Research Article

The Effect of Different Feed Restriction Levels on the Performance of Young Male Kacang Goats

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Abstract | This study aimed to determine the feed consumption and digestibility, and growth perforamnce of young male Kacang goats receiving different feed restriction levels. The study used 15 young male Kacang goats aged 12 - 18 months (based on dental estimation) with initial body weights of 10 - 12 kg. Goats were divided into 3 treatment groups, each consisting of 5 heads. The 3 treatment groups of goats were T0: Goat without feed restrictions (control); T1: Goat was given 100% feeding according to their maintenance life; and T2: Goat was restricted to feeding by given only 50% feeding according to their maintenance life. The ration used was a complete ration consisting of natural grass, milled corn, bran pollard, rice bran, and fish meal. Observed parameters were feed consumption, nutrient digestibility, average daily gain and feed efficiency. Data analysis was carried out according to the ANOVA procedure in a completely randomized design. The results showed that the consumption of dry matter (DM), organic matter (OM), crude protein (CP), and energy of goat in the T2 treatment was lower ($p<0.05$) than in the T1 and T0 treatments. However, the digestibility of dry matter of goat in the T2 treatment was higher ($p<0.05$) than in the T0 treatment; while the digestibility of organic matter, crude protein, and energy were relatively the same between treatments. Goat in the T2 treatment showed negative growth, while goat in the T1 and T0 treatments showed positive growth. Can be concluded that the feed restrictions on young male Kacang goats to only 50% feeding according to their maintenance life have caused a decrease in the consumption of dry matter, organic matter, crude protein, and energy. However, the digestibility of the dry matter of goats in the T2 treatment was higher ($p<0.05$) than in the T0 treatment. The average daily gain rates of goats in the T2 treatment were negative. On the other hand, goats with 100% feeding according to their maintenance life (T1) still showed positive growth, although it was lower than goats with normal feeding (without feed restrictions).

Keywords | Male Kacang goats, Feed consumption, Feed digestibility, Growth performance, Feed restriction levels

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INTRODUCTION

Timor Island, especially West Timor, as a part of Indonesia nation, is a tropical area where the availability of feed fluctuates between the rainy and dry seasons. As a result, livestock performance also fluctuates following climate change. During the rainy season, the availability of feed is abundant so it has a positive impact on the performance of livestock growth. On the other hand, during the dry season (lack of feed), the performance of livestock growth decreases (Tahuk and Dethan, 2010). Kacang goat is one of Indonesia's local livestock whose rearing (farming) has been carried out extensively by farmers/breeders. However, one of the main problems of goat productivity in Indonesia is the limited availability of feed in the dry season and the abundant availability of feed in the rainy sea-

son (Widiyono et al., 2013). According to Purbowati et al. (2015), feed is an important factor in supporting livestock productivity. The provision of feed that meets the nutrients needed by livestock is expected to produce high livestock productivity.

Livestock experiencing a lack of feed in the dry season will experience depletion in body tissue, both fat tissue, and muscle tissue. The depletion in body tissue occurs due to the degradation of body fat and protein to meet energy needs to maintain survival (Klinhom et al., 2006). According to Sarmin et al. (2017), Kacang goats that are limited to feed by giving only 50% of dry matter consumption will use energy from the degradation of body protein to maintain their survival.

In general, the body tissue that experiences depletion earlier when there is a deficiency is the fat tissue at the point of body fat deposition. If the fat tissue depletion has been maximized, but the livestock is still experiencing a lack of feed, the livestock will experience muscle tissue depletion due to the degradation of body protein as indicated by the reduced muscle size and mass in livestock. Both fat tissue and muscle tissue depletion will be shown by a decrease in body weight in livestock (Klinhom et al., 2006). According to a study by Suwignyo et al. (2016), feed restrictions of up to 50% can reduce the performance of goat productivity, but do not interfere with the health status of livestock. Whereas according to a study by Widiyono et al. (2013) limited feed intake in PE goats, for example, affects the levels of phosphate, inorganic, calcium, creatinine, urea nitrogen, blood, cholesterol, glucose, and triglycerides in the blood.

The condition of depletion of body tissue in livestock during the lack of feed phase such as in the dry season is unavoidable in the tropics. Where the severity of depletion of body tissue is determined by the severity of nutritional deficiency experienced by livestock. The lower the nutrients obtained by livestock to meet the maintenance life, the lower the body mass of the livestock as seen from the leaner the body of the livestock which is indicated by a decrease in the average daily gain and body condition scores. Although feed restrictions harm livestock performance, feed restrictions can be used as a strategy to save feed when there is a lack of feed (Sarmin et al., 2017). Where in the lack of feed phase, livestock are given feed that does not match their maintenance life.Conversely in the abundance of feed season, livestock will receive feed according to their maintenance life so that they experience compensatory growth.

Information regarding the decrease in performance of male Kacang goats at different feed restriction levels is still lacking. Therefore, it is appropriate to conduct this study to evaluate the effect of different feed restriction levels on the performance of young male Kacang goats.

MATERIALS AND METHODS

Ethical approval

In this research, approval from the ethics committee is needed, it is because in this experiment was given feed restriction treatment that influences animal welfare.

Research location and time

This study was carried out in the goat barn of the Department of Animal Husbandry, Faculty of Agriculture, Universitas Timor, from March – October 2022. Analysis of feed samples to determine the nutrient content of feed ingredients was carried out at the Laboratory of Food Chemistry, Faculty of Animal Husbandry, Nusa Cendana University, located in the province of East Nusa Tenggara, the Republic of Indonesia.

Research design

This study was designed using a completely randomized design (CRD). A total of 15 young male Kacang goats used were divided into 3 treatment groups, each consisting of 5 heads. The 3 treatment groups of goats were: T0: Goat without feed restrictions (control); T1: Goat was given 100% feeding according to their maintenance life; T2: Goat was restricted to feeding by giving only 50% feeding according to their maintenance life.

Research livestock and feed

Male Kacang goats used aged 12 - 18 months (based on the estimated permanent incisor eruption). The initial body weights of the livestock during the research were 10 - 12 kg/head.

The feed used was in the form of complete feed consisting of forage and concentrates with a ratio of 30: 70, respectively. The composition of the ration was according to the maintenance life (needs) of young goats with body weights of 10 kg with the expected target of the average daily gain (ADG) of 50 g/head/day (Kearl, 1982). Nutritional requirements according to the recommendations above are DM 0,37 kg/head/day (3,7% of BW), energy 0,92 Mcal and TDN 0,25 kg/head/day, CP 39 g/head/day (digestible protein 26 g/head/day).

The forage used to compose a complete ration is natural grass as a source of fiber; while the concentrates consisted of milled corn, bran pollard, and rice bran as a source of easily digestible carbohydrates, and fish meal as a source of protein. Livestock was also given a mineral premix to avoid mineral deficiency that they might experience if they

Table 1: Nutrient content of feed ingredients for the ration

Nutritional Content	Feed ingredients					Concentrate *	Ration*
	Natural grass*	Fish meal*	Milled corn*	Bran pollard*	Rice bran*		
BK (%)	89,872	89,587	87,390	86,829	89,107	87,613	88,067
BO (%)	82,793	71,120	85,435	83,024	73,111	87,237	81,755
PK (%)	4,935	50,111	10,514	18,004	12,631	15,487	14,599
SK (%)	38,053	8,721	1,900	6,198	18,851	7.980	15,567
LK (%)	0,319	4,967	4,678	2,834	4,930	3,165	2,283
CHO (%)	77,539	16,042	70,243	62,187	55,550	68,585	64,873
BETN (%)	39,486	7s,321	68,343	55,989	36,698	60,604	49,307
TDN (%)	44.909**	49.027**	75.989**	78.430**	77.963**	-	-
GE: -(MJ/kg.BK)	14,719	16,615	16,2926	16,089	14,353	16,699	15,540
-(Kkal/kg.BK)	3504,55	3995,99	3880,08	3830,62	3417,49	3975,87	3700,08
EM (Kkal/kg.BK	1918,33	2687,92	3709,27	3319,76	2488, 50	3445,40	2863,99

Note: *Results of Analysis of Laboratory of Food Chemistry. Faculty of Animal Husbandry. Nusa Cendana University (Indonesia) (2022); **According to the equation of Hartadi *et al.* (1980)[8]; NFE: Nitrogen free extract; TDN: Total digestible nutrients. DM=dry matter; OM=organic matter; CP=crude protein; CF=crude fiber; CHO=carbohydrate; GE=gross energy; ME=metabolic energy; MJ=megajoule.

Table 2: The composition of the study feed (basic DM)

Treatment/ Feed ingredients	Proportion of feed ingredients	Nutrient content of the composed ration (%)								
		DM	OM	CP	ASH	EE	CF	NFE	CHO	TDN
Natural grass	30.00	89.872	24.838	1.481	2.124	0.096	11.416	11.846	23.262	13.473
Fish meal	11.00	89.587	7.823	5.512	2.031	0.546	0.959	0.805	1.765	5.393
Milled corn	40.00	87.390	34.174	4.206	0.782	1.871	0.760	27.337	28.097	30.396
Rice bran	4.00	89.107	2.924	0.505	0.640	0.197	0.754	1.468	2.222	3.119
Bran pollard	15.00	86.829	12.454	2.701	0.571	0.425	0.930	8.398	9.328	11.765
Total	**100**		82.213	14.404	6.148	3.136	14.819	49.855	64.674	64.144

Notes : DM=dry matter; OM=organic matter; CP=crude protein; EE = extract eter; CF=crude fiber; NFE: Nitrogen free extract; CHO=carbohydrate; TDN: Total digestible nutrients.

(minerals) were not adequately available in the feed ingredients used. The nutritional content of the feed ingredients that make up the research ration (% dry matter) is presented in Table 1, the ratio of forage and concentrates in the preparation of the ration is presented in Table 2.

Livestock Cages, Supporting Equipment, and Materials

The cages used in this study were individual cages of 15 plots with a size of 70 x 150 cm. The cage is in the form of a stage equipped with separate feed and drinking water containers.

The supporting equipment used in this study was a digital livestock scale of a Rougweight brand with a sensitivity of 0.1 kg to weigh goats and a feed scale with a capacity of 2 kg with a sensitivity of 10 g. In addition, equipment to collect feces and urine was prepared. Other equipment used included forage and concentrates milling machines, machetes, knives, concentrate buckets, and a Wiley mill with a 1 mm sieve diameter for milling feed samples. For the analysis of feed samples, one unit of proximate analysis tool was used.

Research Procedures and Data Collection

Complete feed preparation: Complete feed preparation was carried out by collecting fresh natural grass, drying them in the sun to dry, and milling with a milling machine at a diameter of 10 mm. Furthermore, natural grass that has been milled was mixed with concentrate feed according to the composition of the formulation. Finally, the feed was then ready to be given to goats according to the treatment groups.

Goat adaptation and feed restrictions: Goat was adapted to feed for 14 days (2 weeks) before the data collection of

this study. The purpose of adaptation was to obtain stable goat body conditions during the study, as well as to eliminate the effect of previous feed. Feed restrictions were carried out for 30 days. The purpose of feed restrictions was to determine the effect of the level of lack of feed on feed consumption and digestibility, as well as goat growth patterns.

Goat was health controlled to avoid infection of skin diseases such as scabies and internal parasites such as worms by giving Wormectin at a dose of 0.5 ml/25 kg/day intramuscularly. Measures to prevent transmission were also carried out in goats that have not been infected by giving Wormectin at the same dose.

Observed parameters and data collection procedures

The observed parameters during this study were feed consumption, nutrient digestibility, and average daily gain. The consumption of dry matter (DM) was calculated from the consumption of fresh feed multiplied by the dry matter content of the feed. The consumption of crude protein (CP) and organic matter (OM) were calculated from the multiplication of the consumption of dry matter by the nutrient content (%) of each feed nutrient.

The digestibility of feed nutrients was measured using the total collection method of Harris (1970). The digestibility of feed nutrients measured included DM, OM, CP, and energy. The digestibility of dry matter (%) was calculated using the following equation (Cullison, 1979).

$$\text{Digestibility of DM (\%)} = \frac{A - B}{A} \times 100\%$$

Where: A: an average dry matter of feed consumed (g) and B: an average dry matter of excreted feces (g). Next, the digestibility of feed nutrients was calculated using the following equation:

$$\text{Digestibility of nutrients (ND, \%)} = \frac{(A \times a) - (B \times b) \times 100\%}{(A \times a)}$$

Where:
A: an average dry matter of feed consumed (g) and B: an average dry matter of excreted feces (g).
a = Percentage of nutrient content in feed A (%); b = Percentage of nutrient content in feces B (%)
Digestible Nutrients (%) = ND (%) x feed ingredients nutrients (%).
Average daily gain was known from the difference between final body weight and initial body weight (kg) divided by the length of observation time (days). Feed efficiency was obtained from the comparison between the average daily gain and consumption of DM multiplied by 100%.

Data analysis

The data were processed and analyzed using the Analysis of Variance (ANOVA) procedure. If the treatment had a significant effect, it was continued with Duncan's multiple follow-up tests to determine the difference between treatments Steel and Torri (1995). To facilitate data analysis, SPSS version 26 software was used.

RESULTS AND DISCUSSION

Feed consumption

Feed restriction is a program of restricted feeding in goats at a certain age and period (Santoso, 2014). Feed restriction program by way of gratification is one of the strategies that is widely used as a method that can reduce the impact of excessive feed consumption on the *ad libitum* feeding system.

Table 3 shows the consumption of dry matter and nutrients in male Kacang goats during the feed restriction. The results showed that the consumption of dry matter (DM), organic matter (OM), and crude protein (CP) from consumption of natural grass, concentrates, and total nutrients were very significantly different ($p<0.05$) between T2 treatments (50% feeding according to their maintenance life) and both T0 and T1 treatments. The T2 treatment significantly reduced consumption of DM, OM, and CP when compared to the other two treatments.

The consumption of natural grass for the T0 treatment was not significantly different from the T1 treatment, but the T2 treatment was quite different from the T0 and T1 treatments; whereas the consumption of concentrates was different from one treatment to another. In total feed consumption (grass and concentrates) for DM, OM, and CHO between the T0 and T1 treatments, the difference was not significant but it was significant ($p<0.05$) with the T2 treatment. However, in the consumption of CP, there was a significant difference between the three treatments (Table 3).

Empirical data in Table 4 show that consumption of goats without feed restrictions is higher than that of 100% and 50% feeding according to their maintenance life. This is because there is an opportunity to consume larger feed by goats without feed restrictions than those experiencing feed restrictions. The consumption of DM of livestock in the T0 treatment was 2.41% of body weight, in the T1 treatment was 2.21% of body weight, and in the T2

Table 3: Consumption of dry matter and nutrients in male Kacang goats during the feed restriction

Parameter	Treatment			*p*-value
	T0	T1	T2	
Feed Consumption				
Natural Grass (g/head/day:				
DM consumption (g/head/day)	74.37±2.36[a]	68.90±15.07[a]	48.27±1.21[b]	0.001
OM consumption (g/head/day)	61.57±1.95[a]	57.04±12.48[a]	39.96±1.00[b]	0.001
CP consumption (g/head/day)	3.67±0.12[a]	3.40±0.74[a]	2.38±0.06[b]	0.001
GE Consumption (MJ/Kg.DM)	1.18±0.08[b]	1.08±0.32[b]	0.786±0.00[a]	0.017
GE consumption (Kcal/kg.DM)	282.40±20.57[b]	258.87±76.78[b]	187.25±0.000[a]	0.017
ME Consumption (Kcal/kg.DM)	154.58±11.26[b]	141.70±42.03[b]	102.50±0.00[b]	0.017
Concentrate (g/head/day):				
DM consumption (g/head/day)	215.19±21.13[a]	175.76±40.98[b]	108.84±1.38[c]	<0.001
OM consumption (g/head/day)	187.73±18.44[a]	153.33±35.75[b]	94.96±1.21[c]	<0.001
CP consumption (g/head/day)	33.33±3.27[a]	27.22±6.35[b]	16.85±0.21[c]	<0.001
GE consumption (MJ/Kg.DM)	4061±0.462[b]	3.949±0.370[b]	2.076±0.00[a]	<0.001
GE consumption (Kcal/kg.DM)	992.38±119.48[b]	940.21±88.07[b]	494.26±0.00[a]	<0.001
ME consumption (Kcal/kg.DM)	859.97±103.54[b]	814.77±76.32[b]	428.31±0.00[a]	<0.001
Total DM and nutrient consumption				
DM consumption (g/head/day)	289.56±19.98[a]	244.65±55.49[a]	157.12±1.86[b]	<0.001
OM consumption (g/head/day)	249.30±17.47[a]	210.37±47.76[a]	134.92±1.59[b]	<0.001
CP consumption (g/head/day)	36.99±3.21[a]	30.62±7.06[b]	19.24±0.22[c]	<0.001
GE Consumption (MJ/Kg.DM)	5.24±0.38[b]	5.03±0.68[b]	2.86±0.00a	<0.001
GE consumption (Kcal/kg.DM)	1274.78±99.78[b]	1199.09±163.47[b]	681.51±0.00[a]	<0.001
ME Consumption (Kcal/kg.DM)	1014.55±92.72[b]	956.47±117.43[b]	530.81±0.00[a]	<0.001
Feed Digestibility				
DM Digestibility (%)	75.68±4.37[a]	81.89±3.14[b]	80.95±2.08[b]	0.026
OM Digestibility (%)ns	58.33±6.32	65.30±7.44	62.62±1.994	0.197
CP Digestibility (%)ns	76.62±4.90	75.39±8.29	74.14±2.51	0.795
Energy digestibility (%)ns	69.01±4.21	65.50±7.63	62.88±1.972	0.211

[1]Data are presented in mean±SD;
T0=Male goats without feed restrictions; T1= Male goats with 100% feeding according to their maintenance life; T2=Male goats with 50% feeding according to their maintenance life.
[ns]= not significant. [a,b]Different superscripts on the same line showed differences (p<0.05). DM=dry matter, OM=organic matter, CP=crude protein, GE=gross energy, ME=metabolize energy

Table 4: Changes in body weight of male Kacang goats during the feed restriction

Parameter	Treatment			*p*-value
	T0	T1	T2	
Initial body weight (kg/head)	11.74±1.66	11.28±1.56	11.92±0.62	0.797
Final body weight (kg/head)	12.65±1.80[b]	11.50±1.20[b]	9,93±0.57[a]	0.045
Weight gain (kg/head)	0.91±0.24[b]	0.21±0.57[b]	-1,99±0.76[a]	<0.001
Average daily gain (kg/head)	0.03±0,008[b]	0.007±0,01[b]	-0.06±0,02[a]	<0.001
Feed efficiency (%)	10.51±3.04[b]	2.80±6,98[b]	-42.37±16,11[a]	<0.001

[1]Data are presented in mean±SD;
T0=Male goats without feed restrictions; T1= Malegoats with 100% feeding according to their maintenance life; T2=Male goats with 50% feeding according to their maintenance life.
[ns]= not significant.
[a,b]Different superscripts on the same line showed differences (p<0.05).

treatment was 1.74% of body weight. The consumption of DM in this feed is far below the recommendation of Kearl (1982) by 0.37 kg/head/day or 3.7% of body weight in young goats weighing 10 kg, and the expected daily body weight addition target is 50 g/heat/day. As a result, the produced performance of the goat is also not optimal.

According to Tillman et al. (1998), the speed of feed flow rate from the digestive tract will cause more empty space so that livestock will continue to eat. In addition, feed restrictions on livestock (goats) can reduce the level of thyroxine secretion so that the metabolic process will run slowly and may provide more time for the digestion process and absorption of nutrients for livestock needs (Abdullah and Falconer, 1977). A similar opinion was also expressed by Yuwono et al. (2021) that the physiological response of livestock experiencing feed restrictions will get the maximum benefit from the feed given and another effect obtained is a decrease in the feed flow rate in the digestive tract.

Even so, in this study, it was proven that goats without feed restrictions and goats with 100% feeding according to their maintenance life had the same effect in terms of consumption of dry matter and several other nutrients. It is assumed that the composition of the feed and the nutritional content of the complete feed given is the same so that if the nutritional needs for each treatment have been fulfilled, livestock will stop eating. According to Londok and Rompis (2020), the quality and quantity of feed will affect the compensatory growth in the feed restriction phase, so it also affects feed consumption. In this study of feed restriction, the feed provided consisted of a combination of forage and concentrates with a ratio of 30:70 which was thought to have more effect on supporting the performance of productivity than seen from consumption. The combination of forage and concentrates will provide opportunities for the fulfillment of nutrients so that the costs incurred for feed are relatively low (Ransa et al., 2020). The difference in consumption between livestock without feed restrictions and livestock with restricted feeding did not have a significant effect on feed efficiency (Ekpe, and Christoperson, 1999). Therefore, the feed restriction phase can be a solution to improve the efficiency of feed management in the dry season (Suwignyo et al., 2017).

The results of the study (Table 3) show that the total consumption of DM for each treatment was still below the minimum standard in fattening Kacang goats with a body weight of 10-15 kg for the target of average daily gain of 0-75 g/head/day which is 320-500 g/head/day (Kearl, 1982). The low consumption of DM all treatment groups of goats resulted in lower body weight gain than the expected target.

The total consumption of CP in the T0 treatment of 36.99±3.21 (g/head/day) and the T1 treatment of 30.62±7.06 (g/head/day) was only equivalent to the needs of young goats with a body weight of 10 kg and an average daily gain of 25 – 50 g/head/day as recommended (Kearl, 1982). Where the target of an average daily gain is 25 – 50 g/head/day, CP needs range from 32 – 39 g/head/day. Such consumption of CP from both treatments can be seen from the average daily gain which is also not significant during the observation phase (Table 4).

Goats in the T2 treatment had lower consumption of CP than the standard requirements according to the recommendation of Kearl (1982) because of lower consumption of DM. As a result, goats in the T2 treatment showed low growth, which was indicated by negative body weight gain (Table 4). This is following the opinion of Suwignyo et al. (2017) that the consumption of DM, OM, and CP decreased in male Kacang goats in the restriction phases of 1 and 2 months.

The difference in nutrient consumption between these studies was caused by differences in the body weight of the Kacang goats used. Where Suwignyo et al. (2017) used Kacang goats with body weights of 20 - 25 kg; while this study used Kacang goats with body weights of 10 - 15 kg. According to Hanim et al. (2020), the factors that influence consumption are body weight and the size of livestock.

Livestock will consume feed to replace nutrients that undergo metabolic processes to be converted into energy to maintain the body's organs (maintenance life). In this study, this condition was experienced by goats in the T0 and T1 treatments; while in goats in the T2 treatment, the consumption of DM obtained by goats is lower, indicating lower growth performance. According to a study by Suwignyo et al. (2016), feed restrictions of up to 50% can reduce the performance of goat productivity, but do not interfere with the health status of livestock.

The consumption of energy (Table 3) from natural grass, concentrates, and total energy from the two feed ingredients also showed the same results, where goats with 50% feeding according to their maintenance life had much lower consumption of energy ($p<0.05$) than goat with normal feeding (T0) and goat with 100% feeding according to their maintenance life (T1). The data in Table 3 also show that natural grass provides less energy to meet the energy needs of goats in the 3 treatment groups when compared to concentrates, which provide higher energy.

The consumption of GE (Kcal/kg.DM) (Table 4) of each treatment, namely, the T0 treatment was 1274.78±99.78, the T1 treatment was 1199±163.47, and the T2 treatment

was 681.52±0.000; while the consumption of ME (Kcal/kg.DM) of each treatment, namely, the T0 treatment was 1014.56±92.73; the T1 treatment was 956.47±117.44, and the T2 treatment was 530.82±0.00.

The consumption of energy in the T0 and T1 treatments was sufficient in this study, on the other hand, the consumption of energy in the T2 treatment was not sufficient. As a result, body fat and protein are degraded to meet the needs of goats which has an impact on decreasing body weight during the feed restriction phase (Suwignyo et al., 2017). According to Mathius et al. (2002), energy needs are very important in livestock to support normal body activities. Livestock that lacks energy will increase feed consumption to meet the body's lack of energy.

Feed digestibility

The effect of feed restriction on feed digestibility is presented in Table 3. The digestibility of feed greatly determines the number of nutrients obtained and utilized by livestock. The results showed that the digestibility of dry matter (Table 4) of goats in the T2 treatment (with 50% feeding according to their maintenance life) was higher ($p<0.05$) than goats with normal feeding (T0), but relatively similar to goat with 100% feeding according to their maintenance life (T1). On the other hand, the digestibility of organic matter, crude protein, and energy were relatively the same between treatments (Table 3).

The digestibility of dry matter (DM) in the T2 treatment was higher ($p<0.05$) than in the T0 treatment, but was relatively similar to the T1 treatment. This indicates that in goats that are being restricted to feeding by giving only 50% feeding according to their maintenance life, the rumen microbes' ability to digest feed is higher when compared to goats with normal feeding. It is suspected that the restricted feed flow to the rumen streamlines the rumen microbes to digest feed more optimally. On the other hand, Dashtizadeh et al. (2010), report that the high digestibility of feed in livestock with restricted feeding was caused by the high retention time of feed in the rumen. As a result, the opportunity for microbes to digest feed is greater. The high digestibility of feed in the T1 and T2 treatments contributed to the increase in nutrients obtained by goat.

The digestibility of DM obtained in this study was higher than what was reported by Tahuk and Bira (2022) who obtained the digestibility of DM of 62.80±4.57 - 64.02±3.11% in Kacang goats seen from the difference in sex and castration; and what was reported by Mathius et al. (2002) who obtained the digestibility of DM of 75.40% in PE goats that obtained different concentrations of energy and protein. On the other hand, the digestibility of CP and OM in this study was lower than what was reported by Tahuk and Bira (2020) and (Mathius et al., 2002).

Growth performance

Table 4 shows the effect of feed restriction on male young goat performance. The results showed that the increase in body weight and average daily gain of goats with normal feeding (T0) and goats with 100% feeding according to their maintenance life (T1) showed a positive value of 0,031±0,008 and 0.007±0.019 kg/head/day, respectively. On the other hand, goats with 50% feeding according to their maintenance life showed a negative value of -0.067±0.026 kg/head/day. The efficiency of feed of goat in the T0 and T1 treatments were 10.51±3.04% and 2.81±6.98%, respectively, higher ($p<0.05$) than the efficiency of feed of goat in the T2 treatment of -42.37±16.11%.

The data from this study (Table 4) explain that if the goat experiences a lack of feed, then the decrease in body weight cannot be avoided. This decrease in body weight is caused by the depletion of fat tissue and muscle tissue whose protein is degraded to meet nutritional needs, especially energy to maintain survival. Thus, it can be seen that goats have a natural body defense mechanism to deal with environmental stresses, especially extreme lack of food. This natural body defense mechanism is carried out by sacrificing fat and protein in body tissues as a source of nutrition to replace feed nutrients that are not adequately available to ensure their survival. Livestock that experiences nutritional deficiency for a long time can interfere with their productivity, such as losing weight (Dida, 2021). According to Soeparno (2009), livestock experience a lack of feed or nutrition, their growth slows down or stops, and their weight losses.

In this study, it was also seen that the male Kacang goats with 100% feeding according to their maintenance life were still able to show positive growth. This illustrates that the maintenance living needs of Kacang goats are relatively lower than the standard recommended by Kearl (1982) who states that young goats with body weights of 10 kg and a weight gain of 0 kg/day need 0.32 kg of body weight/day. The results of this study are following a study by Suwignyo et al. (2016) that there was a decrease in the body weight of Bligon goats that experienced feed restrictions. Where feed restrictions of up to 50% can reduce the performance of goat productivity, but do not interfere with the health status of goats (indicated by the physiological status being in the normal range).

The efficiency of feed utilization increases positive growth of goats with normal feeding (T0), as well as in goats with 100% feeding according to their maintenance life. This means that these two groups of goats still utilize the nu-

trients consumed to increase their growth. On the other hand, goat with 50% feeding according to their maintenance life, the efficiency of the feed produced was negative. This indicates that the nutrients obtained are not sufficient to produce weight gain.

The growth performance of Kacang goats in this study is in accordance with a study by Suwignyo et al. (2017) that there was a decrease in growth in livestock that was restricted to feeding. This indicates that to obtain maximum livestock growth, the adequacy of feed both in quality and quantity is an absolute requirement that must be met by farmers/breeders. Lack of feed harms livestock performance. Thus, nutritional adequacy is an important factor that needs to be considered by farmers/breeders to improve the performance of goats (Tahuk and Bira, 2020). According to Mathius et al. (2002), protein adequacy of feed can stimulate the growth of goats if it is supported by adequate energy. Yan et al. (2018) report that feed restrictions for mother goats in early pregnancy affect the development of the placenta and fetus. Also, feed restrictions at the end of pregnancy cause enlargement of the placenta and inhibition of fetal growth. Silva et al. (2018) report that different feed restriction levels in lactating Alpine goats could reduce daily weight gain, but resulted in the digestibility of DM, OM, CP, and energy that were not much different from those of control livestock.

CONCLUSION

Feed restrictions on young male Kacang goats to 50% according to their maintenance life showed a decrease in the consumption of dry matter, organic matter, crude protein, and energy. As a result, the average daily gain and feed efficiency obtained by young male Kacang goats are negative. On the other hand, young male Kacang goats with 100% feeding according to their maintenance life still showed positive growth, although it was lower than young male Kacang goats with normal feeding (without feed restrictions).

The digestibility of dry matter of young male Kacang goats with food restrictions was higher than that of young male Kacang goats with normal feeding as needed.

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CONFLICT OF INTEREST

The researchers declare that there is no conflict of interest regarding finances or the material discussed in this published article.

NOVELTY STATEMENT

The problem of lack of feed has become a limiting factor in improving the performance of kacang goats in the tropics, so a solution strategy is needed. Therefore, the implementation of this research is important to obtain data and information about the severity of protein and energy deficiency on the performance of young male Kacang goats. This data can be a reference for improving raising of goat, especially for feed management during the dry lack of feed

AUTHORS' CONTRIBUTIONS

PKT conducted the experimental design of the research, data analysis, reporting, and drafting of the article. GFB conducted the processing of the complete feed, supervised the research, and data analysis, and drafting of the article. The authors read and approved the final manuscript.

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