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A systems approach to the South African dairy industry

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Abstract

Milk production in South Africa comes under pressure periodically as a result of market forces, but can dairy producers effectively respond to these market forces? During these periods a large number of dairy cows are slaughtered and their numbers decrease. As the average productive life of dairy cows is 2.3 lactations, their numbers cannot be increased easily if market forces change. This paper demonstrates that the national dairy herd can only increase by 1 - 3% per life cycle through normal population growth. Short-term financial issues influencing the milk price or input costs can thus have a drastic and long-term effect on the population dynamics of the national herd. The low surplus numbers imply that selection pressure from the female side is almost non-existent. This raises the question as to whether South Africa breeds of dairy cattle are adapted to local conditions especially as large quantities of semen are imported. The low participation of only 24% in official milk recording is of concern as the performance of cows in milk recording is substantially better, *viz*. the difference between cows in milk recording and those that are not, as far as the productive herd life is concerned, is an improvement of 43%, and in milk production 81%. World-wide agricultural production is increasingly practiced in a systems relationship. The South African dairy industry must realize how interdependent they are and begins to think in terms of a systems approach.

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Introduction

Between 2001 and 2007 the number of milk producers in South Africa decreased by 30% to 3 727. Cow numbers also decreased but not to the same extent, with a decrease of 6% between 2003 and 2007. During the same period the average herd size increased from 70 to 138 cows. Only 19% of the South African dairy herds, or 24% of the cows, are participating in milk recording. In 2007, the national average milk production per cow was 4 590 kg while the average for milk recorded cows was 6 948 kg (Theron & Mostert, 2008a). This is a difference of 51% in production per cow.

The almost stagnant milk production in South Africa as well as a sharp increase in demand for milk and milk products between 2005 and 2007 resulted in net imports during the last three years (Anonymous, 2008). Imports increased from 31 000 tons in 2006 to 46 000 tons in 2007 (MERC, 2007). In 2005, a number of milk producers left the industry as a result of contradictory price signals. This was due to an unexpected decline in the milk price at the beginning of winter; a time when milk producers traditionally receive higher milk prices because of a seasonal drop in milk production. This situation culminated in significant milk shortages in the South African market in 2007, and there was a sharp increase in the price (35% year-on-year) that producers received for their milk. In 2007, the total milk production only increased by 1.9% and the estimated increase for 2008 is 2.3% (MERC, 2007).

However, it seems that exactly the opposite happened in 2008 and the demand for milk and milk products decreased resulting in a surplus and the producer price of milk dropped. However, the retail price of milk and other dairy products did not drop significantly enough to stimulate consumption. According to De Waal (2008) there was a 10% milk surplus due to a decrease in milk consumption and an increase of 6% in milk production compared to 2007.

South Africa experiences cyclical periods of milk shortages followed by surpluses due to market forces. However, cows cannot be controlled by economic or market issues but are under biological control that cannot be switched on and off at will. Milk shortages or surpluses in the country may be the result of market forces but how effectively can the milk producer that is dependent on the cow as a biological entity

respond to such market forces? In the past, commercial dairy producers left the industry when the producer price of milk dropped. This resulted in a decrease in the number of dairy cows as large numbers were slaughtered.

The purpose of this article is to use information from various sources to describe the dilemma of the dairy industry in South Africa. In doing so, it attempts to answer the question of how easily the number of dairy cows can be replaced if market forces change, and what are the biological consequences of the fluctuations. Possible solutions for the alleviation of the effect of short-term market forces will be offered together with the requirements needed for a stable dairy industry in South Africa.

Discussion

A study of the erosion rate of South African Jersey cattle (Du Toit *et al*., 2004) indicated that their productive herd life had declined from 7.9 lactations in 1970 to a level of 2.3 lactations and that the majority of culling was involuntary. Cows achieve maximum production levels in their fifth parity, after which it declines. This results in 70% of Jersey cows failing to reach their maximum production capacity. There is no reason to believe that the situation in the South African Holstein breed is significantly different.

More positively, the average productive herd life of cows participating in milk recording, according to the November 2007 information, was 2.9 for the Holstein and 3.1 for the Jersey (Theron & Mostert, 2008b). Using these figures the productive herd life of cows not participating in milk recording can be deducted by using the following simple equation:

$$0.24\ y + 0.76\ x = 2.3 \text{ lactations}$$
$$x = 2.1 \text{ lactations}$$

Where,

y = the productive herd life of cows in milk recording = 3.0 lactations

x = the productive herd life of cows not in milk recording

Similarly the milk production of cows not in milk recording can be deducted. These comparative figures are presented in Table 1.

Table 1 Comparative productive herd life and milk production of cows participating/not participating in milk recording (Theron & Mostert, 2008a; b)

Cow group	Productive herd life (lactations)	Milk production (kg/lactation)
National average	2.3	4 590
Cows in milk recording	3.0	6 948
Cows not in milk recording	2.1	3 845
Difference between cows in milk recording versus cows that are not	43%	81%

The milk production of cows participating in milk recording is 81% higher than those that are not, and the productive herd life is 43% longer (Table 1). Contrary to the general perception that there is an unfavourable relationship between milk production and productive herd life (Makgahlela *et al*., 2008), the cows in milk recording produce more milk and have a longer productive herd life than the cows not participating. The main reasons for this difference are probably improved management and management decisions at all levels.

If the average national productive herd life of dairy cows is 2.3 lactations, 100 dairy cows will produce 230 calves during their lifetime of which 50% will be bull calves. Thus 100 dairy cows will give birth to 115 heifer calves. With a mortality rate of 12% from birth to first pregnancy, 100 cows will produce only 101 heifers as replacement animals. This implies that the national dairy herd can potentially only increase by 1% per life cycle. Even if the mortality rate is 10%, 100 cows will only produce 103 pregnant heifers, a potential increase of 3% per life cycle. Thus short-term financial issues that influence the milk price or input costs can have a drastic and long-term effect on the population dynamics of the national dairy herd.

However, with a productive herd life of three lactations of cows in milk recording, 100 cows will give birth to 150 heifer calves during their lifetime, and with a mortality rate of 12% these cows will produce 132 replacement heifers. In this case, the potential increase in herd size is 32% per life cycle if selection is not practiced. The potential increase in herd life resulting from different scenarios is presented in Table 2.

Table 2 Heifer replacement and herd life resulting from different scenarios (example of 100 cow unit)

Herd life (lactations)	Mortality (birth to first pregnancy)	Number of replacement heifers	Potential increase in herd size
2.3	12%	101	1%
2.3	10%	103	3%
3.0	12%	132	32%

From a financial perspective, it may be argued that culled cows slaughtered are also generating an income and it is immaterial if the productive herd life is shorter. This argument is invalid, as in South Africa the value of a pregnant, replacement heifer is R 7 000 to R 9 000 more than that of a culled (Greyling, 2008; ai@taurus.co.za: personal communication,) If a cow herd size of 100 has a productive herd life of 2.3 lactations compared to three lactations, approximately 30 more replacement heifers are required, that could have been sold. The result is a financial loss of R 210 000 to R 270 000 per annum. Furthermore the farmer that is not doing milk recording will have a much higher number of first calf heifers in his herd, resulting in a lower milk production. This may contribute to the large difference in milk production between cows in milk recording and those that are not (Table 1).

The low surplus numbers of cows at a national level implies that selection pressure from the female side will be almost non-existent and that selection can only be applied on the bull side. This raises the question as to whether South Africa really breeds dairy cattle that are adapted to local conditions especially as large quantities of semen are imported. In the case of the Holstein, for example, half of the cows have imported sires (Theron & Mostert, 2008a).

The current low producer price of milk in South Africa (October 2008) is expected to give rise to an exodus of milk producers. This exodus, together with a weakening of the exchange rate and the global pressure on milk supply, is likely to result in an increase in the producer price of milk in the near future. As cow numbers cannot be increased quickly, short-term milk production can only by improved by feeding cows additional concentrates. This, in turn, will increase production costs and if the milk price does not keep up with the increased price of feed, the profit margins of dairy producers will again come under pressure and force more farmers to leave the industry. This will result in the slaughter of even more cows and the vicious cycle will repeat itself.

The stakeholders in the South African dairy industry must ask themselves the following questions:

- Why is the participation in milk recording not much higher? Results presented in this article clearly indicate the difference in performance of dairy cows participating in milk recording *versus* the national average. This is probably because these herds have improved management and management decisions at all levels. The National Dairy Recording and Improvement Scheme is financially supported by the government. If farmers are not making use of government support systems already in place, is there thus any justification in the primary dairy industry lobbying for government intervention?
- Can the current genotypes in the country, indeed worldwide, respond to changing needs and environments? Recent studies indicate that the effective population sizes of Holsteins are less than 150 animals, which will make it highly unlikely to respond rapidly to any changes in production systems or environmental conditions (Maiwashe *et al.*, 2006*)*
- Why is there very little vertical integration in the dairy industry? The South African dairy industry is dominated by five major milk buyers and almost 50% of the dairy market is controlled by only two buyers (De Waal, 2008). These milk buyers are only involved in the secondary industry and not in the primary industry. Producers with a substantial volume of good quality milk usually negotiate

higher prices than the average producer. Although they have the advantage of countering transport and transaction costs they are still at the mercy of milk buyers, especially during periods of surplus raw milk supply. Furthermore, most dairy products sold in the retail trade are standard and niche markets are limited (Scholtz, 2007).

- Why is there so little coordinated research and development in the dairy industry? The major secondary dairy companies have their own research agenda focussing on product development. These individual companies strive to improve their productivity and have projects in place to calculate local and international comparative benchmarks (Scholtz, 2007). However, this is not the case with the primary producers. National and international benchmarking of South African dairy farms and production systems should thus be an essential component of the research and development strategy of the primary dairy sector.
- Do breed societies and milk producer organizations understand their role in the industry?
- Why are the emerging and small-scale dairy sectors struggling to enter the dairy industry?
- Why is the pricing structure for raw milk from some of the major milk buyers still favouring volume at the expense of solids in South Africa (Banga *et al.*, 2008)?

Conclusion

Globally, the price of milk and dairy products rose significantly during 2006 and 2007 by between 20 and 60% (Sidwell, 2008). As a result, consumer demand fell and the price of milk and dairy products began to drop off its highs from the end of 2007. However, due to the strong demand in the emerging markets, the international price for dairy products is expected to trade well above average in the coming years (Sidwell, 2008). If a stable dairy industry is not established in South Africa, the South African consumer will be at the mercy of the international price trends and short-term financial benefits exploited by role players in the market.

It seems that stakeholders in the South African dairy industry do not realize how essential their interdependence is if a strong and sustainable dairy industry is to be maintained. There is an urgent need for them to think in terms of the dairy systems approach that is a framework for holistic thinking. A system that encourage and support the emerging and small-scale dairy sector in South Africa to be part of the national enterprise should also be developed.

Worldwide agricultural production is increasingly practiced in a systems relationship in order to optimize the entire production chain of the primary production systems, post harvest processes, transport, marketing and value adding (Tess, 2006, mwtess@montana.edu: personal communication). This implies the integrated utilization of the principles of genetics/breeding, nutrition, physiology, forage management, product technology and economics of production in order to ensure sustainable primary and secondary production enterprises over a period of time. One of the key elements is the support of research and development aimed at profitable milk production and the incorporation of the research results into farming practice.

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