RELATIONSHIP BETWEEN TEMPERAMENT AND LINEAR BODY PARAMETERS OF BEEF CATTLE UNDER COMMUNAL GRAZING SYSTEM.

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GEORGE
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DECLARATION OF INDEPENDENT WORK

I, NEKHOFE AVHASEI JUSTICE, do declare that this dissertation submitted for the degree MAGISTER TECHNOLOGIAE: AGRICULTURE is my own independent work that has not been submitted before to any institution by anyone else or me as part of any qualification.

........................................... ...........................................
Signature Date
PREFACE

It is my wish that this dissertation serves to aid communal farmers to improve temperament in their stocks. This dissertation is presented in the form of one scientific publications from chapter one to chapter three. These chapters are preceded by chapter one which is the general introduction that focus on description of Nguni cattle type, their linear body measurements and temperament. Therefore, chapter two is consist of literature review and chapter three which is the last chapter of this dissertation contains introduction of this study, materials and methods, result and discussion and conclusion and recommendations. This study explores useful information for the improvement of temperament in beef cattle under communal management system.

Care has been noted and applied in order to avoid unnecessary repetition. However, with this one article, repetition was avoidable.
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DEDICATION

I would like to direct these dedications to my family members: My father Nndanganeni; Thihangwi and Takalani (Brothers), Musandiwa and Tshifhiwa Nekhofhe (sisters) for their kind and confidence in me.

Lastly, I send a special dedication to my mother the late Elizabeth Mutshinyani Nekhofhe who passed away in 1999.
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CHAPTER 1.
GENERAL INTRODUCTION

Indigenous cattle are mostly reared where the traditional farming is practiced including Northern Region of South Africa. The majority of farmers own Nguni type of cattle although other breeds are found in the region. They perform well under harsh conditions and they seem to produce better under intensive management. However, communal farmers are becoming aware and interested in indigenous breeds especially Nguni cattle type because of their adaptability. Beef cattle production and research require constant movement and handling of livestock (Erf et al., 1992 & Grandin, 1993).

Dipping, castration, branding, ear-tagging and counting is commonly practiced as beef cattle management norms hence dehorning are partly practiced as some of the animals had horns which were disturbing them to pass through crushpens and as a result they increased bruising to other animals. At Matatani and Muledzhi areas animals including calves are packed in the crushpens, counted, weighed and temperament traits were also measured on the scale and this is done in order to document the information for this research and future use.

Temperament is a behavioural response of animals as handled by man. It is important to be measured in beef cattle farmers under communal grazing conditions as it reduces farmer’s profit and it makes the stock man’s work unpleasant. Therefore, it is also needs to be improved for the improvement of beef cattle schemes. Management system of communal farmers was not conducive to better quality meat due to horns in some animals which ultimately cause bruising in other animals. However, exotic bulls were bought at random for the improvement of other breed types found in these two areas.

The focus of this study is almost in Nguni cattle type managed under communal grazing system. Lastly, the purpose of this study is to determine behavioral response of beef cattle under communal management system at their dipping tanks.
CHAPTER 2.

DISPOSITION OF BEEF CATTLE TYPE UNDER COMMUNAL MANAGEMENT CONDITIONS: REVIEW

INTRODUCTION.

Nguni cattle type is mostly reared by communal farmers in Northern Province. Indigenous cattle are mostly reared where traditional farming is practiced including Northern Region of South Africa. The majority of farmers own Nguni cattle type although other breeds were found in other parts of the region. They perform well under harsh conditions and they seem to produce better under intensive management. However, communal farmers are becoming aware and interested in indigenous breeds especially Nguni cattle type for their productive efficiency. Various studies indicated the following advantages could be observed for some indigenous cattle:

(a) Better adaptation to environmental stresses (parasites, high temperature, humidity, and ultra-violet radiation).
(b) Easy calving, early sexual maturity, long life expectancy, exceptional fertility, sound confrontation and good feed efficiency (Kars et al., 1994).

In the quest for improvement, beef cattle production and research requires constant movement and handling of livestock. Beef cattle improvement schemes require that many measurements be taken on live animals. Measurements such as body condition score, frame score, scrotal circumference, pelvic areas, blood constituents, milk yield and ultrasounds are routinely taken. Castration, dehorning, branding, palpation, dipping, tagging, weighing and artificial insemination are part of beef cattle management norms. All of these require constant handling of cattle, thus the need to understand animal behaviour. Animal behaviour in response to their environment has been well studied in both dairy and beef industries (Erf et al., 1992; Grandin, 1993). Animals learn routine movement and handling with time.

Understanding animal behaviour may reduce the risk involved in handling cattle (Craig,
Arave and Albright, (1981) reported the possibility of increasing economic margins and improving experiments precision through good behaviour management. An animal’s learning experiences affecting their welfare can be utilized in management thus they can be handled without affecting their welfare. Movement orders of animals under voluntary and involuntary situations have been studied in most species (Arave and Albright, 1981; Fordyce et al., 1988; Sherwin, 1990). Species like sheep, goats and dairy cattle have been found to have a specific order of movement (Fordyce et al., 1998; Sherwin, 1990; Hughes et al., 1996; Hargreaves et al., 1990). However the species orders of movement differed when animals were moved under familiar situations (Craig, 1981; Lamb, 1975).

Because most beef cattle producers and researchers consider temperament as an important management trait, temperament as a factor that influences the handling of cattle as individuals has been well studied in the beef industry (Sato, 1981; Hearnshaw and Morris, 1984; Fordyce et al., 1985; Fordyce et al., 1996). Other studies found that temperament heritability and repeatability to be moderate in the most beef breeds. Moderate repeatability shows that temperament differences persist in beef cattle. Beef cattle managed under extensive systems go through handling facilities very few times in their lifetime so they have little opportunity for learning (Fordyce et al., 1988). This is similar to the situation of communal land use which indicated that most of the farmers in the less developed countries of Southern Africa are engaged largely in subsistence production of which communal grazing is an integral part (Duvel and Afful, 1997). Communal grazing lands are held as common property. Under common property regime, all members of a clearly defined group have access to the grazing resource.

The objectives of this study are to determine the importance of temperament for beef cattle in relation to other traits. Lastly, to investigate whether the methods used to measure temperament can be applied in practical breeding programs to improve temperament of beef cattle.
Cattle behaviour

The scientific study of an animal’s behaviour in response to its environment, both animate and inanimate, has been going on for years within schools of Agriculture and veterinary medicine (Lamb, 1975; Arave and Albright, 1981; Fordyce et al., 1985; Grandin, 1993). Many behavioural studies went through secondary observations to main research projects. Few of these studies were designed with the aim of applying findings to management. Arave and Albright (1981) identified the following objectives of the most animal behaviour studies:

- To evaluate the behavioural stress resulting from management systems.
- To determine the adaptive range within genetic groups to changing ecological restrictions.
- To determine and utilise learning experiences of animals in management.
- To document normal animal behaviour so that persons with different backgrounds may supplement their experiences.
- To determine physical mechanism regulating behaviour.
- To increase validity to their research results.

Mohan et al. (1991) found that dark firm dry (DFM) beef was a direct consequence of emotional stress prior slaughter. In addition, in order to avoid DFM there is a need for a better understanding of animal behaviour to control situation both at marketing. Temperament, competition, aggression, dominance order, milking order, leader-follower relationship, grazing behaviour, sexual behaviour and learning have been well studied in cattle industries, especially dairy production (Tulloh, 1961; Roy and Nagpaul, 1984; Kilgour, 1975; Arave and Albright, 1981; Hearnshaw and Morris, 1984; Sato et al., 1993; Grandin et al., 1995; Hasegawa et al., 1997).

Inter-individual behaviours may be categorized as agnostic and non-agnostic behaviour (Sato et al., 1993). Agnostic behaviours are associated with fear, pain and aggression. Non-agnostic behaviours are friendly behaviours within animal’s societies. Many
agnostic behaviours of beef and dairy cattle such as aggression behaviour, escape behaviour and avoidance have been studied (Avaré and Albright, 1981; Hearnshaw and Morris, 1984; Fordyce et al., 1988). This is because agnostic behaviours have clearer social and management functions than non-agnostic behaviour (Sato et al., 1993).

**Temperament**

Temperament is the underlying factor of animal disposition and an important factor concerning the easiness of handling cattle as individuals. Some researchers define temperament based on their main interest. Boissy et al. (1995) stated that all definitions express the way the individual cattle perceived and reacted to fear-eliciting events. Fordyce et al. (1998) defined temperament as the behavioural response to handling by man. Boissy et al. (1995) defined temperament as the individual’s basic stance towards environmental change and challenge. Kilgour (1975) defined temperament as the behavioural characteristics resulting from individual physical, hormonal and nervous organization which contributes to the unique disposition of one animal in contrast to other species members. Many producers and processors believed that cattle with poor temperament have more bruising and darker, tougher meat than cattle with good temperament (Fordyce et al., 1988). Stress prior slaughter can increase the ultimate pH of meat, and in turn affect flavour, tenderness, water holding capacity and keeping quality.

Temperament is considered by cattle producers to be an important trait (Dickson et al., 1969; Sato, 1980; Bessel, 1984; Fordyce et al., 1988; Erf et al., 1992; Boivin et al., 1994; Grandin et al., 1995), and cattle with poor temperament are more difficult to handle. They create safety hazards for handlers and themselves which waste time (Hearnshaw et al., 1984; Boivin et al., 1992; Grandin, 1993; Boissy et al., 1995). Stronger fences, yards, skilled and extra labour is required. Fordyce (1985) found that animal with poor temperament had higher bruise scores than the calm animals, indicating that the bruising of an animal is a function of the individual’s own temperament rather than that of the whole.
Measurement of temperament.

Little scientific research has been conducted on temperament in cattle, in particular that of beef cattle. This is mainly due to the lack of simple meaningful measurements of temperament. Several methods for testing temperament have been reported (Tulloh, 1961; Hearnshaw et al., 1979; Fordyce et al., 1981; Boivin et al., 1992). The scoring systems were designed to reflect the difficulties experienced by cattle handlers when handling cattle. Different researchers rated temperament out of different scoring systems because some believed it was easier to score fewer ratings while others believed more ratings improved accuracy (Sato, 1981; Hearnshaw and Morris, 1984). The following methods of measuring temperament are commonly used: Tulloh (1961) measured behaviour of cattle in yards and described a temperament score. He rated the temperament of beef cattle on a scale of one to five. Therefore, he categorized temperament scores as follows:

1. For docile
2. For slightly restless
3. For restless
4. For nervous
5. For wild

Dickson et al. (1969) used a one to four scale scoring system. Burrow et al. (1988) scored temperament based on the observation that docile animals vacate a weigh scale at slower rate than agitated animals. They were assessed by electrically recording the speed taken by each animal to cover a predetermined distance after vacating a confined area. Hearnshaw and Morris (1984) scored seven behavioural responses for 30 to 60 seconds while standard management practices were applied to animals (i.e. Condition scoring and measuring of height). The seven responses were:

1. Tail swishing
2. Straining back
3. Backward and forward movement
4. Paddling with back feet in an attempt to escape
5. Kicking
6. Kneeling
7. Jumping

Fordyce et al. (1982) developed a crush and paddock temperament test. Scores were taken while the animals were handled on the shoulder and head. The movement responses were rated on a seven point scale as on Sato’s (1991) method. The degree of audible respiration (BLO) was assessed on four levels:
- 0 – no audible respiration
- 0.5 – heavy breathing
- very heavy breathing
- 2.5 snorting

bellowing and kicking and kneeling down were scored as one for each occurrence and zero if not. Scores were added to produce a temperament score. Kilgour (1975) used an open field test in which the time taken to fasten an animal to post was recorded. Grandin (1993) scored cattle temperament, out of five when held in a squeeze chute. Boivin et al., (1992) used a sorting test, recording the time taken to isolate an animal from its social group. Grandin et al. (1995) reported that cattle with a long hair whorl length as a prediction of temperament. This could be effective when used on beef under extensive management (Grandin et al., 1995). Erf et al. (1992) scored the disposition of dairy cattle on a scale of three:
1- No trouble
2- Slightly trouble
3- Definite trouble
Effect of temperament on performance.

Earlier reports showed that temperament had no effect on performance. Hearnshaw and Morris (1984) found that temperament of bulls did not affect growth rates, food utilisation or carcass quality. No relationship was found between fat thickness and temperament score; though the heaviest animals tended to have the lowest scores (Fordyce et al., 1988). Murphy et al. (1994) later reported that these animals were restless nervous or aggressive within a breed.

Fordyce et al. (1988) found evidence of less tender muscles in animals with a worse temperament score, though the PH did not vary with temperament. Carcass bruising increased with increasing temperament score (Fordyce et al., 1988) most carcass bruising was found in areas from which expensive high quality meats are taken e.g. M.longissiums Dorsi, M.gluteaus medias (rump), M.biceps femoris (rump), M.seminembranosus (topside) and M. semitendinosus (Fordyce et al., 1988), thus causing serious economic loss. In lactating cows, Roy and Nagpaul (1984) reported that milk let down was significantly affected by temperament score. The poor performance of the nervous type animals might be due to disturbance in the neuro-humoral mechanisms (Roy and Nagpaul, 1984).

Docile animals in artificial insemination programs demonstrated oestrus in the presence of an observer more often than did their more temperamental contemporaries, though they not on any of the other associate reproductive traits (Burrow et al., 1988). This implies that cattle producers on artificial insemination programs without teaser bulls, or any heat detecting aids should consider the temperament of their animals.
Factors affecting temperament.

Age or experience

In all studies examined, age is confounded with the effect of previous handling experience. However, most studies conclude that temperament of animals improve with increasing age or experience.

Hearnshaw et al. (1979) reported that temperament scores at the time of first testing were higher than at subsequent testing, indicating that animals were becoming accustomed to the measurement routine. Sato (1981) found that cattle were becoming “relatively mild” with age, though the ranking of temperament scores for individual animals did not fundamentally change through life. Fordyce and Gorddard (1984) reported that temperament scores (crush and race tests) of cows assessed during per rectum pregnancy diagnosis declined with increasing cow age and with decreasing body condition. The authors believed that the latter effect reflected a general depression of activity of cows in poor body condition rather than a specific association with temperament.

Other studies by Hearnshaw and Morris (1984) and Kabuga and Appiah (1992) reported temperament scores recorded on cows and their calves. Hearshaw and Morris (1984) found that cows had better mean temperament than their calves, indicating that cows had become accustomed their management. Kabuga and Appiah (1992) reported that calves took a longer time to enter the scales and had significantly longer flight distances and poorer temperament scores than did the cows.

Similar results are available from dairy cattle and other livestock species. Roy and Nagpaul (1984) reported that dairy cows in the sixth parity had the best temperament score of cows in their study and that temperament score improved from the third to the sixth lactation. However selection bias may have confounded these results. Lyons et al. (1988) monitored five behavioural measures in encounters between dairy goats and humans when the goats were 14, 22 and 30 months of age. Human-reared goats
consistently expressed low levels of timidity across all ages, but over time, the behaviour of dam-reared goats increasingly resembled that of human-reared goats, while the ranking of temperament scores of individuals in both rearing treatments remained stable.

Hemsworth et al. (1990) found significant increase in approach behaviour of gilts from the first test (before puberty) to the second test (in early pregnancy), but found no difference in approach behaviour of gilts tested for the first time before puberty and those tested for the first time in early pregnancy. Gilts tested for the second time in early pregnancy displayed increased approach behaviour compared with those tested for the first time in early pregnancy. 40.3% of gilts physically interacted with the experiment in the first test and 71.4% interacted in the second test).

Two studies did not consistently report an effect of increasing age or experience on temperament. Fordyce et al. (1988) did not find an effect of age in cows and steers from extensively managed herds in north-west Queensland. The authors believed this may have occurred because the cattle were handled only once or twice per year. They concluded that the temperaments of cattle over two years of age may not improve with increasing age if they are handled fewer than three or four times per year. The second study reporting inconsistent effects of age was that of Burrow et al. (1988). In this study, the flight speed score of heifers improved slightly from 6 to 18 months of age (from 1.20 to 1.24 seconds) but that of bulls decreased from 1.14 seconds to 0.97 seconds over the same period, even though the bulls had received more intensive handling than the heifers. The authors suggested that there may have been a physiological basis of temperament in the bulls associated with maturity (that is increased hormone levels may have affected temperament as the bulls matured).

**Sex**

Some reports indicated that steers have better temperaments than heifers (Tulloh, 1961; Stricklin et al. 1980) and that bulls have better temperaments than heifers (Shrode and Hammack, 1971). Vanderwert et al. (1985) reported that bulls were quieter (p<0.05)
during weighing than steers. In this study, steers had higher temperament scores than bulls, indicating the steers were more restless and moved more on weighing scale. A tendency to increased flight distances was also observed in steers. This contrasts with the findings of Hinch (1980) that bulls took longer than steers to move through yards and a race, though in a later study using the same test, Hinch and Lynch (1987) found no differences between bulls and steers.

Other reports show no differences in temperament between steers and heifers, between bulls and heifers (Hearshaw et al., 1979; Hearshaw and Morris, 1984) or between bulls and heifers from weaning to 18 months of age (Burrow, 1991). Tilbrook et al. (1989) reported that bulls and steers and steers and heifers that had similar experience of humans did not differ in their behavioural responses towards humans. Burrow et al. (1988) found no differences in flight speeds between bull and heifer calves at weaning, but at 18 months of age, bulls had poorer temperament scores than heifers.

Given the equivocal nature of these results, no firm conclusions can be drawn about the effects of sex on temperament of beef cattle.

*Breed*

Tulloh (1961) found differences between breeds of beef cattle for a subjective temperament score and ease of handling score as calves were worked through lanes and a head bail. Hereford and Angus calves had significantly better temperament scores than Shorthorns. The author concluded that the Herefords were docile, Angus were restless or nervous and Shorthorn were unpredictable. These breeds rankings were similar for both steer and heifer half-sibs that had been reared separately.

Wagnon et al. (1966) used the same breeds as Tulloh (1961) and concluded that Herefords were the most docile, Shorthorns had a mild disposition but vocalised the most, and Angus were the most nervous of the breeds. They also reported a highly significant (p<0.01) difference in social dominance among breeds, with Angus most
dominant and Hereford the least dominant.

Sato (1981) reported that Japanese Shorthorn cattle were more docile than Japanese Black cattle. Stricklin et al. (1980) found that British breeds of cattle were more docile than large European breeds. Of the breeds studied, Hereford was the most docile and Galloway the most excitable. Vanderwert et al. (1985) reported that Limousins had longer flight distances than Angus, but also suggested that some of the differences between these breeds may have been due to early life handling experiences, as the two breeds were acquired from different sources.

Differences in temperament scores have also been reported between Bos taurus breeds that evolved in harsh tropical and subtropical regions. Kabuga et al. (1991) reported that N’damas were more aggressive than West African Shorthorns and had higher dominance values. However, Kabuga and Appiah (1992) found no significant differences between N’dama, Holstein and N’dama x Holstein cows in both ease of handling and flight distance. N’damas took longer to exit the scale and enter the dip, while the crossbreds had a longer flight distance and a poorer temperament score than the other breeds.

Based on published studies, unequivocal differences exist in temperament between Bos taurus and Bos indicus breeds and their crosses. Hearshaw et al. (1979) reported that animal with 1/4 or 1/2 Brahman inheritance had poorer temperament than British breed crosses (p<0.05). Grandin (1980) found that Brahman cattle had longer flight distances than did British breed cattle. Similarly, Hearshaw and Morris (1984) reported significant differences in temperament between Bos taurus and Bos indicus derived breeds, and also among calves sired by Bos indicus bulls, although the differences amongst calves sired by Bos taurus (Hereford) bulls were not statistically significant.

Fordyce et al., (1982) found that in general, Brahman crossbreds had poorer temperaments than did Africander crossbreds which in turn had higher scores than British breeds. Fordyce et al., (1988) showed that Brahman crossbreds had poorer temperaments than did Shorthorns (p<0.05). An AMRC Report (1988) showed that Sahiwal crossbreds
had poorer temperaments than both Brahman and Africander crossbreds. Within both crossbreds of Brahman and Sahiwal, animals with 75% Bos indicus inheritance had higher flight distance and pound speed scores than animals with 50% Bos indicus inheritance. Entwistle and Goddard (1985) recorded temperament scores on breeding cows at pregnancy diagnosis. The proportion of cows culled for poor temperament was higher in Sahiwal crossbreds than in crossbreds of Brahman or Africander.

Without exception, published reports indicate that Bos indicus breeds and their crosses are more difficult to handle under extensive management conditions than either Sanga (Bos taurus breeds that evolved in Southern Africa) or Bos taurus breeds studied. Within each species though, differences in temperament between the breeds also exist.

It is possible that some breed differences may be related to single gene effects. Holmes et al. (1972) reported that cattle homozygous for doubling muscling (muscular hypertrophy) were more temperamental than heterozygotes, which in turn were more temperamental than homozygous normal individuals, irrespective of the breeds of cattle. The homozygous double-muscular animals were said to be more fearful than aggressive. They were described as excitable and incapable of adopting reasonable evasive actions. Despite very frequent handling, many never adapted to human handling. Holmes et al. (1973) suggested that double-muscled animals may have a higher susceptibility to stress and hence reduced ability to adapt to herd management conditions than normal cattle.

**Other Factors that affect temperament.**

In cattle, numerous studies have revealed wide temperamental variability displayed by individuals of the same breed and reared under the same conditions (Dickson et al., 1969; Kilgour, 1975; Sato, 1981; Roy and Nagpaul et al., 1984; Hearnshaw and Morris, 1984; Fordyce et al., 1988; Erf et al., 1992; Grandin, 1993). These differences reflect constitutional bases of individual animals or breeds. Hearnshaw and Morris (1984) reported that environment and genetics influence cattle temperament.
Genetic effects

Many studies indicated difference in temperament between different cattle breeds (Tulloh, 1961; Fordyce et al., 1985, 1988, 1996). Hearnshaw et al., (1969) realised that genotype influences temperament. This could be direct or maternal effect (Fordyce and Goddard, 1984). Bos Taurus breeds were found to be more docile than Bos indicus (Hearnshaw and Morris, 1984). Grandin (1993) found that Bos indicus cross cattle were more difficult to handle than were pure or crossbred Bos taurus cattle. In Bos Taurus breeds, temperament problems have been reported in Charolais, Limousin and Salers (Grandin, 1993). Brahman cross cattle were found to be more temperamental than Afrikander cross cattle and both are Bos indicus (Hearnshaw and Morris, 1984). Dairy breeds were to be easier to approach than beef breeds with respect to their prior handling (Boissy et al., 1987). Highly restless lines within a breed were also observed (Grandin, 1993). Horned cattle tended to have lower temperamental scores than did polled cattle (Fordyce et al., 1988).

Environmental effects

Cows have memories and the ability to learn. This shows that effects of early handling have long lasting effects on the animal’s behaviour (Grandin, 1993). Heifers that had contact with humans during pre-puberty were restless reactive to handling compared to those not handled (Boissy et al., 1987; De Passille et al., 1985). Cows were found to have a strong influence on the temperament of their calves (Fordyce and Goddard, 1984).

Conclusion

Nguni type cattle under communal farmers are mostly regarded as a better breed for the future in communal areas. Cows play an important role in their calf’s life to become accustomed with management practices.

Temperament is an important trait to be considered in selecting beef cattle for breeding
stock. Bruising of an animal increased with temperament and age of an animal and thus, dehorning as one of managerial practice must be done while an animal is still young as it minimizes risks of beef farmers’ profit. The positive relationship between body weight and temperament shows that docile animals grew better than animal which were restless, nervous and aggressive. This review emphasized the importance of improving temperament through selection and training to produce docile and manageable cattle.

Literature cited.


Fordyce, G., & Goddard, M.E., 1984. Maternal influence on the temperament of


Hasegawa, N.,Nishiwaka, A., Sugawara, K & Ito, I., 1997. The effect of social exchange between two groups of lactating primiparous heifers on milk production,


CHAPTER 3.

RELATIONSHIP BETWEEN TEMPERAMENT AND LINEAR BODY MEASUREMENTS OF BEEF CATTLE UNDER COOMUNAL GRAZING SYSTEM.

Introduction.

Selecting animal of good temperament is an important component on beef production. The word temperament is traditionally used to describe the response of cattle to man (Fordyce et al., 1988). Fordyce et al. (1985) found that animal with poor temperament had higher bruises score than the calm animals, indicating that the bruising of an animal is a function of the individual’s own temperament rather than that of the whole.

The descriptions docile, restless, nervous and wild indicate animal behavior on the weighing scale. Body weight of animals were positively correlated with age, sex, breed, age and sex interaction and sex and breed interaction. Body weight and heart girth caused (P<0.001) variation, Nicholson & Sayers (1987); Enevoldsen & Kritensen (1997) indicated that heart girth has often been used as a single component to estimate body weight.

Body weights of animals were highly correlated with temperament. Therefore, animals which were 10 years and above were having better temperament though their body weights were deteriorating. Body weight and heart girth were positively and significantly related on males than on females. However, relationship between temperament and body condition of animals was almost significant.

Temperament as an important trait must be improved in communal farmers as it affects meat quality, makes man looking after animal’s work unpleasant and ultimately deteriorates farmers’ productivity and profitability. Generally, animal with good temperament have to be preferred and selected in order to improve communal farming system.
The study specifically characterized linear body measurements in association with measures of temperament in beef cattle under communal grazing system.

MATERIALS AND METHODS.

Study site

The study was conducted in two different areas which are Muledzhi and Matatani which are situated in Northern Region (Venda) under Northern Province. Therefore, Northern Province is divided into three ecological zones namely:

1. Infected area-is situated near the boarder of South Africa and Zimbabwe. It is about 10 kilometres before Surveillance demarcation. It is characterized by foot and mouth diseases.
2. Surveillance area- is the area between infected and open areas. It is also about 10 kilometres before crossing open area demarcation.
3. Open area- that area occupies the rest the area from Surveillance demarcation.

The three ecological zones were demarcated with the aim of controlling foot and mouth diseases (FMD) which were causing death to many cattle in previous years. However, this study was particularly done in open areas. The climate of Muledzhi is characterized by low rainfall and, savannah mixed veld. Whereas of Matatani is characterized by sweet veld, bare area, low rainfall, high temperature and subsequent winter drought.

Animals and management.

In these areas, Nguni type of cattle is the most dominating as compared to other breeds. But due to the introductions of exotic breeds in these areas, there are few breed types such as Bonsmara, Afrikaner, Jersey, Friesland, Simmental and Hereford types that were found. Management practices that are being practiced include, dipping of animals that is done on weekly basis in summer and fortnight in winter in order to control tick
infection. Therefore, other management practices such as castration of bulls are practiced while the bulls are 1 to 8 months of age. Dehorning and ear-tagging were not commonly practiced. Therefore, there was no selection for replacement cattle. Animals at Muledzhi area grazed in natural communal land without any supplements, whereas of Matatani are supplemented with grass hay in winter. However, breeding of cattle is not limited according to season that is calves are born every time of the year.

Data

Data were collected over a period of two months namely October and November 2000. A total number of 263 animals were measured. All the traits were measured at two different dipping points. Liveweight, heart girth, sex, age, breed type, body condition score, bruising score, scrotal circumference, temperament, identity number and time spent on the scale were measured. All the animals were identified with an ear tag which is the number corresponding to owner’s stock card number.

Measurements.

Liveweights were measured using a computer scale using battery current called RUDDWEIGH KDL data collector. The scale platform was connected in the crush pen while live-weights were taken from computer scale that was placed about 3 metres from the point where the scale panel was connected. Heart girth was measured using a flexible measuring tape. Measurements were taken from cattle of all ages. Body condition score was designed to rate from one to five through palpation method. Scrotal circumference was measured at its largest diameter using a flexible measuring tape.

Therefore, bruises scores, horns wounds were counted from every animal, scoring
method of counting that were as follows:

<table>
<thead>
<tr>
<th>Score</th>
<th>Footnote</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>No horns wounds and scars</td>
</tr>
<tr>
<td>2.</td>
<td>Less than 5 wounds and scars</td>
</tr>
<tr>
<td>3.</td>
<td>More than 5 wounds and scars</td>
</tr>
</tbody>
</table>

Temperaments of animals on the scale were measured using scoring method. Therefore, it was as follows:

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Docile An animal which stands quite on the scale.</td>
</tr>
<tr>
<td>2.</td>
<td>Slightly restless Animal which stands on the scale but having minor movement.</td>
</tr>
<tr>
<td>3.</td>
<td>Mild restless An animal with mild vigorous movement and it may kick.</td>
</tr>
<tr>
<td>4.</td>
<td>Restless An animal that moves frequently and it may be difficult to weigh.</td>
</tr>
<tr>
<td>5.</td>
<td>Nervous Very disturbed and continues very vigorous movement and it is difficult to weigh.</td>
</tr>
<tr>
<td>6.</td>
<td>Wild Struggling violently, unmanageable, dangerous and attempting to jump out.</td>
</tr>
</tbody>
</table>

Time that was spent by an animal on the weighing scale was recorded in seconds using a stopwatch. Therefore, stopwatch was commenced once an animal enters the scale and it was stopped once the scale stabilizes and the weight was recorded. Lastly, traits such as, age, sex, breed type and identity number were recorded while the animals were packed in the crush pen.

**Statistical analysis.**

The General Linear Model (GLM) procedures of Statistical Analysis System (SAS) 1989 were used to analyze the entire data. The models included the effects of age, sex, breed as well as their interactions. Model I was for body weight, heart girth and scrotal
circumference while Model II was for time, bruise score and temperament it was the same as Model I but including sex and breed interaction. 

Model I \( Y_{ijkl} = \mu + R_i + S_j + M_k + R_iS_j + S_jM_k + E_{ijkl} \)

Where  
\( \mu \) = Overall mean  
\( R_i \) = Effect of age  
\( S_j \) = Effect of sex  
\( M_k \) = Effect of breed  
\( R_iS_j \) = Interaction between age and sex  
\( S_jM_k \) = Interaction between sex and breed  
\( E_{ijkl} \) = Random error effect

RESULTS AND DISCUSSION.

Simple statistics for linear body measurements and temperament traits.

Number of observations for linear body measurements was a higher 263 as compared to temperament which was 262 (Table 1.1). Means for heart girth were a high 335.202cm and followed by body weight which was 303.506kg and this has been calculated by their means which were also higher than of the other traits. However, in maximum figures heart girth was higher 800.0cm and followed by body weight which was 620.0kg. Generally, body weight and heart girth figures were high as compared to other traits.

Factors affecting linear body measurements and temperament traits.

The results of Analysis of Variance are shown in Table 1.2. These results indicate that all the effects (age, sex, breed and their interactions) are the significant source of variation for linear body measurements and temperament traits. Least square means and standard errors for effects of age, sex, breed and their interactions are given in Table 1.3 to Table 1.5 and from Figure 1.1 to 1.5.

Factors affecting linear body measurements.
Age. Age caused variation (P<0.001) in body weight and heart girth. This is in line with the findings of Mulaudzi (2000) age of cattle influenced (P<0.001) on body weight. The least square means (Table 1.2) showed that age increased with body weight and heart girth from the animals of less than 3 years to animals of less than 9 years hence 10 years and above animals their body weight and heart girth moderately decreased. This decrease in body weight and heart girth might have resulted due to a fewer number of observations in animals of 10 years and above (Table 1.3). Generally, body weight and heart girth of animals increased with age. Heinrichs et al. (1992) and Heinrichs and Hargrove (1987; 1994) reported that body weight increased linearly with age of cattle. Roberson et al. (1986) also indicated that cattle weights increase with age up to nine years and start to decline. Therefore, Table 1.3 presented that scrotal circumference increased with age of bulls from the age of less than 3 years to animals of less than 9 years and then decreases, the result have been affected either by small number of observation or due castration of almost matured bulls. Generally, scrotal circumference increases with age. Toelle & Robinson (1985) reported that scrotal circumference is a best indicator of a bull and obtained results that show a favourable relationship between scrotal circumference and age at first mating.

Sex. Sex influenced (P<0.001) in body weight and heart girth. Mulaudzi (2000) also stated that live weights were affected (P<0.001) by sex of cattle. Therefore, the least square means in Table 1.4 indicated that female were 70.97kg heavier and heart girth 60.65centimeter bigger in heart girth than male animals. In different, Mulaudzi (2000) found that bulls were 21.09kg and heart girth was 11.4cm higher than in cows. That was in accordance with the results of Gosey (1984); Kertz et al., (1997); Lubout et al., (1986) & Park et al., (1993). Heinrichs and Hargrove (1994) also found heart girth to increase with age of cattle. Generally, in this study cows were heavier than bulls. Therefore, this difference might have been caused by pregnancy period which had just commenced prior to this project getting started.
Breed. Breed caused (P<0.01) variation in body weight. Other breeds types, though were having fewer observations, were heavier than Nguni cattle type. Therefore, Nguni had higher scrotal circumference 2.34cm than the other breed which was 2.24cm. In cattle, numerous studies have revealed wide temperamental variability displayed by individuals of the same breed and reared under same conditions (Dickson et al., 1969; Kilgour, 1975; Sato, 1981; Roy & Nagpaul et al., 1984; Hearnshaw & Morris, 1984; Fordyce et al., 1988; Erf et al., 1992; Grandin, 1993).

Age and sex interaction. The effect of age and sex interaction on body weight and heart girth in Table 1.2 was significant (P<0.001). Mulaudzi (2000) also found a significant effect in age sex interaction. On Table 1.5 it is indicated that body weight and heart girth of male and female animals were increasing with age from animals of less than 3 years to less than 9 years and from 10 years and above animals body weight decreased by 0.1gram while heart girth gained 4.82cm.

Sex and breed interaction. Sex and breed interaction had no influence on body weight, heart girth and scrotal circumference of animals.

Age and breed interaction. Scrotal circumference of bulls between less than 3 years to less than 9 years were big ranged from 2.39 to 2.57cm for Nguni and 2.50cm to 2.72cm for other breed types as compared with bulls of 10 years and above which was 2.00cm for Nguni cattle type and 1.00cm for the other breed types. The difference between young and matured bulls are due to all matured bulls being almost castrated rather than young bulls during the operation of this project.

Factors affecting temperament traits.

Age. Age caused (P<0.10) variation on bruise score and temperament (Table1.2). These are presented in Table 1.3, time fluctuates as the cattle age increases and thus, animals between more than 3 years and less than 5 years spent more time, 5.58seconds, on the scale before it stabilized as compared to animals of the other age. Age increases with
bruise score from animals of less than 3 years to animals of less than 10 years and then decreases by 0.12 score in animals of more than 10 years. Generally, animals of more than 3 to less than 10 years had higher bruising 2.04 score than animals of other ages. Therefore, temperament of animals increases with age from less than 3 years to less than 10 years animals and then drops by 0.96 score and as referred to temperament score. High score designates bad temperament while lower score designates good or docile temperament that means more than 10 years animals were having good temperament than did less than 3 to less than 10 years animals. Increment of temperament with age have also supported by findings of Dickson et al. (1970) and Fordyce and Goddard (1984) which found that temperament improves with increasing of age. This was contradicting with the results of Fordyce et al. (1985) and Fordyce et al. (1988) showed that heavier cattle had better temperament scores.

Bruising score increases with temperament (Table 1.3, Figure 1.1 and 1.2). This is also supported by the study done by Fordyce et al. (1998) which reported that the most obvious effect of temperament was on bruising, with carcass bruising increasing as the temperament score increased. Therefore, he further reported that animals with poorer temperaments have more exaggerated fear responses, and thus a greater likelihood of contusion from collisions. On average, the difference in bruising between cattle with the highest and lowest temperament scores was equivalent to approximately 1.5kg trim per carcass. Fordyce et al. (1985) further reported that animals with poor temperament had higher bruise scores than the calm animals, indicating that the bruising of an animal is a function of the individual’s own temperament rather than that of the whole.

**Sex.** These are shown in Table 1.4, Figure1.3 and 1.4. Male animals had 0.65 seconds higher on the scale prior to it being stabilized than female animals. Female animals had 0.13 score higher bruising around their bodies than did male animals. In temperament, male animals were slightly restless 2.16 score hence females were mild restless 3.03 score. Generally, male animals were violating on the scale but having less bruising that ultimately resulted in good temperament than female animals.
**Breed.** Breed had significant (P<0.001) effect on temperament (Table 1.2). Other breeds were docile than Nguni cattle type is shown in Figure 1.5 and 1.6. Nguni had more bruising as compared with other breeds, and this might have been caused by a big number of observations for Nguni cattle type than other breeds.

**Age and sex interaction.** In the interaction presented in Table 1.5. Male animals between more than 3 and less than 5 years had also spent more time 6.63seconds as compared with females of the same age which was 4.54seconds. Hence females between more than 5 to less than 9 years had 0.32seconds higher on the scale than male animals of the very same age. Therefore, females of 3 years utilized few seconds 4.21seconds and followed by females of 10 years and above which was 4.32seconds. Generally, in this study females spent less time on the scale before it stabilized than male animals.

Male animals between more than 5 to less than 9 years had highest 2.29counts(less than five wound and scars counts) as compared to male animals of less than 3 years which was lowest 1.43counts. As a result of similar increments in temperament and bruise score, male animals between more than 5 to less than 9 years had mild restless temperament 3.32 score but the lowest vary in age, with one bruising score and it was a docile 1.52 score from the female animals of more than 10 years. Generally, in this interaction females of more than 10 years spent less time on the scale and as a result they had good temperament as compared to other females and males of other ages.

Generally, temperament increases with body weight, heart girth, bruises score and fluctuates with time.

**Inter-relationships between body weight, heart girth, bruises score, body condition score and temperament.**

Body weight and heart girth were positively correlated R = 0.83 and significant (P<0.001) than all traits though they were also significant (Table 2.1). Generally that means heart girth may be used to predict body weight of an animal. Nicholson & Sayers
(1987); Enevoldsen & Kristensen (1997) indicated that heart girth has often been used as a single component to estimate body weight, with few occasions where it was used in combination with other measurements.

Although heart girth is a much-favoured means, in practice, however, its measurement tend to be a rapid measurement since time to ensure posture and positioning would lessen its usefulness in all but the most tractable animals. The need for rapidity in measurement reduces the accuracy. Temperament influenced (P<0.01) on body weight, heart girth and body condition score. Therefore, significant effect between bruise score, time and temperament were also positively significant (P<0.10).

**Inter-relationships between body weight, heart girth, bruises score and temperament in different ages.**

These results are shown in Table 2.2, inter-relationships for animals less than 3 years was higher as compared to animals between more than 3 years to less than 5 years of age. Therefore, body weight and heart girth caused (P<0.001) in both different age animals. However, correlation of body weight and heart girth for animals of less than 3 years was higher R = 0.82 as compared to animals between more than 3 to less than 5 years which was R = 0.57, and that might have been caused due to greater number of observations on less than 3 years animals than on more than 3 to less than 5 years animals. Relationship between time and temperament on animals of less than 3 years was positively correlated and significant at (P<0.01).

**Inter-relationships between body weight, heart girth and time in different ages.**

Body weight and heart girth for animals of 10 years and above were influenced significantly (P<0.001) and positively correlated R = 0.93 than of more than 5 to less than 9 years of age animals which was (P<0.001) significant and R = 0.61 correlations. In animals of 10 years and above their body weight, heart girth and time were significant (Table 2.3).
Inter-relationships between body weight, heart girth, bruises score, body condition score and temperament in different sex.

This is shown in Table 2.4, body weight of male animals were highly correlated R = 0.90 with heart girth R = 0.77 than of female animals. This is in accordance with the results of Gosey (1984); Kertz et al. (1997); Lubout et al. (1986) and Park et al. (1993) that bulls gain weight more rapidly than cows. Therefore, it was also in accordance with the findings of Mulaudzi et al. (2000) which indicated that within male group body weight had higher R = 0.72 correlation with heart girth as compared with female animals which was R = 0.62.

Body weight and heart girth influenced (P<0.001) on temperament of female animals. Therefore, temperament and bruise score influenced (P< 0.10) variation on male animals positively. However, there was a significant effect (P<0.01) between female animals and temperament and that effect might have resulted due to a large number of observations for female than on male animals. This was also supported by findings of Hearnshaw & Morris (1984) who found that cows had better mean temperament than their calves, indicating that cows had become accustomed to their management with age.

In this study body weight and bruises score of males, had higher correlation R = 0.49 than of female which was R = 0.23 hence they were all significant (P<0.001). Probably, body weight of males and females animals increased with bruise score. Apart from that, temperament had more significant effect on female than male animals.

Inter-relationships between body weight, heart girth, bruises score, time and temperament on animals of different breed types.

Body weight and heart girth for Nguni cattle type were more inter-related R = 0.84 as compared with the other breeds which was R = 0.35 (Table 2.5). Therefore, there was a significant effect between temperament and heart girth (P<0.001) in Nguni cattle than in
the other breeds, and that might have resulted due to greater number of observations in Nguni type than in other breeds are shown in Table 2.5. Many studies indicated difference in temperament between different cattle breeds (Tulloh, 1961; Fordyce et al., 1985, 1988, 1996).

Conclusion

Based on the results found in this study, other breeds of cattle had good temperament and thus, temperament as it was measured in Nguni type and other breeds of cattle under communal grazing indicated that it should be highly considered in selection of farmer’s breeding stock. It clearly shows that there is a need for temperament to be improved in animals reared under communal grazing system in North of Thohoyandou in Northern Province. It appears that selection of breeding animals for fast growth will most probably not lead to poorer temperament.

Therefore, it must also be taken into consideration as it causes negative effect in an economic background of a farmer and as a result, cattle with bad behavior or temperament can damage kraals and fences and also injure other animals that will lead to the need of finance for repairing and purchasing of medicines. Animals from communal areas should be correctly handled in order to improve their temperament. Docile animals are more desirable not only in relation to growth rate, but because they make the stockman's job a more pleasant one.

In this study it has been found that body weight of an animal increased with age, heart girth, bruise score, time and temperament. Hence female animals were higher in the following measurements namely: body weight, heart girth, bruise score and temperament. That means that cows were heavier and had a greater heart girth than oxen. Apart from that, age has a positive influence on scrotal circumference of an animal.

However, temperament increases with age of an animal and therefore, before temperament can reliably be included in beef cattle under communal grazing system, a
standardized scoring system for temperament need to be identified and adopted by the farmers. It is advisable for farmers rearing their animals under communal grazing system to mix breeds for temperament improvement.

1. ANALYSIS OF VARIANCE TABLES.

Table 1. Simple statistics for linear body measurements and temperament traits.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No.</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight (kg)</td>
<td>263</td>
<td>303.506</td>
<td>87.464</td>
<td>100.0</td>
<td>620.0</td>
</tr>
<tr>
<td>Heart girth (cm)</td>
<td>263</td>
<td>335.202</td>
<td>103.399</td>
<td>86.0</td>
<td>800.0</td>
</tr>
<tr>
<td>Bruises score</td>
<td>263</td>
<td>1.738</td>
<td>0.754</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Body condition score</td>
<td>263</td>
<td>2.122</td>
<td>0.965</td>
<td>1.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Time (seconds)</td>
<td>263</td>
<td>5.103</td>
<td>3.983</td>
<td>1.0</td>
<td>28.0</td>
</tr>
</tbody>
</table>

Table 1.2: Analysis of variance for linear body measurements and temperament traits.

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>WT</th>
<th>HG</th>
<th>SCR</th>
<th>TIME</th>
<th>BRSCORE</th>
<th>TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>3</td>
<td>190007.58***</td>
<td>255101.89***</td>
<td>3</td>
<td>1.34**</td>
<td>3</td>
<td>4.0 NS</td>
</tr>
<tr>
<td>Sex</td>
<td>1</td>
<td>69543.9***</td>
<td>131530.16***</td>
<td>1</td>
<td>0.09 NS</td>
<td>1</td>
<td>10.72 NS</td>
</tr>
<tr>
<td>Breed</td>
<td>1</td>
<td>29612.22**</td>
<td>2320.82 NS</td>
<td>1</td>
<td>0.09 NS</td>
<td>1</td>
<td>0.3 NS</td>
</tr>
<tr>
<td>Age*Sex</td>
<td>2</td>
<td>45197.02***</td>
<td>64295.52***</td>
<td>3</td>
<td>0.60 NS</td>
<td>2</td>
<td>11.40 NS</td>
</tr>
<tr>
<td>Sex*Breed</td>
<td>1</td>
<td>12.90 NS</td>
<td>0.01</td>
<td>1</td>
<td>0.01</td>
<td>0.05</td>
<td>0.06 NS</td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td>0.52</td>
<td>0.43</td>
<td>0.09</td>
<td>0.01</td>
<td>0.05</td>
<td>0.14</td>
</tr>
</tbody>
</table>

*** P<0.001
** P<0.01
*  P<0.10
NS = Non-significant
DF = Degree of freedom, MS = Mean square
WT = Body weight, HG = Heart girth, SCR = Scrotal circumference, Brscore = Bruises score, TEMP = Temperament

Table 1.3: Least Square Means (LSM) ± Standard Error (SE) for linear body measurements and temperament traits as affected by age.

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>No.</th>
<th>WT</th>
<th>HG</th>
<th>SCR</th>
<th>TIME</th>
<th>BRSCORE</th>
<th>TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td>93</td>
<td>246.81 ± 9.46</td>
<td>258.73 ± 12.31</td>
<td>2.54 ± 0.22</td>
<td>4.78 ± 0.70</td>
<td>1.43 ± 0.13</td>
<td>2.44 ± 0.23</td>
</tr>
<tr>
<td>&gt;3-&lt;5</td>
<td>38</td>
<td>333.83 ± 12.51</td>
<td>370.22 ± 16.27</td>
<td>2.55 ± 0.13</td>
<td>5.58 ± 0.83</td>
<td>1.80 ± 0.15</td>
<td>2.56 ± 0.27</td>
</tr>
<tr>
<td>&gt;5-&lt;9</td>
<td>107</td>
<td>455.93 ± 18.38</td>
<td>493.94 ± 23.9</td>
<td>2.56 ± 0.10</td>
<td>4.64 ± 1.20</td>
<td>2.04 ± 0.22</td>
<td>2.72 ± 0.39</td>
</tr>
<tr>
<td>&gt;10</td>
<td>25</td>
<td>349.12 ± 55.33</td>
<td>388.16 ± 73.59</td>
<td>1.50 ± 0.32</td>
<td>4.88 ± 3.23</td>
<td>1.92 ± 0.91</td>
<td>1.76 ± 1.33</td>
</tr>
</tbody>
</table>

No. = Number of observation
Table 1.4: Least Square Means (LSM) ± Standard Error (SE) for weight, heart girth as affected by sex and for scrotal circumference as affected by breed.

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>Sex</th>
<th>No.</th>
<th>WT</th>
<th>HG</th>
<th>TIME</th>
<th>BRSCORE</th>
<th>TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>59</td>
<td>255.37 ± 105.59</td>
<td>284.29 ± 124.20</td>
<td>5.12 ± 3.88</td>
<td>1.61 ± 0.72</td>
<td>3.03 ± 1.55</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>204</td>
<td>326.34 ± 8.1</td>
<td>344.94 ± 10.52</td>
<td>4.47 ± 0.57</td>
<td>1.74 ± 0.11</td>
<td>2.16 ± 0.19</td>
</tr>
</tbody>
</table>

No. = Number of observation
WT = Body weight, HG = Heart girth, TEMP = Temperament

Table 1.5: Least Square Means (LSM) ± Standard Error (SE) for weight, heart girth, time, bruises score and temperament as affected by age and sex interaction.

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>Sex</th>
<th>No.</th>
<th>WT</th>
<th>HG</th>
<th>TIME</th>
<th>BRSCORE</th>
<th>TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td>Male</td>
<td>48</td>
<td>241.73 ± 11.28</td>
<td>256.51 ± 14.67</td>
<td>5.34 ± 1.16</td>
<td>1.43 ± 0.23</td>
<td>1.99 ± 0.38</td>
</tr>
<tr>
<td>&lt;3</td>
<td>Female</td>
<td>45</td>
<td>251.89 ± 11.5</td>
<td>260.95 ± 14.95</td>
<td>4.21 ± 0.79</td>
<td>1.44 ± 0.15</td>
<td>2.88 ± 0.26</td>
</tr>
<tr>
<td>&gt;3−&lt;5</td>
<td>Male</td>
<td>8</td>
<td>350.63 ± 21.61</td>
<td>403.75 ± 28.1</td>
<td>6.63 ± 1.42</td>
<td>1.75 ± 0.26</td>
<td>3.00 ± 0.46</td>
</tr>
<tr>
<td>&gt;3−&lt;5</td>
<td>Female</td>
<td>30</td>
<td>317.04 ± 12.61</td>
<td>336.7 ± 16.4</td>
<td>4.54 ± 0.85</td>
<td>1.86 ± 0.16</td>
<td>2.12 ± 0.28</td>
</tr>
<tr>
<td>&gt;5−&lt;9</td>
<td>Male</td>
<td>3</td>
<td>543.56 ± 35.37</td>
<td>599.26 ± 45.99</td>
<td>4.48 ± 2.35</td>
<td>2.29 ± 0.43</td>
<td>3.32 ± 0.77</td>
</tr>
<tr>
<td>&gt;5−&lt;9</td>
<td>Female</td>
<td>104</td>
<td>368.29 ± 8.43</td>
<td>388.62 ± 10.96</td>
<td>4.80 ± 0.59</td>
<td>1.79 ± 0.11</td>
<td>2.12 ± 0.19</td>
</tr>
<tr>
<td>&gt;10</td>
<td>Female</td>
<td>25</td>
<td>368.28 ± 13.96</td>
<td>393.44 ± 18.16</td>
<td>4.32 ± 0.95</td>
<td>1.87 ± 0.18</td>
<td>1.52 ± 0.31</td>
</tr>
</tbody>
</table>

No. = Number of observation
WT = Body weight, HG = Heart girth, TEMP = Temperament

2. CORRELATION ANALYSIS TABLES.

Table 2.1. Correlation coefficients (observation) for body weight, heart girth, bruises score, body condition score and temperament.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Heart girth</th>
<th>Br score</th>
<th>Temperament</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.83***</td>
<td>0.31***</td>
<td>-0.18**</td>
</tr>
<tr>
<td>Heart girth</td>
<td>-</td>
<td>0.27***</td>
<td>-0.19**</td>
</tr>
<tr>
<td>Br score</td>
<td>-</td>
<td>-</td>
<td>-0.10*</td>
</tr>
<tr>
<td>Bc score</td>
<td>-</td>
<td>-</td>
<td>-0.12**</td>
</tr>
</tbody>
</table>
Table 2.2 Correlation coefficients\(^a\) (observation) for body weight, heart girth, bruises score, body condition score and temperament.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Weight</th>
<th>Heart girth</th>
<th>Br score</th>
<th>Temperament</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>-</td>
<td>0.82(*)</td>
<td>0.43(*)</td>
<td>NS</td>
</tr>
<tr>
<td>Heart girth</td>
<td>0.57(*)</td>
<td>-</td>
<td>0.37(*)</td>
<td>NS</td>
</tr>
<tr>
<td>Br score</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.20(*)</td>
</tr>
<tr>
<td>Bc score</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.22(*)</td>
</tr>
<tr>
<td>Time</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.22(*)</td>
</tr>
</tbody>
</table>

\(^a\)Correlation coefficients above diagonal are for animals less than 3 years and those below for animals between more than 3 to less than 5 years.
Br score = Bruise score, NS = Non-significant,
Bc score = Body condition score
***P<0.001, **P<0.01, *P<0.10

Table 2.3. Correlation coefficients\(^a\) (observation) for body weight, heart girth and time on animals of different ages.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Weight</th>
<th>Heart girth</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>-</td>
<td>0.61(*)</td>
<td>NS</td>
</tr>
<tr>
<td>Heart girth</td>
<td>0.93(*)</td>
<td>-</td>
<td>NS</td>
</tr>
<tr>
<td>Time</td>
<td>-0.47(*)</td>
<td>-0.48(*)</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\)Correlation coefficients above diagonal are for animals more than 5 years and those below are for animals above 10 years.
NS = Non-significant
***P<0.001, **P<0.01.

Table 2.4. Correlation coefficients\(^a\) (observation) for body weight, heart girth, bruises score, body condition score and temperament.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Weight</th>
<th>Heart girth</th>
<th>Br score</th>
<th>Bc score</th>
<th>Temperament</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>-</td>
<td>0.90(*)</td>
<td>0.49(*)</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Heart girth</td>
<td>0.77(*)</td>
<td>-</td>
<td>0.40(*)</td>
<td>0.22(*)</td>
<td>NS</td>
</tr>
<tr>
<td>Br score</td>
<td>0.23(*)</td>
<td>0.21(*)</td>
<td>-</td>
<td>NS</td>
<td>0.24(*)</td>
</tr>
<tr>
<td>Variable</td>
<td>Weight</td>
<td>Heart girth</td>
<td>Br score</td>
<td>Time</td>
<td>Temperament</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
<td>-------------</td>
<td>----------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>Weight</td>
<td>-</td>
<td>0.84***</td>
<td>0.32***</td>
<td>NS</td>
<td>-0.16**</td>
</tr>
<tr>
<td>Heart girth</td>
<td>0.35*</td>
<td>-</td>
<td>0.27***</td>
<td>NS</td>
<td>-0.17***</td>
</tr>
<tr>
<td>Br score</td>
<td>NS</td>
<td>0.35*</td>
<td>-</td>
<td>NS</td>
<td>0.32*</td>
</tr>
<tr>
<td>Time</td>
<td>NS</td>
<td>0.41*</td>
<td>NS</td>
<td>-</td>
<td>0.17**</td>
</tr>
<tr>
<td>Temperament</td>
<td>NS</td>
<td>NS</td>
<td>0.32*</td>
<td>NS</td>
<td>-</td>
</tr>
</tbody>
</table>

*Correlation coefficients above diagonal are for Nguni cattle type and those below diagonal are for other breeds.
NS = Non-significant
Br score = Bruises score
***P<0.001, **P<0.01, *P<0.10

Table 2.5. Correlation coefficients\(^a\) (observation) for body weight, heart girth, bruises score time and temperament.
Figure 1.1 The effect of age on temperament.
Figure 1.2 The effect of age on bruise score.
Figure 1.3 The effect of sex on temperament score.
Figure 1.4 The effect of sex on bruise score.
Figure 1.5 The effect of breed on temperament score.
Figure 1.6 The effect of breed on bruise score.
REFERENCE.


CHAPTER 4.
GENERAL CONCLUSIONS.

Northern Province is characterized more extensively by communal beef farmers. Temperament is less regarded due to lack of information pertaining to the negative impact of the pertaining measures of this trait. It is therefore important to measure temperament and constant movement of animal in the crushpen. Temperament of beef cattle under communal grazing system faces effect of sex, age, breed, and their interaction and that factors can be considered for improvement of temperament traits.

This study characterized linear body measurements in association with measures of temperament in Nguni cattle type under communal grazing system. Temperament was affected by age, sex, breed and their interactions and linear body measurements. Age had caused ($P<0.10$) variation on temperament of animals. Age increased with temperament of an animal. Therefore, animals of more than 10 years were a docile 1.76 score. Females were having better temperament than male animals. Breed influenced ($P<0.001$) on temperament. Particularly, other breeds had better temperament than Nguni cattle type and this may have resulted due to exotic breeds which are more accustomed to management norms than indigenous breeds.

Measures of temperament traits in comparison with linear body measurements such as body weight, heart girth, scrotal circumference fluctuated with time and increases with bruise score and temperament score from less than 3 to less than 9 years animals and decreased in animals of 10 years and above. Therefore, it is recommended that farmers have to accustom animals from young (calves) stage with management practice in order to produce beef cattle with good temperament.

Management practice particularly dehorning must be improved by dehorning all animals at 3 to 5 weeks (during horn buds development) of age and as a result beef cattle with less or nil bruising will be produced and ultimately that will increase marketability and profitability of communal farmers.
RELATIONSHIP BETWEEN LINEAR BODY MEASUREMENTS AND TEMPERAMENT OF BEEF CATTLE UNDER COMMUNAL GRAZING SYSTEM.

BY

AVHASEI JUSTICE NEKHOFHE

Degree : M.Tech.(Agric)
Department : Agricultural management
Supervisor : Dr A.E. Nesamvuni
Co-supervisor : Mr G.J. Taylor

Abstract

Records of this study were gathered at Muledzhi and Matatani dipping tanks located north of Thohoyandou in the Northern Province. Traits evaluated were: Body weight (WT), Heart girth (HG), Body condition score (Bc score), Bruise score (Br score), Time, Scrotal circumference (SCR) and Temperament (TEMP). A total number of 263 animals were used in this study. RUDDWEIGH KDL data-collecta used to measure WT. HG was measured with a flexible measuring tape. The scale for Bc score was one to five and one to three score for bruising while a different measuring tape was employed to measure SCR. Data were accumulated over a period two months year 2000.

The study conducted primarily for firstly, to evaluate how linear body measurement are related to temperament (animal behaviour) and to determine whether temperament have an impact on age, breed and sex. The effect of linear body measurements to temperament was significant. Age had a significant influence (P<0.10) on the temperament. Breed also had a significant influence (P<0.001) on the temperament. Male animals had a higher temperamental effect than females. Body weight increased with temperament of animals. Cattle achieved heavy weights at more than five years and less than nine years with bad temperament, therefore their body weights dropped with good or docile temperament. The calving percentage was generally better for these communal beef cattle, and it was found to be influenced by month and number of bulls available.
Body weight and Heart girth had a significant (P<0.001) effect on animals of different ages, sex and breed and even the model showed the higher proportion, namely $R^2 = 0.52$ (WT) and $R^2 = 0.43$ (HG). Lastly, body weight, heart girth and bruise score influenced (P<0.001) in temperament of female animals. Beef cattle of other breeds found to be having better temperament than Nguni cattle type reared under communal grazing system.