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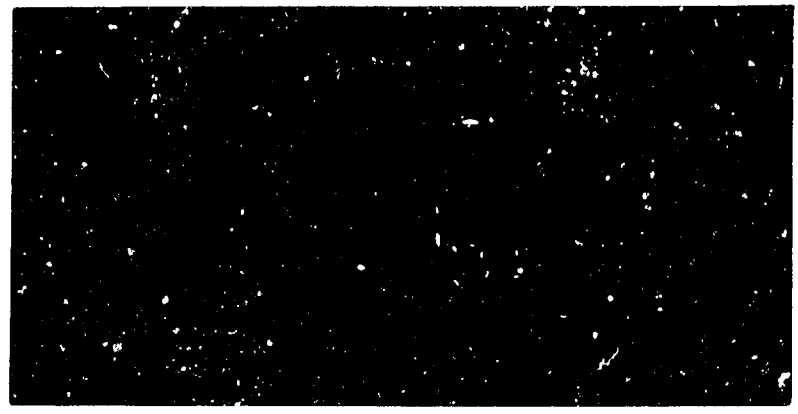

POTENTIAL OF DAIRY GOATS AS A SOURCE OF MILK ON SMALLHOLDER FARMS IN KENYA

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POTENTIAL OF DAIRY GOATS AS A SOURCE OF MILK ON SMALLHOLDER FARMS IN KENYA[1]

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My visit to Kenya is as a part of the Small Ruminant Collaborative Research Support Program (SR-CRSP), and it seems appropriate to describe this program briefly.

CRSP's were established under Title XII of the U.S. International Food Assistance Act of 1975. The intent of Title XII was to involve U.S. Agricultural Universities in selected U.S. Agency for International Development Programs, with the broad objective of increasing food producing potential in countries where this is needed. As the name suggests, CRSP activities involve primarily research, but also include a substantial training component.

The Small Ruminant CRSP was the first such program established under Title XII. The area was selected because of the importance of sheep and goats in many developing countries and the fact that, in the past, these species have received relatively little emphasis, compared to other livestock, in both national and international research and development programs. The Small Ruminant CRSP involves 13 U.S. agricultural institutions, and is engaged in research programs in five countries with emphases as follows:

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Brazil:	meat goats and hair sheep in an arid zone.
Peru:	wool sheep and alpacas in a high elevation environment. There is also a dairy goat project at low elevation.
Indonesia:	Sheep and goat production for meat in the humid tropics.
Morocco:	range production systems; prolific sheep in intensive systems.
Kenya:	dual purpose goats in crop-livestock production systems.

The Kenya program involves work in the areas of Animal Health, Breeding, Nutrition (including forage production and by-product utilization) Management, Systems Analysis, Economics, and Sociology. The U.S. institutions involved in the Kenya SR-CRSP include four universities: California (Davis), Missouri, Texas A&M and Washington State; and Winrock International Livestock Research & Training Center. California State University at Pomona is also assisting with the work in artificial insemination. Work was begun in 1980, so the project is still in the early stages of development.

The dual purpose goat was chosen as a focus for the program for two reasons:

(a) An interest in Kenya, in the Ministry of Livestock Development and in other agencies and groups, in development of systems of milk production from goats.

(b) The SR-CRSP was intended to emphasize smallholder production systems, an emphasis which suggests a focus on dairy or dual purpose goats.

Thus the area of work chosen for the SR-CRSP indicates that the participants, both Kenyan and expatriate, believe that goats have the potential for contributing to milk supplies in Kenya. It is recognized that this potential may be primarily as a source of milk for family use, and that goats may not compete to any great extent with cows as a source of commercial milk production.

A first question which might be addressed is: why livestock at all in intensive farming areas? There appear to be several reasons, including the desire for and nutritional value of animal products in the diet; the function of animals as a savings account, i.e., as a source of income in times of special need or as a source of food in times of crop scarcity; increased production from livestock and crops compared to crops only; as a source of manure for crops; and as a status symbol. Whatever the reasons, livestock are an integral part of many farming systems in even the world's most densely populated countries, such as Indonesia and China. It should also be noted that, where feed quantity and quality provide nutrients sufficiently above the animal's maintenance requirements, milk production is biologically a much more efficient process than meat production.

On a world-wide basis, goats produce only about 1.6% of the total milk supply, but in some countries they account for a considerably higher percent, e.g., Niger 65%, Sudan 24% and Morocco 17%. In Africa as a whole, they supply an estimated 10% of all milk (Sands and McDowell, 1978).

What is the milk production potential of goats? In the U.S., the mean for recorded lactations of 305 days or less

is between 700 and 800 kg of milk, and similar production is achieved in other temperate countries. In tropical countries, however, production tends to be much lower, due to a variety of factors including poorer quality forage, less feeding of concentrates, less intensive management and probably higher incidence of diseases. Published estimates of milk production in tropical and subtropical countries have been reviewed by Garcia (1981) and are summarized in Table 1. Values for kidding interval are also included.

The data in Table 1 show a wide range in yield for both local and European breeds, although the latter have on average a higher performance, as expected. Since it is not uncommon to provide better nutrition and management for imported than for local animals, it is not possible from a summary such as this to know how much of the difference between the means for the two groups is genetic and how much environmental.

Table 1. Milk production per lactation and kidding interval of different types of goats in the tropics and subtropics (from review by Garcia, 1981).

	Milk Yield			Kidding Interval		
Breed Group	No. Estimates	Mean(kg)	Range	No. Estimates	Mean(days)	Range
Local breeds	28	148	50-523	18	279	214-340
Crossbreds				5	348	283-374
European breeds	21	319	137-704	8	374	350-385

It is of interest to note that the two highest means reported for non-European breeds were both for the Damascus breed.

The kidding interval data show that the higher production of European breeds is associated with a decrease in kidding frequency from an average of 1.3 to just under 1.0 kiddings per year, which will make the difference in milk production per year less than that per lactation, and may also result in less meat production from the European breeds.

Based on these data and on observations in other tropical countries, a realistic estimate of the mean potential milk production of dairy x local crossbred does in Kenya, using local feeds only in farming areas, might be 200-250 kg per lactation, with a kidding interval of 12 months or less. Stotz (1981), estimates 150 kg for crossbred does under a grazing situation, and 300 kg for higher grade does in semi-confinement, which are consistent with the above estimate. If three to four does and their followers can be fed on the land used by 1 cow and her followers, this suggests that less milk will be obtained from goats than from cows, except under more intensive management (Stotz, 1981). What then might be reasons for keeping goats rather than cows?

This question has been dealt with in depth by Stotz (1981), with specific reference to Kenya, and will therefore not be considered in detail here. Briefly, potential advantages of goats include:

1. Possible year round milk supply from 3 or 4 does with staggered kidding dates whereas a cow will be dry a substantial part of most years.

2. Reduction of risk; loss of a doe in a 3-doe herd is much less serious than loss of a cow in a 1-cow herd.

3. Higher meat production potential of goats, due to higher prolificacy and more frequent reproduction. Realization of this advantage, however, will reduce the relative milk production of goats, since raising twin kids successfully at the levels of milk production under consideration here will leave only a limited amount of milk for human use.

4. Maintenance of a cow is not feasible on farms of less than about 0.5 Ha, which represent 32% of all Kenya farms (Stotz, 1981). On many such farms, there may be feed for 1 or 2 goats.

5. Because goats use some feeds not used by cattle, it may in fact be possible to keep more than 3 or 4 goats on the land and feed resources required to support 1 cow.

6. Housing can be cheaper, if the animals are to be housed.

Potential disadvantages of goats, in addition to possible lower milk production per unit of feed at low or intermediate management levels, include:

1. Higher labour input,
2. High kid mortality,
3. Susceptibility to abortion,
4. Possibly greater problems in controlling the grazing of the animals, e.g. to avoid crop damage.

There may also be a lower social status associated with ownership of goats than of cattle, and less demand for the milk and milk products.

As these points indicate, the decisions which will determine whether goats become more important as a source of milk in Kenya depend on both biological and non-biological factors. However, a primary limitation to their use in Kenya now is the lack of dairy and dairy cross animals. The local breeds have not been characterized adequately with regard to milk production potential but, particularly in the small East African type most commonly kept in farming areas, the potential appears on average rather low, and small teat size may further limit their utility as a dairy animal. The Galla breed may have higher potential, and in both breeds the extent of variability and thus potential for selection for milk production within the breeds should be investigated.

Importation of dairy breeds of European origin into Kenya has been carried out on a limited scale by both public agencies and private individuals. Performance in some cases has been quite good (Stotz, 1981) but in others animals have not performed well because management did not match their needs. As yet there are not sufficient numbers of animals available for many farmers to be able to acquire either purebred dairy or crossbred dairy x local animals. Furthermore, the relative performance in different parts of the country of animals with varying proportions of dairy breed inheritance (or alternatively the level of management necessary for satisfactory performance of animals of different percentages of dairy breeding) have not been adequately documented.

Importation of goats is expensive and is also precluded from time to time by animal health authorities because of disease risks. Artificial insemination of local does with imported semen may offer a safer and more economical means of obtaining animals of improved dairy potential.

Assuming dairy breed germ plasm can be introduced by importation of animals or of semen, it is of interest to know what breeds and what breeding plan offer the best potential.

A recently completed study (Garcia, 1981) provides information which may be of some relevance to Kenya. The study was conducted over a 10 year period in Venezuela, at 10° N latitude in the wet-dry tropics, and involved comparison of first and second crosses by males of three dairy breeds on local does. In terms of rainfall and type of vegetation, the area resembles some of the drier areas of Kenya. The only supplement was about 200 g of concentrate per doe per day. Thus the conditions probably represent a considerably lower production potential environment than farming areas of Kenya. There was of course no trypanosomiasis exposure in Venezuela. Some results of the study are presented in Tables 2 and 3.

Table 2. Milk yield, lactation length and kidding interval of native and crossbred does in Venezuela (Garcia, 1981).

		Trait		
Breed Group	No.	Milk(kg)	Lact. Length(days)	Kidding Interval(days)
Native	408	57 ± 3.3	151 ± 2.8	305 ± 9.4 (311)*
Alpine x Native	101	151 ± 5.6	195 ± 4.6	357 ± 14.4 (67)
Toggenburg x Native	76	115 ± 6.3	192 ± 5.1	360 ± 21.7 (53)
Nubian x Native	279	98 ± 3.8	182 ± 3.2	356 ± 9.2 (212)
3/4 Nubian, 1/4 Native	125	97 ± 5.0	184 ± 3.2	403 ± 14.7 (70)

* No. kidding intervals

Each of the dairy breed x native crosses showed a highly significant increase in milk production over the native does (Table 2), with Alpine crosses significnatly better than the other two. (It is of interest to note that as purebreds in the U.S., Alpines and Toggenburgs do not differ significantly; both are significantly higher than Nubians in milk but not in total fat production). The increase for the dairy crosses shown in Table 2 was due in part to greater lactation length. Kidding interval was very similar for the three crosses, and about 50-55 days longer than for native does due to a more seasonal breeding pattern for the crosses.

Increasing the proportion of dairy breed (Nubian) inheritance from 1/2 to 3/4 resulted in no further increase in milk production, but a further decrease in efficiency of reproduction as evidenced by an additional increase of nearly 50 days in kidding interval. Data (not shown) on 7/8 Nubians from the same study confirmed that, in that environment, the F_1 dairy x native cross was best and that each successive backcross to the dairy breed resulted in a reduction in one or more components of performance.

Although the Alpine crosses ranked first in milk production, they were poorest in kid survival (Table 3). Thus while Alpines are the indicated breed for crossing if milk production is the first objective, the ranking is not so clear if meat production is also important, as it is in Venezuela and is likely to be in most countries where goats are kept. Alpine-sired kids which survived weighed slightly more at six months and one year than those by the other two breeds, but differences in growth rate were small relative to those in milk production and kid survival.

Table 3. Mortality from birth to 1 year of age for crossbred kids (Garcia, 1981).

% Dairy Breeding	Breed Group	No.	% Mortality
50% (F_1)	Alpine x Native	139	42.4
	Toggenburg x Native	158	39.9
	Nubian x Native	354	26.5
75%	3/4 Alpine, 1/4 Native	41	46.3
	3/4 Nubian, 1/4 Native	295	40.0
	1/2 Alpine, 1/4 Nubian, 1/4 Native	225	47.5
	1/2 Nubian, 1/4 Alpine, 1/4 Native	94	38.3
	1/2 Nubian, 1/4 Toggenburg, 1/4 Native	54	37.0
87 1/2%	7/8 Nubian, 1/8 Native	150	41.3

The ranking of the three breeds on survival, i.e. Nubians first, followed by Toggenburgs and Alpines, was quite consistent in all crossbred combinations. Unfortunately no contemporary purebred native kids were produced in the study. It is estimated that their survival would have been similar to that of the Nubian F_1.

As indicated earlier, this study was conducted in a harsh grazing environment with little supplemental feeding, and both milk production and survival would be expected to be better in many regions of Kenya. The results do provide potentially useful information on ranking of three common dairy breeds for different traits, and indicate potential problems with dairy crosses, e.g. higher kid mortality and longer kidding intervals. Whether and to what degree these problems will actually occur in such crosses in Kenya will require controlled comparisons, if possible in different ecozones and production systems.

The research and development effort needed to establish the feasibility of goat milk production in Kenya is of three kinds:

1. Biological - comparisons of different breeds and crosses
   - development of appropriate feed supplies, including legumes if possible, and feeding systems.

2. Production systems - development of systems of optimizing food production using crops and livestock.

3. Socio-economic - understanding of factors involved in choice of livestock species or farming system.
   - development of appropriate product use and marketing systems.

Ultimately the utility of goats in providing milk for smallholders will depend on the interest of smallholder families in using goat milk and in providing the labour and management necessary for a useful level of production. Goats have the potential for contributing to increased milk supplies in Kenya, especially on the smaller farms, but the extent to which this might be realized will not be known until more dual purpose goats are available and have been evaluated on a wider scale in Kenya than has been done as yet.

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