ekor bangsa kambing BoerPE berumur 8 bulan–13 bulan dengan bobot badan 20,8 kg–34,6 kg dan dibagi dalam kelompok kecil rataan bobot badan =21,8 kg sedang = 28,4 kg dan besar 31,7 kg, bahan pakan yang digunakan adalah rumput gajah, kulit kopi, jagung kuning giling, onggok, tetes, bekatul, roti kering, bungkil kedelai, bungkil kelapa dan *pollard*. Penelitian ini menggunakan metode percobaan rancangan acak kelompok (RAK) dengan 3 perlakuan dan 3 kelompok berdasarkan bobot badan yang diberikan pakan komplit dengan tingkat kandungan PK yang berbeda yaitu P1= PK 11%, P2= PK 13% dan P3= PK 15%. Variabel yang diamati dalam penelitian ini adalah konsumsi pakan, pertambahan bobot badan, konversi pakan, rasio protein efisiensi, dan analisis ekonomi. Data yang diperoleh ditabulasi menggunakan uji ANOVA dengan uji lanjut Uji Duncan. Hasil penelitian menunjukan bahwa tingkat kandungan PK dalam pakan komplit berpengaruh nyata (p<0,01) terhadap konsumsi pakan, pertambahan bobot badan dan konversi pakan serta *Income Over Feed Cost* (IOFC). Sedangkan tidak berpengaruh nyata (p<0,05) terhadap *Protein Efficiency Ratio* (PER). Hasil tersebut dapat disimpulkan bahwa protein kasar dalam pakan juga menunjukkan kualitas pakan kambing BoePE dimana efisiensi rasio protein menunjukkan peningkatan dan dengan perlakuan protein kasar pada taraf 15% memberikan nilai keuntungan yang baik.

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ABSTRACT

The application of feed technology is currently being implemented and is necessary to improve production efficiency, especially for BoerPE goats. The purpose of this study was to analyze the effect of protein content in complete feed on production performance, economic value, and protein efficiency ratio. The material used in this study were 9 BoerPE goats aged 8 months – 13 months with a body weight of 20.8 kg – 34.6 kg and divided into small groups with average body weight = 21.8 kg, medium = 28.4 kg. Large group 31 7 kg, the feed ingredients used are elephant grass, coffee husk, yellow milled corn, cassava, drops, rice bran, dry bread, soybean meal, coconut cake, and pollard. This study used a randomized block design (RAK) experimental method with 3 treatments and 3 groups based on body weight given complete feed with different levels of CP content, namely T1 = CP 11%, T2 =CP 13%, and T3 =CP 15%. The variables observed in this study were feed consumption, body weight gain, feed conversion, protein efficiency ratio, and economic analysis. Data were tabulated using ANOVA test with Duncan's test if the results were significant differences. The results showed that the level of CP content in the complete feed had a significant effect (P<0.01) on feed consumption, body weight gain, feed conversion, and Income Over Feed Cost (IOFC). While no significant effect (<0.05) on Protein Efficiency Ratio (PER). Results concluded that crude protein in the feed also shows the quality of BoerPE goat feed where the efficiency of the protein ratio shows an increase and with crude protein treatment at a level of 1an provide a good profit value.

INTRODUCTION

The era of the industrial revolution 4.0 affects various essential sectors, including the l, livestock sector, one of which is rapidly developing its technology to increase the productivity of various livestock commodities. Modern production equipment helps the animal feed business innovate to develop complete feeds and feed additives that increase livestock productivity and lower mortality rates (Mardhotillah *et al.*, 2022). The application of feed technology which is currently being applied and researched is necessary to improve production efficiency, especially in BoerPE goats where the goat is a commodity resulting from a cross between a Boer goat and an Ettawa goat as a new dual-purpose commodity. Feed technology that is easy to apply will be able to build a potential and profitable BoerPE goat farming business.

Goats are an important part of the farming system for some farmers in Indonesia, even in some Asian countries, and are widespread in various agro-eco-system conditions, from lowland areas on the coast to highlands in the mountains (Sholikha & Dewi, 2020). The breeds of goats that are kept for meat use are Boer, PE, Kacang, Boerka, Boerawa, BoerPE, and Jawa Randu goats.

Goats are also one of the livestock that is in great demand by the community/breeders to be just a hobby or as a main source of livelihood. Raising goats can be done by people from the upper middle to lower classes where the maintenance method is not too difficult and market access is spread everywhere. The level of consumption of goat meat in Indonesia increases with the growth and development of products as well as increasing public knowledge about consuming goat meat. The level of consumption of goat meat in Indonesia reached 0.64 kg/per capita in

2006; 0.50 kg per capita in 2008; and 0.55 kg/per capita in 2009 (Krisnan *et al*., 2017).

Goat farming in Indonesia is increasing day by day accompanied by an increase in the need for goat meat. Public interest in consuming goat meat is quite high because besides the price is affordable for small people. Meanwhile, according to the statistical data of DISNAK JATIM (2020), the distribution of the goat population in East Java reaches 3,645,822 heads. Therefore, the government must be able to meet the needs of goat meat in the community whose demand is increasing day by day without compromising the quality of the meat.

A good type of beef goat is if the growth is fast and the goat looks fat. One good type of beef goat is the BoerPE goat, which is a goat that is the result of a cross between a Boer goat from South Africa and an Etawa Peranakan goat (Humaidah *et al*., 2020), the main forage of goats is forage which is a ruminant animal and the types of forage that are commonly consumed are elephant grass, odot grass, and legumes, also usually add concentrate as complementary feed. To minimize time and effort in raising livestock, usually Peterrank provides a type of feed in the form of complete feed so that farmers do not need to provide more forage (Manehat *et al*., 2020).

Feeding in the maintenance of goats if only forage feeds are still not fulfilled, to meet livestock nutrition it is necessary to provide additional feed that can meet nutritional needs that cannot be met by forage feed alone, namely with additional feed in the form of concentrate. The concentrate is a feed ingredient that is used with other feed ingredients to improve the nutritional harmony of the whole feed and is intended to be combined and mixed as a supplement (complementary) or complementary feed (Kharisma *et al*., 2019).

Giving the right feed can give maximum results can be seen from several indicators, namely the level of feed consumption, the rate of feed conversion, and the growth of body weight in livestock. The higher consumption must be balanced with high body weight, and able to convert with the smallest value where the higher the feed conversion value, the lower the conversion, and the lower the conversion value, the better the conversion.

Feed conversion is a comparison or ratio between the amount of feed consumed by livestock and the products produced by the livestock (Mardhotillah *et al*., 2020). Feed conversion is the amount of feed consumed to get an increase in unit live weight. Therefore, it is necessary to conduct research related to concentrate supplementation in feed to determine whether the feed given can increase the quality of livestock by looking at the amount of feed consumed, body weight gain, and feed conversion in BoerPE goats.

The purpose of this study was to analyze the effect of the level of protein content in complete feed on production performance, economic value, and protein efficiency ratio.

METHOD

The material used in this study were 9 BoerPE goats aged 8 months – 13 months with a body weight of 20.8 kg – 34.6 kg and divided into small groups with average body weight =

21.8 kg, medium = 28.4 kg, and large group 31.7 kg, the feed ingredients used are elephant grass, coffee husk, yellow milled corn, cassava, drops, rice bran, dry bread, soybean meal, coconut cake, and pollard.

Table 1. Feed composition and nutrient compound of boerpe goat

Ingredients	%Feedstuff	Treatment		
		T1	T2	T3
King Grass	35	25,914	22,103	18,284
Coffee Leather	15	11,106	9,4725	7,836
Corn	10	7,404	6,315	5,224
Pile	15	11,106	9,4725	7,836
	5	3,702	3,1575	2,612
Rice Barn	10	7,404	6,315	5,224
Dried Bread	10	7,404	6,315	5,224
	100			
Soybenmill	28	7,266	10,315	13,377
Coconutmill	32	8,304	11,789	15,282
Pollard	40	10,38	14,736	19,112
TOTAL	**100**	**100**	**100**	**100**
Dry Matter* (%)		80,31	81,26	82,22
Crude Protein* (%)		11,00	13,00	15,00
Ether Extract* (%)		4,10	4,25	4,40
Crude Fiber* (%)		17,44	15,88	14,31
Total Digestible Nutrient* (%)		71,89	73,20	74,50

*) Analysis Results by Animal Nutrition and Feed Laboratory Faculty of Animal Husbandry University of Islam Malang

This study used a randomized block design, experimental method with 3 treatments and 3 groups based on body weight given complete feed with different levels of Crude Protein (CP) content, as follows: T1 = Crude Protein 11%, T2 = Crude Protein 13%, and T3 = Crude Protein 15%.

The variables observed in this study were feed consumption, body weight gain, feed conversion, protein efficiency ratio, and economic analysis. Data Collection Procedure This research was carried out in 4 stages with the experimental method. The stages in this research are as follows:

a. The first stage is the preparation of research tools and materials and the manufacture of complete feeds. The material used is a complete feed ration. The equipment used is a BoerPE goat, copper machine, mixer, scales, thermometer, and postal cage.
b. The second stage is the maintenance process. BoerPE goats at each age were weighed at the beginning of the rearing before giving the feed treatment. Weighing of livestock was carried out per individual at the beginning of the study, then weighing was carried out every 2 weeks to obtain daily body weight gain (PBBH). Consumption of both forage and forage feed was calculated once every day during the observation. The amount of feed consumption is known by weighing and recording the feed given, as well as the rest of the feed given every day.

c. The third stage is the measurement of performance variables of BoerPE goat production including feed consumption, body weight gain, and feed efficiency. The data observed in this study included feed consumption, daily body weight gain, feed efficiency and economic analysis, and protein efficiency ratios.

Fresh feed consumption was calculated by subtracting the amount of feed given from the rest of the feed. Previously, the feed was weighed first while the rest of the feed was weighed the next morning.

DM consumption of feed was calculated by multiplying the consumption of fresh feed by the percentage of DM feed, while CP consumption was calculated by multiplying the consumption of DM by the CP content of the feed.

Another parameter that is determined is the ratio of income to production costs (income over feed cost/IOFC). Where the price of elephant grass based on the dry matter is IDR. 2,000 per kg, while the price of concentrates T1, T2, and T3 is IDR. 4,100; IDR. 4,600; and IDR. 5,100 per kg with a goat selling price of IDR. 80,000 per kg.

Data Collection and Data Analysis Techniques The data obtained will be collected and tabulated and then analyzed using analysis of variance (ANOVA) to determine the effect of treatment on the variables tested. If an effect is found, it is continued with Duncan's New Multiple Range Test (DMRT) to determine the difference in treatment.

RESULTS AND DISCUSSION

There was a significant decrease in TPI (Total Protein Intake) (p<0.001) and an increase (p<0.001) in PER as a result of a decrease in the CP content of the food (Table 2).

Table 2. Performance, protein efficiency ratio, and economic value of boerpe goat

Variable	Treatment			SD
	T1	T2	T3	
Feed Consumption (g/head)	1111.96	1145.18	1156.44	13.3
Body Weight Gain (g/ekor)	96.55^{c}	114.79^{b}	132.22^{a}	10.29
Feed Conversion	11.54^{bc}	9.99^{b}	8.77^{a}	0.80
Protein Efficiency Ratio (%)	2.27	2.31	2.38	0.02
IOFC (IDR)	435.90^{c}	665.52^{b}	917.90^{a}	1391.93
Daily Weight Gain (g/head)	289.70^{c}	344.40^{b}	396.60^{a}	30.82

^{a,b,c} Different superscripts on the same line showed significant differences (p<0.05)

The same amount of feed was consumed by poultry in all feeds, hence the drop in TPI could only be explained by a drop in CP levels. Even though TPI was reduced as a result of lower dietary CP levels, weight gain remained the same across all diets since there was no discernible association between the two. As a result, in this experiment, the 20% dietary CP level produced the highest possible PER. Although the birds fed the low protein diet

consumed less protein, there was no appreciable difference in the birds' weight gain due to the low protein diet's AA profile. Inferring that the PU efficiency was higher with the low CP diet, the PER increased with the low protein diet. The TPI and PER statistics are in line with the research of Bush. Bush *et al.* (2014), who found a linear relationship between TPI and PER with decreasing dietary CP content.

The profitability of the cattle fattening industry depends not only on good production results but also on economic analysis as measured by the Income Over Feed Cost ratio (IOFC). Body weight gain during fattening, feed consumption, and feed pricing are variables that affect how the IOFC is determined (Kentjonowaty *et al*., 2023). Large body weight gain does not always equate to high profits, but the combination of cheap feed costs, good growth, and feed efficiency will result in the highest possible earnings (Bush *et al*., 2016). To determine if the ration being used is cost-effective or not, IOFC is computed because feed accounts for more than 70% of production costs. Revenue is the money that manufacturers receive when they sell their products. Additionally, it is noted that income is the sum of revenues and fewer expenses. (Yogyantara *et al*., 2014). The results of the analysis of the diversity of income over feed cost (IOFC) showed that there was a very significant difference ($P < 0.01$) in income over feed cost (IOFC). In treatment T3 had the highest IOFC value because T3 resulted in high body weight gain of sheep and low feed conversion value, so the cost was more efficient. And the T1 treatment produced the lowest IOFC due to the low body weight gain of sheep with high conversion value. According to Sudarwati & Susilawati (2013), IOFC can be calculated through the acceptance approach of the value of the body weight gain of livestock with the ration costs incurred. Feeding complete feed with different protein levels in BoerPE goats gave a significant difference in the IOFC value (Table 1). The IOFC values of treatment T1 (IDR. 435,901 per head), T2 (IDR. 665,520 per head), and T3 (IDR. 917,897 per head) were obtained. The higher the IOFC value, the better the BoerPE goat business profit. The T3 treatment ratio had the highest IOFC value of IDR. 917,897 per head. Thus, the T3 treatment ration (elephant grass and complete feed containing 15% crude protein) had the greatest profit value. These results can be used as the basis for selecting the T1, T2, and T3 rations to be implemented in the BoerPE crossbreed goat commodity.

Other data measurements in this study showed that other possibilities affect the relative growth rate through feed efficiency and protein digestibility. This can be seen from the T3 treatment which has a high PER value compared to other treatments. Feeding with energy according to the needs of BoerPE goats can increase the efficiency of feed utilization and PER because feed can be utilized and digested by the body properly and protein is utilized optimally for muscle tissue growth (Kentjonowaty *et al*., 2021). The T3 feed treatment resulted in an optimal PER value of 2.38 compared to other treatments. This is

presumably because the content of protein source material, namely soybean meal in T3 feed can be utilized optimally. The addition of soybean meal combined with coconut meal widely applied to feed can cause a decrease in feed digestibility because the antinutrient content of mannan in coconut cake and antinutrient phosphoric acid in soybean meal are factors that inhibit digestibility. One of the crude fibers in coconut cake is mannan, which is a complex carbohydrate that must be hydrolyzed into simple sugars for easy digestion. Most of the carbohydrates found in oil palm cake are polysaccharides that are difficult to digest (Rahmanda *et al*., 2020).

The protein content of the ration with the composition of soybean meal did not have much effect on changes in the protein content of the ration. The average PER did not show a significant difference between treatments, as well as feed consumption.

Astuti *et al*. (2015) explained that for the synthesis of body tissue protein, in addition to the crude protein level, the adequacy of amino acids, especially essential amino acids, must be met in the ratio. Sesame meal has the limiting amino acid lysine while soybean meal has the limiting amino acid methionine. It is suspected that soybean meal and coconut meal cause a supplementary effect between amino acids that are deficient to provide an equivalent protein efficiency that can be converted into meat.

CONCLUSION

It was concluded that the higher crude protein (CP) content in the complete feed gave a positive value to the production performance of BoerPE goats as indicated by the growth in body weight and the increased feed conversion ratio value. Crude protein in the feed also shows the quality of feed for BoerPE goats where the efficiency of protein ratios shows an increase and crude protein treatment at the level of 15% can provide good profit values.

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CONTRIBUTION STATEMENT

In this article, Ach Bagus Adhiluhung Mardhotillah acts as the main contributor and correspondence contributor, while Inggit Kentjonowaty acts as a member contributor.

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