

Short Communication

## Biological factors that affect feedlot profit in South Africa

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### Abstract

Between 70% and 80% of South Africa's beef is produced through feedlots. It is therefore important that the commercial beef cattle farmer that markets weaner calves, takes note of the biological factors that determine feedlot profit. Performance is very important and if he pays attention to these factors, he can get higher prices for his weaner calves. The factors that influence feedlot profit can be divided into biological factors (carcass weight, deaths and diseases, weaning weight, feed intake, feed efficiency, carcass classification and days in the feedlot) and the feedlot industry's margins that are dependent on the input prices (mainly weaner and feed prices). When feedlots purchase calves, they mainly rely on perception, experience or use their gut feeling. It is important that feedlots procure calves with good genetic merit that fit the goals of the feedlot and producers should supply such information. In addition, it is also important to note that, the weaner calf and grain prices are also important factors that affects feedlot profit. Other methods to identify the potential performance of feedlot calves, e.g. a production profile classification system, is also being investigated.

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The South African feedlot industry produces between 70% and 80% of the total beef in South Africa. These feedlots have the capacity to accommodate approximately 650,000 animals at a time. Depending on economic and management practices, the South African feedlot industry supply up to 1.7 million cattle for slaughter annually. These feedlots differ in size, from holding a small number of animals to more than 160 000 animals and consists of three different categories namely, farmer feedlots, seasonal feedlots and commercial feedlots. Commercial feedlots are usually integrated with the downstream segments of the value chain in the form of abattoirs, deboning facilities, packing and the retail sector (Spies, 2021).

Few of the animals fed in large commercial feedlots are bred by the feedlots themselves. The feedlots are therefore mainly dependent on beef cattle farmers who supply weaner calves. It is therefore important that these weaner calf producers understand which factors determine the profit of a feedlot. In this way, they can try to meet the needs of the feedlot.

According to Spies (2021) the most important production factors linked to the success and viability of feedlots are:

- The calves must show a positive feeding margin
- Calves must be able to produce at least 210 to 250 kg A2/A3 carcasses after at least 100 days in the feedlot
- A mortality rate lower than 1%, but preferably lower than 0,8%
- The beef to feed ratio must be greater than 1:13 (one kg of beef should be able to purchase at least 13 kg of feed)
- An average daily gain (ADG) of above 1.6 kg/day is optimal, especially if the price gap between weaner and carcass prices decreases. The AMT report (Spies, 2021), in fact indicates that ADG has a significant effect on profitability.

It is also important that feedlots procure calves with good genetic merit that fit the goals of the feedlot. This can be achieved by using performance tested bulls to breed calves for the feedlot. However, in many cases the genetic merit of the sires is unknown and buyers of feedlot calves' resort to other options such as colour and breed type, based on previous experience and perceptions.

A study was conducted in the United States some years ago, to determine the relative economic importance of factors that influence feedlot profit in Charolais-sired feedlot cattle (Buchanan *et al.*, 2016). This information was adapted for South African conditions, where aspects such as bovine respiratory disease and marbling score (determined by image analysis) were removed from the factors that influence feedlot profit, where after the estimates were repeated, and summarized in Table 1. It should be noted that the factors listed here are all biological factors.

**Table 1** Biological factors that influence feedlot profit and the relative economic value in order of importance

<b>Carcass weight</b>	+34.1%	As expected, carcass weight has the biggest effect on profit. Carcass weight and market price per kg are interconnected indicators of profit margins
<b>Deaths, diseases and injuries</b>	-31.6%	These factors all have a negative impact on profit
<b>Weaning weight</b>	-15.3%	A higher weaning weight has a negative effect on profit
<b>Feed intake</b>	-10.7%	A higher feed intake has a negative effect on profit. This should be viewed in context with feed conversion ratio (FCR), since the price of feed is a significant factor that contributes to profitability.
<b>Classification</b>	+5.3%	An optimum classification (A2/A3) contributes to profit
<b>Days in the feedlot</b>	-3.0%	The time in the feedlot has a small effect on profit, if the animal is still growing

Table 1 only focus on biological factors influencing feedlot profit. However, it is also important to note that the purchase price for the weaner calves plus feed costs are also very important cost factors that has a significant effect on overall profit margins.

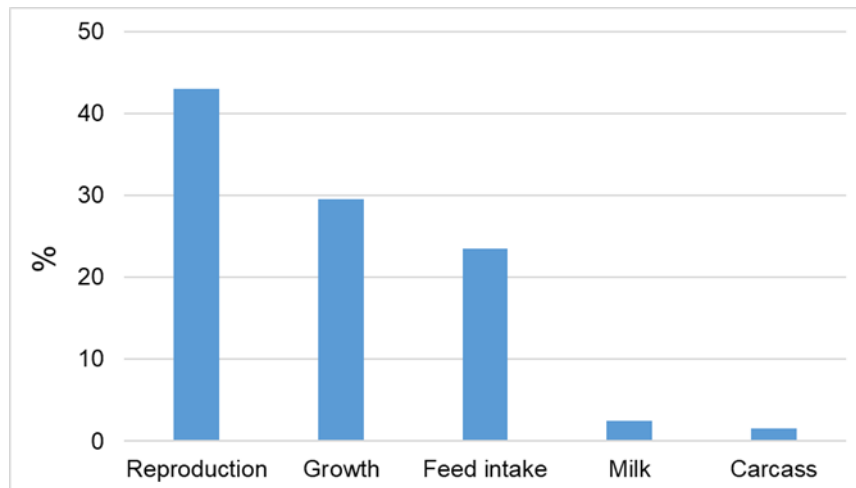
From Table 1, almost half of the feedlot profit (45%) is determined by two production traits. The feedlot profit is dependent on (1) carcass weight (34.1%) which is determined by the growth in the feedlot and therefore ADG, as well as (2) the amount of feed (10.7%) consumed, which can be linked to feed conversion ratio (FCR). Both these traits are measured in the Phase C tests (central growth tests) of the ARC's beef cattle performance testing scheme. Commercial weaner calf producers must therefore use breeding bulls to breed calves for the feedlots that meet these requirements. This can result in higher weaner calf prices if the feedlots are aware of this. Farmers should therefore make the genetic merit of their breeding bulls available to the feedlots. One challenge, however, is that there are probably not enough such breeding bulls available.

It may come as a surprise to some people, but the weight of the weaner calf is the third most important factor, and a heavier weaner calf has a negative effect on feedlot profit, because a heavier calf leads to a negative price margin in the feedlot. This is the reason why heavier calves fetch a lower price per kg at auctions or when feedlots are buying calves directly from farmers. However, it still remains important that a carcass weight of at least 200 kg to 220 kg must be maintained, as many abattoirs, agents, supermarkets and butchers discriminate against carcasses weighing less than 200 kg or even 220 kg. It is therefore surprising that there are still breeders that aim to wean calves that weigh 260 kg at weaning. Not only will they get less per kg for their weaner calves, but their cows will also get bigger, which means they will have to keep fewer cows. The environment may also not be able to support the larger cows, which can lead to a lower calving percentage.

It is also important to distinguish between the feedlot situation and the total production cycle of beef cattle. Successful reproduction is the most important determinant of productivity in livestock production enterprises (MacNeil, 2016; Portes *et al.*, 2020). In the case of beef cattle its relative economic importance is consistently more than double, and often much more, compared to growth, feed intake, milk and carcass traits. In a study done for Red Meat Research and Development South Africa in 2023, the relative economic value of the different traits was estimated and is shown in Figure 1 (RMRD SA, 2023). This demonstrates that the success of a breeding program does not depend only on growth and feed efficiency. In the case of the total production cycle, reproduction (43%) is the most important characteristic, followed by growth (30%) and then feed intake (24%). It is important that the cows' feed intake is not too high and therefore feed intake is relatively more important in the case of the total production cycle. However, growth is still more important than feed intake.

The classification of the carcass has a minor effect on feedlot profit. However, it is necessary to make sure that the cattle are not too thin or too fat when they are slaughtered (they must be A2/A3). This will only change when South Africa gets a grading system that replaces the current classification system.

Likewise, the number of days the cattle are in the feedlot does not have a big effect on feedlot profit, if the cattle are still gaining weight (Table 1).



**Figure 1** The relative economic value of the different traits

Where feedlots do not have sufficient information about the potential of the calves they purchase, they rely on perception, experience or use their gut feeling. Bisschoff & Lotriet (2013) indicated that red is the colour of preference for the feedlot industry. Another example to demonstrate perception or experience is the case where the ARC sold a group of weaner calves at an auction in December 2020. The Bonsmara and Bonsmara x Afrikaner calves, which were red, weighed an average of 195 kg and were sold for R38.56 per kg (excluding VAT). The Bonsmara x Nguni calves, which were multi coloured (mottled), with an average weight of 191 kg, were sold for R28.80 per kg (excluding VAT). The difference was almost R10 per kg, or R2 020 per calf. The reason for this difference is that feedlots know that Nguni types do not grow fast in the feedlot (thus having a negative effect on profitability) and therefore used colour patterns to identify possible Nguni types.

The combined biological factor that has the second largest effect on feedlot profit is deaths, diseases and injuries (Table 1). Unfortunately, there is a "perception" that a certain genotype is prone to pneumonia in the feedlot and therefore feedlots discriminate against calves of this genotype (Niemand, 2013). Horns in cattle can also cause bruises and injuries and more polled cattle can be accommodated in the same space at feed troughs. The risk of bruising and potential carcass damage during transport to the abattoir is also reduced which limits economic losses. Feedlots therefore prefer polled calves or calves that have been dehorned (Grobler *et al.*, 2021).

In addition, to the biological factors mentioned in this article, feedlot profit is also influenced by the feedlot industry's total margin that is dependent on the input prices (mainly weaner and feed prices). According to Spies (2021) the following factors are important: A2/A3 carcass price, yellow maize price (grain by-products like hominy chop, bran, etc. are used in feeding rations), price ratio (one kg of beef should be able to purchase at least 13 kg of feed), price margin and feed margin.

It is important that the commercial beef cattle farmer that markets weaner calves take note of the factors that determine feedlot profit. Performance traits, such as ADG and FCR, are very important and if he pays attention to these traits, he can get higher prices for his weaner calves. Other methods to identify the potential performance of feedlot calves is being investigated. This includes a production profile classification system for incoming calves that can predict their feedlot growth performance (Hentzen & Holm, 2024). This can lead to precision feeding, where feed rations are tailored to meet individual animal growth potential.

A recent study successfully established the production profiling of feedlot calves before the feedlot period, using 3D images, and the subsequent precision feeding by supplying nutrients to the production potential, in a cost-effective way (Hentzen, 2024). Further research is called for to find the most cost-effective diet for calves with different production profiles in each feedlot and country. This can lead to increased profitability, supporting food security, and decreasing the carbon footprint.

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### Authors' contributions

The authors first conceptualized this idea as a popular article. However, it became clear that the article must also be published as a scientific paper with more information and references. Both authors have read and approved the final version of the manuscript.

### Conflict of interest declaration

The authors declare that they have no conflicts of interest relative to this paper.

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