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Research article

The Effect of Breed on Production Performance in Ewe Lambs Under Intensive Management

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Abstract

Crossbreeding local sheep with Dorper sheep has been widely adopted to improve growth performance and meat production. This study aimed to evaluate the effect of breed differences (Dorper F1 vs. Local) on the production performance of ewe lambs in an intensive fattening system. The study was conducted over 63 days using 28 weaned ewe lambs (14 Dorper F1 and 14 Local) with initial weights ranging from 10–18 kg. The measured parameters included dry matter intake (DMI), average daily gain (ADG), feed conversion ratio (FCR), feed cost per gain (FCG), and income over feed cost (IOFC). The results of the t-test showed that the DM intake of Dorper F1 (1.01 kg/day) was significantly higher ($P < 0.05$) than that of the Local breed (0.78 kg/day); however, when expressed as a percentage of body weight, both were equivalent at 4.2–4.3%. Despite the higher feed intake, breed had no significant effect ($P > 0.05$) on the average daily gain rate (0.16 vs. 0.14 kg/day) or the FCR (6.61 vs. 5.69). Although both sheep breeds had equivalent levels of biological efficiency, economic analysis demonstrated that raising Dorper F1 sheep yielded a numerically higher IOFC value (Rp672,914/head) compared to Local sheep (Rp233,875/head). It is concluded that Dorper F1 sheep are more recommended for commercial-scale development owing to their greater economic returns and higher market value.

Keywords: Ewe, Dorper F1, ADG, FCR, IOFC

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INTRODUCTION

Sheep are small ruminants that are very easy to raise and are found throughout almost all regions of Indonesia (Sutrisno et al., 2020). Sheep play an important role in meeting the demand for animal protein and supporting the economy of communities in Indonesia. Demand for sheep meat continues to rise year after year in line with population growth and increased nutritional awareness. However, meeting domestic demand for sheep meat still faces challenges due to the relatively low productivity of local sheep breeds. Local sheep generally excel in climate adaptation and disease resistance but have suboptimal

growth rates and slaughter weights. Therefore, efforts to improve genetic quality through crossbreeding with superior exotic sheep breeds such as the Dorper are necessary. Dorper sheep are known as meat-producing livestock with high growth rates and good carcass quality. Crossbreeding Dorper sheep with local sheep (Dorper F1) is expected to produce offspring with significantly better productivity performance.

To maximize the genetic potential of these crossbred animals, improving feed management is a crucial aspect. An intensive fattening system using complete feed can ensure that the livestock receive balanced nutrition while accelerating the fattening process. However, the response of Dorper F1 crossbred

ewes compared to local ewes when given the same complete feed regimen under intensive management conditions still needs to be evaluated. Sheep experience a delay in weight gain at around 3–4 months of age but show increased growth as they approach adulthood (Munir & Kardiyo, 2015). This evaluation is crucial for assessing the economic and biological efficiency of the fattening program, thereby enabling accurate prediction of target body weight. Based on these issues, this study aims to determine the effect of different sheep breeds (Dorper F1 and Local) on the production performance of female sheep raised under intensive management. The benefits of this study are to provide scientific information and practical recommendations for farmers and the feedlot industry in selecting meat sheep breeds that offer the most profitable production efficiency and economic value.

MATERIALS AND METHODS

Time and Location of the Study

This study was conducted at a commercial farm (Sumber Rachmat Rizky Farm) located in Kampung Cikupa, Sukaresmi Village, Bogor Regency, West Java. This location was selected because the farm implements an intensive fattening system using complete feed. Geographically, the study site is situated in a highland area with a cool microclimate. The Bogor region features hilly topography with a generally cool climate and relatively high rainfall (Sutrisno et al., 2019). The study was conducted over 63 days, from August 6 to October 8, 2024.

Sample and Management

The livestock used in this study consisted of 28 female sheep, comprising 14 Dorper F1 sheep and 14 local sheep (Thin-Tailed Sheep). The sample was selected using purposive sampling with the following inclusion criteria: age ranging from 6 to 12 months (weaned), excellent health, no physical defects, and an initial body weight between 10 and 18 kg. Before data collection began, the sheep underwent a 7-day adaptation phase to the feed and environment. Feeding was conducted twice daily, at 08:00 WIB (40% of the total daily ration) and at 16:00 WIB (60% of the total daily ration). The feed provided was a complete feed at a feeding rate of 6% of body weight. Drinking water was provided *ad libitum*. The nutrient content of the complete feed for fattening sheep is shown in Table 1.

Data Collection Method

The study was conducted over a 63-day rearing period. The parameters observed in this study included:

1. Dry Matter (DM) Feed Intake: Daily feed intake was determined by weighing the feed provided

and subtracting the weight of leftover feed the following day, then converting the result to dry matter units (Supratman et al., 2016).

Table 1. Nutrient content of complete feed for fattening sheep

Nutrient Content	Percentage
Dry matter (%)	88.86
Ash (%)	6.13
Crude protein (%)	14.61
Crude fiber (%)	9.70
Crude fat (%)	6.36
Beta – N (%)	52.06
TDN (%)	70.26
Phosphor (%)	-
NaCl (%)	-
Gross energy (cal/g)	3728

Source: Feed Formulation Analysis by Rachmat Rizky Farm (2024)

2. Average Daily Gain (ADG): Body weight was measured at the start of the rearing period and every 21 days (in the morning before feeding) using a Panda Scale (PD-C200) digital scale. ADG was calculated using the formula provided by Supratman et al. (2016).

$$ADG = \frac{\text{Final weight (kg)} - \text{initial weight (kg)}}{\text{Duration of rearing (days)}}$$

3. Feed Conversion Ratio (FCR): FCR is the ratio of the amount of feed consumed by the livestock to the body weight gain achieved during the rearing period. It is calculated by dividing the amount of feed consumed by the ADG (Nurcahyani et al., 2017).

$$FCR = \frac{\text{Feed Consumption (kg)}}{ADG \text{ (kg)}}$$

4. Feed Cost per Gain (FCG): FCG is an economic parameter in livestock farming that describes the amount of feed cost incurred to produce one unit of livestock weight gain during the rearing period. The FCG formula is calculated according to Gunawan et al. (2024).

$$FCG = \frac{\text{Total feed cost (Rp)}}{\text{Total weight gain (kg)}}$$

5. Income Over Feed Cost (IOFC): IOFC is an economic parameter in livestock farming used to measure the difference between income derived from livestock production and total feed costs incurred during the rearing period. IOFC is calculated by subtracting total feed costs incurred during the study from total income from weight gain (weight gain $\times$ selling price/kg). (Sirait et al., 2020).

Data Analysis

Production performance data, including feed intake, average daily gain (ADG), and feed conversion ratio, were tabulated, and their means and standard deviations were calculated. To determine the differences in performance between the two sheep breeds (Dorper F1 vs. Local), the data were statistically analyzed using an independent samples t-test. The entire data analysis process was conducted using the Statistical Package for the Social Sciences (SPSS) version 25 at a 95% confidence level ($\alpha = 0.05$).

RESULTS AND DISCUSSION

Feed Intake

Based on the observation results (Table 2), the average daily dry matter (DM) intake of F1 Dorper sheep (1.01 kg/head/day) was significantly higher than that of local sheep (0.78 kg/head/day). The difference in consumption levels is due to differences in body weight between the two sheep breeds. F1 Dorper sheep are genetically larger in body *frame* and have a higher initial weight (18.26 kg) compared to Local sheep (13.77 kg). Livestock with larger body sizes have a greater digestive tract (rumen) volume and require higher maintenance nutrient requirements. This aligns with the statement by Zulkarnain *et al.* (2018) that the primary factor significantly influencing feed intake capacity in ruminants is the size or body weight of the animals themselves.

To obtain a more objective comparison of feed intake efficiency among sheep breeds of different sizes, feed intake was evaluated as a percentage of body weight. The results show that the feed intake percentage for F1 Dorper sheep was 4.31% of body weight, while that for local sheep was 4.27% of body weight. These nearly identical percentages indicate that, proportionally, the relative feed intake capacity and palatability of both sheep breeds toward the provided *complete feed* are equally good. This consumption rate in the 4.2–4.3% range is considered very normal and ideal for fattening sheep, and is consistent with Nuryanto's (2017) reference, which states that the normal range for sheep feed intake is 3.3%–7.6% of body weight.

Average daily gain (ADG)

The average ADG for F1 Dorper sheep during the study was 0.16 ± 0.04 kg/head/day, while that for local sheep was 0.14 ± 0.03 kg/head/day (Table 2). Statistical analysis revealed no significant difference ($P > 0.05$) in the daily growth rates of the two sheep breeds. The ADG of local sheep in this study was found to be higher than the results reported by

Metkono and Kardaya (2011), who recorded an ADG of only 0.05–0.07 kg/day for weaned female local sheep.

When viewed from their genetic potential, Dorper F1 sheep should have demonstrated a much more pronounced growth advantage. However, this lack of a significant difference in ADG can be explained by analyzing the percentage increase in body weight relative to initial weight. Proportionally, the local sheep showed a 64.9% increase in weight from their initial weight, while the Dorper F1 sheep increased by only 56.5%. This phenomenon indicates that Local sheep possess very high adaptability and metabolic efficiency in response to the complete feed provided, even though their body size is smaller in absolute terms.

The suboptimal expression of growth-related genes in Dorper F1 sheep is suspected to be influenced by *restricted feeding* according to the farm's standard operating procedures (SOP). Setiadi *et al.* (2016) emphasized that livestock with high genetic growth potential will only exhibit maximum performance if supported by an unrestricted (*ad libitum*) nutrient intake. In the context of this study, energy and protein intake from *the complete feed* appear to be allocated primarily to meet the higher *maintenance* requirements of the Dorper F1 sheep, thereby limiting the remaining nutrients available for muscle tissue deposition. This is supported by the findings of Rangkuti and Fassah (2024) that Dorper crossbred sheep require feed management with higher energy density to trigger the accelerated muscle growth that is characteristic of this breed. The Body Weight Gain graph can be seen in Figure 1.

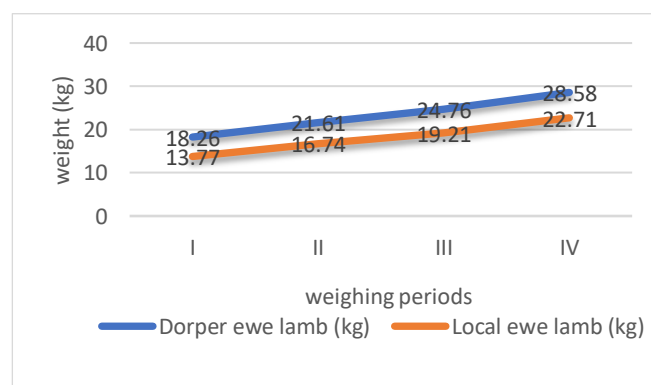


Figure 1. Graph of body weight gain in ewe lambs

Feed Conversion Ratio (FCR)

The average feed conversion ratio (FCR) for Dorper F1 sheep was 6.61 ± 2.15 , while for local sheep it was 5.69 ± 1.09 . Based on statistical analysis, the FCRs of the two sheep breeds did not show a significant difference ($P > 0.05$). This lack of significant difference

is closely related to initial body weight and feed intake. Dorper F1 sheep consumed more feed because their initial body weight was greater (18.26 kg) compared to that of local sheep (13.77 kg). When feed intake was evaluated proportionally to body weight, both were equivalent at 4.2–4.3%. Since the average daily gain (ADG) of both was also balanced, the feed-to-meat conversion ratio (FCR) was statistically indistinguishable.

The FCR value for Local Sheep (5.69) appears slightly more efficient than that of Dorper F1 (6.61), meaning that Local Sheep require 5.69 kg of dry matter feed to gain 1 kg of body weight. This slightly better biological efficiency in Local Sheep is influenced by their smaller body weight, resulting in lower energy requirements for maintenance. Consequently, the proportion of nutrients available from a feed ration—5–6% of body weight—can be allocated more optimally toward body tissue formation (growth). In contrast, Dorper F1's larger body frame requires more nutrients for maintenance. Nevertheless, the FCR values in this study were sufficiently efficient for both sheep breeds. For comparison, Wulandari *et al.* (2014) reported a higher FCR value of 7.5 in sheep fed a complete diet made from cocoa pods. In line with Alwi (2015), the lower the feed conversion ratio, the higher the feed utilization efficiency of the livestock.

Feed Cost per Gain (FCG)

On average, the FCG value for Dorper F1 sheep was Rp34,759/kg, while that for local sheep was Rp30,827/kg (Table 1). These figures indicate that to produce 1 kg of weight gain, raising F1 Dorper sheep requires feed costs of Rp34,759, while Local sheep require lower costs of Rp30,827. Although not statistically significantly different, Local sheep exhibited a lower FCG value, meaning they are more efficient in terms of feed costs per kilogram of weight gain. Basuki (2002) states that Feed Cost Per Gain is possible, indicating that feed utilization has been carried out efficiently from an economic perspective. This condition is directly proportional to the FCR value. Since both groups of sheep were fed the same complete

feed ration at a uniform price per kilogram, fluctuations in FCG are largely determined by the FCR ratio. F1 Dorper sheep have a higher FCG because they consume larger amounts of feed to meet the maintenance requirements of their large body size before the remaining nutrients are converted into meat. Conversely, Local sheep, with their lower maintenance requirements, are able to convert feed into meat at a slightly more efficient cost.

Although raising Local sheep has proven to be slightly more efficient in reducing feed costs per kilogram of weight gain (FCG), this does not automatically make Local sheep economically superior on a commercial scale. In the sheep fattening industry, the FCG parameter must be evaluated alongside total harvest volume and product selling price. Although the feed cost per kilogram of weight gain for Dorper F1 is higher, this breed is capable of producing a total accumulated weight gain that is greater at the end of the fattening period (Dorper F1: 10.31 kg vs. Local: 8.9 kg). Coupled with better carcass quality and yield, Dorper crossbreeds generally command significantly higher market prices than local sheep (Rangkuti & Fassah, 2024).

Income Over Feed Cost (IOFC)

An economic analysis using the Income Over Feed Cost (IOFC) calculation reveals a stark contrast between the two sheep breeds. The IOFC value for Dorper F1 sheep reached Rp672,914 per head, while that for local sheep was only Rp233,875 per head (Table 2). This nearly threefold difference in profit confirms that although the biological performance (ADG and FCR) of the two sheep breeds is statistically comparable, Dorper F1 sheep have numerically higher economic value in an intensive fattening system.

The high IOFC value for Dorper F1 sheep is driven by two main, mutually reinforcing factors. First, the factor of cumulative sales volume. Although daily ADG did not differ significantly statistically, over a 63-day period, Dorper F1 sheep were able to accumulate a higher total actual weight gain (10.31 kg) compared to local sheep (8.9 kg). Second, the factor of selling price

Table 2. Production performance of ewe lambs

Parameter	Dorper F1 Sheep	Local Sheep	Average
Consumption (kg DM/head/day)	1.01 ± 0.06 ^a	0.78 ± 0.05 ^b	0.9 ± 0.16
Average daily gain (kg/head/day) ^{ns}	0.16 ± 0.04	0.14 ± 0.03	0.15 ± 0.04
FCR ^{ns}	6.61 ± 2.15	5.69 ± 1.09	6.15 ± 1.62
FCG (Rp/kg)	34,759	30,827	32,793
IOFC (Rp)	672,914	233,875	453,395

Note: ^{ab}Different superscripts in the same column indicate a significant difference ($P < 0.05$); ^{ns}Superscripts in the same row indicate no significant difference ($P > 0.05$)

per live weight. The selling price of Dorper F1 sheep at the farm level reached Rp100,000/kg, far exceeding that of local sheep, which were priced at Rp57,000/kg. This price difference reflects the market's appreciation for the genetic quality of Dorper sheep, which are known for their higher carcass percentage, better meat texture, and more efficient fat deposition. This aligns with the findings of Astuti et al. (2015), who noted that IOFC is a sensitive indicator influenced by the interaction between weight gain, feed conversion efficiency, and fluctuations in market prices for the products.

Theoretically, these results demonstrate that biological efficiency (low FCR in local sheep) does not always correlate directly with financial profitability when there is a wide disparity in selling prices among commodities. Higher feed investment in F1 Dorper sheep has proven to be a rational economic decision because every rupiah spent on feed costs generates a significantly greater return through increased selling prices per kilogram of body weight. The use of Dorper F1 sheep is highly recommended for farmers targeting the premium market or the meat processing industry, given that the potential profit margin (IOFC) generated is far more optimal compared to raising local sheep under the same management practices.

CONCLUSION

Based on the research results, it can be concluded that differences in breeds (F1 Dorper sheep and local sheep) had a significant effect ($P < 0.05$) on dry matter intake but had no significant effect ($P > 0.05$) on Average daily gain (ADG), Feed Conversion Ratio (FCR), and Feed Cost per Gain (FCG). Biologically, both sheep breeds exhibit relatively comparable feed efficiency and growth rates under intensive management. Nevertheless, from a financial viability perspective, raising F1 Dorper sheep is more recommended for commercial-scale operations because they are capable of generating a much higher profit margin—Income Over Feed Cost (IOFC)—(Rp672,914/head vs. Rp233,875/head), driven by the high market price of Dorper-descendant sheep carcasses.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

REFERENCES

- Alwi, A. (2015). Pertambahan Bobot Badan dan Konversi Pakan Ternak Kambing Peranakan Etawa yang Diberi Pakan Silase Jerami Padi dan Daun Gamal (*Gliricidia sepium*). *Skripsi. Fakultas Peternakan, Universitas Hasanuddin. Makassar*.
- Astuti, Ayu, Erwanto, Santosa, & Edy, P. (2015). Pengaruh cara pemberian konsentrat-hijauan terhadap respon fisiologis dan performa sapi peternakan simmental. *Jurnal Ilmiah Peternakan Terpadu*, 3(4), 201–207.
- Basuki, P. (2002). *Pengantar Ilmu Ternak Potong dan Kerja*. Bahan Kuliah Fakultas Peternakan Universitas Gadjah Mada. Yogyakarta
- Gunawan, A., Hapsah, A., Sugiarti, S., Rostini, T., & Samudera, R. (2024). Analysis of the Cost Efficiency of Using Feed with Different Types of Feed and Ducks. *Jurnal Agrosoci*, 1(5), 246–259. <https://doi.org/10.62885/agrosoci.v1i5.268>
- Nuryanto. (2017). Performance and income of tups fattening that fed by fermentation forage and concentrat feeds. *Prosiding Seminar Nasional*, 712–721.
- Metkono, O. A. F., Kardaya, D., & Sudrajat, D. (2011). Performa domba lokal yang diberi ransum rumput lapang dan ampas tahu yang dipelihara secara tradisional. *Jurnal Pertanian*, 2(2), 88–94.
- Munir, I. M., & Kardiyo, E. (2015). Peningkatan bobot badan domba lokal di Provinsi Banten melalui penambahan dedak dan rumput. *Prosiding Seminar Nasional Teknologi Peternakan Veteriner*, (Lawrie), 390–396.
- Rangkuti, F. A., & Fassah, D. M. (2024). Pemberian Creep Feed dengan Sumber Protein Berbeda terhadap Performa, Karkas, dan Kualitas Daging Domba Dorper. (September). <https://doi.org/10.29244/jintp.22.2.91-97>
- Setiadi, D. (2016). Pengaruh Pemberian Ransum Lengkap Fermentasi Mengandung Kadar Protein Berbeda Terhadap Pertambahan Bobot Badan Dan Konversi Ransum Domba Lokal Betina. *Students e-Journal*, 5(2).
- Sirait, J., Simanihuruk, K., & Hutasoit, R. (2020). Fermentasi Aerob dan An-Aerob Rumput Gajah

- Mini (Pennisetum purpureum cv. Mott) untuk Pakan Kambing Boerka Sedang Tumbuh. *Jurnal Agripet*, 20(2), 150–159. <https://doi.org/10.17969/agripet.v20i2.16503>
- Supratman, H., Setiyatwan, H., Budinuryanto, D. C., Fitriani, A., & Ramdani, D. (2016). Pengaruh Imbangan Hijauan Dan Konsentrat Pakan Komplit Terhadap Konsumsi, Pertambahan Bobot Badan dan Konversi Pakan Domba. *Jurnal IlmuTernak*, 16(1), 31–35. <https://doi.org/10.24198/jit.v16i1.9822>
- Sutrisno, Surono, & Afliha, K. (2020). Pengaruh Suplementasi Probiotik Isi Rumen Kerbau Dengan Level Berbeda Terhadap Nilai Kecernaan dan TDN Pada Domba Balibul. *Jurnal Litbang Provinsi Jawa Tengah*, 18(2), 181–190. <https://doi.org/10.36762/jurnaljateng.v18i2.83>
- Nurcahyani, D. T., Wulandari, S., & Nusantara, S. (2017). Pengaruh Pemberian Dedak Kasar Fermentasi pada Domba Ekor Tipis Sebagai Bahan Baku Konsentrat. *Jurnal Ilmu Peternakan Terapan*, 1(1), 17–24.
- Wulandari, S., Agus, A., Cahyanto, M. N., & Utomo, R. (2014). Effect of fermented cacao pod supplementation on sheep rumen microbial fermentation. *Journal of the Indonesian Tropical Animal Agriculture*, 39(3), 167–174. <https://doi.org/10.14710/jitaa.39.3.167-174>