Final Technical Report: Community-based Goat Productivity Improvement in Central and South Meru Districts (R7634)

1. Executive Summary

Crossbred milking goats have proved to be a popular source of cash income, household daily milk requirements and manure for small holder farmers in medium to high potential zones of Kenya. A study was carried out by FARM-Africa's Dairy Goat and Animal Healthcare (DGAH) Project, which had introduced such crossbred dairy goats to poorer farmers in Meru Central and South Districts in the Eastern Highlands of Kenya. Although dairy goats have been introduced in various parts of the country, most projects have not taken sustainability as part of the implementation strategy and hence the benefits have ended immediately the funding stops (Ahuya, 2002). Also, most of the crossbred goats have been produced at research centres and on government stations, with disappointing results.

There are a number of factors that mitigate against small-scale resource poor farmers as far as livestock production is concerned. These include: lack of grazing/feed resources due to limited land; lack of water; inappropriate land tenure systems (subdivision of land owned by most resource poor farmers); poor management systems/practices; high prevalence of animal diseases; low animal genetic potential; inaccessibility of farm inputs and technical information (extension services); lack of market information; and poor infrastructure.

Although there have been many research and development programmes that have introduced genetically improved goats, their productivity in those new environments and production systems has not been well documented. In addition, the inability to maintain a supply of improved breeding stock to upgrade local animals needs to be addressed if sustainable gains from the improved genotypes are to be realized. Since the FARM-Africa project was community based, there was need for research in the development of decentralized farmer-based breed development including: a proper definition of breeding objectives and grades of crossbred suitable for farmers with different resources; establishment of breeding methods; and development of decentralized institutions and procedures to support the breeding programme. The activities to achieve these included:

a) Recording productivity of local and crossbred goats in farmers flocks;
b) Characterising farm resources and capacities for keeping local or different grades of crossbred goats;
c) Recording physical and economic inputs and outputs of goat production;
d) Identifying breed requirements with MGBA;
e) Identifying the necessary activities for MGBA and their costs;
f) Undertaking cost benefit analysis of the alternative breed.

These activities were necessary in order to describe the production benefits of crossbreeding and subsequently to establish what levels of the various grades of

crossbreds would be suitable for farmers with different resources and technical and resource capacities. Also to be assessed were the costs and financial returns from keeping improved goats under farm conditions. Flocks from representative farms were monitored for 18 months to provide information on reproductive performance, milk production and growth information. The results indicate that a community based farmer-led institution can manage, supervise and promote the farmers breed improvement activities to the benefit of its members in a sustainable way.

The purpose of the project was benefits for poor people generated by the application of new knowledge on the improved performance of livestock in high potential farming system. Outputs from this project have been improved management levels for the goat enterprise which has also assumed a very important profile in the community and the country at large. Farmers have adopted the dairy goat as the source of highly nutritious milk which also provides an economic stability in the home and the community.

2. Background Information

Goats form an integral component of the livestock sector in Kenya. Kenya's goat population is estimated at 10.9m and is spread throughout all the agro-ecological zones of the country, mainly because of its size and feeding habits (Annual Report, 2002). Goats have other attributes that make them suitable livestock for small scale resource poor farmers: they are cheap to acquire compared to cattle; they require very little land; they reproduce quickly; and they are able to feed on a wide range of forages.

Goat rearing is an important activity for resource poor farmers under the mixed crop-livestock production systems that are commonly practiced in Kenya. Goats are a source of milk, manure and act as a means of insurance and savings (Devendra, 1985, Peacock, 2001). Development and improvement of their productivity offer the most significant and direct positive impact for improved family protein and energy intake, family income as well as improved standard of living of the resource poor farmers (Peacock, 2001), Devendra, 1985, Ahuya, 2002).

There are two indigenous goat breeds in Kenya, the Galla and the East African. These are less productive and therefore FARM-Africa's DGAH Project introduced the Toggenburg dairy goat from the UK to upgrade these indigenous goat breeds. In addition the project set-up a sustainable community-based animal health delivery system and an improved feed resource base. There were rigorous farmers to farmer and extension to farmer training programmes aimed at creating a favourable environment to enable the improved goats to realize their full potential for milk and meat production, a strategy that is appropriate and technically sound under such circumstances (Bradford, 1981). Most bilateral and multilateral government projects concentrated merely on on-station genetic improvement strategy, and as such never had significant impacts on the intended beneficiaries. Even the technically well designed USAID sponsored collaborative research support programme, aimed at developing a 4-breed based synthetic composite dual purpose goat, failed to produce a large enough population of improved goats after 15 years of mainly on-station

breed improvement efforts (Okeyo, 1997). The major failures of the genetic improvement initiatives of the 1970s-mid 1980s were their poor government controlled station management regimes. However, it has been demonstrated that a true picture of the productive adaptability of any livestock population, whether introduced or synthesized, can only be obtained if such population is assessed for performance under their normal or intended conditions, in other words the farmers' fields

3. Project Purpose

The project purpose was sustainable and replicable mechanisms and pathways for assembling, disseminating and promoting information on livestock related strategies and technologies in order to increase the likelihood of adoption by resource poor farmers in semi arid, high potential and forest agriculture systems in DFID target countries. The project was therefore initiated in the communities to be run and managed through active participation of the resource poor farmers who were the target beneficiaries. The necessary supportive institution the Meru Goat Breeders Association (MGBA) was formed so as to enable farmers to organise themselves into a legally recognized body, with similar goals.

4. Research Activities

The research activities included:

a) Recording productivity of local and crossbred goats in farmers flocks;
b) Characterization of farm resources and capacities for keeping local or different grades of crossbred goats;
c) Recording physical and economic inputs.

The recording of productivity parameters was done in the goat flocks of member farmers of the MGBA. A representative sample of farmers from the existing communities and locations of the DGAH Project were randomly selected. These included poorer farmers in the groups who were directly supported by the project as well as better-off farmers in the same locations who had already gained crossbred goats through the project buck services. The characterisation was first done based on agro-ecological zones and the goat groups classified according to the location in agro-ecological zones. The farmers chosen fell into three agro-ecological zones as shown in the Table 1 overleaf.

A target of 200 breeding females from local, half-bred (½ Toggenburg, ½ local) and ¾ toggenburg, ¼ local goats and their offspring were recorded between October 2001 and May 2003 to provide data on reproductive performance, milk production, survival and growth information. Records were taken on monthly visits to the flocks and all the animals in the study were uniquely identified and ear-tagged. Records included animal flows from the flocks such as births, deaths, sales and slaughter, as well as the production and use of milk, meat and manure. The amounts and costs of inputs to the enterprises were recorded by the farmers and where no records were available, farmers gave the figures. The inputs were feeds, drugs, building materials and labour.

TABLE 1: Number of farmers sampled by agro-ecological zones

Agro-ecological zone	No. goat groups	No. groups sampled	No. farmers interviewed
Upper midland, main coffee zone (UM2)	10	4	24
Upper Midland marginal coffee zone (UM3)	31	6	36
Lower midland cotton zone	15	5	30
Total	56	18	90

Discussions were held with farmers, MGBA officials and community leaders to identify the goat genotypes and breeds that the farmers desired to have, including the breed standards, physical characteristics and productivity characteristics. These discussions focused on determining the selection criteria that the farmers used when deciding on which animals they would keep for breeding purposes. The farmers were also made aware of the available options for maintenance of the required grades of crossbred goats, namely:

a) Continuation of the provision of the purebred bucks for upgrading towards pure Toggenburg;
b) Simple inter-se mating of the appropriate crossbred; or
c) To develop, improve and stabilize a new breed.

Further discussion workshops were held with Kenya Stud Book (KSB) and other breeder societies to identify and cost the necessary technical support and activities and inputs by MGBA and farmers for the different options and to determine the requirements for stock registration and stabilization of the new breed. The establishment of a new breed derived from crossbreeding will require registration of all foundation stock of pure breeds and crossbreds and also the registration of every succeeding generation. Stabilization of such a breed (once the desired level of upgrade has been reached) will involve several generations of selective breeding of the desired population and inter-se mating of the selected animals. Once stabilized, there would be no need of maintaining an expensive imported exotic stock.

During the execution of this project, which has been a community-based, breed improvement systems, the target institutions whose capacity were enhanced were the MGBA and the local extension service. The capacity building and enhancement activities therefore involved the development of practical field operational procedures for complementation of the most favourable breed improvement option, and appropriate organizational structure to involve members and provide cost effective services.

Discussion with farmers representing various groups in the community revealed that the farmers' main objective of forming an association was to have a body to market their goats and goat products while at the same time overseeing the genetic improvement activities. Through MGBA, the farmers defined the breed standards, registered these with the KSB and henceforth, the association will be the main link

between them and other breed societies. Table 2 below shows the functions of MGBA compared to those of the KSB.

TABLE 2: Functions of MGBA and KSB

Meru Goat Breeders Association (MGBA)	**Kenya Stud Book (KSB)**
Overseeing goat improvement activities	Registration of animals and issuing certificates for pedigree and grade stock
Setting standards for the Meru Goat breed that is under development	Setting up a grading-up scheme for cattle and small ruminants
Overseeing and ensuring that all goats owned by MGBA members are registered	In conjunction with breed societies, setting the rules for the registration of livestock
Organising for goat inspection, training and village shows mainly to promote goat recording and improvement	Arranging for inspections for registration and producing volumes showing how many goats have been registered that year

The structure of the association was developed after many frank and open discussions involving the farmers, extension staff, the Department of Animal Production at the University of Nairobi and FARM-Africa. The structure was intended to enhance as much as possible the efficiency of the association in executing its functions. It was therefore decided that its structure should be as flat possible. The lowest level is the unit, which brings together five to six farmer groups in a community. At the moment there are eighteen units and all report directly to the regional office. MGBA's regional executive committee meets three times a year.

MGBA's mission statement is "*To empower small scale goat farmers through their association to develop, promote and register a dairy goat genotype with the Kenya Stud Book for the benefit of its members and posterity*".

The objectives of the association are:

a) To develop, promote and safeguard identified goat breeds for food and agriculture;
b) To create a forum for goat breeders to share ideas information, and to educate and train each other;
c) To implement and monitor the dairy goat breeding scheme as designed;
d) To promote and sustain performance and pedigree recording of the members herds and any other herd where owners value animal recording;
e) To assist members to market their goats and goat products;
f) To lobby on behalf of goat farmers interests as may be deemed necessary;
g) To network with other goat breeders' associations/societies including the Kenya Stud Book in sharing experience and disseminating the lessons learnt.

5. Out puts

The three-quarter Toggenburg, ¼ indigenous goat appears to be the most appropriate upgrade level (genotype) in terms of survival, growth rate and milk production. The latter two traits are the most important to the farmers. The three quarter genotypes performed very well compared to local goats, pure Toggenburgs and the F1s (see Tables 3, 4 and 5).

TABLE 3: Least squares means and standard errors for daily milk yield (DMY) in litres, age at first kidding (AFK) in days, days before milking starts (DBM), lactation length in days (LL) and lactation yield in litres (LY)

Genotype	Trait				
	Daily milk yield (litres)	Age at first kidding (AFK)/days	Days before milking	Lactation, length (days)	Lactation yield (litres)
¾ Tog (38)	2.6 ± 0.18	616± 35	16.6 ± 2.2	295± 29	531 ± 37.1
F1 (74)	2.4 ± 0.14	615± 27	14.7 ± 1.7	316.8 ± 23	486± 29.6
Tog (147)	1.8 ± 0.07	761± 16	14.9± 87	205.6± 12	378 ± 16.1

Numbers in bracket represents the numbers of animals involved in the analysis.
Tog refers Toggenburg goat
F1 refers the first cross bred between the pure Toggenburg and a local goat.

TABLE 4: Least squares means and standard errors for birth weight (BWT), weaning weight (WWT) and average daily gain (ADG) for three-quarter Toggenburg (Tog), F_1 , pure Toggenburg and East African goats

Genotype	Trait		
	BWT (kg)	WWT (kg)	ADG (g)
¾ Toggenburg/ ¼ East African (653)	3.6± 0.16	15.3 ± 0.12	127
Toggenburg x East African (F_1) (944)	3.2± 0.19	12.7± 0.14	105
Toggenburg (509)	3.5± 0.18	12.5 ± 0.09	104
East African (628)	2.6± 0.55	12.1 ± 0.67	78

Numbers in bracket represents the numbers of animals involved in the analysis.

From the surveys conducted during the study the farmers had many reasons for keeping dairy goats:

a) To have enough milk for the family.
b) To have goats to sell in emergencies (bank).
c) Goats take very little fodder therefore easy to manage.
d) Goats have very good and high quality milk.
e) Goats have many good benefits milk, meat, manure.
f) Goats can finish my poverty.
g) Feeding goats is easier than feeding cattle.

According to the farmers' views (obtained from direct interviews), the characteristics of a good goat should include:

a) High fertility.
b) Produce enough milk.
c) Grow fast reaching maturity early.
d) Good body structure.
e) Big udder and a long neck.
f) Straight back line and a soft udder.
g) Well attached udder with two equal teats facing forward.

From the farmers interviewed, three traits were considered to be the main breeding objectives for the goat development in Meru Central and South districts. These are:

a) Milk production (54%).
b) Growth rate (27%).
c) Manure for crop production (19%)

These formed the basis of the breeding objectives in this project.

Other traits also mentioned were: docility; udder size; long back line; good teats (moderately sized and well placed); and big and well attached udders.

Table 5: Number of improved goats born and their survival rates (%) to weaning by genotype and year from December 1996 to January 2003 in the farms being monitored in the project area

Year	Genotype/Trait					
	Pure Toggenburg		F_1 (Toggenburg x Local)		¾ Toggenburg/¼Local	
	No. Born	% Weaned	No. Born	% Weaned	No. Born	% Weaned
1996	37	98				
1997	106	91	230	95		
1998	83	94	428	95	17	95
1999	92	90	876	90	121	90
2000	102	92	988	97	198	96
2001	93	88	864	98	246	97
2002	104	90	970	94	334	92
Total	617	91.92	4356	94.83	916	94

6. Contributions of Outputs

The outputs of the project have been achieved and have contributed to improving the livelihoods of resource poor small-scale livestock keepers. The first output was the determination of the appropriate improvement levels and goat management technologies for resource poor farmers in medium to high potential production systems. The project was working with four genotypes, that is the local East African goat, the pure Toggenburg, the first crossbred and the three quarter crossbred. While all genotypes have improved their productivity due to overall improved management, the three quarter tog appears to be the most suitable in terms of milk production and growth rates. The project has therefore contributed to improved milk production and an increased income for poor livestock keepers in this production system and has actually pulled them out of poverty.

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