

Doi: 10.21059/buletinpeternak.v46i3.70310

The Effect of Different Agroecological Zones on Body Weight Change, Litter Size, and Profitability of Bligon Goats in Bantul Regency, Special Region of Yogyakarta

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ABSTRACT

This study aims to identify the differences in agroecological zones on changes in body weight, litter size, and profitability of Bligon goats in Bantul District, Special Region of Yogyakarta. This study involved 56 farmers consisting of 11 farmers in coastal areas (zone IV), 21 farmers in the lowlands (zone IV), and 24 farmers in hilly areas (zones I, II, and III). This study also used 120 does of Bligon goats consisting of 40 goats from each area. The farmers and Bligon goats were selected by purposive sampling technique in different agroecological zones classified based on the slope of the land. The design used was Completely Randomized Design (CRD) with the agroecological zones as a treatment factor. This study used a survey method. Data were analyzed descriptively and quantitatively using one-way ANOVA at the 5% level. The results showed that the body weight of Bligon goats from the beginning of kidding to three months or at the weaning period did not have a significant difference, and the litter size was also not significantly different. Profitability analysis using Revenue Cost Ratio (R/C Ratio) and Return on Investment (ROI) showed that farmers in coastal agroecological zones have higher profitability than those in lowland and hilly agroecological zones with a net cash flow of IDR 1,219,000, 00, R/C Ratio of 1.43, and ROI of 44.26. Based on this analysis, it can be concluded that changes in body weight and litter size of Bligon goats in different agroecological zones are the same. Based on the profitability analysis, all farmers in different agroecological zones benefit from raising Bligon goats, but the highest profitability is found in farmers in the coastal agroecological zone.

Keywords: Bligon goat, Changes in body weight, Litter size, Profitability

Article history

Submitted: 8 November 2021

Accepted: 8 August 2022

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Introduction

The livestock sector plays an important role in most countries including in tropical countries like Indonesia (Budisatria *et al.*, 2018; Darcan and Silanikove, 2018) and contributes to the National Gross Domestic Product (GDP) of 1.57% in 2017 and 15.87% of GDP in the agricultural sector (Direktorat Jenderal Peternakan dan Kesehatan Hewan, 2018). This is inseparable from the role of rural communities that raise a lot of ruminant livestock to increase income and savings (Budisatria and Udo, 2013; Ngadiyono *et al.*, 2020).

The widest breed of small ruminants is the goat. The maintenance of small ruminants such as sheep and goats play an important role in people's livelihoods, especially in rural communities (Budisatria *et al.*, 2017), and contributes to increasing people's income and savings

(Budisatria and Udo, 2013; Mhlanga *et al.*, 2018). This supports the almost even distribution of goats throughout Indonesia, including in Bantul District, Special Region of Yogyakarta.

Bligon goats are the most common goat breed in Bantul District. This goat is a cross between a male Kacang goat and a female Peranakan Etawah (PE) goat. Bligon goats are used as meat goats and traded, especially at the beginning of the new school year and the celebration of the Feast of Sacrifice (Budisatria *et al.*, 2021; Warman *et al.*, 2021). The distribution of Bligon goat farming in Bantul District covers different agroecological zones classified based on the slope of the land, namely coastal areas, lowlands, and hilly areas (Rahmawati *et al.*, 2022).

Based on data from the Bantul District Government (2020), this district has different agroecological zones consisting of coastal areas, lowlands, and hilly areas. This can cause

differences in each zone that can affect livestock productivity covering changes in body weight and litter size. Differences in agroecological zones can affect breeder management, production potential, and vegetation that affects feed availability (Budisatria and Udo, 2013). The agroecological zone of hilly areas is assumed to have more diverse forage vegetation such as legumes with higher crude protein content (Budisatria *et al.*, 2021) compared to other agroecological zones. Differences in the nutrient content of each type of feed in each agroecological zone can affect the productivity of Bligon goats which includes production and reproduction performance, such as changes in body weight of the does at the beginning of calving until the weaning period at the age of three months and litter size. Besides, the maintenance management applied by farmers in each agroecological zone can also affect livestock productivity.

The number of livestock ownership, the type of goats, and the provision of feed also have an impact on production costs (cash out flow) and the profitability of farmers (Kusumastuti, 2012). This difference is certainly influenced by the maintenance management carried out by farmers in each zone which can affect input and output costs. The profitability of farmers in different agroecological zones in Bantul District is assumed to vary and has not been known yet. Therefore, this study aims to identify the effect of different agroecological zones on changes in the body weight, litter size, and profitability of Bligon goats in Bantul District, Special Region of Yogyakarta.

Materials and Methods

Research setting

Field data were collected from January to July 2021. The determination of the location of the study used a purposive sampling technique with the consideration that the location represented the agroecological zone of coastal, lowland, and hilly areas and there were Bligon goats. Locations covered three different agroecological zones in Bantul District which were classified based on the slope of the land. Based on the predetermined criteria, the researcher selected Sanden and Sub-district representing coastal areas (zone IV), Pajangan Sub-district representing the lowlands (zone IV), and Dlingo and Imogiri sub-districts representing hilly areas (zones I, II, and III). Basri *et al.* (2011) divide the slope of the land into four zones. Zone I is a zone with a land slope of more than 40% (extremely steep slopes) which is a hilly and mountainous physiographic area. Zone II is a zone with a slope of 16% – 40% (steep slopes) which is a hilly physiographic area. Zone III is a zone with a slope of 8% – 15% (moderate slopes) which is a physiographic area of hills and sloping plains. Zone IV is a zone with a land slope of less than 8% (gentle slopes) which is a flat physiographic area to alluvial soil deposits.

Research materials

The material in this study was 56 farmers and 120 does of Bligon goats maintain in a breeding system. The determination of research material was based on the purposive sampling technique. The farmers consisted of 11 farmers from the coastal area, 21 farmers from the lowlands, and 24 farmers from the hilly areas with the criteria of having at least one year of experience in raising livestock and raising Bligon goats with a breeding system. The Bligon goats selected as samples consisted of 40 goats of each area with the criteria that the does had given birth at least once and were in good health and fertility.

Research design

The research used a Completely Randomized Design (CRD) with the same direction as the agroecological zone as a treatment factor, namely coastal areas, lowlands, and hilly areas in Bantul District, Special Region of Yogyakarta.

Method

This research used a survey method and direct observation. It used primary data obtained from direct observation of goats and interviews with farmers with the help of a questionnaire.

Observed variables

The variables observed in this study were respondent identification, changes in body weight, litter size, and profitability analysis. Respondent identification covered age, education level, experience in raising livestock, and the number of livestock ownership. Changes in body weight of the does were observed for three months, i.e. at the beginning of kidding until the weaning period at the age of three months. Litter size or the number of kids at birth is known from interviews with farmers and direct observations at the research location for the last year. Profitability analysis was calculated for the last year of rearing (July 2020–July 2021) based on the total Bligon goats maintain by farmers and converted into livestock units (ST). Each ST consisted of seven goats or 0.14 ST per head (Pagala *et al.*, 2021).

Data analysis

Data were analyzed descriptively and quantitatively. Descriptive analysis was done by grouping the available data in the form of tables and then completed with a descriptive explanation. Quantitative analysis was carried out by calculating the mean, standard deviation, and the influence of agroecological zones on the observed variables using a one-way analysis of variance (ANOVA) with a significance level of 5% ($P < 0.05$) with the tool of the Statistical Product and Service Solutions (SPSS) 16.0.

Profitability analysis was measured based on cash in flow consisting of the selling price of live goats and the selling price of manure. Cash out flow or expenses consisted of fixed costs and variable costs. Fixed costs covered building

cages, land, purchase of does or male goats, and equipment. Variable costs included the purchase of Bligon goats, labor, feed, medicines, vitamins, veterinarians, and stud rent. Net cash flow was calculated based on the difference between cash in flow and cash out flow.

The revenue cost ratio (R/C ratio) is a comparison between revenues and expenses of a business that can be calculated based on the following formula according to Nursida and Susanto (2017):

$$\text{R/C Ratio} = \frac{\text{Cash flow (revenue)}}{\text{Cash out flow (expense)}}$$

If R/C=1, then the Bligon goat business is at the break even point. If R/C<1, then the Bligon goat business is uneconomical (loss). If R/C>1, then the Bligon goat business is considered profitable.

$$\text{ROI} = \frac{\text{Net cash flow (profit)}}{\text{Fixed cost or invest}} \times 100\%$$

Return on investment (ROI) is a tool for measuring the ability of a livestock business to generate profits by looking at the profit generated on the investment which can be calculated by the following formula according to Nursida and Susanto (2017).

Results and Discussion

Identification of respondents

In terms of the age of the farmers, the average age was 58.45 years in the coastal areas, 56.71 years in the lowlands, and 55.08 years in the hilly areas (Table 1) and there was no significant difference. This average is in the productive age, namely 30–60 years as stated by Harmoko *et al.* (2020) and Sulfiar *et al.* (2021).

In terms of education level (Table 1), most farmers completed junior high school in coastal areas (45.45%), senior high school/vocational school in the lowlands (42.86%), and elementary school in hilly areas (33.33%), and none of the

farmers had a bachelor's degree in all agroecological zones. The education level was dominated by the upper secondary education category in the lowlands and the basic/low education category in the coastal and hilly areas. The low level of education of farmers will affect the management of goat rearing which is still traditional by relying on experience. This is in line with Fitriza *et al.* (2012) and Purnomo *et al.* (2021) that the maintenance carried out by farmers with lower levels of education mostly refers to habits that have been carried out since childhood (parental factors). Therefore, with the higher education of farmers, it is expected that the performance of the livestock business can develop well.

Livestock experience is one of the characteristics affecting the success of a livestock business. The livestock experience is the duration for farmers managing the livestock business (Efu and Simamora, 2021). The longest livestock experience based on the agroecological zones was in hilly areas (30.17 years), lowlands (21.52 years), and followed by coastal areas (14.18 years) (Table 1). Based on the results of the analysis, there was a significant difference ($P<0.05$) in the experience of raising livestock in different agroecological zones with the longest experience in hilly areas. Based on the results of interviews, this is because farmers in the hilly areas have already raised livestock earlier than those in other agroecological zones. Even, some farmers stated that this practice has been carried out from generation to generation. The level of experience in raising livestock and the intensity of training will further improve the ability of farmers to manage livestock businesses. This is in line with Usman *et al.* (2016) and Atmoko *et al.* (2019) that farmers who have run livestock businesses for a long time have sufficient experience in raising livestock. The longer the experience in managing livestock, the higher the knowledge and skills in managing livestock.

The numbers of Bligon goats maintain by farmers in different agroecological zones varied. This is possibly due to different capital and management owned by the farmers. The livestock business is still considered a side business for

Table 1. Identification of respondents in different agroecological zones in Bantul Regency, Special Region of Yogyakarta

Description	Agroecological zones		
	Coastal area n=11	Lowlands n=21	Hilly area n=24
Age (year) ^{ns}	58,45 ± 11,32	56,71 ± 10,91	55,08 ± 11,23
Education level (%)			
a. No school	9,09	4,76	4,17
b. Did not pass elementary school	9,09	9,52	16,67
c. Pass elementary school	27,27	23,81	33,33
d. Pass junior high school	45,45	19,05	29,17
e. Pass senior high school	9,09	42,86	16,67
f. Pass bachelor degree	0	0	0
Experience of raising livestock (year)	14,18 ± 11,44 ^a	21,52 ± 17,00 ^b	30,17 ± 17,61 ^c
Number of Bligon goat ownership (head)			
a. 1–5	18,18	66,67	75,00
b. 6–10	45,45	23,81	16,67
c. More than 10	36,37	9,52	8,33

n: Number of farmers in different agroecological zones.

respondents. Based on these results, it can be said that the livestock business in Bantul District is considered a small-scale livestock business (less than 50 heads) (Prabowo, 2018; Widiastuti, 2021).

Farmers in coastal and hilly areas had more than 15 goats with a percentage of 9.09% and 8.33%, respectively. Meanwhile, no farmer in the lowlands has more than 15 goats. The number of goats maintain by farmers in these three zones varied possibly due to different farmers' abilities in managing Bligon goats. In general, rural communities make animal husbandry a side business and are still traditional, so the ownership is still relatively low and will increase if the does produces kids. This is supported by Emawati *et al.* (2018) that traditional businesses are represented by farmers with narrow lands who have 1–2 goats. The low number of livestock ownership in Bantul District is since farmers main job is farmers' in all agroecological zones of coastal areas, lowlands, and hilly areas. Thus. They choose to raise fewer Bligon goats in order to have more time for farming. Besides, the low number of livestock ownership is also because farmers make this business a side business. Goats will be sold during the certain period such as school payments and the start of the growing season. The limited capital makes farmers allocate more capital for agricultural needs such as purchasing plant seeds, fertilizers, pesticides, and others.

Changes in body weight

Statistical analysis on changes in body weight of the does showed no significant differences in different agroecological zones at the beginning of calving, the first, second, and third months of weaning. In the first month of calving (30 days), there was a decrease in body weight of Bligon goats in the three agroecological zones, namely -2.96% in coastal areas, -3.20% in lowlands, and -4.75% in lowland hilly areas respectively (Table 2).

The decrease in body weight of the does in the first month was due to the milk production to meet the nutrient needs of kids. This is also supported by Baliarti *et al.* (2016) that the decrease in body weight of the mother during the weaning period is a result of high milk production to meet the nutrient needs of the kids. In the second month after kidding (60 days old), there was a decrease in body weight of Bligon goats in coastal areas (-0.68%), lowlands (-1.43%), and (0.57%) hilly areas. In the third month after kidding (90 days or weaned), there was an increase in the

body weight of Bligon goats in the three agroecological zones. This is assumed due to the nutrients needed to produce milk are not as high as during the first month, so the nutrients consumed by the does can be diverted to increase body weight. This is supported by Budisatria *et al.* (2018) that the increase in body weight in the second and third months indicates that in the second and third months the ability of nutrients to meet the needs of milk production is not as large as in the first and second months.

Litter size

Litter size (LS) is one of the livestock productivity parameters that play a role in determining the fertility level of female goats and the rate of increase in the goat population (Parasmawati *et al.*, 2013; Widiastuti *et al.*, 2022). In this study, the average LS in different agroecological zones was 1.65, 1.62, and 1.37 in the coastal area, the lowlands, and the hilly area respectively (Table 3). The data obtained in this study are lower compared to previous studies by Murdjito *et al.* (2011) with an average LS of 1.73 LS and Widi *et al.* (2016) with an average LS of 1.78. This can be influenced by genetic factors, does age, body weight, environment and microclimate of the cage location, consumption of does feed during pregnancy, and higher nutrient content of feed before ovulation which can increase the number of the ovulated ovum (Destomo *et al.*, 2020; Fikri *et al.*, 2020).

Table 3. Litter size of Bligon goats in different agroecological zones in Bantul Regency, Special Region of Yogyakarta

Agroecological zones	Average \pm standard deviation
Coastal area	1,65 \pm 0,62
Lowlands	1,62 \pm 0,58
Hilly area	1,37 \pm 0,49

^{ns} Non significant.

On average, Bligon goats in different agroecological zones had different abilities to produce more than one kid at each birth (prolific). The prolific trait is one of the reproductive traits, namely the ability to give birth to more than one kid per birth (Hamdani, 2015). The prolific trait is controlled by the fecundity gene, namely the BMP15 gene. The pattern of gene control on the proliferative mechanism indicates that there are differences between breeding goats and sheep, but the prolific nature of goats and sheep is still controlled by the same gene, namely BMP 15 (Hidayat *et al.*, 2019).

Table 2. Average of body weight and changes in body weight of Bligon goats from early kidding to weaning at the age of three months in different agroecological zones in Bantul Regency, Special Region of Yogyakarta

Description	Agroecological zones					
	Coastal area		Lowlands		Hilly area	
	BW (kg)	CBW (%)	BW (kg)	CBW (%)	BW (kg)	CBW (%)
Kidding time ^{ns}	40,53 \pm 12,10	-	39,87 \pm 10,22	-	32,08 \pm 4,45	-
First month ^{ns}	39,33 \pm 13,14	-2,96	38,59 \pm 9,51	-3,20	30,55 \pm 5,11	-4,75
Second first ^{ns}	39,07 \pm 12,62	-0,68	38,05 \pm 9,41	-1,43	30,73 \pm 5,72	0,57
Third month ^{ns}	39,43 \pm 12,50	0,93	38,52 \pm 9,28	1,21	30,95 \pm 5,42	0,73

BW: body weight, CBW: changes in body weight.

^{ns} Non significant.

Profitability analysis

Cash in flow. Cash in flow is also called earning or the amount of money that comes in based on livestock sales, value added livestock, product sales, and also sales of by-products such as manure (Kusumastuti, 2012; Yulia *et al.* 2015; Tjahyani *et al.*, 2020). In this study, the total cash in flow calculation was based on the sale of goats, both kids and does/bucks. The sale of manure was considered IDR 0,- because farmers used goat manure to fertilize their own agricultural land. The highest total cash in flow was in coastal areas with a value of IDR 6,413,000.00/breeder/year, while in the lowlands and hilly areas reached IDR 3,500,000.00/breeder/year and IDR 4,500,000.00/breeder/year respectively (Table 4) with live cattle sales providing the highest amount of total cash in flow.

The high total cash in flow in coastal areas is also affected by the Bligon goats ownership of more than 10 goats with a higher percentage (36.37%) and this is related to the number of goats that can be sold. This is supported by Indrayani and Andri (2018) that the greater the number of livestock kept, the greater the income obtained by the breeder. Farmers sold Bligon goats, both kids and does/bucks for the feast of sacrifice and this is in line with Budisatria *et al.* (2019) and Novra (2020) that livestock are usually sold at religious holiday celebrations such as Eid al-Fitr and Eid al-Adha for Muslims and to be slaughtered and processed as foods, namely satay (Sate Klathak) which is widely sold in Bantul District.

Cash out flow. Cash out flow is also called expenditure or the amount of money incurred and is calculated based on investment costs and variable costs (Kusumastuti, 2012; Murdiandi *et al.*, 2020). The variables included in the fixed costs were the construction of the cage, the

purchase of does or does that are kept in the cage for breeding, and the purchase of equipment for cage cleaning activities as well as feeding and drinking. The cost for the land for the cage is considered IDR 0,- because all Bligon goat farmers in all agroecological zones use their land to build the cage. The total cash out flow in coastal areas, lowland, and hilly areas reached IDR 5,914,000.00/farmer/year, IDR 2,971,000.00/farmer/year, and IDR 4,206,000.00/ farmer/year respectively.

Fixed costs are costs that do not change with changes in the level of activity in the short term (Dwita *et al.*, 2016; Kusumastuti *et al.*, 2018). In this study, the variables calculated in the investment cost were cage building, purchase of goats, and cage equipment. The building of the cage was calculated based on the estimated current price of the livestock building materials such as materials for the main construction (wood or bamboo), roofing material (asbestos, tile, or zinc), and other supporting parts (floor of the cage and feeder) and reduced by the cage depreciation costs. Purchases of Bligon does /studs that are included as fixed costs are does that is kept by farmers in the long term in cages for breeding. The cage equipment calculated was the cost of purchasing equipment such as buckets for the drinking facility as well as tools for cleaning the cage and reduced with equipment depreciation costs. Purchase of goats contributes the most to fixed costs in different agroecological zones with IDR 2,900,000.00/farmer/year in coastal areas, IDR 1,100,000.00/farmer/year in the lowlands, and IDR 1,867,000.00/farmer/year in hilly areas (Table 4). The total purchase price of goats is lower in the lowlands and hilly areas as some farmers receive assistance in the form of does from the local government so that farmers only need to purchase the stud or add does.

Table 4. Analysis of the profitability of Bligon goat farmers in different agroecological zones in Bantul Regency, Yogyakarta Special Region in the last year (2020–2021)

Description	Agroecological zones		
	Coastal area n=11	Lowlands n=21	Hilly area n=24
Total of goats ownership (LU)	16,66	15,24	13,58
Average ownership of farmer (LU)	1,46	0,77	0,69
<i>Cash in Flow</i>			
Operational income			
a. Live goat sale (IDR)	6.413.000	3.500.000	4.500.000
b. Feces sale (IDR)	0	0	0
Total <i>cash in flow</i> (IDR)	6.413.000	3.500.000	4.500.000
<i>Cash out flow</i>			
Fixed cost/Invest			
a. Cage (IDR)	784.090	411.900	692.000
b. Cage area (IDR)	0	0	0
c. Does/male goats (IDR)	2.900.000	1.100.000	1.867.000
d. Equipment (IDR)	30.500	31.000	30.000
Operational cost			
a. Goat purchase (IDR)	945.000	741.000	533.000
b. Labor (IDR)	0	0	0
c. Feed (IDR)	846.000	612.000	777.000
d. Medicine and vitamin (IDR)	109.000	48.000	79.000
e. Rent of male goat (IDR)	14.000	29.000	33.000
Total <i>cash out flow</i> (IDR)	5.194.000	2.971.000	4.206.000
<i>Net cash flow</i> (IDR)	1.219.000	528.000	294.000
R/C ratio	1,43	1,18	1,07
ROI (%)	44,26	32,82	19,38

n: Number of farmers in different agroecological zones, LU: Livestock Unit, R/C Ratio: Revenue Cost Ratio, ROI: Return on Investment.

Variables included in the operational costs were the purchase of livestock, labor, feed, purchase of medicines, and vitamins, and the cost of renting a cage. Labor costs were considered IDR 0 because all farmers in all agroecological zones did not pay for labor, and family members, especially wives, contribute to raising livestock in between farming activities because most of the farmers' main jobs is farmers.

The purchase of male Bligon goats to be kept for a short time and will be resold later was included in the operational costs. The purchase of the goats depends on the availability of capital owned by the breeder at certain times which allows them to increase the number of goats for IDR 945,000.00/farmer/year in coastal areas, IDR 741,000.00/farmer/year in the lowlands, and IDR 533,333.00/farmer/year in hilly areas. Based on the results of interviews, the capital used for purchasing the goats to be kept for a short time and will be resold later was obtained from the sale of mature does and kids.

Feed costs had the highest percentage (60% – 70%) of all operational costs (Koesmara *et al.*, 2019). The cost of forage feed in the calculation of the breeder's income analysis was considered IDR 0, - because the forage was obtained from grazing in their own agricultural or plantation areas or utilizing forage around their living environment. Farmers only purchased concentrate for feeding so the cost of feed was calculated in cash based on the purchase of concentrates such as bran, soybean husk, bran, and pollard.

The feed costs obtained from the calculation were IDR 846,000.00/farmer/year in coastal areas, IDR 612,000.00/farmer/year in the lowlands, and IDR 777,000.00/farmer/year in hilly areas. The difference in the feed costs incurred by the farmers is influenced by the management of the farmer and the number of livestock owned. The higher the number of livestock, the higher the feed costs incurred. Besides, the feed cost incurred also depends on the preferences of the farmer in feed management. If the farmer does not have sufficient capital to purchase concentrate, then the Bligon goat will only be given forage. This preference can change at any time depending on the capital ownership. This shows that farmers' capital is limited and this is in line with Budiarsana (2016) that the provision of additional feed in the form of concentrate is rarely done by farmers due to limited capital so that farmers rely more on forage around their living environment.

The cost of purchasing medicines and vitamins covered veterinary costs paid by farmers in the past year. The cost of medicines and vitamins reached IDR 100,000.00/farmer/year in coastal areas, IDR 48,000.00/farmer/year in the lowlands, and IDR 0-. This is also related to the experience of raising livestock. The longer the experience of raising livestock, the higher the farmer's ability to overcome problems in goat breeding by utilizing forage in the surrounding areas and minimizing the purchase of medicines,

and calling a veterinarian which can increase operational costs.

Another variable of the operational costs is the cost of renting the stud to breed the does. The cost of renting a stud was IDR 14,000.00/farmer/year in coastal areas, IDR 29,000.00/farmer/year in the lowlands, and IDR 33,000.00/farmer/year in hilly areas. This is related to livestock ownership which is on average higher in the coastal area compared to the other two areas. The high cost of renting a male goat in the lowlands is due to low livestock ownership with an average of 16.24 ST. Most farmers do not have their male goats so they need to rent the stud from other farmers. The payment could be in cash or other forms such as cigarettes, agricultural products, and others.

Net cash flow. The net cash flow value in this study was calculated based on livestock rearing for the past year, namely IDR 1,219,000.00/farmer/year in coastal areas, IDR 528,000.00/farmer/year in the lowlands, and IDR 294,000.00/farmer/year in hilly areas. This is consistent with higher total cash in flow in coastal areas which results in higher net cash flow. The average livestock ownership in the coastal agroecological zone is higher than the other two agroecological zones with the highest percentage of livestock ownership of more than 10 heads with a percentage of 36.37% (Table 1). Thus, the overall net cash flow produces a positive value so that the farmers have got the benefits of raising Bligon goats so far.

Revenue cost ratio. The revenue cost ratio or R/C ratio is the comparison value between business revenues and total costs or the comparison between cash in flow and cash out flow (Sajari *et al.*, 2017; Jakfar and Murdhani, 2020). The higher the R/C ratio, the more profitable the business. Based on the livestock ownership scale, the highest R/C ratio in different agroecological zones is the Bligon goat ownership of more than 10 heads. This is in line with the statement of Krisna (2014) that the level of livestock ownership greatly influences the business income obtained by farmers. The scale of the livestock business is described by the small number of livestock ownership of one to five heads. This is because the higher the livestock ownership, the higher the cash in flow obtained from the added value of Bligon goats and the number of goats that can be sold. The R/C ratio is a comparison between the revenues obtained and the costs incurred. If the value of the R/C ratio is >1, then the business is considered feasible to continue and if the value of the R/C ratio is <1, then the business is not feasible. The higher the R/C ratio, the more profitable the business.

Return on investment. Return on Investment (ROI) is a form of profitability ratio to measure the company's ability with the overall funds invested in the assets used for the company's operations to generate profits (Sajari *et al.*, 2017). The percentage of ROI obtained in this study was 44.26% in coastal areas, 32.82% in

lowlands, and 19.38% in hilly areas (Table 4). Based on the comparison of net cash flow and cash out flow, the amount of profit obtained compared to the invested investment is good. This means that for each capital of IDR 100.00, obtained a profit of IDR 44.00 in coastal areas, IDR 32.00 in the lowlands, and IDR 19.00 in the hilly area. The higher the ROI value, the better the capital turnover of the business meaning that the higher the ROI value, the better the investment value of Bligon goats. Based on the results of the ROI calculation, it can be seen that the business is profitable. The high percentage of ROI in the agroecological zone of the coastal area indicates that farmers can maximize profits with minimal capital and have efficient livestock business (Purnomo *et al.*, 2021).

Conclusions

Based on the results of the study, it can be concluded that the difference in agroecological zones does not affect changes in body weight and litter size in Bligon goats. Based on the profitability analysis of the Bligon goat business for the past year, farmers in coastal areas have higher profitability compared to those in lowland and hilly agroecological zones with a net cash flow of IDR 1,219.000,00, R/C Ratio of 1.43 and ROI of 44.26.

Acknowledgement

The author highly appreciates the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for funding this research through the Research and Community Service Grants No. 018/E5/PG.02.00.PT/2022 and contract No. 1714/UN1/DITLIT/Dit-Lit/PT.01.03/2022.

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