

Partial Budget Analysis to Determine Additional Income of Etawa Crossbred Goat Farmers Using Breeding System in Kulon Progo Regency, Yogyakarta, Indonesia

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Abstract—Etawa Crossbred goat is a small ruminant germplasm whose population must be maintained and increased. This study aimed to identify the revenue and cost as well as to analyze the income added value of Etawa goat. The research was conducted in Kulon Progo as the center of crossbred goat breeding in Yogyakarta. The samples involved were 60 farmers in Pagerharjo Village, Samigaluh Subdistrict, who were selected using a purposive sampling technique. The partial budget analysis was done descriptively and quantitatively. The results showed that the total revenue was IDR 10,497,996.03 and the total cost was IDR 7,189,265.60, therefore, the total income was IDR 3,308,730.43/period, under the assumption that 1 period equals 2 years. Farmers' highest revenue was goat kid sales (70.71%), and the highest cost was female kid purchase (60.21%). Partial budget was conducted with assumed reduction in weaning period from 5.55 months to 3 months therefore the additional income was IDR 726,000. The added value from improved management was 21.94%. The overall research results showed that the reduction in weaning period was one of the techniques to improve livestock management. This can be used as a preliminary recommendation for increasing the income of Etawa crossbred goat farmers using breeding system.

Keywords—breeding system, etawa crossbred goat, germplasm, partial budget

I. INTRODUCTION

Indonesia is one of the countries where small ruminants serve as a means for poverty alleviation and for livelihood recovery programs in areas affected by natural and other disasters [1]. There are four local goats in Central Java-Indonesia: Kejobong, Jawarandu, Etawa crossbred, and Kacang [2]. Originally, Etawa crossbred goats were developed through an upgrading program of local Kacang goat, using Jamnapari bucks imported from India, during the Dutch colonization period [3]. Raising Etawa crossbred goat

would still be an important part of farmers' activities in the rural areas in Indonesia [4]. The goat offers hope of productivity improvement, and it has good development prospect to support the economy of local farmers [5]. For many years, the objective of raising Etawa crossbred goat is multifaceted; farmers raise the goats for milk production, for fertilizer production, for replacement stocks or for savings [6].

Etawa crossbred goat has potential to be developed for profitable entrepreneurial business. This goat is widely distributed in Indonesia and is highly adaptive to the soil types in various regions. Raising the goat is relatively easy and cheap, it does not require a large area of land [7]. Goat is one type of livestock familiar with farming systems in rural areas. One benefit of goat farming business is increasing the income of rural communities because goats' body size is not too large, they are easy to treat, they are fast growing, they could give birth to more than one kid per birth; they have short kidding interval, and they grow fast. In addition, these goats have high adaptability to the agroecosystem of a place. Farmers buy these goats to start their business as well as to increase their income. Income is the difference between the revenue of livestock business per year with the total production cost per year [8].

In order to develop and improve the productivity of Etawa crossbred goats, reproduction performance plays an important role. Farming business serves as the main support to increase the population of Etawa crossbred goats, therefore, it is necessary to make some efforts to increase the goats' productivity, which in turn, can increase the income of farmers [5]. Weaning period has a critical importance for kids' growth and the marketability of milk production.

Ensuring the profitability of weaning process is also important for dairy goat breeders [9].

Partial budget analyses are used to compare some alternatives for a farm business, such as adopting new technology, changing enterprises, or modifying production practices [10]. Therefore, this research was important to evaluate the improvement of goat farming management, measured by the added value generated after farmers applied weaning period reduction treatment on Etawa crossbred goat breeding system as one of the options to improve their income

II. METHODS

The study was conducted in Pagerharjo Village, Samigaluh Sub-district, Kulon Progo. The samples were farmers in the area. There were 60 samples selected by census from Menoreh Agung Goat Farmers Group, which has the largest number of members in Pagerharjo village, Samigaluh Sub-district, with a total area of 6,929.31 ha (69.29 km²). Samigaluh is one of the sub-districts in KulonProgo Regency located in the north. By the end of 2016, the administrative area of Samigaluh Sub-district consists of 7 villages, one of which is Pagerharjo (11.42 km²), having 15,114 goats (more than 0.89 percent of the total population). There were 708 bucks and 1606 does in Pagerharjo [11].

The primary data collection was conducted by interview using questionnaires. The primary data included farmers' profiles, livestock ownership, livestock production performance, revenue and production costs. Partial budget analysis was used to determine farmers' value-added income. Partial budgeting is a planning and decision making framework that is used to compare the costs and benefits of alternatives in a farm business [12,13]. Partial budgeting was used to develop a deterministic simulation model that estimated the net cost or benefit of the improvement of maintenance management. The assumptions used in the study were based on a decrease in the weaning period over a 5-year period, assuming that after a doe gave birth seven times, they were considered unproductive.

In this research, the partial budgeting was performed through an improvement estimation of breeding management. The assumption used complied with performance standards for goat reproduction, i.e., removing does that already gave birth seven times, setting the kidding interval to 8 months, setting the weaning period to 3 months, limiting only two kids per birth, and giving 3 births every three years.

The total revenue was calculated from the additional revenue plus cost decrease. The total cost was calculated from revenue decrease plus additional cost. The economic parameter as the measurement was additional revenue which was derived from the increase in the number of kids/period, and the additional cost was the purchase of milk replacer to

be given to the kids until they were ready to feed by themselves, and labor cost during the rearing of the kids until they could be sold (Table 1).

Table 1. Partial budget framework

Description of planning changes	
<i>A. Revenue Decrease</i>	<i>B. Revenue Addition</i>
	(IDR)
1. Additional costs	3. Additional revenue value
Substitute Milk	Kid sales
Labor	
2. Revenue decrease value	4. Cost decrease value
-	-
C. Total revenue decrease	D. Total revenue addition
Income change (B-A)	
Recommendation	

The analysis was conducted using Microsoft Excel software.

III. RESULTS AND DISCUSSION

Etawa Crossbred goat farmers belong to productive age category (51.50 years); and mostly completed formal education equivalent to elementary school (65.00%). Some farmers also attended non-formal education to support livestock breeding system, including goat selection techniques, livestock breeding, feed processing technology, waste treatment, and marketing (Table 2).

Table 2. Characteristics of respondents

Component	Farmers group (n = 60)	
	n	%
Age (year)	51.50±11.87	
Formal education (%)		
No School	2	3.33
Elementary School	39	65.00
Junior High Schools	11	18.33
High Schools	7	11.67
Colleges	1	1.67
Non formal education (%)		
Attended trainings	30	50.00
No training	30	50.00
Business experience (year)	28.37±14.64	
Family members (person)	4.15±1.10	
The main job (%)		
On farm	59	98.33
Non farm	1	1.67

These farmers had long business experience (28.37 years), which indicates that it is a multi-generation enterprise. The average number of family members were 4.15 people. Family members can help in the maintenance activities and also in the processing of agricultural products. The plantation crops managed by these farmers were cloves (*Eugenia aromatica*), coffee (*Coffea arabica*), tea (*Camellia sinensis*) processed into worth selling products.

Table 3. Etawa crossbred goat ownership by farmers

Type of goat	Head	Animal unit
Bucks	1.50±0.88	0.24±0.14
Doe		
Pregnant	2.45±1.40	0.39±0.22
Breastfeeding	1.64±1.04	0.26±0.17
Not breastfeeding	2.00±1.11	0.32±0.18
Young Kids	1.88±1.14	0.15±0.09
Male	1.79±0.87	0.04±0.02
Female	2.11±1.49	0.05±0.04
Total	13.37±7.92	1.46±0.86

Table 3. shows that the total Etawa crossbred goat ownership was 13.37 goats/farmer, or 1.46 Animal Unit/farmer. The average of livestock ownership consists of doe, followed by female kids because these farmers preferred breeding although some farmers also raised the does for animal contest. In addition, the age and gender of the farmers also serve as important factors when examining livestock ownership patterns [14].

Table 4. Characteristics of Etawa Crossbred goat production

Component	Existing
Doe first age the mated (months)	14.00
Doe of first kid (months)	16.54
Distance time after first kid until pregnant again (months)	6.13
Doe unproductive (years)	4.77
The weaning period (months)	5.55
Kidding Interval (months)	11.68
Litter Size	1.80
S/C (times)	1.60
Mortality (%)	10.00

Viewed from the appearance of goat production, Table 4 shows that the does became unproductive at the age of 4.77 years or after giving birth seven times. The kidding interval was 11.13 months with a weaning period of 5.55 months. According to [15], the kidding interval of Etawa Grade does is around 330.20 ± 109.88 days. The litter size of Etawa Grade does was around 2.94 ± 0.93 does. The weaning period is long because farmers usually want the kids to have optimal body weight. In addition, population increase also takes a long time. Therefore, it is necessary to improve the maintenance management in order to increase the population of kids. Some efforts have been made, such as by decreasing the weaning period.

Manure from goats and other livestock has been used for crop production for many years. Keeping dairy goats has several advantages for the farmers, such as improved income from the sales of live animals and manure. Manure has commercial value, enabling farmers to sell it and earn additional income [16]. Most of the farmer respondents also had crop farming including vegetable farming, therefore they used the manure to increase the plant production.

Table 5. Cost and Revenue of goat rearing business

Component	Unit	Price	Total	%
Revenue				
Sales of kid (kids)	3.16	1,897,529.76	7,429,107.14	70.77
Selling of compost (sack)	75.19	10,185.19	755,555.56	7.20
Value added doe (doe)				
Value added kid (kid)	1.32	1,232,000.00	1,564,000.00	14.90
	1.83	749,333.33	1,477,222.22	14.07
Total Revenue			10,497,996.03	100.00
Cost				
Purchase of female kids	2.77	1,494,125.62	4,328,333.33	60.21
Goat health	1.54	29,076.92	48,307.69	0.67
Interest Rate			942,857.14	13.11
Mortality (goat)	2.15	919,128.79	1,869,767.44	26.01
Total Cost			7,189,265.60	100.00
Total Income			3,308,730.43	

Agung Menoreh livestock farmers group is the fertilizer supplier for PT. Pagilaran, a tea plantation and processing company. PT Pagilaran also encourages women to establish a female farmers group to handle the processing of green tea, black tea, and hydroponic vegetables with a concept of Sustainable Food Center under the model of an Integrated Farming System which utilizes house yards as a place to conduct plant and livestock enterprise. The calculation of livestock manure sales was based on the assumption of the manure sold in the capacity of 1 sack weighing 20 kg, with a price of IDR 10,186 – therefore, if the average sales was ± 75.19 sacks / farmer, the farmer had around IDR 755,555 additional income.

The total cost was IDR 7,189,265.60 / period. The purchase of female kid contributed to the highest cost (60.21%) of the total production costs. Female kids are raised to become does because the dominant maintenance system is a breeding enterprise. Additional health costs covered vaccines, medicines, and herbal medicine, amounting to IDR 48,308.00 / farmer. The improvement of animal health care facility aims at promoting animal health and enhancing goats' productivity [17].

Animal mortality is one of the costs that farmers shall consider. The goat kid mortality was considered to contribute to the production cost at IDR 1,869,767/farmer, or 26.01% of the total production cost. The average number of goat kid mortality was ± 2.15 heads/farmer, with an assumed price of IDR 919,129.00/kid. A high goat mortality rate can be caused by environmental conditions and mastitis suffered by

female does, causing goat kids to fail to receive sufficient food. Therefore, to reduce goat mortality rate, it is necessary to make efforts to control and monitor animal diseases [18].

Farmers' total income was IDR 3,308,730.43/period with an assumption that 1 period was 2 years (Table 5). To increase farmers' income, it is necessary to improve the maintenance management, one of which is through the reduction of weaning period, from 5.5 months to 3 months. This way, it is expected that there would be an increase in the number of goat kids, which can be raised into does if they are female kids, or can be sold if they are male kids. This is because male goats usually have more carcass than female goats, therefore, they are more suitable as meat goat.

Farmers' added revenue was analyzed using partial budget based on the calculation of additional revenue minus additional cost with an assumption of reducing the weaning period (Table 6).

Table 6. Partial budget analysis of increase in income of Etawa Crossbred goat

A. Decrease in Revenue (IDR)	
1. Additional Cost	
- Milk replacer (1/2 l x 2 goats x IDR 7,000.00 x 75 days)	524,000.00
- Labor (75 days x IDR 10,000.00/day)	750,000.00
2. Decrease in revenue	-
B. Additional Revenue (IDR)	
3. Additional Revenue	
- Increase in the number of kids (2 kids x IDR 1,000,000.00)	
4. Decrease in cost	2,000,000.00
	-
C. Total decrease income	1,274,000.00
D. Total additional income	2,000,000.00
Income change (B-A)	726,000.00

Recommendation : Additional income of IDR 726,000.00 /doe /period or the added value generated by farmers per doe is 21.94% from the farmers' total revenue. so this program is recommended to be continued.

The additional revenue was obtained from an increase in the number of goat kids produced per doe. If assumed that all the goat kids were sold, then there would be an additional revenue of IDR 2,000,000/period. Cutting the kidding interval would directly reduce the weaning period, leading to an increase of in goat kid sale [19]. The additional costs were for purchasing milk replacer and labor cost. In raising goat kids with reduced weaning period, cow milk as milk replacer is needed for 2.5 months, or 75 days. On the other hand, there was also additional labor cost because more labors

were needed to feed them with the milk replacer, i.e. IDR 10,000/ day. In fact, the partial budget analysis resulted in an additional revenue of IDR 726,000/ farmer. With an average of three does per farmer, this means that the additional income for the farmers every period, or every 2 years, was IDR 2,178,000/ period. The added value generated by the farmers per doe was 21.94% from the farmers' total revenue.

Based on partial budget analysis, it can be recommended that the improvement of maintenance management by reducing the weaning period can offer an added value for farmers' revenue. It is better for farmers to apply this method as a means for production planning, aimed at preserving germplasm, increasing the population and promoting sales value [20]. Furthermore, farmers also need to consider better livestock maintenance and health using better technology [21].

IV. CONCLUSION

Etawa crossbred goat farmers, breeding system, generate a total revenue of IDR 10,497,996.03/ production period and a total cost of IDR 7,189,265.60/ production period, therefore, the total income generated is IDR 3,308,730.43/ production period, with an assumption that 1 period is 2 years. Partial budget analysis is recommended to increase farmers' income because there is a 21.94% increase in revenue. Therefore, there needs to be a coordination among farmers as practitioners, Animal Husbandry Service and educational institutions to further implement this method, supported by livestock health improvement and goat kid selection for breeding

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