Strategies for dairy production in rural areas

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One of the major reasons given for keeping cattle in the rural areas of KwaZulu-Natal is for milk production (Tapson & Rose, 1984). In many situations the household has to milk several cows to get only a few litres of milk. Milk production in the traditional systems where cows are kraaled at night is limited by lack of feed intake at night, apart from the poor availability of grazing on communal grazing areas, and the fact that many herds are only released from the kraals relatively late in the morning and kraaled again before dark. Other constraints such as once per day milking vs. twice a day also limit yields.

Crossbreeding of local stock (to retain local environmental adaptation) with imported dairy breeds (for milk production) has been considered the method of choice for producing dairy cattle in many regions of the developing world. In East Africa, after up to 30 years selection for milk production under good management, the indigenous Zebu did not produce more than 960 litres per lactation (Jonsson, et al., 1993). Consequently, the use of crossbreeds or the newly developed tropical dairy breeds, such as the Australian Milking Zebu, the Australian Friesian Sahiwal or the Jamaica Hope is advocated. An ILCA (International Livestock Centre for Africa) project in Ethiopia, albeit at a milder climate in a subtropical highlands environment, concluded that there was a clear superiority of crossbreds over the local indigenous breeds (Kiwuna et al., 1983). However, in contrast to the aforementioned, ILCA in 1993 proposed testing the hypothesis that significant productivity gains (litres/cow) can be obtained with pure indigenous breeds and that the cost efficiency (including cost of risk) of milk production by crossbred cows is lower than that of indigenous cows (Rey, et al., 1993).

A survey in 1950 showed that good Nguni's could produce "2 gallons" (9 litre) and excellent Nguni's "3 gallons" (13 litre) per day (Department of Agriculture, 1950). Nguni cows milked at Bartlow Combine in the 1950' and 1960's confirm these productions. Considering this data, it is a regrettable loss that the selection of a "milking" Nguni was stopped at Bartlow Combine. At Makhathini in KwaZulu-Natal, where Jerseys, Jerseys x Nguni crosses and Nguni's are being evaluated in a hot sub-tropical environment, no conclusive differences have been established between any of these types, when supplementary feed is restricted (Table 1). The relative difference in yield between morning, when the once a day milking occurred, and afternoon milking is that the afternoon milk yield is 75% of the morning milking. However, the Jerseys clearly show a lower fertility in the hot environment. The short lactations recorded for the crossbreds and Nguni's are a cause for concern, as it was for the ILCA project in Ethiopia (Kiwuna et al., 1983), and a concerted effort is being made to attempt to rectify this through different management strategies.

Table 1 The mean milk production data and intercalving period for Jersey, Jersey X Nguni and Nguni cows

<table>
<thead>
<tr>
<th>Breed</th>
<th>Milked</th>
<th>Lactation period (days)</th>
<th>Yield per day (litres)</th>
<th>Lactose %</th>
<th>BF %</th>
<th>Protein %</th>
<th>Inter-calving period (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersey</td>
<td>Twice per day</td>
<td>300</td>
<td>9.0</td>
<td>4.22</td>
<td>4.55</td>
<td>3.85</td>
<td>505</td>
</tr>
<tr>
<td>Jersey X Nguni</td>
<td>Once per day</td>
<td>122</td>
<td>4.5</td>
<td>4.72</td>
<td>4.30</td>
<td>3.65</td>
<td>400</td>
</tr>
<tr>
<td>Nguni</td>
<td>Once per day</td>
<td>80</td>
<td>5.0</td>
<td>4.92</td>
<td>5.37</td>
<td>3.13</td>
<td>428</td>
</tr>
<tr>
<td>Jersey X Nguni</td>
<td>Twice per day</td>
<td>275</td>
<td>6.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

A system of restricted suckling (Ugarte, 1991) has been shown to minimise milk let-down problems and even improve milk production under good nutritional regimes, as well as increasing calf performance. Calf mortality being a major problem in rural dairy systems. Restricted suckling reduces stress in both cows and calves. The efficiency of milk utilization is higher in calves that are suckled than when they take the same amount of milk from a bucket. Other benefits of suckling calves are a reduced incidence of diarrhoea (scours) and the elimination of navel suckling, and are generally healthier as a result of which suckled calves...
can be housed in groups. Mastitis is also reduced in restricted suckling systems.

Approximately 15% of the milk in the udder at the start of milking remains at the end as residual milk, containing 3 times more fat content than normal milk. However, only small amounts of residual milk have been found in the udder of cows after the calves have suckled (1.2 - 3.4%), always less than in hand or machine milked cows (Ugarte, 1991). Suckling calves twice daily for the first month after birth, and then once daily until weaning at 10 to 12 weeks reduced milk consumption by the calf, and consequently calf growth, but the production obtained at milking increased by approximately 30% over cows suckled twice daily until weaning. However both the suckled treatment produced 28% more milk than as non-suckled control treatment.

Strategies to improve the household supply of milk, as well as for small-scale commercial dairy production, have been proposed and some are being tested locally. These include zero-grazing systems, the limited use of BST and the use of urea-molasses blocks to supply energy, protein and enhance rumen fermentation on low quality roughage.

Many of the Jersey X Nguni crossbred cows tend to get overfat, indicating that these animals tend to partition their energy towards body growth. The use of BST in an attempt to drive the partitioning of energy to milk production, is being investigated at Makhathini. In Zimbabwe the administration of BST in Mashona and Nkone cows, 75 to 90 days into lactation, significantly increased milk yield by 1.5 kg per day and also tended to increase the length of lactation (Phipps et al., 1991). During the 14 week trial the total milk produced by the treated cows was 987 kg compared to 204 kg for the control cows. Using Mashona X Friesian cows, receiving 3 kg dairy meal per day, the administration of BST significantly increased milk yield from 8.6 to 11.0 kg per day. Small-scale dairy farmers also participated in the trials to evaluate BST, with stall-fed cows receiving chopped Napier fodder and 0.5 kg concentrate per kg milk, BST improved milk yield by 2.3 kg per day. However, an inadequate supply of forage can restrict the response to BST (Phipps et al., 1991).

The cost and logistical problems of procurement often result in the unavailability of concentrates for dairying in rural areas. In an attempt to alleviate this, the use of urea molasses blocks (UMB), to maximise rumen fermentation on low quality roughages, is being tested at Makhathini. Leng (1991) proposed two basic concepts to be applied for optimising the utilisation of forages for dairy animals, these being:

- to make the digestive system of the cows as efficient as possible by ensuring optimum conditions for microbial growth in the rumen.
- to optimise production by balancing nutrients so that these are used as efficiently as possible for milk production without jeopardising the reproductive capacity of the cow.

These two concepts could be implemented by feeding a combination of non-protein nitrogen, minerals and bypass protein. The bypass protein supplementation is used to optimise the efficiency of use of the absorbed nutrients. In an Indonesian study, UMB supplements (500 g/day) to roughage diets improved milk yield by 25%, 885 litre to 1113 litre over an 18 week trial period (Hendratno, et al., 1991). A similar 22% improvement was measured in goats.

Leng (1989) considers that the low productivity off tropical feedstuffs stems from an inefficient utilisation of the feed because of deficiencies in the diet. These deficiencies are of nutrients critical to the well being of the microbes which ferment or digest the feed, and nutrients required to balance the products of digestion to requirements. Leng suggested that because of an inefficient utilisation of nutrients increases metabolic heat and that the often low intakes of poor quality forage of ruminants in the tropics is imposed by a combination of climatic and metabolic stress. Correction of a nutrient imbalance by supplementation of a bypass protein often increases intake on poor quality forages to a constant intake of around 80 to 100 g per kg body weight daily.

Leng (1989) advocates the supplementation of high bypass protein supplements, above UMB in order to balance the protein:energy ratio, postulating that in hot areas energy is not lost to body heat production. Cold stress increases the requirements for oxidation of acetogenic substrate, whereas hot/humid climates increases the requirements of protein relative to VFA energy by ruminants. Therefore, if protein is supplied to ruminants in hot climates, a low digestibility of feed need not be a major constraint to production. Amelioration of heat stress of animals may be achieved by supplementation with bypass protein meals on low quality diets.

A unique variation of the zero-grazing system, in areas where commercial feeds are readily available, is to purchase high producing lactating dairy cows, possibly with fertility problems or 3 teats, from a commercial producer. These are fed purchased complete meal, not bred, and milked until the amount of feed
consumed costs more than the milk produced. This lactation (Fig. 1) can last up to two years and when completed the farmer is left with a fat cow which he sells to cover the costs of another dairy cow. At a daily intake of 25 kg complete meal at R 1.00 per kg and a milk price of R 2.50, the break-even production would be 10 litre per day.

In conclusion, it appears that a combination of appropriate biotechnology, sound nutrition and management programmes can successfully improve milk yields for small-scale and subsistence farmers in rural areas.

![Figure 1 Mean lactation curve of six non-pregnant Friesian cows](image-url)

**References**


Tapson, D. R., & Rose, C. J., 1984. An investigation into the KwaZulu cattle industry. Agriculture and Rural Development Research Institute, Fort Hare 2/84.