

The Economics of Smallholder Dairy Goat Production in Mafefe Community of Limpopo Province, South Africa

¹M.V. Mosoma, ²A. Belete, ³G.M. Senyolo and ⁴M.B. Masuku

¹Department of Agriculture, Forestry and Fisheries, Directorate: Land Settlement, 103 Sefala Building Cnr Beatrix and Belvedere Str. Arcadia, Pretoria, South Africa

²Department of Agricultural Economics, University of Limpopo, PB X1106, Sovenga 0727, South Africa

³Agricultural Economics, School of Agricultural Sciences and Agribusiness, University of KwaZulu-Natal, P.Bag X01, Scottsville, 3209, Pietermaritzburg, South Africa

⁴Department of Agricultural Economics and Management, University of Swaziland, P.O. Luyengo, Luyengo, M205, Swaziland

Abstract: This study presents cost-return analysis of the leasing system of smallholder dairy goat production in the Mafefe area of Limpopo Province in South Africa. The study was carried out to analyze the economic viability and sustainability of leasing system to the development of dairy goat's keepers in Mafefe ward of Limpopo Province. The study used the NPV and BCR analysis to assess the economic impact of the proposed technology. The primary data used for the analysis were obtained during a 2007 household survey of 30 purposively selected farmers who keep dairy goats. Also a time series data for the years 2004 to 2008 were collected from the same respondents. The results show that production of dairy goats through leasing is economically attractive for smallholder dairy goat farmers and would have benefits from the financial and economic point of view. With the discount rate of 10%, the NPV and BCR were found to be R8869.21 and 3.08 respectively. This implies that dairy goat production through leasing system is a profitable project. Government should assist the households with the development of an appropriate marketing infrastructure, training and support programs for their dairy goats for the production of competitive dairy products.

Key words: Benefit cost ratio, dairy goat, economics of smallholder, net present value, production

INTRODUCTION

Dairy goats are seen as suitable animals to assist families to break the cycle of poverty. They have helped people to survive and thrive for countless generations and they are kept in many different systems of production in the tropical world (Devendra and Burns, 1982; Josserand, 1984; Kosgey *et al.*, 2006). They are easy to handle and manage, especially by women and children and are also able to survive on a wide range of forage. Goats in general and dairy goats in particular play an important socio-economic role in the rural areas of Limpopo Province in South Africa (Peacock, 1996).

Keeping dairy goats is a possible and viable option in improving the household cash flow of rural people in Mafefe village and resolves the issue of food security. The main purpose of keeping dairy goats in the rural areas is to promote community development, food security, poverty reduction and thereby crime prevention. Delgado *et al.* (1999) indicated that dairy goats are not only a

source of high quality protein for the family, but also provide small cash income. Other researchers (Devendra, 2001; Peacock, 2005; Verbeek *et al.*, 2007; Kosgey, 2006; Kosgey *et al.*, 2008) also confirmed that dairy goats are good source of food security and income generation. They have the potential to improve the diet of the rural population and also supplementing the producer's income (Roets, 1998; DeJong *et al.*, 1994; Braker *et al.*, 2002).

The emphasis on smallholder dairy goat production in Limpopo province calls for increased efforts towards the development of locally tested technology that will increase productivity given farmers' present resources level. Available information about smallholder farmers indicates that they are good decision makers, given their experience and resources, and that a mere reallocation of their resources will not appreciably increase incomes (Stevens, 1977). Assuming that smallholder farmers allocate their resources to maximize profit or expected utility of profit, subject to satisfying their subsistence needs, new technologies will only have a chance of

success if they effect an improvement in the standard of living. There is a need to understand the economics of leasing system to develop dairy goat production and the potential impact of proposed new technologies before making definite recommendations.

Due to the important roles dairy goats play in the life of the rural people, the Center for Rural Community Empowerment (CRCE) at the University of Limpopo came up with the idea of financial innovation to Mafefe village. This innovation is adapted to the local environment where there is lack of capital to invest into technical innovation as dairy goat keeping. Veldhuizen *et al.* (1997) is of the opinion that combining local and external knowledge, with the aim of increasing capacity within the innovation system can adapt quickly to changing conditions and thus to improve livelihoods. Through this approach a dairy goat keepers group was formed to gradually take responsibility of leasing dairy goats to individuals on the conditions that the lease is repaid in the form of monthly installment that can be obtained through the sale of milk and also from selling the animal offspring. No concrete study has been undertaken on economic viability of such dairy goat project in the study area in particular and in Limpopo province in general. The objective of the current study was, therefore, to analyze the economic viability and sustainability of leasing system of dairy goat keepers in the Mafefe area and explore possibilities for expansion of goat production under leasing system in other parts of the Limpopo province. Moreover, this study is important for identification of constraints, and opportunities for guidance and targeting of expansion of the dairy goat multiplication and future breeding programs in Limpopo.

METHODOLOGY

The study area and data collection: The historical data (2004 to 2008) were collected in Ga-Mampa, Mafefe village of Capricorn District in the Limpopo Province. Mafefe village has been a pilot site for CRCE where technical and financial innovations have been introduced over the past years. Mafefe has high population densities, and also there are a large number of small-scale farmers producing a variety of agricultural products. There is high demand of dairy goat products such as milk, meat and skin. The majority of people in the surrounding areas buy goats for traditional rituals.

The study used purposive sampling to select 30 households to participate in the study. The method used to collect data from Mafefe village was household interview. A structured questionnaire was used to collect information from households that keep dairy goats in one form or another.

Analytical technique: The study used the two different project criteria to analyze the data collected from the 30

households. The two criteria used to evaluate the economic viability of leasing system to the development of dairy goats are the Net Present Value (NPV) and Benefit Cost Ratio (BCR). A project is considered to be financially viable when the NPV is positive and the BCR is greater than unity. According to Gittinger (1982), the standard models for determining the profitability and hence economic viability of any project (in our case dairy goats' project) can therefore be written as follows:

The net present value:

$$NPV = \sum_{t=0}^n \frac{B_t - C_t}{(1+i)^t}$$

The benefit cost ratio:

$$BCR = \sum_{t=0}^n \frac{B_t / (1+i)^t}{C_t / (1+i)^t}$$

where

B_t = Benefits in year t

C_t = Costs in year t

n = Number of years the project will be under operation

i = Discount rate

RESULTS AND DISCUSSION

As can be seen from Table 1 household members in the age bracket below 38 years were less and those older than 39 years more. It seems that dairy goat farmers in the study area are composed of a mixture of adults and pensioners. Of the 30 households 19 (63.3%) of them are females and the remaining 11(36.7%) are males. This perhaps indicates that the female households tend to have a high potential for keeping dairy goats in the rural area

Table 1: Summary of some socio-economic characteristics of dairy goat farmers in Mafefe community

Parameter	Frequency	Percentage
Age:		
38-39 years	4	13.2
39-60 years	20	66.8
64-70	6	19.9
Total	30	100
Sex:		
Female	19	63.3
Male	11	36.7
Total	30	100
Education level:		
No schooling	6	20.0
Primary	6	20.0
Secondary	18	60.0
Total	30	100
Income sources:		
Salaried employment	31	0.0
Farming	25	85.0
Remittances	2	5.0
Total	30	100

than men. The study found that the highest percentages of households were educated up to secondary education. The study also indicated that farming is the only source of income for 85% of the respondents.

Dairy goat management practices by farmers in Mafefe community: Generally, households supplemented their dairy goats feeding with field crop residues, home grown fodder and purchased feed. Results from the survey indicated that all the respondents (100%) fed their dairy goats with field crop residues and fodder crops. About 96% of the respondents fed their dairy goats with home grown feeds, while about 40% of the respondents fed their dairy goats with purchased feed.

Cleaning the stalls, milking and feeding dairy goats: The main tasks in the dairy goat production were cleaning the stall, milking and feeding. Most activities were carried out by women and children. According to survey results about 70% of women and children are responsible for taking care of feeding dairy goats followed by 30% of man taking care of feeding dairy goats in the households.

Feeding strategy of dairy goats: The results indicated that 53.3% of the households fed its dairy goats twice per day, usually once in the morning and once in the afternoon. About 33.3% of the households fed its dairy goats once per day, especially during the mid-day, and slightly >10% (13.3%) of the households fed its dairy goats more than twice per day. This implies that the majority of farmers feed its dairy goats twice per day for the goats to be strong enough.

Availability of feed needed for the dairy goats: About 60% of the households among the dairy goat keepers indicate that the feed for dairy goats are readily available at the same time every day, while 37% of the households keeping dairy goats mentioned that the feeds for goats are sometimes available but not every day. Only 3% of the households indicate that the feed for the goats are not readily available and the dairy goats have to move around in search of feed. This perhaps indicates that their goats do not produce enough milk because of poor feeding strategy.

Marketing of goats and by-products: Marketing is a complex activity that starts with a farmer's decision on how to dispose of his produce to the activities of the intermediaries (ARC, 1998). In the study area, there has not been any headway as far as goat marketing is concerned. Almost all dairy goats are marketed as live animals with little value being attached to other by-products. Lack of information, appropriate infrastructure such as abattoirs, roads and marketing points were cited by the households as some of the problems.

The results further indicated that 86.7% of the respondents sell their goats and by-products to the local

Table 2: Dairy goat flock size composition and production

Year	2004	2005	2006	2007	2008
Dairy goats (number)					
Female goats	5	10	15	22	27
Male goats	3	5	7	7	6
Kids born	5	5	3	5	8
Total	13	20	25	34	41
Purchases (number)					
Female goats	-	2	-	4	2
Male goats	-	2	3	2	2
Deaths (number)					
Female goats	-	-	2	2	-
Male goats	-	-	2	-	-
Male kids	2	3	3	2	2
Female kids	1	-	-	3	-
Total	3	3	7	7	2
Sales (number)					
Female goats	-	-	2	-	-
Male goats	-	3	2	4	3
Male kids	-	4	3	3	-
Milk production (L)					
Dairy milk production	150	220	350	400	250
Milk sold	0	150	250	300	150
Home consumption	150	70	100	100	100

Computed from survey data (2007)

Table 3: Projected revenues and operating costs

Years	2004	2005	2006	2007	2008	Average
Revenues (R)	-	1600	1200	1200	400	1100
Sale of male kids	-	-	1200	-	-	1200
Sale of female goats	-	1800	1200	2400	1800	1800
Sale of male goats	-	3400	3600	3600	2200	3200
Subtotal	-	3400	3600	3600	2200	3200
Sale of milk (R)						
Raw milk sale	-	900	1500	2000	900	1325
Total	-	4300	5100	5600	3100	4525
Operating costs (R)						
Feed costs	-	1100	1200	1300	1300	1225
Veterinary services	200	200	200	200	200	200
Total	200	1300	1400	1500	1500	1425

Computed from survey data (2007)

people in the same village, while 43.3% of the households sell goats and by-products to the people from neighboring village. The result is that goats are traded informally, that is, out of hand sales. As such, buyers buy directly from the farming households whereby no commissions charged.

Cost benefit analysis of dairy goats: Table 2 shows a summary of dairy goat flock size and production for 5 years (from 2004 to 2008) which is assumed to be the average life of the project. The results show a growth in the total number goats over years. The project faced a high mortality rate of kids over years, and this could be due to poor management (feeding strategy and housing). From 2005 to 2007, seven goats were sold to the market, while there was an increase in milk production over the years. Households were benefiting from the sale of dairy goats and milk sold to the local community and neighboring village.

Table 3 shows the revenues generated and costs incurred on the dairy goat project over the five year period. In 2004 the dairy goat project did not sell milk and

Table 4: Calculation of net present value (rands)

Year	Total flow of costs	Total flow of benefit	Discount factor (10%)	Present value of cost	Present value of benefits
2004	200	0	0.909	180.80	0
2005	1300	4300	0.826	1073.80	3551.80
2006	1400	5100	0.751	1051.40	3830.10
2007	1500	5600	0.683	1024.50	3824.80
2008	1500	3100	0.621	931.50	1925.51
Total				4263.00	13132.21
Net present value (NPV)			+8869.21		
Benefit cost ratio (B/C)			+3.08		
Computed from data (2007)					

Table 5: Summary of discounted cash flow analysis of the dairy goat project

Measure	Normal conditions	Benefits reduced by 20%	Costs inflated by 20%	Combined Effect-costs inflated by 20% and benefits reduced by 20%
Present value of costs	4263.00	4263.00	5115.60	5115.60
Present value of benefits	13132.21	10505.77	13132.21	10505.77
Net Present Value (NPV)	8869.21	6242.77	8016.61	5390.17
Benefit Cost Ratio (BCR)	3.08	2.46	2.57	2.05

Computed from data (2007)

kids and hence no revenues were generated. On average, the project's revenue from the sale of goats and milk was R4525, the total average operating costs over the year was R1425.

The findings from the economic analysis in Table 4 revealed that the dairy goat keepers group should invest on dairy goat project since the NPV from the project is positive and the BCR is greater than zero. This perhaps gives an indication that the project will provide enough financial benefits to justify the investment. According to Gittinger (1982) a higher NPV index and a higher ratio of benefits to costs indicate that investing on a project is financially beneficial and economically viable.

Sensitivity analysis: The purpose of the sensitivity test is to determine the effects that marginal changes in certain variables would have on the project. It is necessary to run sensitivity analysis in such projects to determine the effects of uncertainties. It was concluded that the variables that are most likely to be subjected to change are the price of goat milk, the goats themselves and cost of the inputs. Consequently, we have considered the following three situations:

- Benefits reduced by 20%
- Costs inflated by 20%
- Combined effects where both benefits are reduced by 20% and costs inflated by 20%

As can be seen from Table 5 the project would be sensitive to the reduction of benefits that is likely to result from changes in prices as production increases, assuming all other things remain constant. As can be seen from Table 5, a reduction of benefits by 20% could cause the Net Present Value (NPV) to fall from 8869.21 to 6242.77, and the Benefit Cost Ratio (BCR) from 3.08 to 2.46. The project is therefore fairly sensitive to changes in prices of goats and goat milk but still profitable.

A similar assessment was made by assuming that the costs are inflated during the life of the project. As shown in Table 5, a 20% increase costs result in a drop of the NPV from 8869.21 to 8016.61 and BCR from 3.08 to 2.57. This perhaps indicates that the project is less sensitive to the increase in costs than to a reduction in benefits.

The combined effects include reduction of benefits by 20% and an increase of cost by 20%. Table 5 shows that the effects of the two variables combined will result in a positive NPV (5390.17) and a B/C ratio of more than one (2.05).

CONCLUSION

In general, the study reveals that small scale farmers are better off in producing dairy goats through leasing system. The introduction of dairy goat keeping to the rural people is an attractive innovation and technically as well as financially viable option. It also aims at ensuring that rural people know how to develop new technology that could benefit them in a sustainable and economically viable way. An important added advantage is that this leasing system method to develop dairy goats would be a new cultural practice being introduced to Mafefe rural community.

From the data represented in this study, it appears that smallholder participation in production of dairy goats could play a significant role in creating jobs and improving the financial well-being of small-scale farmers. The project was found to be economically sound and financially viable. The analysis shows that milk production with dairy goats in smallholder farming systems in Limpopo Province of South Africa can be a viable proposition. In general, the project is considered to be viable, but future studies need to consider more scenarios to revise for either underestimation of costs or overestimation of prices of products or other uncertainties.

RECOMMENDATION

Dairy goat keepers in the study area indicated that goats can be traded informally i.e., out of hand sales, buyers in the village buy directly from the farming households whereby no commissions are charged. The marketing of goats through formal market in the Capricorn District in particular is still very discouraging as compared to the total number of goats in the province. Therefore, the government should assist the households with the development of an appropriate marketing infrastructure for their dairy goats and dairy goat milk so that these households will be able to produce for market.

Training and support programs for dairy goat farmers need to be put in place and this has to be supported by appropriate extension services.

It is imperative that a dairy goat multiplication and future breeding programmes for poverty alleviation should be commensurate with farmer's resource and management capacity to ensure success, and suggests the use of appropriate messages and technologies based on the understanding of the farmer's objectives, options and constraints

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