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Effect of using complete feed containing protected soybean groat on production performance and feed efficiency of fattening Thin-Tailed Sheep

Pengaruh penggunaan complete feed terhadap penampilan produksi dan efisiensi pakan penggemukan Domba Ekor Tipis

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ABSTRACT

This study aimed to determine the effect of using complete feed containing protected soybean groats on the production performance and feed efficiency of fattening thin-tailed sheep. Protection using 37% formaldehyde as much as 1% of dry soybean groats to bypass protein during rumen fermentation. A total of 15 male thin-tailed sheep, aged 12 months with an initial body weight of 23.43±1.40 kg were divided into 3 groups of feed treatments, namely the first group (P1) complete feed 100%, (P2) complete feed 90% + protected soybean groats 10%, and (P3) complete feed 80% + protected soybean groats 20%. Protection of soybean groats using 37% formaldehyde was given as 1% dry matter. The research design used a Completely Randomized Design (CRD). Data were analyzed using analysis of variance, and differences between treatments were further tested with Duncan's Multiple Range Test. The results showed a significantly different effect (P<0.001) on dry matter consumption but not significantly different (P>0.05) on daily body weight gain, relative daily body weight gain, feed conversion, and feed efficiency. The conclusion of the research was that the use of complete feed containing 20% protected soybean groats was efficient due to its ablity to increase dry matter consumption and the FCG produced was low so that higher IOFC was obtained.

ABSTRAK

Penelitian ini bertujuan mengetahui pengaruh penggunaan complete feed yang mengandung menir kedelai terproteksi terhadap penampilan produksi dan efisiensi pakan penggemukan Domba Ekor Tipis (DET). Proteksi protein menggunakan aldehid 37% sebanyak 1% dari bahan kering menir kedelai untuk bypass protein pada saat fermentasi rumen. Sebanyak 15 DET jantan umur 12 bulan dengan bobot badan awal 23,43±1,40 kg dibagi menjadi 3 kelompok perlakuan pakan yaitu kelompok pertama (P1) complete feed 100%, (P2) complete feed 90% + menir kedelai terproteksi 10% dan (P3) complete feed 80% + menir kedelai terproteksi 20%. Proteksi menir kedelai menggunakan formaldehid 37% dengan pemberian 1% bahan kering. Desain penelitian menggunakan Rancangan Acak Lengkap (RAL). Data dianalisis menggunakan analisis variansi, perbedaan antar perlakuan diuji lebih lanjut dengan Uji Jarak Berganda Duncan. Hasil penelitian menunjukkan pengaruh berbeda sangat nyata (P<0,001) terhadap konsumsi bahan kering namun berbeda tidak nyata (P>0,05) terhadap pertambahan bobot badan harian, pertambahan bobot badan harian relatif, konversi pakan dan efisiensi pakan. Kesimpulan penelitian adalah penggunaan complete feed mengandung menir kedelai terproteksi 20% mampu meningkatkan konsumsi bahan kering namun belum mampu meningkatkan penampilan produksi domba ekor tipis ditinjau dari pertambahan bobot badan harian, pertambahan bobot badan harian relative, konversi pakan dan efisiensi pakan, penggunaan completed feed dengan menir efisien karena menghasilkan FCG rendah sehingga diperoleh IOFC tinggi.

Kata kunci:
Complete feed
Penampilan produksi
Menir kedelai
Domba ekor tipis

INTRODUCTION

Indonesia has a tropical climate, making it suitable for the development of sheep. Per capita meat consumption in 2016 amounted to 6.778 kg, an increase of 5.69% from the 2015 meat consumption of 6.413 kg (Direktorat Jenderal Peternakan dan Kesehatan Hewan, 2017). Increased meat consumption can be met by various livestock, such as cattle, buffalo, goats, sheep, and poultry. Increased sheep meat production can be obtained with good sheep fattening, on both maintenance and feeding. However, the productivity of thin-tailed sheep is generally still low, such as the low daily weight gain of sheep, which ranges from 26.49-44.46 g/head/day (Maulana & Baliarti, 2021).

Improving the productivity of sheep is achieved through fattening with the use of quality feed. High sheep productivity can be achieved if nutrient needs are met. One of the most efficient feeds used to fulfill livestock nutrition is complete feed. Improving the appearance of thin-tailed sheep production can be done by providing protein source feed ingredients (Riyanto et al., 2017). One alternative feed ingredient that contains high protein at an affordable price is soybean groats.

Soybean groats are one of the local protein source feed ingredients in the form of fractions of whole soybeans, or can be called whole soybean sorting results with a protein content above 35% (Riyanto et al., 2020). Protein is needed by the sheep body for growth and for the repair of damaged body tissues (Sari et al., 2014). One way to prevent protein from soybean groats from being completely degraded in the rumen and directly absorbed in the small intestine is with protection technology using fomaldehyde (Tiven et al., 2015). The high protein content in soybean groats requires protection technology so that the protein is not completely degraded by rumen microbes, so an alternative is needed for the protection of soybean groats protein.

Protein protection can be done using formaldehyde given at 1% of dry matter (Riyanto et al., 2017). The soybean groat protein protection method using 37% formaldehyde is a different protection method from the protection method that has been carried out by previous researchers. It is especially on the principle of cross-linking the double chain of aldehyde with soybean groat protein so that the protein can be trapped in a strong cross-link to avoid excessive degradation by rumen microbes during the rumen fermentation process. The principle of formaldehyde against proteins is to form protein-formaldehyde bonds. These bonds are stable at neutral pH such as in the rumen (pH 6-7) but labile at acidic pH in the abomasum (pH 2-3). Neutral rumen fluid causes the protein-formaldehyde bond above to be stable against the hydrolysis of enzymes produced by rumen microbes (Suhartanto et al., 2014). This study aims to determine the effect of using complete feed containing protected soybean groats on the production performance and feed efficiency of fattening thin-tailed sheep. A total of 15 male thin-tailed sheep aged 12 months with an initial body weight of 23.43 ± 1.40 kg.

MATERIAL AND METHODS

The materials used in this study were 15 sheep with an age of 12 months (poel 1). The research ration was a complete feed containing protected soybean groats with 5.5% body weight on DM basis. The equipment used in this study was cages (130x100x70 cm), feed bins, drinking places, feed grinders, feed mixers, and scales, including livestock scales with a weight capacity of 50 kg and an accuracy of 0.01 kg and feed scales with a weight capacity of 15 kg and 5 kg with an accuracy of 0.1 kg and 1 g. The scales were used to measure the weight of livestock.

The method used in this study was the use of complete feed containing protected soybean groats using different percentages. The research was conducted with an experimental method using a Completely Randomized Design (CRD) with a unidirectional pattern. The treatments given were:

P1: complete feed 100%
P2: complete feed 90%+10% protected soybean groats
P3: complete feed 80%+20% protected soybean groats

The nutritional content of the treatment shown in Table 1.

The research was carried out through several stages, namely: The preparation phase includes the preparation of the cage (cleaning, irrigation, and disinfection), preparing sheep by adapting the sheep to feed and the environment for ± 1 month, as well as preparing the feed starting with the

Table 1. Nutrient content of treatment summary

Treatment	Nutrient						
	Crude Protein	Crude Fat	Crude Fiber	Organic Matter	NFE	Ash content	TDN
P1 (CF 100%)	15.12	20.91	2.55	87.16	48.58	12.84	58.2
P2 (CF 90% : PSG 10%)	15.72	19.52	3.46	87.69	48.99	12.31	61.22
P3 (CF 80% : PSG 20%)	16.53	18.13	4.37	88.23	49.2	11.77	64.32

NFE: Nitrogen free extract. TDN: Total Digestible Nutrien. CF: Complete Feed. PSG: Protected Soybean Goats

salting of the soybeans, then grinding into smaller pieces and subsequently protecting. Protecting the soy barrel was done by levelling the soybeans on the floor and then spraying it with a formaldehyde solution with a content of 37% mixed with water in a ratio of 1:5, counting 1% of the dry material of the soy barrel. It was then reversed with a scope and a mixer to produce a mixture of formaldehyde with a homogeneous barrel, then soaked in an air-resistant state using a trash bag for 24 hours, then winded and mixed with the complete feed in proportions that have been calculated according to the treatment feed. Feeding was added with a mineral mix of 1% of the total feed.

The treatment and data collection phase included feeding twice, at 8:00 p.m. and 4:00 p.m. according to the sheep's needs. Drinking water was given ad-libitum. Temperature and humidity measurements were taken at 7:00 p.m. 12:00 p.m. and 16:00 p.m. Sanitation of the cage was carried out every morning. The data collection included 1x24-hour weighting of the remaining feed in the morning, weighting the body weight of the sheep once in two weeks, recording the price of feed materials, feeding, buying, and selling sheep. Parameters observed in the study were Average Daily Gain (ADG), Average Daily Gain Relative (ADGR), dry matter consumption, feed conversion (FCR), feed efficiency (FER), feed cost per gain (FCG), and income over feed cost (IOFC).

The data was obtained in the statistical analysis used quantitative analysis for the income over feed cost and feed cost per gain parameters and variance analysis (ANOVA) based on the Completely Randomized Design (CRD). If the result was different, then a further test was performed with the Duncan Multiple Range Test (DMRT) to determine the difference between the treatments.

RESULT AND DISCUSSION

The observation results of thin-tailed sheep performances that receiving treatment feed P1, P2, and P3 were examined in Table 2.

Dry Matter Intake

The feeding of complete feed containing protected soybeans has a very real effect ($P<0.001$) on the consumption of dry material. Thin sheep that receive P3 treatment feed, i.e., complete feed 80% contains protected soy beans, 20% consume more dry material than P1 and P2 treatments.

Duncan's further trials showed that the treatment of P3 feeds differs significantly from P1 and P2, whereas the difference between P2 and P1 is unrealistic. The consumption of this dry material has increased; treatment P1 compared to P3 has an increase of 14.1%, whereas treatment P2 compared with P3 is 14.0%. Thin-tailed sheep feeding the P3 treatment feeds consume more dry material; this indicates a good taste of the feeding because feeding containing soya seed that is protected by 20% level has a more dominant soya aroma than feeding that contains 10% protected soy beans (P2), so feeding P3 seed is preferred and can encourage sheep to eat more dry feed. Besides, sheep cannot choose feeding due to the same physical form of feeding. The use of formaldehyde in feed does not have a negative effect on the consumption of dry material (Riyanto et al., 2020).

According to Ibrahim (2020), food with a high favourability tends to be preferred by cattle, so the consumption of food increases. Treatments P1 and P2 result in the same consumption of dry material; this is presumed because the content of raw protein is relatively the same, so sheep consume no far different feed. It is consistent with Sanda et al. (2019) that the nutrient content of particular proteins is relatively the same, which leads to the absence of differences in the consumption of dry ingredients. The consumption of dry material may be influenced by the nutritional content of the feed given (Saraswati et

Table 2. Mean effect of treatments on production performance and feed efficiency of thin-tailed sheep

Variable	Treatment			Significant
	P1	P2	P3	
Initial body weight (kg)	23.70±1.86	23.35±1.32	23.24±1.22	
Final body weight (kg)	33.10± 1.11	34.18± 1.50	35.69± 1.88	
Average Daily Gain (ADG) (g/head/day)	95.98±13.99	110.45±22.53	127.08±22.69	ns
Average Daily Gain Relative (ADGR) (%)	0.41±0.09	0.48±0.12	0.55±0.11	ns
Dry matter intake (g/head/day)	1014.16±33.07a	1015.07±65.94a	1179.96±40.98b	***
Feed conversion	10.76±1.73	9.45±1.62	9.56±2.00	ns
Feed efficiency	0.09±0.01	0.11±0.02	0.11±0.02	ns
Feed cost per gain (Rp.)	43.367	43.250	49.009	
Income over feed cost (Rp.)	609.274	621.628	647.930	

Note: a,b different superscripts on the same line indicate significantly different (P < 0.001). *** indicates significant or significantly different (P<0.001). ns indicates non-significant or not significantly different (P>0.05). P1: 100% complete feed, P2: 90% complete feed + 10% protected soybean groats, P3: 80% complete feed + 20% protected soybean groats.

Table 3. Digestibility of Thin-tailed Sheep

Variable	Treatment			Significant
	P1	P2	P3	
Dry matter digestibility (%)	64.13	66.44	72.719	ns
Organic matter digestibility (%)	64.69	64.56	72.88	ns
Protein crude digestibility (%)	57.26	60.41	64.76	ns

Note: a,b different superscripts on the same line indicate significantly different (P < 0.001). *** indicates significant or significantly different (P<0.001). ns indicates non-significant or not significantly different (P>0.05). P1: 100% complete feed, P2: 90% complete feed + 10% protected soybean groats, P3: 80% complete feed + 20% protected soybean groats.

al., 2018).

The feed used in this study has a uniform physical shape for both P1, P2, and P3. The mixture of soybeans mixed in a complete feed does not affect the physical shape of the feed since it has already undergone a homogeneous mixing process. According to Mangisah & Kusmiyati (2015), giving complete feed can reduce the risk of cattle choosing preferred feed because the physical form of complete feed is uniform and does not allow cattle to choose only their preferred type of feed because all feed ingredients have been mixed homogeneously in almost the same size. The consumption of dry material by thin sheep in treatment P3 was sufficient and overall sufficient for the life needs of the sheep, with the rest being used for production even though the production of thin tails is not optimal. This study consumed dry material from treatments P1 of 1014.16 g/hour/day (equivalent to 3.35% of body weight during maintenance), P2 of 1015.07 g/hour/day (equilibrium of 3.40% of body weight in maintenance), and P3 of 1179.96 g/hour/day (equitable to 3.85% of physical weight during maintenance).

Dry Matter Digestibility

Based on the research data obtained (Table 3.), the average yields of P1, P2, and P3 dry matter digestibility were 64.13, 66.44, and 72.71. The results of the variance analysis showed that the average incidence of DM between different treatments is unrealistic (P<0.05). The potency between different livestock is not realistically assumed because the consumption of each treatment has an unrealistic influence. Increased DM consumption can lead to increased digestive power. (Comilo Tiven et al., 2015), which examined the nutrition of thin sheep that were given a green and concentrated ransom, as well as some that were supplemented with CPO and protected CPO, sequential results of 58.6%, 58.48%, and 58.18% showed that the intake of dry matter was higher in this study, namely with the use of complete feed and complete feed containing protected soy.

Organic Matter Digestibility

Based on the research data obtained (Table 3), the average results of P1, P2, and P3 organic matter digestibility were 64.69, 64.56, and 72.88. The results of the variance analysis showed that the treatment differences influenced (P > 0.05) the intake of organic material. It's because OM consumption also has unrealistic influence. The concentration of organic matter is directly compared to that of dry matter because organic material is the constituent material of dry matter. The in vitro digestion of dry material shows the proportion of feed dry material that can be digested by microbes inside the rumen (Hambakodu & Ina, 2019).

Crude Protein Digestibility

Based on the data obtained from the study (Table 3), the average yields of P1, P2, and P3 crude protein digestibility were 57.76, 60.41, and 64.76. The results of the variance analysis showed that the treatment differences influenced unrealistic (P > 0.05) crude protein digestibility. In addition, the contents of PK in the ransom can also affect the consumption of PK. Raw protein fertility is also affected by the long stay of the feed in the rumen as well as the form of the given feed. The results of different variance analyses do not show that the P1, P2, and P3 feed shapes are the same as the mesh. Wajizah et al., (2015) stated that the amount of feed digestibility in the rumen is influenced by the chemical composition of feed, especially the content of crude fiber and protein which supports the digestibility of feed during the fermentation process. Crude protein digestibility is also influenced by the length of stay of feed in the rumen and also the form of feed given. The results of the analysis of variance were not significantly different, indicating that the feed forms P1, P2 and P3 were the same, namely mesh.

Average Daily Gain (ADG) Feed Conversion and Feed Efficiency

Based on Figure 1., thin-tailed sheep were found with an average initial weight of P1, P2, and P3 in succession of 23.70 kg, 23.35 kg, and 23.24 kg with a 12-month age range (poel 1). The selection of sheep is determined by determining the range of weights and the uniformity of the race. They will be chosen with a large skeleton but with a body that's not too fat. Final body weight (Table 1.) with feed P1 was 33.1 kg, feed P2 was 34.18 kg, and feed P3 was 35.69 kg. The sheep's growth chart showed at Figure 1. Generally, at each weighing (2 weeks once), it is seen that sheep show an increase in body weight. This indicates that the thin-tailed sheep given treatment feeds P1, P2, and P3 showed increasing growth rates. Thin-tailed sheep are healthy and still in growth, as evidenced by an increase in ADG. (average

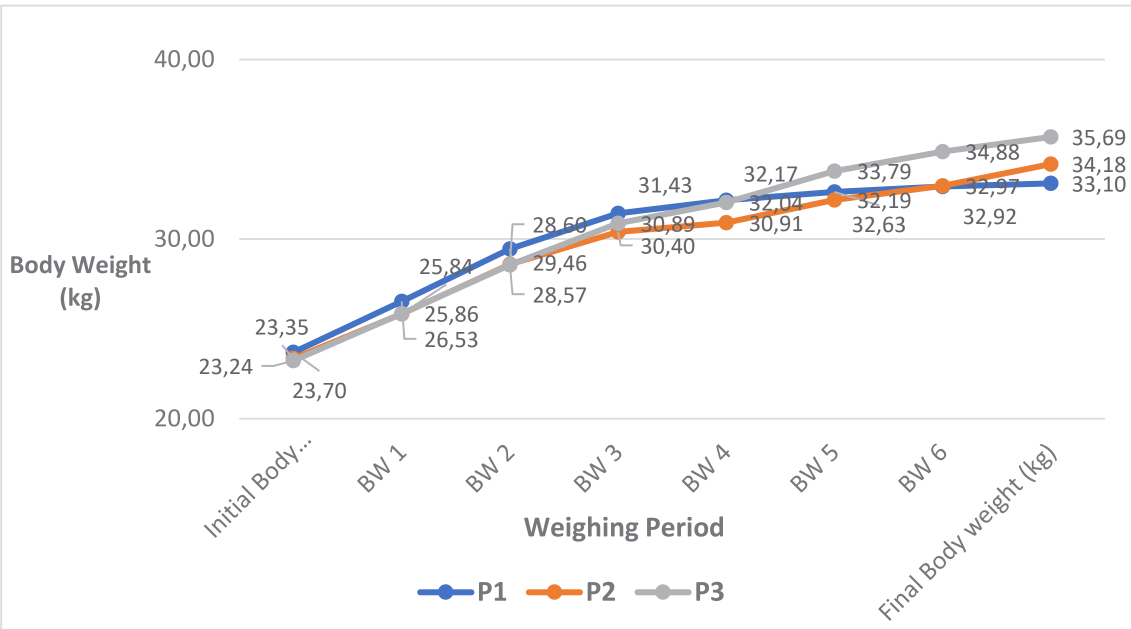

Figure 1. The growth chart of Thin-Tailed Sheep

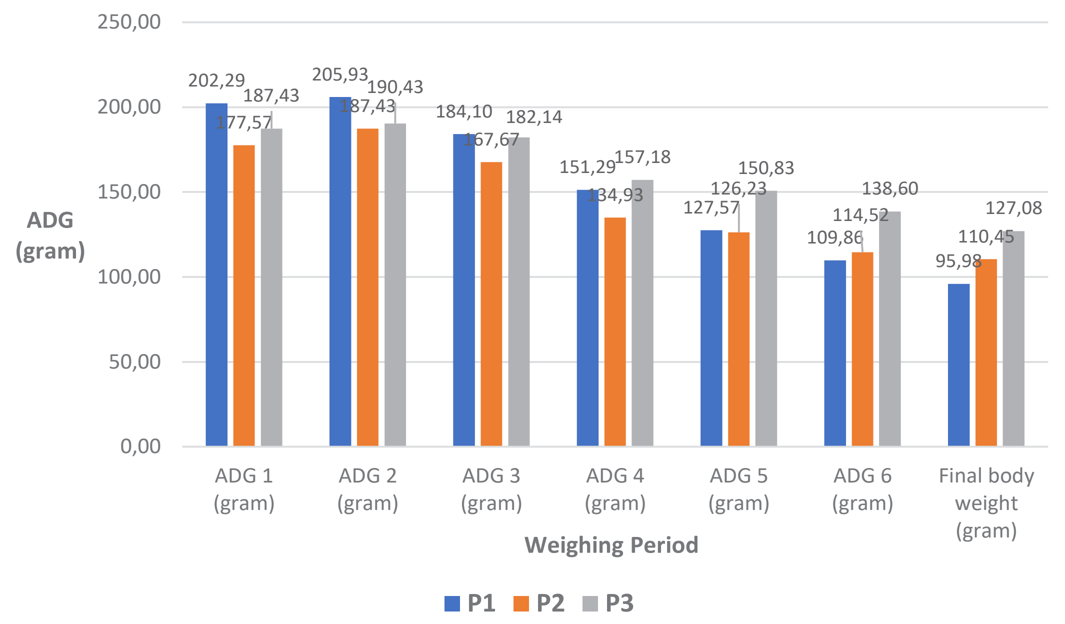

Figure 2. The graph of daily weight gain of Thin-Tailed Sheep

daily gain).

Providing a complete feed containing protected soybeans did not make a noticeable difference (P > 0.05) to the appearance of the reviewed thin-tailed sheep production in terms of daily body weight gain, relative daily body mass gain, feed conversion, and feed efficiency. This is due to the content of raw protein nutrients in relatively similar treatment feeds, namely P1 (15.12%), P2 (15.72%), and P3 (16.53%). Complete feed delivery containing protected soybeans does not affect feed conversion or feed efficiency. Feed conversion is influenced by the value of dry matter consumption and daily body weight gain. The conversion of different feeding is not real because the consumption of different dry matter is very real, but the daily body weight gain resulting from different feeding stuffs is unreal. The results of this study are consistent with the results of (Riyanto et al., 2017) research, which resulted in unrealistic conversions of different ransoms between treatments due to the consumption of dry matter, but a different daily body weight increase is not realistic. According to Heldini (2015) that the conversion of one feed is influenced by the daily weight gain, the daily body weight gain is not different so that the resulting feed conversion is no different either.

The conversion of feed can be used as one of the measurements to assess the ability of sheep to replicate ransom into meat products. The conversion value of this feed indicates that the use of complete feed containing protected soybeans has not yet been able to significantly increase the body weight of the sheep with the amount of feed consumed. The feed conversion rate of this study is already in the standard range of 7–15 sheep feed conversions. Different feeding efficiencies are not real because the daily body weight gain and the resulting feed conversion are not different. The efficiency of this feed suggests that the thin-tailed sheep that consume dry matter have not yet been able to produce a different daily body weight gain. The results of this study are consistent with Riyanto et al. (2017) research that the use of protected soy sauce and lemur fish oil in cattle ransom. The fact that the Simmental-Ongole male intersection produces different feeding efficiency is unrealistic, as the consumption of livestock feeding has not yet produced significant daily body weight gains, resulting in the same feed efficiency as control feeding. Feeding efficiency is the amount of feeding needed to produce an increase of one kilogram of body weight. Feeding efficiency values show great efficiency in feeding meat, as shown by weight gain. Non-significant of differences in feeding efficiency are also due to almost identical nutrient values, which affect daily body weight gain and livestock consumption. The higher the value of daily body weight gain with the lower consumption of dry matter, the better the feed efficiency value. Other factors affecting feed efficiency are the nutritional adequacy of the feed to satisfy the life of the tree, the ability of cattle to digest feed, growth, and the type of feed given (Handayanta et al., 2018).

Feed Cost Per Gain

The results of feed cost per gain and income over feed cost are analyzed descriptively. The result of feed cost per gain can be seen in Table 2, which is the value of feed cost per gain. P2 (Rp43.367,-) has a good value compared to P1 (Rp43.250,-) and P3 (Rp49.009,-). The value of feed cost per gain is said to be lower when the value produced is lower, which means that the cost of feed used to increase the body weight of sheep per kg is also cheaper. According to Ratih et al. (2017), the value of feed cost per gain is calculated based on feed cost and body weight produced. The use of a complete feed with the main ingredient of the grass of the oak indicates a relatively cheap outcome. Differences in the value of feed cost per gain in each study can be caused by different feed ingredients and price differences in each region.

Feeding costs are also changing every time, which shows a difference in each study. The addition of soybeans, which is a residual feed material for sorting soya with protection technology, will not only increase feed costs but also increase the value of the daily body weight gain of cattle, resulting in a low feed cost per gain. According to Suryani et al. (2014), the feed cost per gain is influenced by the cost of feed and the quality of feed given. A high feed cost will result in a higher value of feed costs per gain anyway.

Income Over Feed Cost

Results of income over feed cost treatment in Table 2. showed that treatment P2 (Rp647.930,-) yielded a greater value than P1 (Rp609.274,-) and P3 (Rp621.628,-). The value of the income over the feed cost of the sheep produced is influenced by a number of factors. The factors that influence the value of income over feed cost are the selling price of cattle per kg of body weight, the price of feed per kg, the consumption of feed, and the increase in daily body weight. The cost of feed for sheep can be suppressed by the use of waste feed materials such as soya towers. Income over feed cost in each study has differences that can be due to the price of feed materials, different sheep prices in each region, and changes in prices over time.

CONCLUSION

The use of a complete feed containing 20% protected soybeans increases the consumption of dry matter but is not yet able to improve the appearance of reviewed thin-tailed sheep production from daily weight gain, relative daily body weight gain, and conversion. Use of 20% protected soya beans on complete feed is more efficiently reviewed from lower feed cost per gain and higher income over feed cost.

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