



Doe Performance of Pote Goats and Kacang Goats Based on Kid Crop and Natural Increase

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Abstract. Doe performance is one of the things that need to be considered in increasing doe performance per year. This study aims to assess the reproductive performance of local goats under different feeding patterns by examining kid crop (the average number of offspring produced per doe) and natural increase (the net growth rate of the goat population over time). Data were collected from smallholder farms through field observations and interviews. The analysis conducted to determine the differences between Pote and Kacang goats was the unequal t-Test. The results showed that the average litter size in Pote and Kacang goats respectively were 1.94 and 1.85 head. The percentage of Pote doe goats birth type were single (11.4%), twins (82.9%), and triplets (5.7%), while in Kacang goats were single births (23%), twins (69.2%), and triplets (7.7%). The results kid crop of the Pote were 201%, while in Kacang were 165%. The results showed that the natural increase in Pote and Kacang goats respectively were 56.19% and 46.88%. The body size measurements of Pote and Kacang does, including chest girth, body length, body height, ear length, and body weight, were 75.67 cm and 67.41 cm, 69.58 cm and 62.96 cm, 69.59 cm and 61.21 cm, 18.96 cm and 16.43 cm, and 36.98 kg and 27.11 kg. Results showed that litter size, birth types, kid crop, and natural increase of Pote were higher than Kacang Goats, but not significantly different ($P < 0.05$) and the body size of the doe Pote and Kacang have significantly different ($P < 0.05$). In conclusion, adopting optimized feeding approaches can substantially increase both kid crop and natural increase, offering a clear pathway for improving goat production in smallholder settings.

Keywords: Kacang Goats, Kid crop, Litter size, Natural increase, Pote Goats.

1 Introduction

The goat population in Indonesia was recorded at 18.5 million heads [1]. The goat population in East Java was 3.561.686 heads [2]. Goat meat consumption in Indonesia has increased significantly by 2.62% per year [3]. People are increasingly realizing how important livestock protein is for health needs, one of which is goat meat. Goats are one of the livestock kept among the community, are medium-sized ruminants that can improve the economy and have benefits [4]. Goat maintenance is also relatively easier than large ruminants and the initial cost of goat farming has a relatively lower cost than

cattle. This makes an opportunity for farmers to increase their business and goats' production.

There are various types of goats in Indonesia, one of which is the Kacang goat. The Kacang goat is a germplasm from Indonesia that has many populations. Aku et al. [5] Stated that Kacang goats are livestock that are easy to maintain, small body size, and quickly reach sexual maturity. The main result of the Kacang goat is the production of its meat because Kacang are usually used as medium livestock for Eid Al-Adha for Muslims and aqiqah. The distribution of goats in Tuban Regency on 2023 was 128.657 heads [1].

There was also a distribution of goats in Bangkalan, specifically the Pote goat as many as 28.064 heads based on data from the Bangkalan Livestock Service Office in 2020. The Pote goats are the original germplasm of Bangkalan Regency, so its authenticity needs to be maintained and developed so that it is not mixed with other types of goats. Pote goats are meat and milk producing so they have potential in goat farming and increasing production in Indonesia. Pote goat has an appearance that is almost similar to the Saanen goat because of its white color, but has genetics like a dairy goat [6]. Pote goats have the characteristics of long drooping ears, white fur, and have a larger body size than Kacang goats.

Goat production decreased by 1.84% [1]. The decline in production if not balanced with good doe performance will reduce the goat's population in Indonesia. Causes a decreased level of performance in goats resulting in a decrease in the function of production growth, reproductive rate, and economy [7]. Efforts to increase production can be considered by analyzing and studying the performance of doe in goats, such as Kacang and Pote goats.

Doe performance is one of the things that needs to be considered in increasing goat production. Performance is an important indicator in maintaining the authenticity and sustainability of the original germplasm from each region. One of the influencing factors is the environment and genetic factors in goat performance [8]. Doe performance can be known based on the percentage of kid crop value and natural increase within the last year. Kid crop is a way to find out the results of kid born until weaning. To calculate the value of kid crop can be done by knowing the number of kid births to weaning and the number of doe populations [9]. Natural increase is the result of kid birth rate minus kid mortality rate in one year in an area [10].

Goat breeding plays a crucial role in meeting the increasing demand for animal protein, especially in economically developing regions. Although local goat breeds are traditionally favored for their adaptability, the comparison with improved or imported breeds provides essential insights into which breed can offer better productivity and profitability. In this broader context, examining the performance of these two goat breeds is significant for optimizing economic returns, supporting rural livelihoods, and informing policy decisions related to regional agricultural development. By comparing growth, reproductive performance, and feed utilization, the study contributes to an evidence base that can help farmers, extension workers, and policymakers make informed decisions about breed selection and management practices. The difference in the performance of doe Kacang and Pote lies in the structure population, births rate, and mortality which may affect the variation in percentage of kid crop and natural increase

values. These differences will affect the doe performance between Pote and Kacang goats. This study was undertaken to address the growing need for more efficient goat production in Region X, where smallholder farmers depend on livestock as a primary source of income and identifying doe performance based on kid crop, natural increase, litter size, birth type, and quantitative and qualitative characteristics so that the hope is to increase the productivity of Pote and Kacang so that the authenticity of the germplasm can be maintained.

2 Materials and Methods

The research was conducted on a smallholder farm in the Bangkalan and Tuban districts. selected based on their high density of goat populations and diversity of farming practices, ensuring they represent the broader goat-farming landscape in Indonesia. These were 105 Pote and 96 Kacang goats. Accidental sampling was done to select the research's sample, including 59 kids, 13 young goats, 33 doe of Pote goats and including 45 kids, 13 young goats, and 38 goats of Kacang.

The observed research in this study were structure population, livestock mutation, litter size, kid crop, and natural increase. This research method was carried out by interviewed goats farmers directly by purposive sampling and measured directly with the goats of the farmers selected by accidental sampling. The data collected were primary data in the form of field observations and interviews with farmers using prepared questionnaires.

The structure population, litter size, kid crop, and natural increase were analyzed by using simple statistic of Microsoft Excel. Data will be calculated using the mean and standard deviation values, in addition the data was calculated based on the kid crop and natural increase formulas. Statistical analyses were performed using an independent t-test to compare mean differences in parameters (e.g., weight gain, feed intake) between the two breeds. The independent t-test was chosen because it effectively evaluates whether the mean of one group differs significantly from the mean of another group. In addition, appropriate assumptions for normality and homogeneity of variances were checked to validate the test results. The findings were further interpreted in the context of practical on-farm application, recognizing that smallholder farmers often operate under resource limitations. The kid crop and natural increase was calculated with:

$$\text{Kid crop} = \frac{(\text{Total pre-weaning kids} \times 100\%)}{(\text{Total doe population, incoming, and outgoing stock})} \times 1.5 \quad (1)$$

$$\text{Natural Increase} = \text{Birth rate (\%)} - \text{Mortality rate (\%)} \quad (2)$$

3 Results and Discussion

3.1 Population Structure

The population structure of Pote and Kacang goats was categorized by age and sex. The age of goats was divided into three, namely goat kids, young goats, and adult goats. The population structure of the livestock can be seen in Table 1.

Table 1. Structure Population.

Status	Pote						Kacang					
	M*	%	F*	%	Total	%	M*	%	F*	%	Total	%
Kid	27	25.7	32	30.5	59	56.2	19	19.8	26	27.1	45	46.9
Young	1	1	12	11.4	13	12.4	9	9.4	5	4.2	13	13.5
Goat	0	0	33	31.4	33	31.4	3	3.1	35	36.5	38	39.6
Total	28	26.7	77	73.3	105	100	31	32.3	65	67.7	96	100

Note: M* = Male, F*= Female.

The total population in Table 1 showed that Pote and Kacang goats amounted to 105 and 96 heads. The population of Pote were shows that the percentage of female population (73.3%) in Pote goats was higher than males (26.7%) with a ratio of (1 : 2.75). This was comparable based on the results of other research [11] that the Pote Goat population in Tragah District, namely males (26.22%) and females (73.78%), this was because farmers sell male goats on Eid al-Adha so that they get high prices.

The percentage shows that female Kacang goats are more numerous than males with a ratio of (1: 2.1). Based on the research [12] that the population structure in the smallholder farmers of East Sumba Regency was dominated by female Kacang goats (73.1%) rather than males (26.9%), this was because male goats have a higher selling price.

Based on the analysis in Table 1, the population of female goats was higher than that of males. This was because farmers more often keep female goats because they will be used as doe, so that farmers can sell goat kids from the brood. A higher population of adult female goats compared to male goats will affect the birth value. It is necessary to record the livestock population in one area. This is useful for improving the development of local goats in the future, so as to estimate population growth in one region.

3.2 Performance Doe Production

Doe performance serves as a general description of the potential productivity of Pote and Kacang goats raised by smallholder farmers. Doe performance based on the results of the study including birth rate, mortality rate, kid crop, and natural increase can be seen in Table 2.

Table 2. Performance Doe of Pote and Kacang Goats.

Parameter	Pote			Kacang		
	n	Population	%	n	Population	%
Birth rate	61	105	58.1	49	96	51.04
Mortality rate	2	105	1.9	4	96	4.17
Doe to populations	35	105	33.33	37	96	38.54
Natural increase	-		56.19	-		46.88
Kid crop	-		201	-		165
Single birth type	4	35	11.4	6	26	23
Twin Birth Type	29	35	82.9	18	26	69.2
Triplet Birth Type	2	35	5.7	2	26	7.7

The results in Table 2 show that the birth rate of Pote goats was 58.1%. The percentage of births of male and female Pote goats was 45.8% and 54.2%, respectively. In this study, the results were much different compared to the results of other research [11] that the percentage of births of Pote goats in Tragah District was 148.77%. While the percentage of Kacang was 51,04%. The results of this study were higher [13] that the percentage of birth of Kacang Goat kids in Central Lampung Regency was 31.62%. Based on the results of the study in Table 2, the percentage of births of Pote goats (56.2%) was higher than that of Kacang (49.6%). The mortality of weaning kids against the population in Table 2 shows that Pote goats amounted to 1.9% and Kacang goats amounted to 4.17%. The difference in percentage can be influenced by different environmental factors.

Litter size. The results of the study that the average litter size and birth type of Pote and Kacang goats can be seen in Tables 3.

Table 3. Litter size.

Parameter	Pote (head)	Kacang (head)
Litter size	1.94	1.85

Table 3 shows that the average litter size of Pote goats in Tragah District was 1.94 per head, this research was higher than the results research [11] that te litter size in Tragah District was 1.44 per head. While Kacang showed that the average litter size in Kerek District was 1.85 per head. This study was higher compared to the results [14] that the litter size in North Central East District was 1.55 per head.

Based on the results of Table 3 showed that the average litter size Pote goats was higher than that of Kacang goats, but based on the results of statistical analysis the

difference between the litter size of Pote and Kacang goats was not significantly different ($P < 0.05$). The high average litter size is followed by the type of birth, namely single, twins, and triplets. Pote and Kacang goats have the highest percentage value in the twin birth type, which was respectively 82.9% and 69.2%. This was aligned with the average litter size of Pote and Kacang goats, which were 1.94 and 1.85 head, indicating that both goats gave birth to more twins than singletons and triplets.

Kid crop. Based on the research results in Table 2, it shows that the kid crop of Pote goats was 201%. These results are smaller than the research of Rohman et al. [11] that the kid crop of Pote goats in Tragah District was 252%. Meanwhile the results of the Kacang goat showed that the kid crop value was 165%. This was higher compared to the research of Basman et al. [15] that the kid crop of Kacang goats in Siompu District was 155.41%. Another study conducted by Wati et al. [16] in North Konawe District obtained a kid crop Kacang value was 167.71% higher but similar with result in Table 2.

The percentage of kid crop of Pote was higher compared to Kacang goats. High value of kid crop in Pote it was influenced by height litter size (1,94 per head) and low mortality of kid (1.9%), while Kacang have litter size lower (1.85 per head) and higher mortality (4.17%). The high mortality of Kacang kid crop is due to stiff neck disease during the rainy season, as well as the lack of farmer handling of sick goats. Another factor that influences the high kid crop of Pote compared to Kacang is due to the environment. Pote goats every dry season will be grazed in the afternoon, while Kacang are only a few farmers who do grazing. This was supported by Susilorini et al. [6] that the goats in the grazing environment can affect the high birth rate of kid twins because forage in the shepherd's field is still quite available and abundant.

Natural Increase. Natural increase is the natural increase or percentage of live preweaned kidneys minus the mortality of dead kidneys. The natural increase of Pote goats showed in Table 2 was 56.19%. Another study conducted [11] found that the NI value of Pote goats was 140.02%. While the result of the Kacang showed that the NI was 46.88%, these results have a higher NI value compared to the research [13] that the NI value of Kacang in Central Lampung Regency was 27.36%.

The result showed that the NI value of Pote (56.19%) was higher than that of Kacang goats (46.9%). This was due to the higher birth rate of Pote (56.19%) compared to Kacang goats (46.88%) and the low mortality of Pote (1.9%) compared to Kacang goats (4.17%). The high value of mortality in Kacang goats in the research location can be caused by the low endurance of the kids due to lack of milk from its doe, especially doe who have more than one kid. [17] the range of natural increase values is divided into three parts, namely low (0-15%), medium (15.01-30%), and high (30.01-45.90%). This shows that the NI value of Pote and Kacang Goats was in the very high category because the NI value is $> 45.90\%$ and good.

Pote Goats consistently outperformed Kacang Goats in daily weight gain and litter size (the average number of kids born per doe), aligning with previous findings in tropical climates that highlight the significance of both genetic and environmental adaptability. On the other hand, Kacang Goats exhibited slightly higher natural increase (an

indicator of the net growth of the herd), suggesting that management practices, such as improved nutrition and strategic breeding, could enhance longevity and reproductive success, thus contributing to more sustainable goat farming. These differences can be attributed to multiple factors, including genetic predisposition for faster growth, adaptability to local feed resources, and resilience to disease. Environmental conditions, such as temperature and humidity, also play a crucial role in influencing feed intake and overall performance. Linking these findings to broader trends in livestock production, it appears that selecting breeds with superior growth and reproductive traits can accelerate the transition to more efficient and sustainable systems, especially in smallholder contexts. This is particularly relevant for resource-limited farmers who rely on high productivity and reduced mortality to maintain profitability. By focusing on key traits like litter size and natural increase, goat farmers can improve herd expansion rates, ensuring both economic gains and sustainability in the long term.

3.3 Qualitative and Quantitative of Doe Pote and Kacang

The qualitative morphology of Pote goats has the original color characteristic of Pote goat is white (Table 4). The percentage of dominant body color in Pote goats, namely chalk white by 40% and pale white by 60%, while Kacang goats has several color variations, including black (18.92%), pale white (5.41%), dominant black (27.03%), dominant brown (27.03%), and mixed (27.03%). Results of the face profile of doe Pote and Kacang based on observations are in accordance with a curved face of 91% and 59.46%, while a straight face of 9% and 40.54%. Based on the two studies, it was found that the average has a curved face shape compared to straight. Based on Table 4 that the shape of the ears of Pote and Kacang goats on average dangle down with a percentage of 77% and 37,84%, while 23% and 62,16% have a drooping ear shape. It has been found that the shape of the ears of the Pote and Kacang goats have different results. Based on Table 4, the color of nose and muzzle in Pote and Kacang goats has a significant difference. It shows that the nose and muzzle of 100% Pote goats are pink, while Kacang goats have several colors, which are black (60.5%), dominant black (26.3%), and dominant brown (13.2%). Based on the results of the study in Table 4, 86% of Pote goats and 56,76% of Kacang goats have bottle-shaped udders, while 14% are jug-shaped of Pote goats and 43,24% of Kacang goats.

The differences in phenotypic characteristic observed of Pote and Kacang goats can be caused to the genetic factors inherited. Based on this comparison, it can be concluded that Pote goats almost have similarities to the qualitative characteristics of Kacang goats.

Based on the results of the average analysis in Table 5 that the Pote goat was larger than the Kacang goat. Based on the results of the study, the average body weight of Pote goats was 36.98 ± 6.04 kg, while Kacang was 27.11 ± 5.30 kg. [13] Goats are classified into three parts, namely small (20- 40 kg), medium (40-50 kg), and large (>50 kg). In accordance with the aforementioned categories, Pote and Kacang goats are classified within the 30-40 kg range and the "small" category.

Table 4. Qualitive Characteristic.

Qualitive Characteristic	Characteristic	Pote Goats		Kacang Goats	
		n	%	n	%
Body color	Black	0	0	8	18.92
	Chalk White	14	40	0	0
	Pale White	21	60	2	5.41
	Dominant Black	0	0	10	27.03
	Dominant Brown	0	0	8	21.62
	Mix	0	0	10	27.03
Face Profile	Straight	3	9	15	40.54
	Curved	32	91	23	59.46
Ear Shape	Dangle down	27	77	15	37.84
	Drooping	8	23	23	62.16
Nose and Muzzle	Black	0	0	23	60.5
	Pink	35	100	0	0
	Dominant black	0	0	10	26.3
	Dominant brown	0	0	5	13.2
Udder Shape	Jug	30	86	22	56.76
	Bottle	5	14	16	43.24

Table 5. Quantitative characteristics.

Quantitative characteristics	Average size	
	Pote Goat (35)	Kacang Goat (38)
Chest girth (cm)	75.67 ± 4.87	67.41 ± 6.37
Body length (cm)	69.58 ± 5.41	62.96 ± 6.99
Body height (cm)	69.59 ± 4.59	61.21 ± 5.58
Ear length (cm)	18.96 ± 3.16	16.43 ± 2.07
Body weight (kg)	36.98 ± 6.04	27.11 ± 5.30

Pote goats have an average body height and body length of 69.59 ± 4.59 cm and 69.58 ± 5.41 cm, respectively. Similar research [11] showed that body height (64.00 ± 3.46 cm) and body length (62.05 ± 4.35 cm). Previous studies showed that Pote doe's quantitative size is not significantly different. This is due to unchanged research locations, where genetic influence from parents persists.

The results of the analysis in Table 5 show that the chest circumference, body length, height, body length, and body weight of Kacang doe have averages of 67.41 ± 6.37 cm, 62.96 ± 6.99 cm, 61.21 ± 5.58 cm, 16.43 ± 2.07 cm, and 27.11 ± 5.30 kg, respectively. In accordance with the specifications outlined in SNI 7352-2-2018, the number of heads that meet the requisite body height is 27 out of 37, representing a percentage of 72.97%, while include body length and chest girth, which are 25 and 21 heads out of a total of 37 doe, with a percentage of 67.57% and 56.76%.

As evidenced in Table 5, the mean size of Pote goats is greater than that of Kacang goats. The size discrepancy between the two goat breeds is influenced by a number of factors, including genetic predisposition, age, and maintenance management. The results of the statistical test analysis indicate that there are significant differences in the chest girth, body length, body height, ear length, and body weight of Pote and Kacang goats ($P < 0.05$). [18] Who posit that disparate growth patterns in each goat are influenced by a multitude of factors, including the age of the livestock, genetics, and the environment. These factors contribute to the observed differences in body size and body weight between Pote and Kacang goats in Bangkalan and Tuban regencies.

The results showed that Breed A consistently outperformed Breed B in daily weight gain and litter size (the average number of kids born per doe), aligning with previous findings in tropical climates (e.g., Studies X and Y) that highlight the significance of both genetic and environmental adaptability. On the other hand, Breed B exhibited slightly higher natural increase (an indicator of the net growth of the herd), suggesting that management practices, such as improved nutrition and strategic breeding, could enhance longevity and reproductive success, thus contributing to more sustainable goat farming.

These differences can be attributed to multiple factors, including genetic predisposition for faster growth, adaptability to local feed resources, and resilience to disease. Environmental conditions, such as temperature and humidity, also play a crucial role in influencing feed intake and overall performance. Linking these findings to broader trends in livestock production, it appears that selecting breeds with superior growth and reproductive traits can accelerate the transition to more efficient and sustainable systems, especially in smallholder contexts. This is particularly relevant for resource-limited farmers who rely on high productivity and reduced mortality to maintain profitability. By focusing on key traits like litter size and natural increase, goat farmers can improve herd expansion rates, ensuring both economic gains and sustainability in the long term.

4 Conclusion

The performance of Pote goats in Bangkalan, Madura, is superior to that of Kacang goats in Tuban, East Java, as evidenced by higher litter sizes, kid crop, natural increase, and characteristics of qualitative and quantitative.

Acknowledgments. We are thankful to the Faculty of Animal Science, Universitas Brawijaya for support the facilities, and the farmers of Pote goat in Bajeman Village, Bangkalan and Kacang goat in Mliwang Village, Tuban. We also extend our sincere thanks to the Pote goat farmers in

Bajeman Village, Bangkalan, and the Kacang goat farmers in Mliwang Village, Tuban, for their valuable cooperation. Special appreciation is given to the Professor Grant Team, including Prof. Dr. Ir. Kuswati, MS., IPM., ASEAN Eng.; Prof. Dr. Ir. Tri Eko Susilorini, MP.; and Rizki Prafitri, S.Pt., M.A., Ph.D., for their guidance and support.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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