Milk production from goats for households and small-scale farmers in South Africa

EF Donkin
Department of Animal Health and Production, Faculty of Veterinary Science
Medical University of Southern Africa, P.O. Box 243, MEDUNSA 0204

Abstract
Milk production is important as a component of primary health care, in the prevention of protein malnutrition in South Africa. Milk production from goats is more appropriate than from cows, for householders and small-scale farmers. The Milch Goat Project in the Department of Animal Health and Production at MEDUNSA was established in 1987. The aim was to investigate the feasibility of using goats for the production of milk by householders and smallholder farmers in developing areas. Milk goats are scarce in South Africa, but when bred with Indigenous goats, the resulting Crossbred goats have been shown to give sufficient milk for subsistence or household purposes. In addition, Indigenous goats have been shown to have a genetic resistance to heartwater, a major tick-borne disease; and a proportion of Crossbred goats inherits this resistance. These milk goats have been kept successfully by farmers in developing areas. Research and extension activities are constrained because of limitations of funding.

Introduction
Milk has always been an important component in the normal balanced diet, providing energy, protein, calcium, other minerals and vitamins. As the population in Southern Africa continues to grow, milk will become more important as a source of high quality protein to reduce malnutrition, especially in children. As such milk production is a vital form of primary health care in both rural and peri-urban areas.

Milk production in commercial enterprises is usually from cows, because of the economies of scale. However the cow has disadvantages as a source of milk for the householder or smallholder farmer. Dairy cows are expensive, require large amounts of food, produce large amounts of milk (more than household needs), have a relatively long generation interval, and when slaughtered have large carcasses (posing problems of storage and distribution). In contrast, dairy goats are less expensive, are easily handled by women and children, eat less, produce appropriate quantities of milk for a household, have a short generation interval, produce more progeny, and when slaughtered give a carcass of manageable size. In addition goat's milk is of benefit to children who are allergic to cow's milk.

The number of goats in South Africa has been given as 5 858 807 in 1994/95 (Directorate of Animal Health, 1996), but this cannot be a precise figure, as numbers fluctuate from year to year, and an accurate census is difficult. Defined breeds of goats in South Africa include Angoras and Boergoats. If a rough estimate of the numbers of these breeds is two million and one million respectively, there are probably about three million goats of other (Indigenous) breeds, some with degrees of crossbreeding. The Boer goat is also an indigenous breed, developed in South Africa specifically for meat production.
The increase in human population will put pressure on resources, and means of intensification and greater efficiency must be found to increase food and other products, in order to improve the quality of life for all people of the country. The herds of goats are a resource to be developed, and there are many examples where improvements in productivity have been achieved in other parts of the world.

Economic benefit arises:
* when an animal fulfils a perceived need; or
* when an opportunity for marketing is available.

Where the need for milk is clearly perceived, in the context of subsistence or small-scale production, goats may often be more appropriate for supplying milk than a cow (Devendra, 1992). This principle has been accepted by many developing communities throughout the world, but has not yet found much application in South Africa. A good example of an effective programme has been documented by Miller & Mwangi (1996), where 1300 Kenyan farmers were reported to be participating in the development of milk production from goats. This has followed the comprehensive research and development programme which resulted in the Kenyan Dual Purpose Goat (Semenye et al., 1989).

**Development of a breed to ensure utilisation:**
A breed or type of animal identified as having potential for sustainable economic productivity can be developed through the following processes:

1. **Characterisation:** The breed or type must be identified and the numbers assessed. Important characteristics or desirable traits must be documented.
2. **Applications:** Appropriate technology or systems must be developed to allow the successful development of the breed in a wider context. Relevant economic or social applications must be established.
3. **Programme of Development:** A programme of extension and development must be worked out with those who will benefit from the process, and adequate support services must be available. This should include assistance with marketing development.

The Milch Goat project at MEDUNSA has used indigenous goats in a new way, and the most important aspects of the first two items have been investigated. Now a programme of development is required.

**Results of crossbreeding goats for milk production**
This is the main aspect investigated in the Milch Goat Research Project by the Department of Animal Health and Production at MEDUNSA.

**Rationale**
There is a perceived need for milk production in the rural developing areas, and this is the main use attributed to cattle where people can afford to own them. However, many people do not own any cattle at all (Bembridge, 1987). Milk goats are scarce in South Africa, but indigenous goats are plentiful. The research at MEDUNSA has aimed to assess crossbreeding as a means of introducing milk production from goats for smallholder farmers in the developing areas of South Africa. Preliminary results of productivity of these goats in terms of fertility, kidding rate, and milk production have been reported (Donkin, Boyazoglu, Els,
Macgregor, Ramsay and Lubout, 1996); and subsequently more fully (Donkin, 1997). Results of research into the

genetic resistance to heartwater were reported in 1992 (Donkin, Stewart, Macgregor, Els and Boyazoglu, 1992).

These can be summarised as follows:

1. Fertility
Data on fertility in the first three years are shown in Table 1. These results were confirmed by information from subsequent years (Donkin, 1997).

Conception rates were high (in excess of 93%) for Saanen and Crossbred goats. However, for indigenous goats in the first year, where the goats were bred at seven months, conception was only 50%. The kidding percentages for Saanen and Crossbred goats were similar, varying from 123% in the first year to 200% in mature goats. Indigenous goats had a lower rate of twinning in yearling goats, but had also achieved a kidding percentage of 200% at three years of age.

2. Milk Production
Data on milk production for the first three years are shown in Table 2. These results were confirmed by information from subsequent years (Donkin, 1997).

Milk production from indigenous goats was very low and difficult to measure. Their lactations were short, and barely sufficient for their kids' needs, in spite of the generous diet. Saanen and Crossbred goats produced much larger amounts of milk, and sustained milk production for a 9 or 10 month lactation. Indigenous goats showed very high levels of milk fat and protein, whereas Saanen goats showed much lower levels. The milk composition of Crossbred goats was higher than that of the Saanens, but considerably lower than that of the Indigenous goats. In summary, this research has shown:

- Milk can be produced efficiently and economically by goats.
- Indigenous goats give barely enough milk to provide for the needs of their kids.
- Crossbred goats give less milk than Saanens, but of a much richer quality. The yield of crossbred goats is nevertheless sufficient for subsistence or household purposes.

3. Resistance against Heartwater
Heartwater is a major tick-borne disease in many parts of Southern Africa and is fatal to many types of goats and other livestock. Saanen, Indigenous and Crossbred goats were reared tick-free, and at the age of eight months were given the virulent Ball 3 strain of heartwater blood. All goats showed the same temperature reaction, with a peak of approximately 41°C on Day 10 or 11, but the Saanen goats showed more severe clinical signs. All eight Saanens succumbed to the disease, but only two of the eight Crossbred goats, and one of the Indigenous goats. This indicated that the Indigenous goats had a genetic resistance against heartwater, and that this resistance was transmitted to a good proportion of the
Crossbred goats. These results were confirmed in a subsequent phase of the research (Donkin, 1997).
This experiment has established:
• Saanen goats show no genetic resistance to heartwater.
• Indigenous goats do have a genetic resistance to heartwater. They get sick, but do not die from heartwater.

• A good proportion (approximately half) of the Crossbred goats show genetic resistance to heartwater, and have apparently inherited this characteristic from the Indigenous goats.
• It will be possible to keep goats for milk production in areas where heartwater is endemic.

4. Other Diseases
The main disease identified was coccidiosis, accompanied by pneumonia, which caused unacceptably high mortality among goat kids: 31% of Saanen, 24% of Crossbred, and 28% of Indigenous female kids. It is believed that this problem was largely management related, and worsened by overcrowding and consequent poor hygiene; but the presence of rotavirus might also have been significant. The main disease problem affecting adult goats was mastitis, which caused deaths from peracute cases. Another important problem that became apparent after four years of age in Saanens, was the incidence of squamous cell carcinoma on the udder. Reduced exposure to the sun, by the provision of adequate shade should alleviate this problem; but the crossbreeding programme was seen to be of benefit, since no cases occurred in Crossbred goats.

5. Outreach and Extension
Outreach and extension activities for promoting the keeping of milk goats by householders and smallholder farmers in the developing areas have been limited by lack of funds. Nevertheless, a number of small-scale farmers have purchased Crossbred goats, and have successfully kept them. Constraints identified included the cost of purchased feeds, and the lack of support from government extension agencies. Training and support should be aimed firstly at increasing the competence of extension staff, primarily through practical experience, rather than being given directly to the farmers, at least initially.

Acknowledgements
The Milch Goat Project has received support from the following donors, and we gratefully acknowledge their assistance:
• Janssen Pharmaceutica supported this project for a number of years during its development.
• The British Council assisted in the planning stages.
• The Department of Development Aid supplied the indigenous goats.
• S.A. Breweries have supplied feed ingredients in recent years.
In addition, it is important to acknowledge the assistance given by numerous colleagues in the Faculty of Veterinary Science at MEDUNSA over many years.
References


**Table 1** Parturitions of Saanen, South African Indigenous and crossbred goats.

(First three years)

<table>
<thead>
<tr>
<th>Breed</th>
<th>Age (yr)</th>
<th>Bred (No.)</th>
<th>Kidded (No.)</th>
<th>Kidded (%)</th>
<th>Kids born Total</th>
<th>Kids Born (%)</th>
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<tr>
<td>Saanen</td>
<td>1</td>
<td>55</td>
<td>51</td>
<td>93</td>
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<td>All</td>
<td>110</td>
<td>103</td>
<td>95</td>
<td>169</td>
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<td>Indigenous</td>
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<td>64</td>
<td>42</td>
<td>50</td>
<td>46</td>
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<td>All</td>
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<tr>
<td>Category (Lact. No. and Breed)</td>
<td>Lactation Mean±SE (kg)</td>
<td>Mean Days*</td>
<td>Milk fat Mean±SE</td>
<td>Protein (%) Mean±SE</td>
<td>Lactose (%) Mean±SE</td>
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<tr>
<td>Saanen Indigenous</td>
<td>614 ± 142</td>
<td>285</td>
<td>2.88 ± 0.31</td>
<td>2.63 ± 0.26</td>
<td>4.61 ± 0.20</td>
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<td>23 ± 13</td>
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<td>9.06 ± 1.84</td>
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<tr>
<td>Saanen Crossbred</td>
<td>558 ± 87</td>
<td>290</td>
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<td>Saanen Crossbred</td>
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<td>266</td>
<td>5.13 ± 0.63</td>
<td>3.77 ± 0.26</td>
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* Milk production beyond 300 days not included