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PROMOTING PROFITABILITY AND SUSTAINABILITY IN THE BACKGROUNDING OF BEEF CALVES: THE ROLE OF AGRICULTURAL EXTENSION.

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ABSTRACT

There are indications that the backgrounding of beef calves will become more important in future as heavier beef carcasses are required. To increase the profitability of beef systems, backgrounding prepare weaned calves for finishing on high energy rations to promote rapid weight gain in a feedlot. Backgrounding operations may be pasture or dry-lot based or some combination thereof. The primary objective of this study was to investigate factors leading to poor average daily gain (ADG), high morbidity and mortality rate and the increased costs of gain. The secondary objective was to study the management practices followed in the backgrounding of beef calves concerning purchasing, adaptation, processing, raising, health management and marketing strategies. Forty questionnaires were administered to farmers, small and large feedlots doing backgrounding of beef calves. Data was generated by using the SUM equation and the means, minimum and maximum were generated by using PROC MEANS in SAS (2004). On-farm observations were employed in collecting data and discussions with other farmers and experts doing backgrounding of beef calves. According to this study, the ADG for summer differed significantly ($P<0.05$) from that of winter as the ADG during summer was 22.2% higher than that of winter. However, the study also showed that the feed intake in summer differed significantly ($P<0.05$) from that of winter with summer feed intake being 13% higher than winter feed intake. The production costs per calf in this study were R300.50±158.60 for feeding costs, R138.10±90.80 for remedies, R56.40±22.10 for processing and R37.50±24.30 for transport costs. It was also evident that parainflueza 3 known as flu was the infectious disease that mostly led to morbidity and mortality. With protozoal diseases, gall-sickness and red-water was the major cause of mortality. Mortality as a result of nutritional disorder including bloat and acidosis was reported by 37.5% of the respondents. The paper stresses the role of agricultural extension in the optimization of backgrounding systems.

Keywords: Backgrounding, profitability, sustainability, Beef calves, Agricultural extension

1. INTRODUCTION

There are typically three stages of beef production, namely cow-calf, growing and finishing phases. Most calves go through some sort of post-weaning growing program, although specific programs vary in structure and type. Calves that have been weaned and are intended for sale as commercial feeder cattle, but have not yet been placed in the feedlot, are commonly referred to as stockers or backgrounding (Peel, 2003:365). Stocker or backgrounding operation links the cow-calf and feedlot sectors by providing a means of adding weight and value to calves (Peel, 2006:271).

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According to Peel (2003:366) backgrounding provides both production and marketing value for the beef industry. The production value comes from providing additional weight and upgrading cattle to transform many calves from the cow-calf sector into feeder cattle as demanded by the feedlot sector. The backgrounding sector utilizes a wide variety of feed resources mostly forage-based production systems and, along with the cow-calf sector, is the primary user of forage in the country.

There are strong indications that the retailer sector in South Africa will in future require heavier beef carcasses (450-480kg) as in many other countries (Bradfield, 2014). However, it appears that most South African beef cattle breeds have reached a ceiling in terms of weaning weight (Neser, 2013- Personal communications). This leaves the industry with very few options, although the optimization of backgrounding systems may partly solve this challenge.

Backgrounding of cattle is generally utilized to prepare the calf for subsequent segments of the beef cattle industry. Cravey (1996:34) suggested that backgrounded calves may demonstrate greater feedlot profitability as a result of greater ADG, gain: feed ratio, decreased medicinal cost and mortality compared to non backgrounded cattle. According to Cravey (1996:35) preconditioned calves had a 0,12 kg ADG advantage, a 7,2% better feed efficiency and a 3,1% lower mortality. Step, Krehbiel, Depra, Cranston, Fulton, Kirkpatrick, Gill, Payton, Montelongo & Confer (2008:3149) indicated that calves from a single source that were retained after weaning for 45 days had less feedlot morbidity and health cost during the initial feedlot receiving period compared to commingled or direct-transported calves after weaning. Not too little and/or over weight gain is required to gain optimal profit, since cattle may finish at high weights that do not meet current carcass specifications.

According to Duff & Galyean (2007: 823) preconditioning seems to be a highly effective means of decreasing BRD morbidity, but its application is not widespread. The ultimate value of preconditioning programs is the ancillary benefit of decreased morbidity in the feedlots and this may not be realized by cow/calf or stocker producers. In addition, perhaps improved information flow regarding the backgrounding of cattle will result from the greater national emphasis on individual animal identification and trace-back, which might stimulate the demand for preconditioned calves. Dhuyvetter, Bryant & Blasi (2005:514) suggested that based on a 45 day post weaning preconditioning program cow/calf producers realized an increase in returns compared with the sale of calves at weaning that are not preconditioned, and that feedlot producers can also benefit from such programs and can afford to pay premiums for conditioned calves.

The objectives of the study are to investigate factors leading to high mortality rate, poor body conditioned (under- and over-conditioned) and increased cost of gain. Secondly to study the general management practices followed in backgrounding of beef calves. Thirdly to emphasize future advisory action in terms of this potentially advantages practice.

2. MATERIALS AND METHODS

2.1 Introduction

The survey was developed to gather information on the specific production management practices in backgrounding of beef calves in order to identify factors leading to a poor ADG, high rate of morbidity and mortality as well as the increased costs of gain.

2.2 Sampling

For this study a comprehensive sampling was used to examine the population of forty producers doing backgrounding. The targeted population was producers who practice backgrounding of beef calves with large feedlots, small feedlots and producers doing backgrounding without feedlots in different provinces. A list of some producers in the Free State was obtained from the Department of Agriculture and Rural Development, in Senekal, while others were obtained from the internet.

2.3 Administration

A semi-structured and open-ended questionnaire was designed to give empirical evidence about the investigation into factors affecting backgrounding of beef calves on different farms doing backgrounding.

The distributions of the questionnaires were selected based on the quantity of cattle in backgrounding systems and size of the institutions. These include large feedlots, small feedlots and people and/or the farmers doing backgrounding without feedlot. Some of the questionnaires with the covering letters were faxed and emailed to some respondents and those who delayed to respond were reminded and thanked if they already responded. Some of the questionnaires were administered face to face with the respondents. Assistants were introduced to the objectives of the study and trained of what should be expected from respondents.

2.4 On-farm observations

Other survey methods that were employed in collecting data were observations on the farms doing backgrounding, discussions with other farmers and experts in backgrounding of beef calves. The observations were made on the farm called Alma, 28°53’45.29600”S latitude, 27°28’49.85815”E longitude in the Thabo Mofutsanyane district of the Free State in South Africa. The following were observed on the farm; Purchasing, adaptation, processing, raising of calves, health management (identifying sick calves, providing treatment and analysis of post-mortem results), marketing strategies (classing and sorting of calves for marketing to the feedlots).

The observations were also made on the pasture management based on the rotational grazing systems and the production of quality and sufficient quantity pasture throughout the year.

2.5 Dataset, coding and analysis

Raw data was entered in Ms Excel for decoding before it was transferred to the SAS dataset. On the encoding, the answers “Yes” were coded as 1 and “No” answers were coded as 2. The standard deviations are reported as a number of dispersion. Data was generated by using the SUM equation and the means, minimum and maximum were generated by using PROC MEANS in SAS (2004).

2.6 Descriptive statistics

In most cases simple means and standard deviations for the population are reported. Where the categories are classified, the results are expressed as the average percentage of total. The

questions with a low number of responses may have means that are affected by potential outlier responses. Information on sample size, measure of averages or central tendency and the measure of dispersion is reported for each variable where appropriate.

3. RESULTS AND DISCUSSIONS

3.1 General description

The total number of owned land (ha) ranged from 0 to 10 000 ha, while rented land (ha) ranged from 30 to 6 000 ha (Table 1.). The total ha of the farmers who owned land was 68,1% higher than that of hired land. The farmers doing backgrounding without having a feedlot were 62,5%; those with small feedlots doing backgrounding were 17,5% while those with large feedlots doing backgrounding were 20%. It can also be depicted that 72,5% of the respondent had less than 1000 calves on the farm and farmers with 1000 to 3000 were 12,5% while 15% of the respondents were of the farmers with more than 3000 head of calves.

Table 1. Mean, median and ranges for own and rented land of farmers doing backgrounding of beef calves.

Variables	Mean±s.d	Median	Range
Own land (ha)	1123.6±1937	475	0-10 000
Rented land (ha)	764.9±1495	400	30-6000

[1]s.d= standard deviations

3.2 Purchasing of calves

Eighty four percent of the respondents preferred summer as the season of preference for backgrounding calves with the main reason being the availability of enough feed during this time of the year. Sixty five percent of respondents selected winter as a season of preference due to better selling and purchasing price by 26,92% and 23,08% respectively and 26,92% for the availability of maize residues (Figure 1). Beck, Gunter, Cassida, Pjillips & Freeman (2000:5) found it being economically advantageous for dry lot backgrounding who utilizes high-concentrate diets with molasses-based supplement in the autumn and winter since calves showed better gain and economic performance.

Most respondents (70%) agreed that they use agents and 30% said they don't use agents when buying or selling calves. In response to where they buy calves for backgrounding, 62,5% used auction,75% from other farms and 45% from private persons while 7,5% chose others. This implies that most backgrounders use several sources when purchasing calves.

The respondents were asked if they consider dry calves (calves already weaned) and most of them (82,5%) said they consider dry calves while 17,5% said they don't. Among 82,5% who consider condition of calves, 21,2% said they consider the condition of calves as dry calves posses better growth and weight potential, 57,6% because of they are healthier and has less stress, while 3,1% said any condition is acceptable.

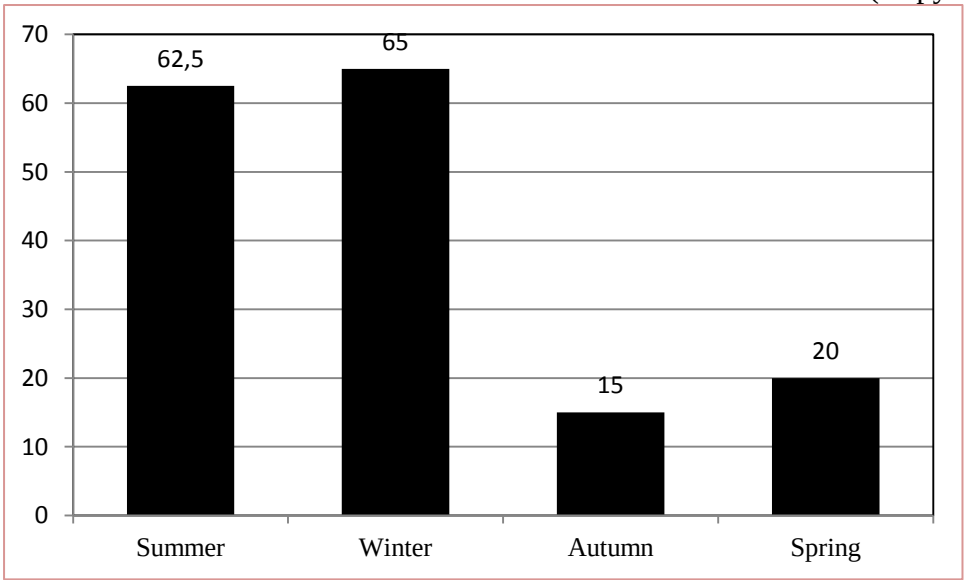

Figure 1. Preferred seasons of the year for backgrounding

According to the study, most of the respondents (77, 5%) start backgrounding calves from 160 to 190 kg, while 12,5% prefer backgrounding calves at a weight of 160kg or less and 10% at the weight of 210kg or more (Figure 2). Thirty one respondents (77,5%) said they consider calves' breed type because some breeds show a better ADG and FCR than other breeds and 22,5% said they don't consider breed type when buying calves for backgrounding. The latter is due to the fact that they had no choice because they are backgrounding their own calves (stud or dairy calves) and other farmers are buying different breeds in bulk, mostly from the auctions. Strydom, Frylinck, Van Der Westhuizen & Burrow (2008:603) found that the Drakensberger, Tuli and Bonsmara gained weight faster and produced larger carcasses than Brahman (*Bos indicus)* and the Nguni. They also found no differences in feed conversion ratios (FCR) over an extended period of 131 days among Nguni, Tuli, Drakensberger and Bonsmara (all indigenous breeds).

Most of the respondents (77,5%) said they consider the sex of calves while 22,5% said they don't. The study indicates that out of 77,5% who consider sex, steers were preferred above heifers for backgrounding of beef calves by 77,5% and 22,5%, respectively. More than 90% (90.3%) of the respondents indicated that they prefer steers due to better growth rate and selling price, while 6.4% said any sex is acceptable because they are buying calves in batches and 3,2% said heifers are also acceptable as they can market them as pregnant heifers at a later stage.

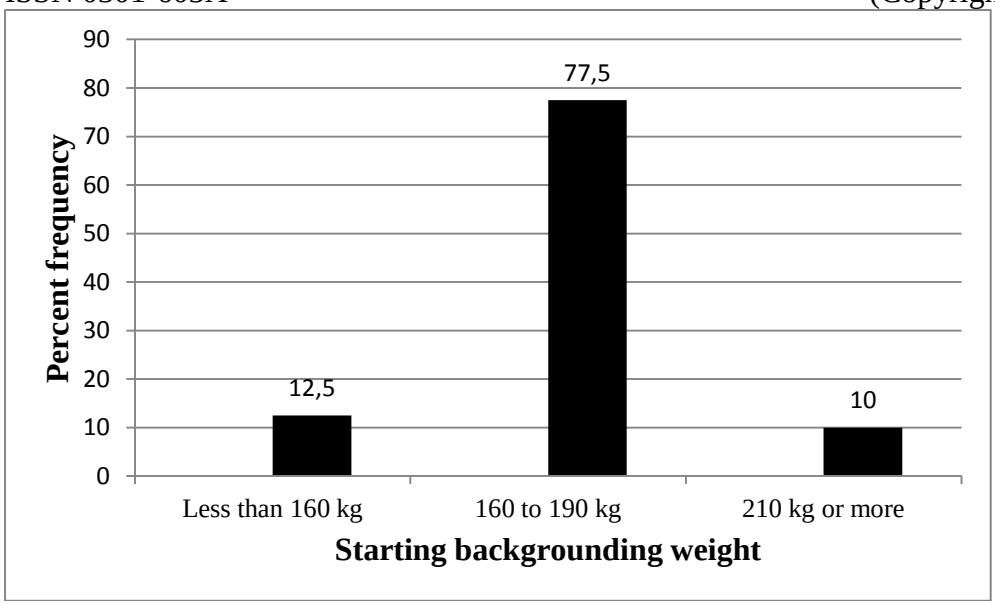

Figure 2. Preferred starting weight in backgrounding

3.3 Adaptation of calves

The post-weaning environment plays a more important role in growth performance of animals than the pre-weaning environment. All respondents (100%) indicated that they weigh calves after arrival and they use different feed types for adaptation. Table 2 indicates that 17,5% use feed for adaptation from agricultural cooperatives, 2,5% use calf grower (mostly dairy farmers), 35% uses good quality grass hay, 7,5% uses maize concentrates, 17,5% uses molasses based concentrates, 20% uses starter ration (mostly feedlots doing backgrounding) and 7,5% uses salt and phosphate.

The study also showed that 39 respondents (97,5%) inspect their calves after arrival and only one respondent (2,5%) does not do inspection. After inspecting calves, 10,3% returns sick calves, 15,4% negotiate a lower price and 31 (79,5%) indicated that they provide treatment if they find sick caves (Table 2). It was indicated by 82,5% of respondents that they provide feed supplementation.

3.4 Processing of calves

In response to how long do they take before they process, 51,3% said they start processing in less than 24hrs after arrival because they want to eliminate the possibilities of diseases, and 35,9% said they take 24hrs before they can start processing because calves must get water and grass for quick adaption. Nearly thirteen percent (12, 8%) said they start processing after 24hrs or more so that calves can recover from transport stress. The latter is mostly applied by the large feedlots that buy calves from far places e.g. Namibia.

Table 2. Frequency distribution of backgrounding farmers regarding type of feed used for adaptation of new calves.

Variables	Frequency	Percentage (%)
Adaptation feeds		
Agricultural Coops	7	17.5%
Calf grower	1	2.5%
Good quality grass	14	35%
Maize concentrates	3	7.5%
Molasses meal/syrup	7	17.5%
Starter ration	8	20%
Salt and phosphate	3	7.5%
Inspection of calves		
Yes	39	97.5%
No	1	2.5%
Reaction to sick calves		
Return calf	4	10.3%
Negotiate a lower price	6	15.4%
Provide treatment	31	79.5%

In Table 3 all respondents in this study (100%) indicated that they vaccinate during processing, 95% of respondents indicated ear-tagging, sorting and weighing as well. Deworming was indicated by 92,5% of the respondents while 82,5% of respondents indicated they provide feed supplementation and 80% indicated the implanting of a growth promotant. Loken *et al.* (2009:1851) used Bovi Shield Gold 5 to vaccinate calves against bovine rhinotracheitis virus, para-influenza 3 virus, bovine respiratory syncytial virus, boviral viral diarrhea virus (type 1 and 2), *mannhaemea haemolytica* and *hemophilus somnus*.

3.5 Raising of calves

Eighty percent of respondents indicated that natural grazing is the main source of feed, while 40% indicated that they planted pasture, 42.5% uses commercially bought feed and 10% uses self produced and processed feed.

Growth and daily gain are important factors in breeding, backgrounding and finishing operation. The majority of respondents (59%) indicated that their ADG varied from 0,6 to 0,9 kg, while 25,6% indicated that their ADG is equal to or more than 1 kg while the ADG of other respondents (15,4%) is less or equal to 0,6 kg. Most of the respondents (80%) reported that they provide mineral licks while 20% reported that they don't provide licks.

Table 3. Frequency distribution of respondents concerning processing activities and factors delaying the processing process.

Variables	Frequency	Percentage (%)
Processing activities		
Castration	18	45%
Branding	21	52.5%
Dehorning	27	67.5%
Deworming	37	92.5%
Ear-tagging	38	95%
Hoof trimming	0	0%
Implanting growth promotant	32	80%
Sorting and weighing	37	92.5%
Vitamin supplementation	33	82.5%
Vaccination	40	100%
Delaying factors		
Calf's temperament	5	12.5%
Equipment failure	8	20%
Lack of skilled labour	9	22.5%
Lack/shortage of facilities	8	20%
Weak/sick calves	6	15%
Seasonal variation (day length)	3	7.5%
Other farming activities	0	0%
Bad weather conditions	3	7.5%
Nothing	5	12.5%

3.6 Health management

Most of the respondents (72.5%) indicated their mortality rate being less than 2% while 27.5% indicated their mortality rate to be ranging from 2 to 4% and no respondents indicated mortality rates above 4%. More than 22% of the respondents reported mortality because of bloat, 15% because of acidosis and 7, 5 % due to liver abscesses.

From Figure 3 it is evident that para-influenza 3 known as flu was the infectious disease leading to a high rate of mortality (70%) and black-quarter was the second highest disease by 45%, while 22,5% indicated lumpy skin disease, 17,5% indicated anthrax and 7,5% indicated botulism as the infectious diseases leading to mortality. Only 10 respondents (25%) indicated other infectious diseases that lead to mortality. Most of the respondents indicated *Pasteurella multocida* as the cause of deaths, while *Mannheimia haemolytica* and pneumonia was indicated each by 20%. Ten percent indicated leptospirosis as a cause of the mortality. Twenty percent of the respondents indicated that none of the infectious diseases has led to mortality.

The majority of the respondents (62,5%) indicated gall-sickness as the protozoal disease that causes death to the calves while red water was indicated by 45%, heart-water by 27,5%, elephant skin disease by 2,5% of the respondents and 7,5% reported that none of the protozoal disease led to mortality. These results are supported by Masika, Sonandi & Van Averbeke (1997:42) that most of the livestock owners in the Eastern Cape Province perceived tick-borne diseases in cattle to be second most important cause of morbidity and mortality in communal areas, especially gall-sickness and red-water.

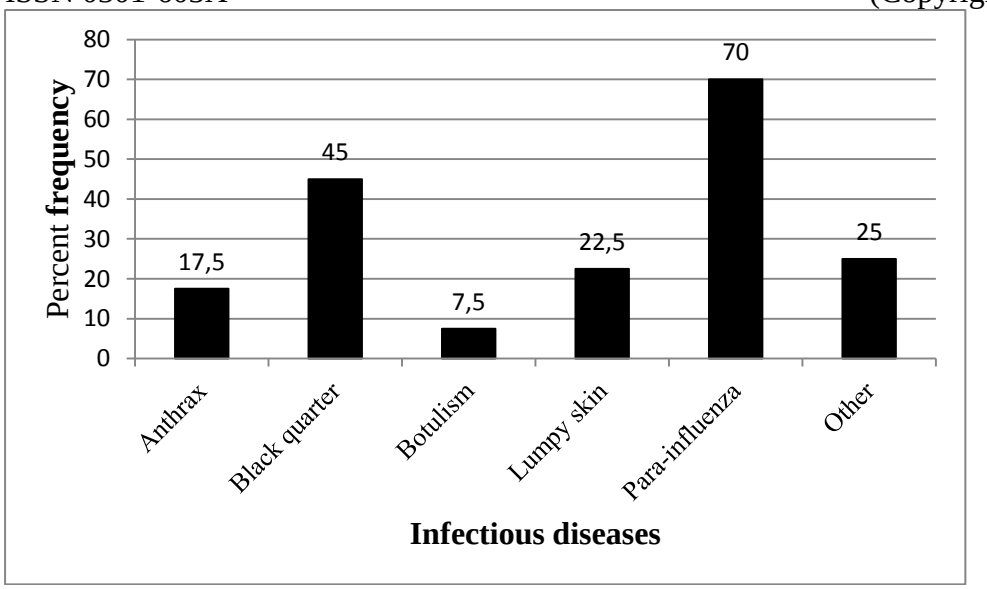

Figure 3. Mortalities due to infectious diseases

3.7 Marketing of calves

Most of the respondents (60%) market calves at 240 to 260 kg, while 22,5% market calves at 260 to 300 kg and other respondents (17,5%) indicated that they market their calves at 300 kg or more. Five networks for selling and marketing calves were reported namely: abattoirs, market agents (speculators), feedlots, butcheries and private sales. From the results it is evident that 37,5% of respondents are selling directly to the abattoir, 87,5% of respondents to a feedlot, 5% to the private buyers and 12,5% indicated other.

Most of the respondents (62,5%) indicated that they are not partially or completely selling calves during February, August and/or Easter weekend. February and August were selected by eight respondents (20%) each while three respondents (7.5%) reported selling during Easter weekend. From the respondents who indicated other the majority (60%) sell their calves throughout the year.

In response to whether they sort calves according to gender, breed type and weight when marketing, 87,5% reported that they sort them accordingly. This increases selling value of the calves, avoids trampling and bruising of small calves by big calves. More attention can also be given to some of the breeds e.g. Friesland. The respondents who reported not sorting their calves (12,5%) reported that they are not sorting because calves are sold in a batch.

3.8 Summary of production costs

According to this study (Table 4), the ADG for summer differed significantly *(P<0.05)* from that of winter as the ADG during summer was 22.2% higher than that of winter. However, the study also showed that the feed intake in summer (6kg) differed significantly *(P<0.05)* from that of winter (8kg) being 13% higher than winter intake. These results are similar to those found by Anderson, Rasby, Klopfenstein, & Clark (2003:697) that ADG for steers during the winter period was 0,53kg and ADG for the summer period was 0,93kg. Demircan, Koknaroglu, & Yilmaz (2007:21) also found that the ADG of cattle fed during the warm season was higher than that of the cold season *(P<0.05)*.

The production costs per calf in this study were R300.50±158.60 for feeding costs, R138.10±90.80 for remedies, R56.40±22.10 for processing and R37.50±24.30 for transport costs. These results are supported by various researches in animal production and agribusiness that feeding cost threatens profitability of any animal production enterprise (Chipfupa, 2012:11). The study shows that the feeding costs was 54% higher than that of the remedy costs per calf and the processing costs was 33,5% higher than that of the transport. However, the study shows that transport was the lowest of all the production costs per calf. Transport costs are mostly determined by the distance to and from the backgrounding farm. The results revealed in this study are in line to those found by Norton (2005:37), that feeding costs constituted 64,4%, 69,6 and 85.9% of the variable costs in beef backgrounding, beef cows and beef finishing, respectively.

Table 4. The mean, ± s.d, median and ranges of the ADG, feed intakes (summer and winter), feeding costs, processing costs, remedy and transport costs per calf.

Variables	Mean±s.d	Median	Range
ADG			
Summer	0.90±0.30[a]	1.00	0.00 – 2.00
Winter	0.70±0.30[b]	0.60	0.30 – 1.60
FI			
Summer	2.30±1.90[a]	2.00	0.00 – 8.00
Winter	2.00±1.50[b]	1.50	0.50 – 6.00
Production costs			
Feeding costs/calf	300.50±158.60	260	2.60 – 750
Remedy costs/calf	138.10±90.80	150	10 – 350
Processing costs/calf	56.40±22.10	51	26.5 – 147
Transport costs/calf	37.50±24.30	30	16 – 120

ADG = Average daily gain
FI = Feed intake
[a, b] Means with different superscript in columns vary significantly *(P<0.05)*

4. CONCLUSION

It was concluded that most of the farmers practice sound management practices which assist them to sustain productivity and profitability. It is evident that the backgrounding of beef calves involves the growing of weaned calves ranging from 160 to 190kg on roughages, mostly from natural grazing to provide moderate growth until they weigh 260kg or more for marketing to a feedlot or direct to an abattoir. The aim of backgrounding is to build muscle and bone mass without excessive fat at relatively lower costs (Rasby, Rush & Stock 1996:1). Calves that gain too much fat may finish at weights too heavy to fit today's carcass weight specifications (Lardy, 1998:4).

The results revealed in this study showed that seasonal variation has an effect on performance and profitability of beef calves. ADG for summer season differed significantly from that of the winter season *(P<0.05)*. Depending on the nature of backgrounding calves, lengthening of the grazing season can place an economic advantage to the farmer. For example, farmers doing backgrounding of beef calves will prefer longer grazing season to achieve the desired gain, while backgrounding calves for small- and larger-feedlots should be shortened since supplemental feeding is provided.

The study also showed that one of the BRD's, para-influeza 3 known as flu was the infectious diseases that mostly led to morbidity and mortality. With tick-borne diseases gall sickness and red water was the major cause of mortality. There was less mortality reported as a result of nutritional disorder including bloat and acidosis.

5. EXTENSION IMPLICATIONS

The message the extension authorities must convey is that the backgrounding of beef calves will become more important in future. This practice holds significant potential and can be seen as on farm value adding, allowing the producer to participate in the value chain. However, producers should be cautioned with regard to the origin from which calves are being purchased. Therefore, buyers should possess good technical skills and expertise in buying calves so that prices can be negotiated based on the condition of the calves (value for money). An auction is considered to be a high risk source because calves from different farms are commingled. Steers are higher in price than heifers, while Friesland calves obtain the lowest prices. The Friesland calves are lower in price, but because they are a milk breed it takes longer to condition and is mostly subjected to foot-rot disease requiring more management attention.

Furthermore the importance of stress management and proper adaptation should be properly expressed by extension officers. Once calves have been weaned and sold to a backgrounding farm, they are exposed to transitional stress. Calves entering backgrounding operations should be introduced to a starter ration for adaptation and a finisher ration must be supplied to nearly ready market calves. During the adaptation phase some calves die due to digestive problems, with the most common diagnoses being red intestines known as "rooiderm", bloat and liver failure/abscess. Special care should be taken during this period.

In order to avoid over or under-conditioning in backgrounding of beef calves, the backgrounding period should be adapted accordingly. This will help to minimize stress, feeding and remedy costs as well as labour costs. The time of purchase and the consideration of price cycles are also a determining factor for the maximization of profits.

It also needs to be emphasized that feeding costs remain the highest of all production costs in backgrounding of calves. This can be minimized by utilizing natural veld supplemented by concentrates applying proper ration preparation techniques. Furthermore producers are still not sure which input level (feeding level) provides the maximum output level. To achieve maximum profit, the basic principles of production economics (input vs. output level) must be applied. These principles will help the farmer to identify the optimum level of production without reaching the level of diminishing marginal returns.

Therefore, further research based on feeding levels need to be conducted which will help backgrounders to identify optimum production levels depending on their type and structure of backgrounding programs.

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