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Acceptability and influence of rangeland fencing in the southern region of Botswana

by

NKANYEZI VENUS SEBINA

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ABSTRACT

The study is an attempt to examine whether the "fencing component" of the National Policy on Agricultural development is an appropriate step towards addressing the environmental and economic problems associated with and emanating from communal grazing management systems. This was investigated by relating the influence of different ranch types to the efficiency of livestock production and the management of livestock and natural grazing. The technology (fencing component) also forms part of the complex of problems associated with stock accumulation (exacerbated by low off-take rates) and the resulting overstocking and degradation of natural resources, which undermine sustainable production.

The investigation was commenced in November 1996 and was confined to the three communal areas of Lerolwane, Sekhutlane and Mabule and the adjacent community, group and individual ranches, which represent the variation from camp(s) communally utilised to multi-camps used individually.

The preference of a one-camp system, allowing no rotations but the liberty to do as the individual pleases, above the alternative of being part of a multi-camp system, seems to indicate that sustainability is not the livestock farmer's main motive, or that group farming is an attractive incentive. The individual multi-camp ranch seems a solution on condition that leads to improved production and resource management and that the outcome outweighs the high investment and maintenance costs.

However, the type of ranch has no influence on the improved practice adoption and the efficiency of livestock production and grazing land management. Analysis revealed that livestock farmers from different ranch types tend to overrate the conditions of their grazing or underrate the seriousness of the degradation and as such want to increase their herd size (resistance to stock reduction) which usually result in overstocking.

The findings that the ranch type has little influence on improved practice adoption and production efficiency, questions the upgrading of communal ranches to more

sophisticated group and individual ranches as a means to facilitate the emergence from subsistence to commercial farming. The identified constraints and suggested program of change can contribute significantly towards improving the sustainability of livestock farming in Botswana.

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CHAPTER 1

BACKGROUND AND MOTIVATION

1.1 INTRODUCTION

Concerns have been expressed for many years over the apparent degradation of communal rangelands of Botswana due to overgrazing. A problem of this nature has far reaching implications for the sustainability of the livestock industry on which the welfare of most rural communities depends, and calls for an urgent investigation. This is the primary concern of this research. The introductory chapter discusses the nature, scope and importance of the problem.

1.2 THE PROBLEM

The degradation of communal rangelands and the subsequent negative impact on livestock productivity is a major cause of concern in Botswana (Balopi, 1996:6-7). A similar concern has been expressed in Government Paper No.1, (1991) and by Kwelagobe (1996) that the livestock industry in communal areas is experiencing a continuous decline in terms of low calving percentage, off-take rates, sales and high mortality. This is in spite of concerted efforts from the Government to improve the livestock productivity through the encouragement of better husbandry methods.

For the livestock industry to be productive, efficient and sustainable, the current communal grazing areas should be fenced as a step towards addressing the negative effects of overstocking and overgrazing. The aim of this study is therefore, to investigate the effect of fencing communal grazing areas as a facilitator of better management in the livestock industry.

In order to clarifyi the concept of the fencing component, there is need to understand closely related aspects such as the importance of cattle towards cattle farming in African society; the importance of natural grazing for supporting livestock population; and to discuss the components of rangeland degradation.

1.3 IMPORTANCE OF CATTLE

In the lives of certain economically unsophisticated communities cattle have become an inseparable part of the people's tradition (Chavunduka, 1976:398). In African societies, cattle play important social, spiritual and economic roles. The various roles as indicated by some authors below are complex and interrelated.

Like other African herd owners, Batswana seek to accumulate animals (cattle) as a store of wealth as well as a means of supplementing their income. As indicated by Düvel & Afful (1994), cattle are a form of accumulated wealth, a means for men to be able to marry (payment of lobola), a source of food (meat and milk) - in fact, the mainstay of the diet of many rural communities is milk and sour milk (curd) to go with different vegetables and grain porridge in Southern Africa of which Botswana falls under.

Livestock is vitally important as a source of protein, draught power, and cash income and as a form of savings for periods of drought in Botswana. A study in Southern District by Flint (1986) has shown that livestock farmers obtain 35% of the output from their herds as milk, 18.5% as meat (from domestic slaughter and natural mortality) and 6% as draught power, while 33.5% of the output was obtained from cash sales. Livestock also plays an important role as draught power in smallholder arable agriculture.

Gulbrandsen (1980:58 and 163) notes that wealthier farmers tend to give poorer farmers one or two of their heifers to herd on a long-term basis (*Mahisa*). The *Mafisa* system is the Tswana variant of long-term lending of livestock between pastoralists, known among many African pastoral tribes. The holder then has the right to milk the *Mafisa* cows and use the cattle for draught purposes.

Gulbrandsen (1980:150-151) also noted some significant changes in stock consumption patterns. Some people have converted part of their stock into expensive houses; others have invested considerable assets in secondary school education for their children. He also indicated that many case histories testify that the rapid rise in urbanisation during the last decade has forced many senior households to consume a

significant amount of their pastoral capital, since they are not as well supported by their urban dwelling sons as by their mine working ones.

Coertze's (1986:131-134) research also discussed the prevailing attitudes towards livestock in Africa. The following attitudes towards cattle by peoples of Africa were discussed:

General - For Tswana people cattle are not ordinary livestock. Each is given its own name and praise poems are made up for them, as for important individuals. In Setswana one of the choruses of a praise poem for cattle reads *"ke modimo o nko e metsi"* - it is a god with a wet nose.

Religious value - The cattle-kraal is the burial place of the men in most cases. Cattle are thus sacrificial goods and the best means by which the good will of one's ancestors can be won and one's prosperity ensured. The ritual significance of cattle can be seen in the funeral ceremonial of the black people of Southern African. With these people an important person should be buried in the hide of a black bull.

Socio-economic value - The most acceptable goods of marriage are cattle and these are initially collected from the relatives of the bridegroom. Most lease-lending agreements concern cattle. Normally they are entered into when a rich cattle owner places some of his/her cattle in the care of a poorer relative or friend. There is a saying in Setswana *"fa o gama kgomo ya lefisa, o lebelela tsela"* - if one milks a lefisa cow, one always keeps one's eye on the road (being on the lookout for the owner).

Economic value – As far as selection for breeding purposes is concerned, bulls are selected only on phenotype with the main emphasis on specific hide colour and variations in horn growth. Turning to general husbandry practices, it is clear that the peoples of East and Southern Africa care for their cattle to the best of their ability, mostly by moving the herds from place to place to find good grazing and water. Ownership of stock is usually indicated by means of earmarks and branding. In most cases, however, the sentiments are expressed that cattle have a right to exist and to increase in numbers, as is the case with human beings. Even in modern times this

persists because one frequently finds that cattle owners with the highest number of cattle have the smallest turnover.

Chavunduka (1976) also outlined the following important roles cattle play in African society:

Spiritual roles - Before the burial of an adult person a beast is slaughtered to accompany his soul.

The use of cattle in various transactions - P*ayment of the bride price* is paid in the form of cattle. However, this custom has undergone changes and modifications. P*ayment of fines. N*owadays fines for most offences can be paid in cash, but other fines or offences such as breach of custom or moral taboos were in the form of cattle. When *incest has been committed,* the individual concerned may be ostracised (excluded) from the society or the parents of the girl impose a fine.

The importance of numbers of cattle – Livestock is recognised as a form of wealth. The emphasis, however, tends to be placed on numbers rather than the quality of animals. As the number of cattle that an individual owns increases, his social standing increases correspondingly.

Economics roles - It has been suggested that cattle are a stable form of investment little affected by inflation and devaluation, and not as "slippery" (as easily spent) as cash.

1.4 IMPORTANCE OF NATURAL GRAZING

Düvel & Afful (1994:10), indicated that the extent of the problem of the destruction of the natural vegetation is closely related to the importance and extent of this resource. In Botswana, of the estimated 1.3 million people (Central Statistics Office, 1991) about 76% live in the rural areas and derive their livelihood mainly from agriculture, off farm activities (brewing, basket making, woodwork etc.) and remittances. Natural grazing comprises the major portion of the surface area. About 290000 Km^2 (70%) is zoned as communal land, most of which is grazed by livestock

owned by Batswana in what the Ministry of Agriculture calls the traditional or communal sector (White, 1993:11). It is therefore, obvious that the larger part of Botswana's natural vegetation will remain semi-arid bush veld, much more suitable for pastoral use than arable use. It is this natural resource that almost exclusively supports the country's livestock population. Of the total of 101434 cattle farms (Botswana Agricultural census, 1993) on which all the cattle of the country are found, 100927 (99.5%) farms are subsistence cattle farms (traditional farms). These farms graze their cattle communally and hold some 1562200 (86%) livestock units of the total large stock numbers in Botswana.

White (1993:8-9) indicated that Botswana's rangelands are neither a uniform nor a uniformly productive environment. As a result, some parts of the rangeland may produce ample forage at times when most of the rangeland has little forage. These highly productive areas can support large numbers of animals and enable less well endowed areas to rest and recuperate.

In Botswana most large wild and domestic herbivores are highly mobile and pursue a nomadic grazing strategy. Therefore, managing domestic livestock in this way, as all livestock once were and many still are, enables livestock owners and their animals to reap the same benefits through nomadic grazing (White, 1993:9). On the other hand, the true value of the communal grazing areas is difficult to calculate since it plays an extremely important role in terms of socio-cultural benefits and as wealth storage (Düvel & Afful, 1994:7).

1.5 RANGELAND DEGRADATION

The fear of uncontrolled overgrazing and degradation of the range that emerged in the 1930's mounted steadily in succeeding decades in Botswana, which was by then referred to as the Bechuanaland Protectorate (Peters 1994). The conventional explanation of rangeland degradation assumes that an essentially stable system has been perturbed by mismanagement - overstocking, and untimely utilisation of forages (Abel et al. 1989). Cook (1970), for example, defines ecological succession as an orderly progression of community development that terminates in a state of equilibrium, until disturbed by man or some natural catastrophe. Abel & Blaikie,

(1989:113) have also defined range degradation as an effectively permanent decline in the rate at which land yields livestock products under a given system of management. *"Effectively"* means that natural processes will not rehabilitate the land within a timescale relevant to humans and that capital or labour invested in rehabilitation are not justified. This definition excludes reversible vegetation changes even if these lead to temporary declines in secondary productivity. It includes effectively irreversible changes in both soils and vegetation.

For their part, the Tswana continued to believe that the cause of overgrazing was the lack of rain, which forced concentration of cattle around scarce water sources (Peters 1994). Although boreholes offer the possibility of opening up new areas of grazing and taking the pressure off locally-degraded areas they also remove one of nature's checks (natural grazing) on livestock numbers (Baker 1980).

The Botswana government has based rangeland policies on similar, conventional interpretations of rangeland degradation as mentioned above (Stoddart, *et al,* 1975). This holds that overstocking causes degradation, or 'desertification (Baker 1980). The components of degradation as indicated by Abel (1989:102) include:

(i) *Soil erosion.* The loss of mineral particles, organic matter and nutrients;

(ii) *Changes in soil structure.* In particular those affecting available water capacity;

(iii) *Decrease in palatable and nutritious plant species, and increases in unpalatable and non-nutritious ones;*

(iv) *Decrease in perennial grasses, and increases in annuals;*

(v) *Shrub encroachment;*

(vi) *Decline in the quality and quantity of forage;*

(vii) Decline in the primary and secondary productivity of rangeland;

(viii) Decline in the welfare of herd-owners.

According to Sandford (1983:11-12), the mainstream view holds that most of the world's rangeland are suffering from desertification and that, although in some cases unwise attempts to cultivate rangeland have been the culprit, in most cases the cause of desertification is overgrazing by domestic animals. Desertification has speeded up during the last century and overgrazing is due to an increase in the density of livestock, partly caused by a decline in the area of rangeland but mainly by an absolute increase in livestock numbers. This increase in livestock numbers is, in turn, attributed to one or more of a number of causes acting alone or in conjunction with each other. One cause is an increase in the number of pastoralists and this triggers both a demand for more livestock to support the extra pastoralists and also a greater supply of herding labour to look after extra stock. Another cause is thought to be an improvement in veterinary medicine and services, which has reduced or eradicated many of the previous causes of livestock mortality and thus removed the main limitation of the growth of the livestock population. A third cause is thought to be traditional economic and social systems which place a very high social value on the accumulation of livestock numbers rather than, for example, on the economic value of output from these livestock or on environmental conservation. Fourthly, it is believed by some people that the penetration of the international capitalist economy into pre-capitalist economic systems has led to the breakdown of previous self-regulatory mechanisms and an excessive pressure to increase both livestock numbers and output.

The views that desertification is caused by domestic grazing in Botswana, are expressed in Campbell & Child, (1971) and Peters, (1994). The official Botswana view is reflected in this extract from the National Conservation Strategy (Government Paper No. 1 of 1990:4-5):

'The main environmental issue requiring solution is degradation of range pasture resources, due to a variety of management and other factors. The main sustainable development opportunity based on natural resources, which require support from the Government and all interested parties, is the opportunity in the livestock sector

through the restoration of degraded rangeland and the adoption of improved management techniques leading to increase (d) off takes.'

In Botswana rangeland degradation is easily traceable in small districts like the North East and Southeast and also highest and more pronounced around boreholes and villages. As is well known, it is almost impossible to apportion the costs of range degradation and soil erosion to individual farmers in communal areas. As a result the incentive to adopt cost-effective and range resource-efficient production systems in communal areas by individual farmers is unlikely to develop when the rest of the farming community does not implement the same management practices (Ministry Of Agriculture, 1991:41).

The Government holds that the reason for overstocking and poor pasture management is because communally held rangeland is grazed by privately owned livestock. Thus a 'tragedy of the commons' (Hardin, 1968) ensues, in which individual herders increase their herds because the individual gains all the marginal benefit (extra stock) while sharing the marginal cost (range degradation and reduced grazing) with other herders. These interpretations have led, logically, to the policy recommendation that individuals and communities be allowed to fence grazing land to improve livestock management and productivity (Government Paper No. 1 of 1991:10).

1.6 THE PURPOSE OF THE STUDY

The current strategy for development of the agricultural sector in Botswana is focused on fencing to decrease rangeland degradation and improve livestock management and productivity (Ministry of Agriculture, 1991:41). The envisaged costly major intervention of large scale fencing of communal grazing areas, which according to White (1993:61), is based on the strategy or assumption that giving farmers exclusive rights to a tract of land and allowing them to fence, will motivate them to improve livestock and range management and thus increase productivity, has the potential to aggravate the condition on the commonage, if not done on a sound basis (Ministry of Agriculture, 1981).

In the promotion of fencing, uncertainty exists concerning the optimum approach that will allow for proper implementation of sound management practices and that are acceptable to and reconcilable with the needs of the communities. To investigate this, is the main purpose of this exploratory research.

The study is based on the following assumptions:

a. Fenced grazing areas allow for better management of rangeland and stock (Ministry of Agriculture, 1991:41).

b. The strategy of fencing is compatible with the needs of the communities whose environment will be affected by such practice.

c. "The strategy of fencing will impact significantly on the lives of the community members and is dependent on their commitments for implementation. This emphasises the necessity of need appraisal and an assessment of the perceived acceptability of fencing, which is also the basis of participative development. The justification of the latter is based on the fact that":

   (i) it increases likelihood of success, (because according to Cohen & Uphoff, 1980, no meaningful progress can result unless the people contribute to development efforts) and

   (ii) it is reconcilable with the democratic right of self-determination and with the philosophy of development viz. "help towards self-help".

CHAPTER 2

MODELS OF RANGELAND UTILIZATION

2.1 INTRODUCTION

The most complex issues are related to the use of rangelands (Chambers & Feldman, 1973:56). Rangeland usage requires generally, that those responsible for the cattle are also responsible for the rangelands used by their cattle.

The previous chapter alluded to the background problem and the related aspects of the importance of cattle, the importance of natural grazing, and rangeland degradation as they relate to the welfare of the livestock farmers. In this chapter the different uses of rangelands as manifested in different types of ranches in Botswana are discussed. An attempt will be made to define the concepts on the use of rangelands. Four types of ranching are relevant in this analysis, namely communal, community, group or syndicate and individual ranching.

2.2 COMMUNAL GRAZING

Many people with wide experience of rural development in Africa believe that communal grazing is inherently unmanageable, and that communal access to pastures can only bring about their depletion and ultimate ruin (Ministry of Agriculture, 1981:1). Examples to support this view are all too common (Runge (1981), Roe (1988), Mckean (1992) and Keijsper (1992)). These days it is indeed hard to find a significant area of communal range anywhere between the Sahel and Botswana, which could not be used as evidence against the concept of communal grazing rights. Düvel & Afful, (1994:14) indicated that, since communal grazing is an integral part of subsistence stock farming and the problem of overstocking, a more detailed description of it and its features is appropriate.

Gilles & Jamtgaard (1981) describe a communal pasture as one that is owned by a collectivity upon which all members may graze animals. Because the pasture belongs to all, it is impossible for one member of a community to exclude another's animals.

According to Mckean (1992), communal grazing or common pasture is frequently termed *common property* to refer to unowned resources, to which no one has recognized rights of any kind and which, therefore, is not property at all. The author also indicated that common property is best thought of as a variety of shared private property. All members of a clearly defined group base common property on the concept of equal access to a resource.

White (1993:11) illuminates some of the features of communal grazing by saying that every tribesman (a citizen who is a member of the tribe occupying the tribal area) is entitled to sufficient land for cultivation and housing to meet his subsistence needs, and he has the right of access for his stock to communal grazing land. While access to communal grazing land and natural water sources is open; access to arable or residential land or to artificial water sources is not, but controlled by the grantee, who has the right to exclude other people. The Ministry of Agriculture (1981), based on Schapera's research, indicated that during the 1930's and 40's, Tswana tribes had divided their grazing areas into sections, called *dinaga* (grazing areas). Each of these was the responsibility of a *modisa* (the man in charge of a grazing section). The main duties of the modisa were to observe the changing conditions of the range, to allocate cattle posts (an area of land for rearing cattle or livestock) according to a set of principles designed to avoid overgrazing, and to relocate cattle posts when increasing stock numbers were endangering the pasture. Hitchcock (1980), Gulbrandsen (1980) and Peters (1994) discuss the traditional rights to land of tribesmen of the Tswana people.

Prior to 1970, the Chief regulated the granting of the rights to use any land. Since 1970 the Tribal Land Boards, constituted under the Tribal Land Act of 1968 have regulated the granting of rights to use any land. No fees are payable for the granting of any customary rights to use any land under the Tribal Land Act. All grants of customary rights made since 1970 are certified by a certificate issued by the Land Board, but grants made by the Chiefs prior to 1970 were often given verbally in the

kgotla (a traditional group meeting place where community affairs are conducted or the village meeting place) and are undocumented. Since the granting of rights to use any land are heritable and a large number of the original grantees are still alive. Many people who have legitimate title to land have no documentary evidence to prove it.

Vink (1986:10) noted that during growing season cattle are kept at the cattlepost until the harvest was completed on arable land, thereafter the land reverted to the commonage until the next crop was planted. According to Vink (1986:10), shifting cultivation was practised under conditions of land abundance and there was, therefore, little reason for a group of landholders to try and claim rights to a particular piece of land. With the increasing population pressure on land, this has led to modifications to the traditional communal system of land tenure.

In addition to the mentioned Customary Law and Tribal Land Act, there has developed over time a body of administrative practice connected with the administration of land and water rights. The most important of these is the "eight kilometre rule" which specifies that boreholes for livestock watering must be eight kilometres apart. Also important is the practice by government Departments of allocating unused government drilled boreholes to individuals or syndicates for livestock watering (White, 1993:12).

As outlined by White (1993:18), the Government commissioned Chambers and Feldman in 1972 to prepare a " Report on Rural development ", which became the basis of the Tribal Grazing Land Policy (TGLP) in 1975. The objectives of TGLP were focused on preventing the environmental degradation and stimulating a more commercial approach to cattle farming. Implementation of Tribal Grazing Land Policy started in 1976 with the commencement of the zoning exercise (designating grazing land as commercial and communal). Under this policy some individual cattle owners have been provided with exclusive rights under long-term common law leases in the commercial areas in the expectation that they would develop commercial ranches and reduce pressure on communal land.

The traditional system of rights to land is an issue that needs attention. The late first President of Botswana (Sir Seretse Khama, 1975) articulated the development problems connected with this traditional system of rights to land in the following way:

"Sustained livestock production depends on the availability of good grazing. Protection and improvement of the veld should therefore be a constant objective if we want the cattle industry to keep growing. Unfortunately current practices are working against this goal. With favourable beef prices farmers are naturally eager to increase their herds, and to have good grazing for their animals. But under our system of uncontrolled grazing too often the result of having more and more animals is severe overgrazing. In turn we get soil erosion, bush encroachment and steady reduction in the amount of good grazing land available. The trouble is that, as things stand, it is in no one's interest to do something about it. If one man moves his cattle off a piece of land someone else moves his cattle in. The problem cannot be solved unless livestock numbers are somehow tied to specific grazing. Only then will farmers have a clear incentive to control grazing. Until farmers have this incentive good grazing land will continue to be destroyed --along with the future of our livestock industry."

Considering, therefore, how strongly the communal traditional land right system is established, and the close connection it has with rural and agricultural development in Africa, the advantages and disadvantages of communal grazing in the context of development need to be examined (Düvel & Afful, 1994).

The advantages of communal grazing are as follows:

a. *Full and free access to land.* Every tribesman has the right of access for his stock to communal grazing land (White, 1993:11). He also has the right of access to natural surface waters for domestic and stock watering purposes and to develop artificial ground water (e.g. wells and boreholes) or surface water sources (e.g. dams and hafirs) for his own use. These rights are heritable.

b. *Maintenance of tribal unity and authority.* There exist rules and regulations that control access to and use of resources. In this context Bromley & Cernea (1989:15) indicate that, "the property owning groups vary in nature, size, and

internal structure across a broad spectrum, but they are social units with definite membership and boundaries, with certain common interests, with at least some interaction among members, with some common cultural norms, and often their own endogenous authority systems."

c. *Limits gap widening.* It prevents land, which belongs to the tribe as a whole to be taken by a few wealthy cattle owners. That is, the national principle of social justice be geared towards ensuring that tribal grazing land is equitably distributed. Sir Seretse (1975) stated that, "if development does not benefit all of Botswana it is not the kind of development we want."

d. *No land speculation.* In a community there exist institutions and institutional arrangements that enforce prescribed rules of conduct with respect to access and utilisation of resources. For instance, in customary tenure systems over much of Africa the ownership of certain farmland may be vested in a group, and the group's leaders then allocate portions of the land to various individuals or families. As long as those individuals cultivate their plot, no other person has the right to use it or to benefit from its produce (Bromley & Cernea, 1989:15).

e. *Benefits collective development.* There is a great deal of co-operation among resource users towards their common interests. According to Peters (1994:3), the commons prove to be "good to think with"; this is especially so for theorists in political science, psychology, and economics interested in dilemmas of "collective action" and " public goods".

The following have been identified as disadvantages of communal grazing:

a. *No guarantee of tenure.* Communal tenure provides neither security nor incentive to individual producers, and, hence, represents obstacles to economic improvements and to individual enterprise (venture). This is mentioned repeatedly in the literature by various researchers, including Hardin, (1968), Sandford, (1983:120), Roe, (1988:146) and Peters, (1994:66).

b. *No commercial value for land.* Under the communal system, individuals may not obtain ownership of land. Thus, it cannot serve as security for a commercial loan and it offers no value on which mortgage may be taken. According to Peters (1994:64), (largely) members of the Kgatla and Ngwato political elite mentioned Tswana tribal area's lack of any commercial value of land as a disadvantage.

c. *Improved agricultural productivity impeded.* Peters (1994), quoting Isang (1930), puts it as follows, "our resources are communal property and nobody who is willing to progress can have freedom to use his progressive ideas." The more specific reasons for this, as mentioned by Düvel & Afful (1994), are the following:

i. It is hardly possible to feed and breed better quality stock due to uncontrolled mating and conception and calving cannot be synchronised to periods of likely feed suitability.

ii. Irresponsible damaging of fences and watering places.

iii. Discourages off-take system because the uneconomic small holders let their marketable livestock graze for too long on the grazing land before they are sold.

iv. Unwillingness of farmers to cultivate forage on fields as livestock cannot be fed separately.

v. Livestock diseases are easily spread. A situation were the disease easily spread, was experienced in Botswana in 1995 when a chronic infectious disease of cattle, Contagious Bovine Pleuropneumonia (Lung Sickness) broke out in the Xaudum area in the North West District.

vi. Stock limitation in communal areas is treated as taboo (Ministry of Agriculture, 1981:4-5). It is widely accepted that if ever it becomes

feasible to restrict livestock numbers, per owner, or per unit area, the time for its introduction is not now (Khama, 1975).

d. *Limitations to protection of natural resources and the environment.* Widespread degradation of resources under common use has been attributed to a general lack of adequate regulation inherent in this type of use. The reasons for insufficient control and resultant resource damage can be categorised as related to management objectives, namely conservation, production and social welfare (Düvel & Afful, 1994:19).

e. *Limitations to social welfare.* Problems relating to conservation and production have obvious impacts on social welfare and *vice versa*. Constraints to social welfare due to the institution of common use may typically result from the shift away from traditional methods of its management and use. One obvious effect of this shift to management by modern, central governments is decreasing traditional, local authority and power. In this process there is a shift of the focus of decision-making concerning social welfare to the central government, away from the smaller social unit, for example the community.

Mckean (1992), classified communal land as an unowned non-property to which no one has rights and from which no potential user can be excluded. Bromley (1989) referred to it also as non-property with no defined group of users or "owners" and so the benefit stream is available to anyone. Individuals have both privilege and no right with respect to use rates and maintenance of asset. The asset is an "open access resource."

Runge (1986:624) said, "empirically, it is crucial to distinguish between open access and common property if appropriate policy is to be formulated. Problems of open access arise from unrestricted entry, whereas problems of common property result from tensions in the structure of joint use rights adopted by a particular village or group."

Communal areas therefore, lack appropriate and suitable management systems and, furthermore, the communal land tenure system is often cited as a disincentive to the

promotion of effective grazing management systems as it tends to be everybody's resource and nobody's responsibility. Mckean states that the importance of independent jurisdiction over the commons is highlighted by many examples of failed common property systems where national governments undermine the independence and authority of the local unit that has managed the common property. This kind of interference is the source of environmental tragedy in Botswana, where the central government, in a self-conscious attempt to undermine the authority of traditional chiefs, has created land boards to allocate common land (Mckean, 1992:260).

2.3 COMMUNITY RANCH

The psycho-analysis of ranching in the context of a country such as Botswana is a challenging one, first of all because of the range of academic disciplines involved: technical (in respect of water supply as well as animal husbandry and agriculture), economic, administrative and financial, legal and, especially, sociological (Livingstone, 1976). The idea behind the community ranch concept is to encourage the community to farm in an ecologically sound manner and thereby to optimally utilise and conserve their natural resources, especially vegetation and soil (Keijsper, 1992:13).

Community farms or ranches in Botswana are communally owned and operated, and stocked with cattle from the community. They are intended for the small cattle owners without sufficient cattle numbers or mobility to participate in the group ranching scheme, which will be discussed later. A prerequisite for funding a community farm is that it should have a constitution, a management plan and, have registered participants as an Agricultural Management Association (AMA) to give the group ' body corporate" status with limited liability. After registration, the Department of Animal Health and Production through the Land Development Programme can supply fencing material for the community farm.

A community farm is therefore, defined as "a ranching unit that is communally grazed, operated and owned by registered members of an Agricultural Management Association, and which has the objective of improving range condition and animal production.

In contrast to the group ranches (see 2.3), which made new grazing available, the community ranches are to be located within the overgrazed zones surrounding villages, in order to demonstrate improved management of the existing grazing resources (Sweet, 1986). This land does not belong to the community necessarily, but may be rented (though possibly from members in their private capacity). On the other hand, the community herd belongs to individual members rather than to the community (society) and the management committee is primarily responsible for general decision-making but not decisions regarding the disposal of animals, as an individual member determines this.

According to Bromley (1981: 72), a community ranch is similar to common property in that the management group (the "owners") has the *right* to exclude non-members, and non-members have a *duty* to abide by the exclusion. Individual members of the management group (the "co-owners") have both *rights* and *duties* with respect to use rates and maintenance of the things owned by the group.

2.4 GROUP OR SYNDICATE RANCH

In view of the many disadvantages and constraints of the communal grazing system, alternative solutions have been sought. The most prominent alternative that has been developed and implemented in Botswana on a selective basis is the Tribal Grazing Land Policy (TGLP) ranch concept (see 2.1). The idea behind the Tribal Grazing Land Policy (TGLP) ranch concept is to encourage the community to farm in an ecologically sound manner and thereby to optimally utilise and conserve their natural resources, especially vegetation and soil. For more details on the policy refer to Government of Botswana White Paper No. 2 (1975), Hitchcock (1980), Roe (1988), and Peters (1994).

Under this concept, group formation has been encouraged among small farmers with the hope that group members can gain through the sharing of facilities and resources and consequently can achieve what individuals cannot do on their own (Tsimako, 1991: 20). According to Tsimako (1991:7), TGLP has been implemented in six districts in the central western sandveld areas of Botswana where most of the areas

were assumed to be still vacant. These include the six districts namely; Southern Ngwaketse, Kweneng, Central, Kgalagadi, Ghanzi and Ngamiland.

About 501 leasehold ranches have been demarcated throughout the country or in the six districts. About 332 (66.3%) of these have been allocated to individuals and groups of farmers who have formed themselves into Syndicates and AMAs (ranching groups registered under the AMA Act of 1978) while the rest (169 or 33.7%) have not been allocated yet. Group membership range from two (2) to fourteen (14) members (Tsimako, 1991:7). The concept basically involves the provision of livestock infrastructure which consists of camping systems, handling facilities, reticulation of water, etc. to groups of stock-farmers in the community to facilitate the application of sound livestock and veld management practices.

According to Oxby (1981:45), Kenya is the African Country with the longest experience of group ranches. In order to cater for the needs of the whole community and group ranches evolved. It was hoped that by allocating land rights to a group of pastoralists, ideally the group that had traditional rights to it, the rights of the majority would be protected.

Another objective beside this was to make pastoral production more commercial, that is, to sell for slaughter the animals that planners consider "surplus" in order to provide meat and other animal products for the urban areas. African countries with the experience of group ranches are Tanzania, Upper Volta (now known as Burkina Faso), Rwanda, and Senegal, but all with different land rights (Oxby, 1981:49).

A group ranch then, is a production enterprise in which a group of people jointly have title to land, market the surplus in rotation, herd their stock collectively, yet continue to own the livestock as individuals (Düvel & Afful, 1994:22 quoting Simpson, 1973). Membership of the group, in theory, is based on kinship traditional land rights.

The experience with both Kenyan and Botswana group ranches and in other parts of East Africa has resulted in a wide spread sense of failure. The reasons for the failure of these ranches include:

a) *The nature of pastoralists land rights* (Oxby, 1981). At one extreme, the Kenyan Group ranch members acquire full title to land they use on a semi-permanent basis (that is more security of land); the Botswana ranch members had land on lease for some time, up to 50 years in some cases (that is little security to the land); and then at the other end is the Rwandan case in which ranch members have no ownership rights at all (that is no security to land).

As indicated by Düvel & Afful (1994:23), this arrangement does not augur well for grazing land development and conservation. Besides, the registration process actually decreases the pastoralists rights to the land and therefore, their feelings of responsibility towards it. Under the traditional system the pastoralists do not only have customary use rights to the land, but usually consider themselves freeholders of land which has been handed down to them over generations. Therefore, the signing of legal documents may be interpreted by some pastoralists as not acquiring rights, but as giving them up. In Rwanda they can become liable to instant expulsion from the land they regarded as their own; in Botswana, they are obliged to pay rent for the land they regard as their own. Even in Kenya, accepting the legal title, one group ranch may be interpreted by the pastoralists and by the administrators alike as relinquishing certain customary rights to areas, which were included in other group ranches or which are outside any ranch boundaries.

b) Groups are found to experience relatively more complex problems in running their ranches than individuals. Instead of partnership in ranch development, management etc., group ranches are run on individual lines with members operating independent cattle posts within a fenced or unfenced ranch. Some have gone to the extent of dividing paddocks among different members operating independent cattle posts within a fenced or unfenced ranch (Tsimako, 1991:25).

Group members complain that financial arrangement or contributions are not equitable, that is, they are not based on the number of cattle members own or keep in the ranch but on equal payment per member, which is to the disadvantage of those owning smaller herds. This has resulted in some group

members with very few livestock to rather discontinue the keeping of livestock. As a result, some of these have withdrawn from syndicate ranches to move back into the communal areas (Tsimako, 1991:25).

c) There is an assumption that exclusive right over land will give an incentive to farmers to control livestock numbers and invest in improved management and range preservation. Oxby (1981) notes that so far there has been no evidence that stock numbers have been reduced except by migration. The surplus animals are moved away rather than slaughtered and consequently the pressure on the pasture outside the ranches is increased. Some problems encountered in establishing stock quotas on group ranches are the practical difficulties of keeping track of or controlling stock numbers over a large area and that pastoralists reject the notion of a stock quota which is permanent and setting an upper limit on the animal numbers for a particular area of land. This is because their view on maximising their economic benefits is that the quality and location of the pasture is so variable from year to year that it is best to keep the maximum number of animals at all times so that full use will be made of the plentiful pasture in good years, even though the herds may be depleted through starvation in bad years.

As far as the lease is concerned, there are no specific requirements that bind the farmer to keep his or her livestock below a certain limit except general statements which indicate that the rancher should use the ranch in accordance with the principles of good husbandry and laws and regulations of Botswana. In fact when the Central and Ngwaketse Land Boards expressed the desire to set maximum stocking limits on TGLP ranches in the form of appendices to the lease, the Attorney General's Chambers ruled it illegal (Tsimako, 1991:22). Tsimako, (1991) quoting Machacha, (1985), indicated that, the general dislike for the idea of stock limitations dates back to the early years of TGLP consultation campaign. At implementation concerns were in fact raised that if conservation laws were put to practice they may harm the TGLP because farmers would fear to obtain ranches thinking that they could be used as a means of stock limitations.

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The system can cater for the needs of the whole community (Oxby, 1981) or protect the interest of the majority of Botswana farmers (Sir Seretse Khama, 1975). It is characterized by the following problems:

(i) It is not economically viable in the sense that it may be satisfactory in good years, but in years of low rainfall there may not be enough pasture within the ranch to prevent the pastoralists from ignoring the boundaries and seeking grazing elsewhere.

(ii) Enforcement of stock quotas is not possible because a reduction in the number of livestock implies either a big reduction in living standards or enforced migration of some group ranch members and their animals out of the group ranch.

(iii) An authentic and durable form of group management making provision for consensus and timely decision concerning strategies, innovation etc. has proved very difficult in group ranches.

(iv) Ownership of livestock determines, among other things, whether and how livestock are to be transferred or sold. It is, therefore, possible that the group ranch member would be reluctant to sell certain animals in the herd that he manages, if he does not have the consent of the owner who may be a child or a woman. The latter usually has well defined rights to milk and other animal products.

Similar problems were cited by Tsimako (1991), in Botswana and by Düvel & Afful, (1994), in North West Province (former Government of Bophuthatswana) with emphasis on Kudumane and Ganyesa Districts as affecting group ranches performance.

Based on the above problems, it is very clear, that the traditional organisation of pastoral production remains largely unchanged, and it would be unrealistic to expect the mere establishment of group ranches to enable radical changes in pastoral production, such as establishing stock quotas and increased off take (Oxby, 1981).

2.5 INDIVIDUAL RANCH

This ranch has the limitation of catering for the needs of the few in the community (Oxby, 1981), but the potential to meet the basic objectives of

(i) becoming economically viable,
(ii) limiting stock numbers in a ranch or enforcement of stock quotas,
(iii) developing an authentic and durable management, and
(iv) attaining long term stability in range management (Ministry of Agriculture, 1991 and Oxby, 1981).

When TGLP was announced in Botswana, it was thought that exclusive leasehold rights over land would give an incentive to farmers to control livestock numbers and invest in improved management and range preservation. It was thought that the new system would encourage better methods of range management in part through fencing, reticulation of water and adoption of improved methods of livestock management such as controlled breeding, supplementary feeding, artificial insemination designed to improve herd quality as well as rotational grazing (Tsimako, 1991:21).

In Kenya this type of fencing management system whereby communal land rights are transferred to private and exclusive interests, has contributed to a massive problem of rural poverty, unemployment and landlessness (Ministry of Agriculture, 1981).

The following are management problems observed in many individual ranches in Botswana:

(i) *Overstocking.* Throughout the country good management of grazing and control of livestock numbers in accordance with available grazing resources have not been implemented on many ranches. Though some efforts have been made to sell livestock to the Botswana Meat Commission (BMC), local butcheries etc, the off take remains low and has remained low even during the many successive drought years of the 1980s. This has been the case in both fenced and unfenced ranches. As a result, overgrazing has become a major

problem on individual ranches, group ranches and communal areas. Most of the ranchers have exceeded the recommended stocking rates of 400 livestock units allowed for their ranches (Tsimako, 1991).

(ii) *Management*. The poor performance of many individual ranches is a result of general mismanagement. As indicated by Tsimako, (1991), many ranches are still undeveloped and, as such, are operated as cattle posts. In the Ngwaketse Areas where a higher percentage of the ranchers have invested in perimeter fencing, many ranches are operated as fenced cattle posts.

(iii) *Dual rights*. Ranchers have also been able to move their cattle temporarily out of their ranches onto the communal area, either because their ranches are overgrazed, burnt by veld fires or their boreholes have broken down (Tsimako, 1991). The practice of dual rights goes against other aims of establishing individual ranches namely those of relieving the communal area of large herds of cattle to leave room for small farmers and to control overgrazing in communal areas.

(iv) *Absentee management.* Nationally almost all the ranches do not have a resident owner (Tsimako, 1991). Absentee management by ranches makes it difficult for the ranchers to receive extension advice and to effectively and regularly oversee technical and management operations necessary for the successful running of the ranches.

Similar management problems have been observed on individual ranches by White, (1993) and Keijsper, (1992). Bromley (1989) indicated that, those who see all ultimate wisdom in private or individual ranch alone must answer to the following. Firstly much of the World's landlessness is not attributable to an absolute physical scarcity of land but rather to the concentration of its ownership in the hands of a few rich powerful families. This is especially prevalent in Botswana and large parts of Africa. Secondly, we are often told that private or individual ranch leads to the "highest and best use of land".

Moreover, the Ministry of Agriculture itself in general doubts the economic viability of commercial ranching. So, if the TGLP ranches after more than ten years of exclusive control still do not perform better and the economic feasibility is doubted, where is the logic and evidence for assuming that flexible sized ranches, fenced by individuals in the communal areas will increase herd productivity (Keijsper, 1992). This has not been and will never be achieved. "Cattlepost farming" within both the communal and TGLP ranching areas is still the rule, with commercial farming being the exception (Keijsper, 1992).

CHAPTER 3

THEORETICAL EXPOSITION

3.1 INTRODUCTION

The problem of overstocking generally regarded as the major cause of degradation of natural resources in the communal rangeland areas of Botswana calls for urgent attention. Both documented evidence and empirical findings indicate that socio cultural factors place significant constraints on stock reduction and proper management of communal grazing. As indicated by Düvel & Afful, (1994:31), numerous reasons are put forward why subsistence cattle farmers should reduce stock numbers, but little evidence is found of successful cases of stock reduction. There is overwhelming evidence that subsistence cattle farmers in general reject the idea of limiting their stock numbers.

The earliest traceable reference to the provisions for stock control orders in Botswana was provided under the Agricultural Resources Conservation Act of 1972. It was intended to curb overstocking and overgrazing in both communal and commercial areas and implied making sure that the ranches keep the recommended stocking rates. Apart from the above Act, the Land Tenure White Paper, approved in the mid 1980s, clearly stated that the Government should " ensure rigorous enforcement of the Conservation Act in all grazing areas including communal land, Tribal Grazing Land Policy (TGLP) areas, State Land and Freehold Land in order to curb the general misuse of land by cattle owners" (Government White Paper No.1 of 1985: National Policy on Land tenure, Section 1.20). In fact, Tsimako (1991) notes that the general dislike for the idea of stock limitations dates back to the early years of the TGLP consultation campaign.

At implementation of TGLP concerns were in fact raised that if conservation laws were put to practice they may harm TGLP program because farmers would fear to obtain ranches, thinking that they could be used as a means of stock limitation. Van Der Jagt (1993:42) and Cousins (1992:8) provide similar evidence. They found that

destocking programmes were unpopular and worsened drought shortage problems in both Botswana and Zimbabwe. The commonly noticed disadvantage of grazing systems was fear of stock limitations and potential conflicts of both intra and inter-community nature. Similar observations have been made by other researchers like Oxby, (1981) and Keijsper, (1992).

The resistance to stock reduction by livestock farmers needs to be understood to ascertain whether it can be overcome, or whether it has to be accepted as unchangeable or a logistic constant of behaviour (Froude, 1994; Motsamai, 1992 and Keijsper, 1992). The focus should rather be on the promotion of proper and sensible management (improved livestock management practices and range conservation as well as increased cattle productivity, upgrade rural life standards and bring about a reduction in the income gap between the rich and the poor). The proper management of the communal grazing lands, no doubt, depends on appropriate theoretical models which can increase our understanding of how these systems function, and therefore, of what kind of intervention measures are required, if necessary (Düvel & Afful, 1994).

3.2 MODELS OF COMMUNAL GRAZING MANAGEMENT

The earliest model of exploitative attitude towards land, which has since been extremely influential in the analysis of communal resources use in Africa was by Hardin (1968). The use of these resources, for example the traditional system of communal grazing, has been blamed for a major cause of overstocking and overgrazing on communal grazing lands (Düvel & Afful, 1994). An often cited parable used to illustrate this behaviour is the "Tragedy of the Commons" and "Prisoner s Dilemma" game in which the private benefit of grazing an additional head of cattle on a common range exceeds the private costs, because the costs of maintaining range quality can be shifted to the group as a whole (Hardin, 1968). It also assumes that all rural people utilise whatever access they have to the grazing land and that all have the incentive to keep adding additional animals to this grazing resource. There is evidence that a substantial proportion of rural households have no cattle. For example, in Botswana, about 40% of the farming households have no cattle (Keijsper, 1992). Such an approach as communal grazing will also call for the enforcement of rules imposed by some outside agents, and most importantly, suggests

the separation of private and social costs and benefits of individual grazers (Düvel & Afful, 1994).

The proponents of the Prisoner's Dilemma model of the common property externalities as illustrated would expect privatisation schemes to succeed in countering the resource deterioration in communal grazing regions of Sub-Saharan Africa (Düvel & Afful, 1994). Tsimako (1991) and Keijsper, (1992) however, point out that in Botswana, veld degradation also occurs in commercial farming areas.

One of the implications of Hardin's thinking is that pastoral societies cannot devise and impose appropriate rules of behaviour on their individual members (Düvel & Afful, 1994). Shepherd (1989: 52) rejects this argument and cites a study undertaken in the Bay Region of Southern Somalia which aimed at returning common property rights to the rural people who had lost them, and thereby ensuring the survival of resources which would otherwise be lost as well. On the issue of overstocking and overgrazing arising as a result of the tragedy of the commons and the Prisoner's Dilemma argument, Crotty (1980:133-39) also cites two case studies involving the Kenyan livestock development project and the tribal grazing policy of Botswana to reject the Prisoner's Dilemma as a basis to reduce communal resource degradation.

Vink (1986), however, notes that in both the Kenyan and Botswana cases, the disruption caused by attempts to introduce individual private tenure led to proposals for the introduction of private tenure on a group basis which failed largely because of the conceptual and administrative disabilities. For example, the simple imposition of development of grazing schemes by development planners without detailed local planning involvement may prove a costly learning exercise, as has been the case in Botswana (Sweet, 1987) and Kenya (Hogg, 1987). One point worthy of note is that even though the models failed because they were based on an incorrect view of the reasons why a specific production strategy was followed, they still provide an important starting point for the construction of stock development strategies (Düvel and Afful, 1994 and Monu, 1995). Hardin's model has, however, been widely criticised by Runge (1981) and others including Vink (1987), Roe (1988), Shepherd (1989), MacKean (1992) and Monu (1995).

Runge (1981) offers an alternative model to solve the problem and challenges the 'Tragedy of the Commons' assumption based on the Prisoner's Dilemma game on theoretical and empirical grounds. He rather defines the 'commons' problem as one of co-operation which he calls the Assurance Problem (AP) based on the "Battle of the Sexes"game (Luce & Raiffa (1957) as quoted by Runge, 1981) rather than one of conflict. He further argues that uncertainty is the major motivating force in over-exploitation of the common property resources. The assurance problem, Runge (1981) says, is a formal way of looking at interdependence and uncertainty associated with non-separable externalities. This means that the collective use of a common grazing area is not a separable behaviour. Choices to graze on a common range are not made by each individual in emptiness; rather they are conditioned on the expectations of the likely behaviour of others. Co-ordinated strategies evolve inside the structure of the game, he argues. In this sense they mirror institutional rules, which by providing assurance, extend the set of possible solutions. By providing security expectations, that is, assurance, reliable institutions are endogenous responses to the uncertainty of social and economic interacting (Monu, 1995).

Runge (1981) indicates that overgrazing results from the inability of interdependent individuals to harmonise their actions rather than from a strict dominance strategy. In other words, to achieve Pareto-Superior outcomes of range preservation through stinting (limited grazing on the commons), a co-ordinated strategy must be devised according to some set of rules-institutions. This can provide some assurance regarding actions of others (Düvel & Afful, 1994). Runge (1981) and others, including MacKean (1992) and Monu (1995), believe that co-operative solutions offer no incentive to defect. MacKean (1992:248) notes that the key element determining the success or failure of institutions is that the solutions wanted all require not just regulation but co-operation with regulation. This is what biologist Garrett Hardin (1968) has neatly described as "mutual coercion mutually agreed upon", thus corroborating Runge's assertion.

The lesson from the assurance game is to let individuals have full freedom to innovate self-binding rules which best serve their needs before enforcing rules from outside (which may be needed but are expensive visa-a visa voluntary co-operation) which should be considered a second best (Düvel & Afful, 1994). It is necessary to note that

if endogenous (within) changes to rules in a common property regime are not forthcoming, regulation by an external authority is unlikely to succeed (Vink & Kassier, 1987:177 quoting Libecap and Wiggins, 1984, 1985). The reason is that if participants cannot reach agreement among themselves, they will oppose regulation. The reasons for opposition usually include the establishment of vested interests in the rent, which is currently gained by participants. In this view there is doubt about the ability of policy makers to increase the efficiency of resource use if this has redistributive consequences and the groups harmed have political influence. Policy aimed at adapting common property rules therefore, needs to take these vested interests into account. This serves as an additional caution to reliance on externally imposed regulations (Vink & Kassier, 1987:177).

However, where the cost of maintaining or achieving co-operative rules is too high, outside enforcement could be necessary. If not, the introduction of private property rights (in land or some other instrument) could achieve the desired objectives. Runge (1981:604) says that such rules will be better suited to the needs of the group (whatever its size because assurance is largely a matter of information conveyed via transactions and communications) and it is more likely to succeed if based on this premise. Frohlich and Oppenheimer (1970) are of the opinion that enforcement from outside the group is not a sufficient condition for preservation of a public good such as range quality. This is because there is nothing to prevent the enforcing authority from abusing its position and putting control of land in the hands of a favoured few with no interest in preservation or range quality (Düvel & Afful, 1994). This once again strengthens Runge's claim.

In this regard Vink (1986:196) quotes Lawry, (1985:61-62); Lawry et al., (1985:19) and Runge, (1986:631-32) to the effect that: "Policies based on the conventional approach to the problems of the livestock subsector have failed because they have been aimed at the removal of the existing tribal land rights system, and do not take account of the economic, physical and social environment within which livestock holders operate, nor do they take account of changes to this environment". The authors (Shepherd, 1989; Keijsper, 1992 and Monu, 1995) also identify a number of reasons why changes to the communal grazing regime should remain common property characteristics.

First, most stockholders have small herds and could not finance a ranching operation even if their intentions were to farm animals on a commercial basis. Second, many of the grazing areas are in arid or semi-arid regions, and livestock production is land-intensive. Private tenure will not enable herders to move animals to new pastures as the seasons change unless farms are large enough, which in turn is an unrealistic scenario under present "national" border arrangements in Botswana.

Third, policy makers often ignore the cost of tenure change to the small farmer. Private property usually involves high transaction and enforcement costs while common property institutions are usually less costly and better adapted to local conditions. The costs of maintaining private property institutions will in any case most probably be circumvented by individual if it is not in their interest to incur them.

Fourth, close reliance on natural resources for survival implies that phenomena such as a drought fall unequally on different members of the group. If those adversely affected are large proportions of the group, common property may ensure social stability in the short run while allowing the group to adapt to changing conditions over time.

Fifth, the right to be included in the group which has access to grazing rights is a hedge against individual failure where people are living at the margin between starvation and survival. As the level of risk, which the community faces, increases, the importance of the hedge also increases. Finally, the opportunity costs of changing current rules are high. If these current rules meet the needs of the community in their present form there will be a resistance to change.

Cousins (1989:34-35) in his modified framework labelled "a political economy model of common property regimes" however, indicated one new element of "key actors" in recognition of the complexity of political dynamics at work in common property situations and the consequent need to clearly identify the agents engaging in interaction and struggle. His model emphasises the ecological and technological characteristics of the grazing resource in order to focus attention on the resource in question within a larger ecological resource use system. The ecological perspective also helps to bring into focus the place of the common property regime in overall

production system (Düvel & Afful, 1994). It is not hard to understand why this is necessary because the communal grazing land may play different roles in the livelihood strategies of livestock owners in different places. For example in Zimbabwe, the supply of inputs to arable production is critical while in Botswana cropping is less important but beef production is important (Parson, 1981), and more differently so, livestock in Lesotho plays a major role as retirement benefit for returning migrant workers (Düvel & Afful, 1994, quoting Murry, 1981).

The ecological characteristics of the grazing resource need to be totally taken into account if the livestock production system is to be environmentally adaptive (Düvel & Afful, 1994:36). According to Cousins (1989), power relation is a better focus than decision making, because power structures are integral to property regimes and power over the distribution of benefits often account for institutional change. This emphasis on power relations even becomes more important when one considers the fact that in communal grazing areas as they exist in Botswana and South Africa, both the tribal leaders and other important people own large herds (Parson, 1981:244 and Vink, 1986:185).

Related to the issue of power relations is the question of the patterns to interaction and struggle inherent in managing common property. In Cousin's view this emphasis is necessary because beside individuals, there are other kinds of collective identifications, for example, kinship networks, farmer's groups, women's groups' etc., which operate in the community. In this kind of interactions, Cupertino and non-Cupertino are not the only primary strategies; others include the enforcement and application of sanctions or monitoring user group member's behaviour. This implies that interaction may involve coalitions and alliances between groupings within a community. It is therefore, possible, for example, to have local interest groups building alliances with external agents such as state officials or development agencies (Düvel & Afful, 1994). Within the context of managing communal resources like grazing lands, patterns of interaction then must include notions of political struggle, which can take many forms including direct and non-confrontational modes. The outcomes of this interaction and struggle can be broadened so that, beside efficiency and equity considerations, questions like whose intentions were realised or served in the struggle over common property can be addressed (Düvel & Afful, 1994).

In this whole scenario of managing common property, the major or key actors who engage in interaction and struggle over common property need to be highlighted to conclude the refinements that Cousins made (Düvel & Afful, 1994). This new element is necessary in view of the complexity of the political dynamics at work in common property situations. From this review of the theoretical discourse around the management of common property regimes emerge certain factors contributing to sustainable use of communal property systems (Monu, 1995:90), which form the current thinking in any management decision regarding communal grazing resources. Monu (1995) therefore, indicated that, Associates in Rural Development Inc. (1992) has recently identified what it refers to as "Institutional Conditions for Sustainable Natural Resource Management (NRM) Related to Decentralisation and Local Authority".

First, there must be incentives for resource users to govern and manage the natural resources sustainably including an acknowledged authority to control access and membership. Thus, it is important to consider cultural incentives as well as economic ones.

Secondly, any regime of natural resources management that is developed must be based on indigenous knowledge or a combination of outside knowledge and indigenous knowledge. Resource users are knowledgeable about their environment and any changes that might occur. The attempt here is not to deify indigenous knowledge but rather to suggest that it is better to build on what the people know.

The third condition is that self-governing institutions must exist in the resource area and the resource users must participate meaningfully in the decisions that affect the management of the resources. Local institutions are more likely to have an intimate knowledge of the resources and the environment, a better understanding of the access and use regulations. In addition, local institutions are more likely to be sensitive to the resource needs of the residents.

Another important condition is that there must exist a mechanism for conflict resolution. Community level conflict resolution mechanism is essential for effective

sustainable resource use. Conflict resolution mechanisms or institutions must be locally based rather than centrally designed.

Finally, national and regional policies and institutions must create an enabling environment for sustainable resource use. User tenure rules, for example, are essential in creating an enabling environment for natural resources use. National policies must recognise and promote local level institutions for conflict resolution and enforcement, education and extension support.

In summary, the political economy model and institutional conditions for sustainable natural resource management related to decentralisation and local autonomy does justice to important problems facing managers of communal grazing resources and can be considered as most important for success regarding the problem on our hands for the following reasons.

First, it retains the communal property characteristics of communal grazing. This has also been indicated by other writers including Runge (1986:631), Vink et al. (1987:177-80), Roe (1988:164-97), Shepherd (1989:52), MacKean (1992:248), Keijsper (1992:35-47), and Monu (1995:81-93). It is also flexible enough to take into account the spatial, socio-economic difference in the communal grazing areas. Bembridge and Tapson (1993) support this view.

Furthermore, the institutional conditions for sustainable natural resource management embodies the most important principal conditions, the need for common property institutions, which is impossible without taking into account inter-dependence and uncertainty in individual decision making. Once this need is accepted, then the factor of non-separable externalities (marginal private costs and marginal social costs) becomes recognized (Düvel & Afful, 1994).

Finally, it recognises the importance of achieving efficiency and equity in the use of communal resources (like the grazing) to further the ends of society. These conditions can therefore, form the framework for developing a communal livestock management strategy which can achieve balance between the needs and interests of society as a whole and the stock owner as an individual (Düvel & Afful, 1994).

3.3 MODELS OF ADOPTION BEHAVIOUR

According to Düvel & Afful (1994:39), "while there is still an on-going debate as to which is the most appropriate solution to the problem of retrogression of natural resources and particularly the natural grazing, the critical and decisive issue is that they will have to be adopted by the farmers. This brings to the fore the crucial role of the human being, and the challenge to understand and influence his adoption behaviour."

They further suggests that, "in spite of a magnitude of valuable contributions from the various human sciences that all have the common objective of understanding human behaviour, there is as yet no theoretical concept or model that makes adequate provision for the complexity and dynamics of human behaviour and, at the same time, is simple and practical for the practitioner in providing guidelines for the systematic identification of the causes of behaviour and for bringing about change in a systematic and purposeful manner."

Düvel & Afful (1994:40) stated that, the effective search or identification of the relevant causes of adoption behaviour, is only possible with a suitable and well founded theory because of the great diversity and the complex structure of the variables commonly involved." Over the decades and especially since the classical investigation by Ryan & Gross (1943) into the adoption and diffusion of hybrid seed maize, different approaches and concepts have been proposed and used. Thus early approaches include, according to Bennis (1965:348-49), the training approach, the consulting approach, and the research in which the results are used systematically as an intervention. It was only with the situational functional approach that a major contribution was made. "In contrast to the former approaches, it accepts behaviour change to be the result of an interplay of a number of dynamically interdependent variables, thereby resembling the nowadays popular and often referred to systems approach. This implies an almost endless number of potentially relevant variables. However, which factors are functional in a specific situation, cannot be answered from a fixed general inventory or codex, but requires an extensive, time consuming, specific situation analysis, hypothetically testing all possibilities" (Düvel & Afful, 1994:40).

According to Düvel & Afful (1994:40), "valuable guidelines, perhaps more useful for planning and designing extension approaches or strategies than for identifying the causes of determinants of behaviour, evolved from propositions concerning the adoption process." The classical five stadia concept (awareness, interest, evaluation, trial, adoption) as indicated by Campbell, (1966) was widely accepted as a popular scheme for the adoption process in spite of the criticism expressed by Rogers and Shoemaker, (1971) who thereupon designed the innovation-decision process. This concept was later revised (Rogers, 1983:165) and consists of the phases knowledge, persuasion, decision, implementation and confirmation.

Knowledge as initial stage is misleading if interpreted in the narrow sense of the word, and vague or of little practical value if the concept is understood to imply all cognitive aspects (Düvel & Afful, 1994). The well-known phenomenon that a mere dissemination of knowledge very often fails to elicit the desirable action or behaviour change is not explained. Needs, which, in the form of problem perception, already feature very prominently in Campbell's (1966) model and are increasingly accepted as critical, if not the key dimension in behaviour change are merely seen as 'prior' condition. This has also been emphasised by Johnson, et al. (1987) when defining needs.

They also indicated that, " just as there are different theories of the problem, different concepts of need also exist." A *normative need* is said to exist when a standard of service or of living is established and certain people are found to fall short of enjoying that desirable standard. *Comparative need* is not based on a set standard but rather on the relative position or condition of a group when measured against some other group. *Felt need* is a need perceived by individuals experiencing the problem. It may be equated with want and is phenomenological in character. *Expressed need* is a felt need that is articulated as a demand. It is a need put into action in the form of asking for service, protesting, signing a petition, and so forth.

In seeking an appropriate theoretical concept relating to behavioural change in extension, Lewin's (1952) field theory can be most useful. Perhaps the most basic feature of Lewin's field theory is, without going into detail, that it regard behaviour (B) of an individual to be a function (F) of the total situation, viz. the life space (LSP),

consisting of both the condition of the individual (P) and the environment (E), factors which are closely interdependent. This can be formulated as follows:

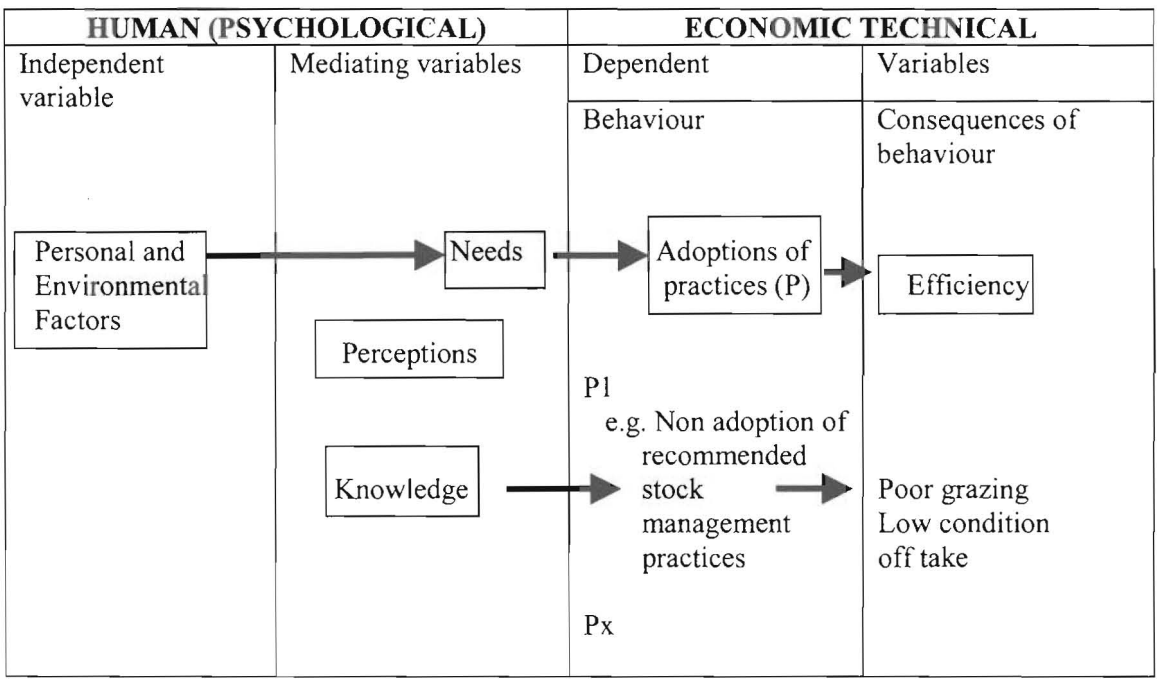
$$[B = f(P, E) = f(Lsp)].$$

In spite of the many positive attributes and promising features, the field theory, in general, failed to evoke much enthusiasm and consequently found little practical implementation (Düvel & Afful, 1994). Long (1992:20) made a valuable contribution in drawing the attention to the fact that, "a more dynamic approach to the understanding of social change is therefore needed, which stresses the interplay and mutual determination of 'internal and external' factors and relationships, and which recognises the central role played by human action and consciousness." However he said, one way of doing this is through the application of 'actor - oriented types of analysis, ranging from transactional and decision - making models to symbolic interactionist and phenomenological analysis.

Tolman (1961) introducing his theory based on the assumptions that behaviour is intentional, governed by expectancies and the outcome of the individuals behaviour space, introduced the valuable concept of intervening variables. In the context of Lewin's field theory this would imply distinguishing between (a) variables that have an intervening nature, and thus a direct influence on decision - making or behaviour and (b) between, those that are of a more independent nature. Only the former would qualify as forces directly responsible for bringing about change, while the latter, namely the more independent factors, although they have an influence on the forces, not be regarded as forces as such (Düvel & Afful, 1994).

This then provides a possibility whereby the great number of variables already found to have been correlated with behaviour (Rogers, 1983: 261), can be effectively reduced to a "check - list" that is surveyable and is still sufficiently comprehensive to directly or indirectly make provision for all causes of behaviour, namely by the subdivision of behaviour determinants, into independent and intervening variables and concentrating on those variables or determinants that are the most imminent, that is, the last or most immediate causes of a particular act (Düvel & Afful, 1994).

The implied assumption is, and this is supported by research findings (Düvel, 1991), that the influence of the independent variables becomes manifested in behaviour via the intervening variables. The obvious variables on which attention therefore needs to be focused in behaviour analysis are the intervening variables. These, according to extensive research by Düvel (1991), can be broadly categorised into needs, perception and knowledge. These intervening variables represent the main human determinants. In the context of the problem under review the assumed interdependency of behaviour, the consequences of behaviour and behaviour determining variables in relation to the problem of poor grazing and stock management and the suggested solution of fencing can be illustrated as follows (Figure 3.1).



(**Source**: Düvel, 1991)

Figure 3. 1: The relation between behaviour - determining variables, the behaviour (stock management) and its consequences

3.4 HYPOTHESES

Using this model of Düvel (1991), in the context of the problem of poor grazing and stock management and the suggested solution of fencing, leads to the following hypotheses.

1. The conservation status of the natural grazing (rangelands) is a function of the adoption of recommended conservation practices.

2. The adoption of conservation practices (i.e. fencing of rangelands and the recommended stocking rate) is influenced by livestock farmers' perceptions and needs. More specifically the non-adoption can be attributed to the following:

2.1 Insufficient needs resulting from; a misperception or over-estimation concerning the status of natural grazing and of the efficiency of practice adoption,

2.1.2 a limited aspiration scope concerning the need for improved grazing management, and

2.1.3 a perceived incompatibility of conservation efficiency and conservation practices with livestock farmers' needs and problems.

2.2 An unfavourable perception concerning the solution of stock reduction,

2.2.1 a perceived low prominence of stock reduction compared to other alternatives,

2.2.2 an unawareness of the advantages of stock reduction, and

2.2.3 an awareness and concern about disadvantages and constraints of stock reduction.

The management of communal grazing lands, depending on appropriate theoretical models, has been discussed with the understanding of how these systems function and the intervention measures required. This therefore, suggests that attention therefore needs to be focused on behaviour analysis of the intervening variables (needs, perception and knowledge). The issue now, based on the hypotheses above, is to

discuss the methodology used in carrying out this research study. This issue is the focus of the next chapter.

CHAPTER 4

METHODOLOGY

4.1 INTRODUCTION

This chapter outlines the methodology used in the investigation of the acceptability and influence of rangeland fencing with special reference to the Southern Region. The description of the study area, questionnaires design, sampling procedure, survey and data processing and reliability are discussed.

4.2 DESCRIPTION OF STUDY AREA

Although the problem is a national one, the limited research resources enforced a delineated and more focused research area. It was conducted in the Ngwaketse District in the South East of Botswana, with an area of 26,876 square kilometres and consisting of both hardveld and sandveld (Figure 4.1). The hardveld covers approximately one-third of the district and the sandveld covers the remaining two-thirds. The population is estimated to be 160,000 people while the number of livestock is approximately 99,000 cattle. The reason why Ngwaketse District was selected was that the area met the conditions of availability, proximity and homogeneity in terms of climate and vegetation.

In order to effectively identify the constraints preventing modifications to the traditional system of managing communal grazing in conjunction with limiting stock numbers and fencing of communal grazing areas, both "adopters" and "non-adopters" (of the fencing component) had to be interviewed. For this reason, the Southern Region or Ngwaketse District (Figure 4.2) was selected because it is a relatively confined area having all types of grazing systems and their management variations which are bound to influence the perceptions regarding fencing of communal areas, grazing management and stock reduction (Table 4.1).

The grazing systems referred to are: Individual ranch (ranches owned by individual farmers), Group or syndicate ranch (owned by more than two people on partnership base), community ranch (owned by the community members) and communal ranch which refers to an open grazing accessible to all.

Figure 4. 1: Map of Botswana indicating the area of research study

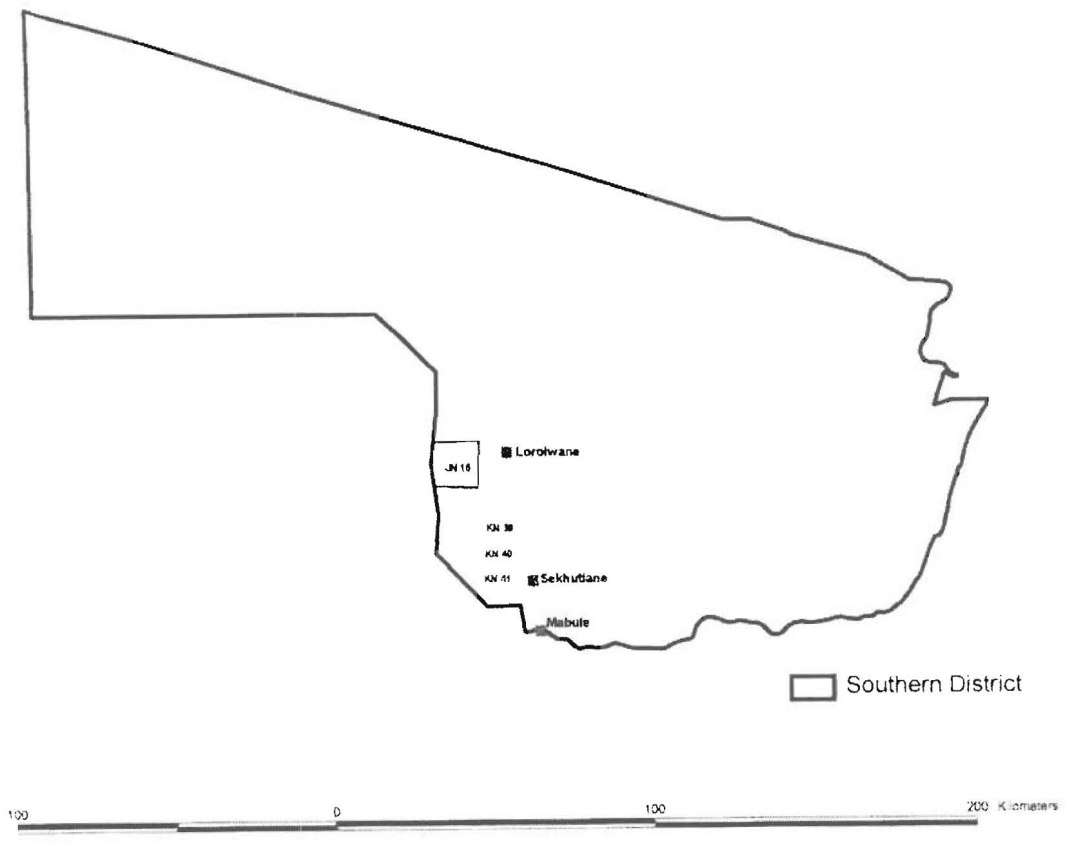


Figure 4. 2 Southern District indicating areas of study

4.3 SAMPLING PROCEDURE

With a view of minimising the influence of other external factors and interactions having little or no bearing on the investigation, the sixty eight traditional farmers (members of a communal ranch) were selected as a 60% random sample from the three villages (Lerolwane, Sekhutlane and Mabule) adjoining the group and individual ranches. This was with a view that communal rancher's opinion regarding other types of ranching are only meaningful if they have some knowledge about them.

As far as individual ranchers, 16 (50 percent) farmers were available for interviewing and were included in the survey. In group or syndicate ranches, all 27 members from ranches KN39, KN40 and KN41 were included in the survey.

On JN16 ranch, which is a community ranch around Lerolwane village, all 21-ranch members were available for interviewing and were included in the survey. Prior to sampling a list of all ranches and communal farmers (non-ranchers) was made available by the extension officers in charge of the respective areas.

Table 4. 1: Livestock farmers interviewed based on ranching system, 1996

Ranching system	% Respondents per ranching system		
	n	% sample	% of respondents
Individual (N=32)	16	50	12.1
Group/syndicate (N=27)	27	100	20.5
Community (N=21)	21	100	15.9
Communal (N=113)	68	60	51.5

N = population; n = sample

4.4 DEVELOPMENT OF INTERVIEW SCHEDULE

The nature of the research viz. the identification and analysis of respondents' needs, perceptions and knowledge concerning the various aspects of grazing management and stock reduction called for a personal interview as a means of data collection.

Other reasons (Düvel & Afful, 1994) for selecting the personal interview schedule as a means of data collection are the following:

The possibility to keep the respondent interested and attentive for a longer period of time during the lengthy interview.

- It allows the interviewer to ensure that the respondent does understand the questions and the purpose of the study.

- It allows for various observations and assessment of various aspects like the grazing condition of stock, the rating of attitudes, etc.

- More opportunity exists for probing for more information.

The interview schedule was developed on the basis of a problem conceptualisation relating to assumptions formulated in the hypotheses generated in chapter 3.

After completing the construction of the questionnaire a pilot survey was done to pre-test the questionnaire. For this purpose ranch and communal (traditional) farmers were interviewed in the Gaborone Region several hundred kilometres from the survey area. The major finding was that the length of the interview time per farmer would be around 1½ to 2½ hours.

The following steps were undertaken to ensure that the data collected was as reliable as possible:

(a) Proper selection and training of interviewers

Gaining the co-operation of the Division of Planning and Statistics (Ministry of Agriculture) and using their previous enumerators as interviewers enhanced the acceptability of interviewers. They were furthermore oriented and trained concerning the reasoning behind and the meaning of the questions, as well as their interpretation and coding, and the ways to establish rapport and gain the co-operation of the respondents.

(b) Obtaining goodwill, trust and co-operation

A challenge for any large organisation is to build a shared vision where officials at all levels are of the utmost importance both for the success of the research itself and the implementation of the results thereafter.

Initially, a formal proposal outlining the problems, motivation, objectives and the methods of the study was discussed with the Division of Planning and Statistics (Ministry of Agriculture) and approved by them. Thereafter the tribal authorities, including the chiefs and headmen concerned were informed of the scope and objectives of the study. Extension staff at all levels were very much involved at this stage as local tribal authority meetings were conducted in their areas where the objectives and need for such a study were explained in detail.

(c) Involving a Setswana specialist in the final translations of the questionnaire into Setswana

(d) Frequent attendance of interviews by the writer in his role as co-ordinator and thereby exerting control and safeguarding uniform interpretations and assessments.

(e) Involvement of enumerators in providing objective measures. In order to correctly evaluate the subjective ratings of respondents concerning the condition of their natural grazing, enumerators were commissioned to do an independent and objective veld assessment of the same grazing which is grazed by the respondents' cattle based on the type of grazing system (chapter 8).

4.5 THE SURVEY AND DATA PROCESSING

The survey began on November 4th, 1996 and was completed on December 20th, 1996. The writer sat with each enumerator at one of the interviews to give guidance and direction where it was necessary. At each survey area, four enumerators were involved as interviewers. After completion of each interview schedule by the enumerator the writer then checked each interview schedule that was turned in. The computer centre of the University of Pretoria did the processing and calculations of the data. The computer programme SAS (Statistical Analysis System) software system was used for this purpose. In all, a total of 132 livestock farmers were interviewed. The breakdown of the 132 livestock farmers interviewed, based on specific names of the communal areas, community, group and individual ranches included in the survey, are shown in Table 4.2.

Table 4. 2: A specific breakdown of the 132 livestock farmers interviewed per ranching system, 1996

Ranching system	Respondents per ranching system	
	n	% respondents
Individual ranching (n=32)	16	12.1
Syndicate ranching-KN 39 (n=6)	6	4.6
KN 40 (n=13)	13	9.9
KN 41 (n=8)	8	6.1
Community Ranching – JN 16 (n=21)	21	15.9
Communal Ranching – Lerolwane (n=28)	15	11.4
Sekhutlane (n=35)	21	15.9
Mabule (n=50)	32	24.1

Some problems were encountered among the individual ranch respondents. They were reluctant to respond to certain questions thinking that they were below their standard. The researcher however, found it necessary to meet with the respondents personally and the objectives were once again explained to them and good human relationships were developed between all persons concerned.

4.6 QUALITATIVE RELIABILITY

Every possible precaution was taken during the interview to explain the objectives and background to the survey and questions were phrased in such a way as to avoid prejudice and bias among the subjects.

This not withstanding, it would be presumptuous to think that the data were completely accurate throughout.

Errors can be the results of the following:

- poor training of interviewers

- poor interviewing by enumerators
- incorrect translations and transcriptions
- faulty processing of data
- use of proxy information (that is, respondent is not the real or actual owner of the cattle)
- telescoping (respondent misallocating events in time, for example, expenditure in the month)

The use of different interviewers in the different survey areas could also be a major limitation of this work. Furthermore, the length of the interview time, about 1½ to 2½ hours, could have made respondents tired and therefore resulted in inaccurate responses.

Although many of these cannot always be overcome in a survey of this nature, numerous attempts were made to minimise their effects.

These included:

- Pilot survey monitoring of the questionnaire and re-training during the survey period where necessary.

- Writer sitting at interviews with interviewers or enumerators to direct and guide interviewers or enumerators where necessary.

- Comprehensive training by writer and correction of problems which arose through additional informal training by the writer.

- Cross - checking with colleague for the accuracy of the Setswana translation.

- Flexibility for a break where it took more than 1½ hours to interview.

In this chapter the methodology used in the investigation of the study has been described. The next chapter describes some aspects of the area under discussion, its

farm types, stock numbers as well as the resource conditions relevant to a study of livestock development.

CHAPTER 5

CURRENT SITUATION

5.1 INTRODUCTION

The problem that gave rise to this study is the deterioration of grazing condition being the result of high stocking rates and the traditional grazing systems and ranches found in Botswana.

This chapter addresses the background situation in the study area, in terms of the current conditions of resources, types of farms, number of stock, as well as some background information concerning some personal variables of the respondents.

5.2 TYPES OF FARMS

The current situation regarding the types of farms in the survey area were summarised in Table 4.1 in chapter 4 above. The farms were classified into individual, group or syndicate, community, and communal farms.

In addition to a question regarding the present type of farming, respondents were also asked to indicate if they have more than one type of ranching system. These findings are summarised in Table 5.1.

The findings in Table 5.1 indicate that one-quarter (25%) of the respondents on individual ranches keep their stock on more than one type of ranch, that is, on individual and communal ranches. As far as the group or syndicate ranchers are concerned, one third (33%) of them also keep their stock on communal ranches, while only 5% of the community ranchers have stock on both community and communal ranches. This effectively means that over and above the 68 respondents classified as communal ranchers, 14 other respondents or ranchers are making use of the communal ranch.

Table 5. 1: Distribution of respondents indicating respondents with more than one type of ranching system based on ranch type, 1996 (N = 132)

Ranch types	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	n	%
Individual	12	75							12	9.1
Individual plus communal	4	25							4	3.0
Group/Syndicate			18	67					18	13.6
Group plus communal			9	33					9	6.8
Community					20	95			20	15.2
Community plus communal					1	5			1	0.8
Communal							68	100	68	51.5
Total	16	100	27	100	21	100	68	100	132	100

The other independent variables such as age group, educational level and herd sizes were analysed for their influence on the usage of more than one ranch by respondents (Table 5.2). All the three types of characteristics of the respondents showed a clear association with the usage of more than one ranch type.

According to Table 5.2, respondents on the age group 30 t0 49 had the highest proportion of having more than one grazing ranch type; this was followed by those respondents from the age group between 50 to 69 years. This suggest that those respondents aged 30 to 69 used more than one ranch type than respondents aged less than 30 and those aged greater than 69 (r=-0.24: p0.01).

The educational level attained indicate that those respondents with primary (1 to 7 years) and post primary (more than 7 years) educational level used more than one ranch type than those with no education (r=-0.38; p0.01). Because more educated respondents appear to have more than one ranch type, it seems reasonable to assume that they have some sources of generating more income (running their businesses) to buy more stock to increase their herds.

Table 5. 2: Distribution of respondents indicating respondents with more than one type of ranching system based on age group, educational level and herd size, 1996 (N = 132)

Age group	Respondents per ranch type											
	Individual		Group		Community		Communal		More than one ranch type		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
< 30	-	-	-	-	-	-	2	2.9	2	14.3	4	3.0
30-49	2	16.7	1	5.6	8	40	28	41.2	6	42.9	45	34.1
50-69	8	66.6	9	50.0	9	45	32	47.1	5	35.7	63	47.7
> 69	2	16.7	8	44.4	3	15	6	8.8	1	7.1	20	15.2
Total	12	100	18	100	20	100	68	100	14	100	132	100
Education level												
None	-	-	7	38.9	18	90	37	54.4	2	14.3	64	48.5
1-7 Years	7	58.3	7	38.9	2	10	26	38.2	8	57.1	50	37.9
>7 years	5	41.7	4	22.2	-	-	5	7.4	4	28.6	18	13.6
Total	12	100	18	100	20	100	68	100	14	100	132	100
Herd size												
< 20	-	-	2	11.1	14	70	37	54.4	1	7.1	54	40.9
21-50	-	-	7	38.9	4	20	19	27.9	6	43.0	36	27.3
51-100	-	-	5	27.8	1	5	8	11.8	3	21.4	17	12.9
101-150	1	8.3	3	16.7	1	5	2	2.9	-	-	7	5.3
I51-300	6	50.0	1	5.6	-	-	2	29.	3	21.4	12	9.1
> 300	5	41.7	-	-	-	-	-	-	1	7.1	6	4.5
Total	12	100	18	100	20	100	68	100	14	100	132	100

The pattern emerging from the examination of the respondents' herd size, in relation to the use of more than one ranch type seems to show that, as the herd size increases the need to have more than one ranch type also increases (r=-0.67; p0.01).

These findings are supported by Tsimako's (1991:25), that ranchers choose to leave some of their cattle in the communal areas as insurance (security) against total loss in cases of disasters such as drought, fire, disease etc. In this way, farmers with ranches benefit disproportionately because in addition to having exclusive rights on their ranches, they also have access to communal grazing (Tsimako, 1991:25).

5.3 SOME PERSONAL ASPECTS OF RESPONDENTS

With a view to a better understanding and appreciation of respondents involved in the survey, some personal characteristics are briefly presented (Düvel & Afful, 1994:64).

Table 5. 3: Distribution of personal characteristics of respondents based on ranch type, 1996

Characteristics	Respondents per type of ranch									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	n	%
Gender (n = 132)										
Male	15	93.7	26	93.3	21	100	62	91.2	124	93.9
Female	1	6.3	1	3.7	-	-	6	8.8	8	6.1
Total	16	100	27	100	21	100	68	100	132	100
Age groups (n = 132)										
< 30 years	-	-	1	3.8	1	4.7	2	2.9	4	3.0
30 – 49 years	4	25.0	5	18.5	8	38.1	28	41.2	45	34.1
50 – 69 years	10	62.5	12	44.4	9	42.9	32	47.1	63	47.7
70 years plus	2	12.5	9	33.3	3	14.3	6	8.8	20	15.2
Total	16	100	27	100	21	100	68	100	132	100
Marital status (n = 132)										
Married	15	93.7	23	85.2	15	71.4	50	73.5	103	78.0
Divorced	-	-	-	-	-	-	1	1.5	1	0.8
Single	-	-	1	3.7	6	28.6	14	20.6	21	15.9
Widowed	1	6.3	3	11.1	-	-	2	2.9	6	4.5
Separated	-	-	-	-	-	-	1	1.5	1	0.8
Total	16	100	27	100	21	100	68	100	132	100
Education (n = 123)										
No formal school	1	6.3	8	29.6	10	47.6	31	45.6	50	37.9
1-7 Yrs schooling	4	25.0	12	44.4	10	47.6	29	42.6	55	41.6
8-12 Yrs school	10	62.5	7	26.0	1	4.8	8	11.8	26	19.7
>12 Yrs school	1	6.3	-	-	-	-	-	-	1	0.8
Total	16	100	27	100	21	100	68	100	132	100

Table 5.3 shows that farmers in the sample were predominately males (94%). Of the 6 percent female farmers, 4.5 percent are predominately in the communal ranches. The reason why not more women are involved in cattle rearing is, of course, a cultural one and closely relates to the overall traditional dissociation of women from cattle (Gulbrandsen, 1980:51-52). A high proportion, namely 63 percent are above the age

of 50. Especially among the communal and group ranches the higher ages seem to dominate. Most household heads (78%) are married, with usually only one wife. Thirty-eight percent of heads of households have received no schooling and are unlikely to be responsive to written forms of communication. The majority of these are found on communal and community ranches.

The average number of children is 1.9 (between one and two), but besides their own children they have on average (1.3) other dependants in their care (Table 5.4).

Table 5. 4: Mean number of dependants of respondents on different ranch types, 1996

Dependants	Mean number of dependants per ranch type							
	Individual		Group		Community		Communal	
	n =16	s.d.	n=27	s.d.	n = 21	s.d.	n = 68	s.d.
(a) Boys	1.5	0.8	1.7	0.8	1.6	0.7	1.6	0.7
(b) Girls	1.5	0.7	1.7	0.8	1.6	0.7	1.5	0.7
(c) Children (a + b)	1.9	0.7	2.0	0.8	1.9	0.7	1.8	0.7
(d) Dependants (other)	1.2	0.4	1.2	0.5	1.3	0.7	1.3	0.6

In general there is some similarity as far as the mean number of children (a + b) is concerned based on type of ranching. These findings also indicate that on average community and communal ranchers had more dependants compared to other ranchers.

5.4 NUMBER OF LIVESTOCK

Livestock production in Botswana takes place on natural rangelands, which are mostly communally owned (Van Der Jagt, 1993:1). Planning for sound herd management requires better methods of range management in part through fencing, reticulation of water and adoption of improved methods of livestock management, for example; controlled breeding, supplementary feeding, artificial insemination designed to improve herd quality as well as rotational grazing (Tsimako, 1991:21). Often individual, group or syndicate and community ranchers own large herds of cattle.

The respondents were asked how many livestock they keep. The livestock included bulls, cows, and calves less than one year, oxen, heifers, goats, sheep and donkeys/horses. Of the 132 individual farmers interviewed 125 had cows, 90 had goats, 31 had sheep and 99 had either donkeys or horses (Table 5.5 shows the mean number of livestock per households).

Table 5. 5: Mean number of livestock (cattle) kept as indicated by respondents, 1996

Livestock type	Mean number of livestock per respondents			
	No. of respondents	No. of livestock	Std. Deviation	Range
Bulls	77	2.64	3.15	1-20
Cows	125	46.92	75.79	1-400
Calves	123	25.46	45.17	1-300
Oxen	79	16.82	33.34	1-205
Heifers	100	20.04	29.40	1-156
Goats	90	32.64	48.37	1-270
Sheep	31	45.32	67.99	1-300
Donkeys/Horses	99	9.72	6.92	1-39

The general picture that emerges from Table 5.5 is that livestock is the predominant type of lifestyle and that the herd size, as reflected by the standard deviation and range varies tremendously. These findings also seem to indicate that the average calving percentage is in the region of 54 percent (number of calves divided by the number cows plus number of heifers multiplied by hundred), which leaves a lot of room for improvement.

The mean distribution of herd size on the different ranches indicates that individual ranches had the highest average herd size for mature livestock unit of 329.2 (add all the means for bulls, cows, oxen and heifers) followed by group ranch with 57.9 mature livestock unit (Table 5.6). The average bull cow ratios also indicate that individual ranches had the highest bull cow ratio of 5.1:202.3 followed by group ranches with 2.1:34.4 bull cow ratio. Based on the ranch type, the findings also indicate that the calving percentage differs, with individual ranch being the highest.

The sum indicates the total number of stock per ranch type (bulls, cows, calves, oxen, heifers, goats, sheep, and horses and donkeys).

Table 5. 6: Mean distribution of herd size and composition according to different ranches, 1996

Ranch type		Mean stock per ranch type							
		Bulls	Cows	Calves	Oxen	Heifers	Goats	sheep	Horses donkey
Individual	Mean	5.1	202.3	107.8	55.0	66.8	71.2	62.2	14.6
	Sd.	5.1	117.0	81.4	60.3	45.0	60.0	85.0	10.0
	Range	20.0	325.0	285.0	205.0	156.0	200.0	300.0	39.0
	Sum	82.0	3034.0	1725.0	880.0	1068.0	1139.0	995.0	233.0
Group	Mean	2.1	34.4	18.2	7.7	13.7	17.9	5.1	1.7
	Sd.	2.9	25.3	15.0	7.9	11.2	26.4	15.0	3.7
	Range	13.0	100.0	65.0	32.0	40.0	117.0	73.0	18.0
	Sum	56.0	928.0	492.0	209.0	370.0	483.0	137.0	47.0
Community	Mean	0.7	14.0	5.9	1.4	2.3	14.5	2.1	9.4
	Sd.	1.0	22.0	10.5	3.3	5.0	21.9	8.7	7.1
	Range	4.0	100.0	50.0	15.0	20.0	80.0	40.0	27.0
	Sum	14.0	294.0	124.0	30.0	49.0	305.0	44.0	198.0
Communal	Mean	0.8	20.8	11.6	3.1	7.6	14.9	3.4	7.1
	Sd`.	1.2	27.5	15.6	5.4	12.9	41.1	18.6	6.0
	Range	6.0	150.0	90.0	28.0	80.0	270.0	150.0	23.0
	Sum	52.0	1417.0	791.0	210.0	517.0	1011.0	229.0	484.0

5.5 CONDITIONS OF RESOURCES

5.5.1 Grazing and rainfall conditions

According to Field (1978:16) we are solely dependent upon nature, but, fortunately, nature is in many ways reasonably reliable and predictable. The most important factor of climate is the precipitation which may be in the form of dew, rain, or hailstones, all having different properties.

Grazing condition is the most important component of rangeland in cattle production (Field, 1978:55). This can be maintained in a stable state if ecological factors of climate, soil, plant and animal live are in balance. The current situation regarding the

condition of the grazing in the survey areas is as summarised in Table 5.6. Respondents made an assessment of the grazing conditions on the basis of their experience and knowledge.

Table 5. 7: Assessment by respondents of grazing condition on different ranch type, 1996

Grazing condition	Respondents per ranch type							
	Communal		Community		Group/Syndicate		Individual	
	n	%	n	%	n	%	n	%
Currently	(n = 129)		(n = 128)		(n = 129)		(n = 124)	
Don't Know	4	3.1	4	3.1	5	3.9	13	10.5
Poor	8	6.2	3	2.3	-	-	1	0.8
Fair	56	43.4	65	50.8	57	44.2	20	16.1
Good	61	47.3	56	43.8	67	54.9	90	72.6
Weighted average	3.3		2.8		3.4		3.6	
Three Years Ago	(n = 128)		(n = 128)		(n = 129)		(n = 124)	
Don't know	6	4.7	7	5.6	8	6.2	16	12.9
Poor	68	52.7	67	52.3	59	45.7	38	30.6
Fair	52	40.3	51	39.8	58	45.0	55	44.4
Good	3	2.3	3	2.3	4	3.1	15	12.1
Weighted average	2.5		2.0		2.5		2.4	
Five Years Ago	(n = 129)		(n = 128)		(n = 129)		(n = 124)	
Don't know	12	9.3	12	9.4	14	10.9	23	18.5
Poor	104	0.6	102	79.6	96	74.4	74	59.7
Fair	10	7.8	12	9.4	16	12.4	25	20.2
Good	3	2.3	2	1.6	3	2.3	2	1.6
Weighted average	2.4		1.6		1.9		1.9	

The findings in Table 5.7 indicate that the current grazing condition on all ranches except the community ranch were found to be fair to good. A detailed assessment of the grazing condition by enumerators and respondents on specific ranches is discussed in Chapter 8. The cause of the rather disturbing situation regarding the grazing

condition in all the grazing ranches, as indicated by Tsimako, (1991:24), might have been due to lack of knowledge on how to run a viable livestock ranch.

These findings also indicate that the grazing conditions for all the ranches have improved over the years as reflected by the weighted average. The extremely critical condition of grazing in all the four types of ranches (communal, community, group/syndicate and individual ranches) five years ago might have been due to the very severe drought in those years.

Like the rest of the country the Southern District has a semi-arid climate with summer rainfall. The rainfall season for the district is from November to March. The eastern part of the district receives more rainfall than the western part. The district has a mean annual rainfall range of 500mm to550mm.

Grazing conditions are often seen to be only a function of rainfall. The respondents were therefore, asked to give their own opinion on how the rainfall was in the previous five years (Figure 5.1).

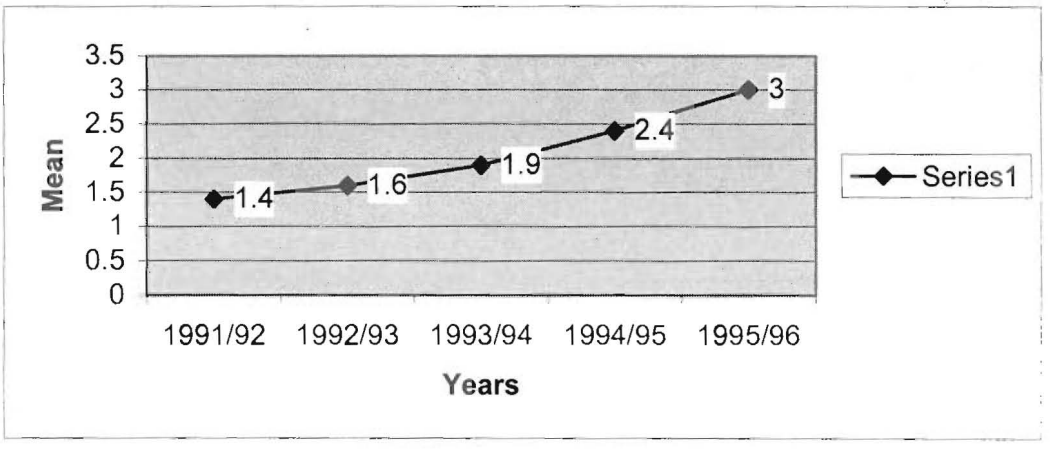


Figure 5. 1: Respondents' mean assessment of the rainfall in the previous five years, 1996

The findings in Figure 5.1, as reflected by the weighted averages from a 5 – point scale indicate an almost linear increase in the rainfall over the previous five years.

These findings also seem to indicate a similar situation of rainfall at the Masiatilodi ranch for the previous five years (Figure 2).

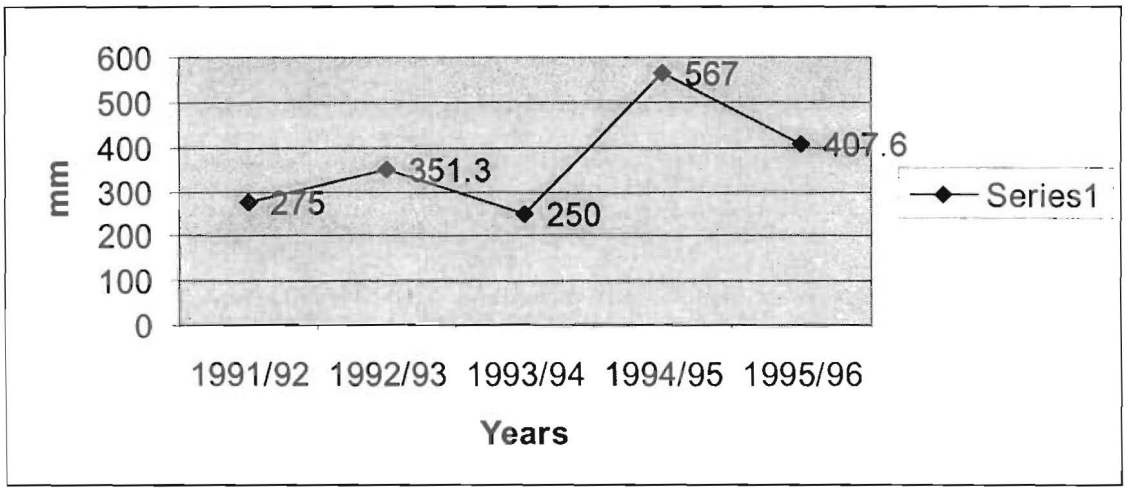


Figure 5. 2: Rainfall in millimetres at Masiatilodi for the previous five years, 1996

From these figures it can be seen that there are marked fluctuations in the rainfall from year to year which obviously affects the fodder production from the rangeland. The length of the dry season can be crucial and extended droughts may result in the death of livestock (Field, 1978:16).

5.5.2 Bush encroachment

The presence of increasing amounts of bush has been noticed to coincide with heavy stocking rates (Field, 1978:75). Bushes compete with herbaceous plants for moisture and thus reduce the grassland production of the rangeland.

To test whether respondents tend to underrate the current bush encroachment conditions, they were asked to rate the bush encroachment in their grazing areas (Table 5.8). These ratings were compared with those of enumerators, accepting that the enumerators' rating represented a more objective rating of the current bush encroachment conditions.

Table 5. 8: Respondents and enumerator's ratings of the degree of bush encroachment based on ranching systems, 1996.

Bush encroachment ratings	Respondents per ranch type							
	Individual		Group/Syndicate		Community		Communal	
Respondents	**n=125**	**%**	**n=129**	**%**	**n =128**	**%**	**n=128**	**%**
Very serious (1)	6	4.8	3	2.3	6	4.7	37	28.9
Serious (2)	25	20.0	39	30.2	37	28.9	21	16.4
Fair (3)	65	52.0	80	62.0	78	60.9	59	46.1
No problem (4)	29	23.2	7	5.4	7	5.5	11	8.6
Mean	2.5		2.7		2.9		2.5	
Enumerators	**(n=132)**		**(n=132)**		**(n=132)**		**(n=132)**	
Very serious (1)	-	-	-	-	-	-	-	-
Serious (2)	-	-	131	99.2	127	96.7	132	100.0
Fair (3)	131	99.2	1	0.8	5	3.8	-	-
No problem (4)	1	0.8	-	-	-	-	-	-
Mean	2.5		2.5		2.5		2.5	

The findings summarised in Table 5.8 clearly show that respondents tend to perceive bush encroachment to be less of a problem than the enumerators do. Whereas the majority of respondents rate bush encroachment to be in a *fair condition* in all the four types of ranching (individual, group/syndicate, community and communal), both individual and group/syndicate ranches were rated by enumerators as *fair*, while community and communal ranches were assessed by enumerators to be in a *serious condition* regarding bush encroachment. The differential perception or misperception is particularly conspicuous (noticeable) in the case of the more common communal and community ranches.

However, the weighted averages seem to indicate that respondents perceive bush encroachment to be more towards fair condition while enumerators rated bush encroachment to be more towards serious condition which does not differ that much with the percentage ratings above.

On a request to rate, in order of importance, the bush encroachment control measures, the respondents are shown in Table 5.9.

Table 5. 9: Assessment of bush encroachment control measures based on respondents' ratings, 1996

Bush encroachment ratings		Control measures for bush encroachment					
		Stocking rate reduced by 50%		Rotational grazing practised		Rotational resting practised	
		(n = 130)	%	(n=130)	%	(n=130)	%
Better control	(1)	73	56.2	63	48.5	26	20.1
No difference	(2)	35	26.9	37	28.5	35	26.9
Worse	(3)	15	11.5	28	21.5	64	49.2
Don't know	(4)	7	5.4	2	1.5	5	3.8
Weighted average		1.6		1.7		2.4	

Reduction of stocking rate by half (56.2%) features as the most important control measure for bush encroachment followed by rotational grazing (48.5%) as reflected by the weighted average. The respondents' views are that rotational resting as a measure would worsen bush encroachment, if practised. The fact that stocking rate reduction is perceived as a possible solution to bush encroachment problems suggests that stocking rate reduction should, in general, be highly acceptable, if bush encroachment is perceived as a serious problem.

5.5.3 Soil Erosion

Soil erosion is the wearing away of the earth's surface by the action of water, wind, animals and mankind. It must also be remembered that soil, plants and animals are but a few of the many components of the range ecosystem. None of the above components can function in isolation of the other, that is plants will need soil to grow, animals will need plants for survival, while soil will also need both plants and animals to re-establish itself. Improper grazing management can be detrimental to both plants and soil (Field, 1978:87).

The answers given in response to a question as to how serious the problem of soil erosion is are summarised in Table 5.10.

Table 5. 10: Respondents' assessment of the problem of soil erosion on ranch type, 1996

Ratings for soil erosion	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	(n=127)	%	(n=130)	%	(n=130)	%	(n=130)	%	(n=517)	%
Serious problem (1)	9	7.1	12	9.2	26	20.1	59	45.4	106	20.5
Fair problem (2)	51	40.2	92	70.8	90	69.2	55	42.3	288	55.7
No problem (3)	54	42.5	25	19.2	12	9.2	13	10.0	104	20.1
Don't know (4)	13	10.2	1	0.8	2	1.5	3	2.3	19	3.7
Weighted mean	2.4		2.1		1.9		2.0		2.1	

The findings in Table 5.10 indicate that soil erosion was a fair problem on all the ranches. The fair to serious problem of soil erosion in community ranching as indicated by the weighted average might be due to the removal of the vegetative cover of the soil by overgrazing (overstocking). These findings based on weighted averages indicate that soil erosion is a fair problem for all ranch types.

Since man causes erosion, accelerated erosion may be corrected. The responses in reaction to a question as to which factors contribute most to soil erosion are summarised in Table 5.11.

Table 5. 11: Respondents' assessment of factors contributing most to soil erosion on their ranching areas, 1996

Contributors to soil erosion	Average Rating	% *
Burning	2.3	29.4
Cultivation	2.4	29.7
Cutting of trees	1.8	22.8
Large cattle herds	1.4	18.1

*Based on a conversion of the 4-point scale to a percentage

Table 5.11 shows that most farmers (29.7%) ranked tillage (*cultivation*) number one, as the major contributor to soil erosion. Burning seem to be the second most contributing factor to soil erosion. The fact that large herds or overstocking is not perceived as a serious cause, may be related to the need to own large numbers of cattle. It is hardly surprising that farmers do not perceive large cattle herds as a major contributing factor to soil erosion. To the farmers what matters is to have more cattle.

Table 5. 12: Respondents' mean assessment of factors contributing most to soil erosion on different ranch type, 1996

Contributors to soil erosion	Mean weighted rank per ranch type				
	Individual	Group	Community	Communal	Standard deviation (S)
Burning	1.5	2.7	2.3	2.4	1.3
Cultivation	2.4	2.0	2.8	2.3	1.7
Cutting of trees	1.9	1.6	1.9	1.9	1.3
Large cattle herds	1.8	1.2	1.5	1.4	1.2

*Based on a conversion of the 4-point scale to a percentage

The general picture that emerges from Table 5.12 is that the most contributing factor to soil erosion is cultivation. On the community ranch cultivation was rated as the highest contributor to soil erosion while burning was rated as the highest contributor to soil erosion in-group ranch. As for the other ranches burning and cultivation were also regarded as the most contributing factors to soil erosion.

The big variation in the rating of the most contributing to soil erosion as reflected by the high standard deviation (s = 1.7), may in part be attributed to the fact that the farmers are not able to reduce their stock to the recommended stocking rates or practise rotational grazing with seasonal resting of camps as well as lower stoking rates.

Corrective measures with regards to soil erosion can take the form of altering land management systems so that nature can rebuild the damaged ecosystem (Stoddart, Smith & Box, 1975:422).

5.6 SUMMARY

Cattle rearing in Botswana is predominantly dominated by males. Of the few female farmers involved in cattle rearing majority of them are in the communal ranches. The reason for the predominance of males in cattle rearing is a cultural one and closely related to the overall traditional dissociation of women from cattle (Gulbrandsen, 1980:51-52).

There are four farm types classified as individual, group, community and communal farms. The study found that 10.6 percent of the respondents from these farms tend to have more than one grazing ranch type. Similarly, respondents age 30 to 69, those with large herd size and those with educational attainment of standard 1 to 7 and above showed a clear association with the usage of more than one ranch type.

Results have also revealed that large herds of cattle are kept in Botswana. The range number of cattle (1 to 400) indicate that a few stock farmers own up to four hundred cattle, which is much higher than the number of cows (cattle) considered necessary for primary needs of survival and subsistence. The mean distribution of herd size on different ranch types shows that individual ranches had the highest average herd size of mature livestock unit and bull cow ratio followed by group ranches.

Even though many cattle are kept, the current grazing conditions on all ranches except the community ranches were, in general rated as fair to good. The grazing conditions for all the ranches have improved over the years. This is reflected by the increase in the rainfall over the previous five years. Three to five years ago the grazing conditions on all ranches was in a worse condition due to drought or lack of rainfall.

The study found that soil erosion was a fair problem on all the ranches. Similarly, cultivation and burning were regarded as the most important contributing factors to soil erosion.

Finally farmers tend to perceive bush encroachment to be less of a problem than the enumerators do. Even though reduction of stock features as the most important control measure for bush encroachment respondents regard rotational resting as a

measure that would worsen bush encroachment if practised. The fact that stock reduction is perceived as a possible solution to bush encroachment problems suggest that stock reduction should, in general, be highly acceptable, if bush encroachment is perceived as a serious problem.

CHAPTER 6

EFFICIENCY ASPECTS OF STOCK

6.1 INTRODUCTION

Productivity in the livestock industry in Botswana remains largely undeveloped. It is characterised by extensive farming in communal areas where off-take has remained as low as 8% compared to 17% in commercial areas, and mortalities as high as 12% compared to 5% in commercial areas, and calving percentages as low as 50% compared to 60% in commercial areas (Ministry of Finance and Development Planning, 1997:226).

For the livestock industry to prosper, be viable, competitive and remain a major source of income and employment opportunity in the rural areas, increased calving percentages, higher off-take rates and a decrease in mortality are essential (Sigwele & Khupe, 1996:36).

This study investigates some efficiency criteria, namely, calving percentage, off-take rates and mortality and factors affecting them, in the context of different ranching systems.

6.2 CALVING PERCENTAGE

6.2.1 Knowledge about calving percentage

Calving percentage is an aspect of major importance in beef cattle production in Botswana, probably the most important as far as profitability is concerned (Ministry of Agriculture, 1980:17). An increase in calving percentage can mean an increase in Botswana's export of beef even to the level that it covers imports of basic cereals.

According to Sigwele & Khupe (1996:32) the calving percentage is barely above 50 percent in the communal areas, where over 85 percent of cattle are found.

In order to test whether respondents do know or understand what the calving percentage is, respondents were asked what their calving percentage was (Table 6.1). About 93 percent of the respondents indicated that they did not know what their calving percentage was, while only 7 percent indicated that they had an idea of what their calving percentage was. No single respondent knew what his communal ranch's calving percentage was.

Table 6. 1 Distribution of respondents on different ranch types according to their knowledge of their calving percentage, 1996 (N=132)

Knowledge of calving percentage	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n=16	%	n=27	%	n=21	%	n=68	%	n=132	%
Does not know	13	81	25	93	19	90	66	97	123	93
Has an idea	3	19	2	7	2	10	2	3	9	7
Knows	-	-	-	-	-	-	-	-	-	-

Even on the individual ranches where the percentage of respondents having some knowledge of their calving percentage is the highest, only 19 percent have a vague idea of their calving percentages. The percentage on community ranches is 10 percent while only 3 percent of communal farmers have a vague idea of their calving percentage. A reason for this poor knowledge may be the absentee or cattle-post type of management, which is practised on all ranch types.

The mean knowledge about calving percentage and management practices and efficiencies are as indicated in Table 6.2. The findings indicate that respondents with no knowledge about calving percentage do not perform worse with regards to practise adoption than those with knowledge about calving percentage. In fact in many cases they perform better, but the differences are not statistically significant ($p > 0.01$).

Table 6. 2: Mean distribution of respondents' knowledge about calving percentage and management practices and efficiencies, 1996 (N=132)

Practices	Practice adoption about calving percentage	
	No knowledge (n = 123)	Some knowledge (n = 9)
Dip/spray for ticks	2.9	2.8
Hand dress for ticks	2.8	2.4
Internal parasite control	2.2	2.3
Animal castration	4.4	4.3
Dehorning	4.3	4.0
Artificial insemination	1.3	1.2
Breeding system	1.6	1.9

The relationship between respondents' age and their knowledge regarding calving percentage is shown in Figure 6.1. These findings indicate that more farmers in the 30 – 49 year category had an idea about their calving percentage than in any other age category. This knowledge seems to decline somewhat with age. That is, from 13.3 percent for the 30 to 49 years category to 5.8 percent (70 years and older).

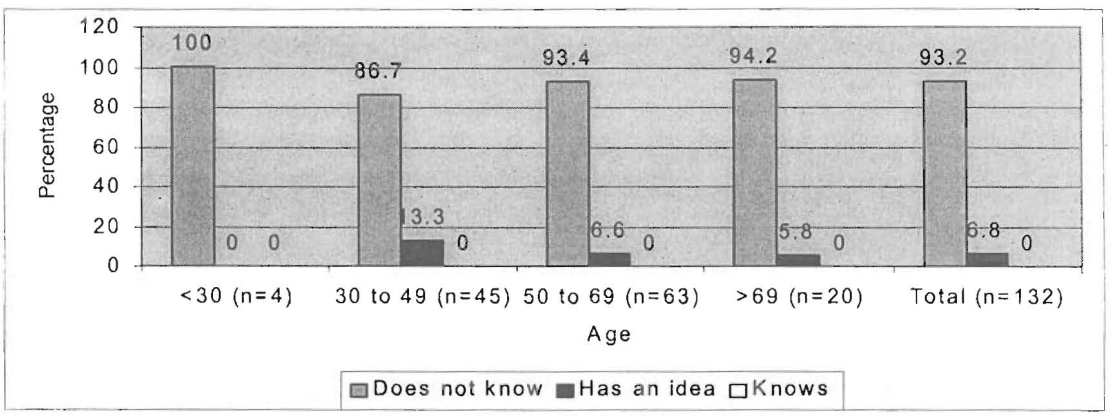


Figure 6. 1: Respondents' knowledge about calving percentage based on age group, 1996

As far as the influence of education is concerned Table 6.3 indicates that the idea or knowledge concerning calving percentage is related to the level of education. That is,

the correlation coefficient between education and knowledge about calving percentage is r= 0.263, which is highly significant at (p= 0.002). For example only 1.6 percent of the respondents with no formal education had an idea of the calving percent while this percentage increases in liner fashion to 20 percent in the case of respondents with more than 12 years of formal education.

Table 6. 3: Percentage distribution of respondents based on education and knowledge about calving percentage, 1996 (N=132)

Knowledge about calving	Respondents according to education categories									
	None		1-7 years		8-12 years		>12 years		Total	
	n=64	%	n=41	%	n=17	%	n=10	%	n=132	%
Does not know	63	98.4	37	90.2	15	88.2	8	80.0	123	93.2
Has an idea	1	1.6	4	9.8	2	11.8	2	20.0	9	6.8
Knows	-	-	-	-	-	-	-	-	-	-

The findings in Table 6.4 indicate that respondents with herds of more than 150 tend to have a better knowledge of calving percentage than those with smaller herds. The study found that there is no linear positive correlation between herd size and knowledge of calving percentage (r = 0.149; p= 0.089).

Table 6. 4: Percentage distribution of respondents based on herd size and knowledge of calving percentage, 1996

Knowledge about calving	Respondents per herd size													
	<20		20-50		51-100		101-150		151-300		>300		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Does not know	54	100	32	88.9	15	88.2	7	100	10	83.3	5	83.3	123	93.2
Has an idea	0	0	4	11.1	2	11.8	0	0	2	16.7	1	16.7	9	6.8
Knows	-	-	-		-	-	-		-	-	-	-	-	-

The study found that most of the respondents from all four grazing systems (individual, group, community and communal ranches) do not know or understand what the calving percentage of their stock is or represents. It is therefore, necessary for farmers to know their calving percentage as this can provide them with a measure of how they can raise their livestock productivity.

6.2.2 Calving percentage

A high calving percentage is one of the basic requirements of a profitable beef cattle operation. While many factors affect economic returns in a cow and calf enterprise, if there is no calf there is no return (Ministry of Agriculture, 1980:112). The calculation of the calving percentage was based on the number of calves born per cows bred. This also serve as an indication of the profitability of the cattle farming enterprise. The calculated calving percentages are shown in Table 6.5.

Table 6. 5: Distribution of respondents according to calving percentage and ranch type, 1996

Calving percentage	Respondents per ranch type								Total	
	Individual ranch		Syndicate ranch		Community ranch		Communal ranch			
	n = 16	%	n = 27	%	n = 21	%	n = 68	%	N = 132	%
<10	1	6.2	1	3.7	4	19.1	12	17.7	18	13.6
10 – 25	3	18.8	4	14.8	2	9.5	4	5.9	13	9.8
26 – 40	3	18.8	4	14.8	5	23.8	13	19.1	25	18.9
41 – 55	3	18.8	2	7.4	2	9.5	7	10.3	14	10.6
56 – 70	4	25.0	5	18.6	2	9.5	13	19.1	24	18.2
> 70	2	12.4	11	40.7	6	28.6	19	27.9	38	28.9
Mean		46.1		58.8		51.0		58.8		55.9

Even though, the Ministry of Finance and Development Planning (1997/98–2002/03:228) had indicated that calving percentage in communal areas is as low as 50% compared to 60% in commercial areas, the findings in Table 6.5 indicate that farmers have an average calving percentage of 55.9 percent. It is worth noting that the calving percentage of communal and community ranches is not lower than that of individual and group/syndicate ranch members. In fact, the average calving percentage of the individual ranch members is significantly less, namely 46.1 percent. The probable the reason for this is that on other ranches, viz., communal, community and syndicate ranches there are large numbers of uncastrated animals roaming around, thus resulting in an effective high bull/cow ratio.

Another reason for the similarity of calving percentage on the different ranch types is one given by Tsimako (1991:24), namely that, management standards on individual ranches have not noticeably changed for the better compared to those applied under the cattle post system. In other words there is no difference in management between the individual ranch farmers and communal farmers with regards to knowledge about calving percentage of their stock.

The mean calving percentages of the different age categories of farmers (Figure 6.2) show no clear tendency (r = -0,095; p= .306) except that the youngest farmers (less than 30 years of age) tend to have the highest calving percentage, namely 72.6 percent, compared to the 50 to 57 percent of the other categories. A reason for the higher calving percentage of the younger farmers may be the one indicated by Gulbradsen, (1980:160) namely that young men, especially from the working class, usually aim to have a large herd.

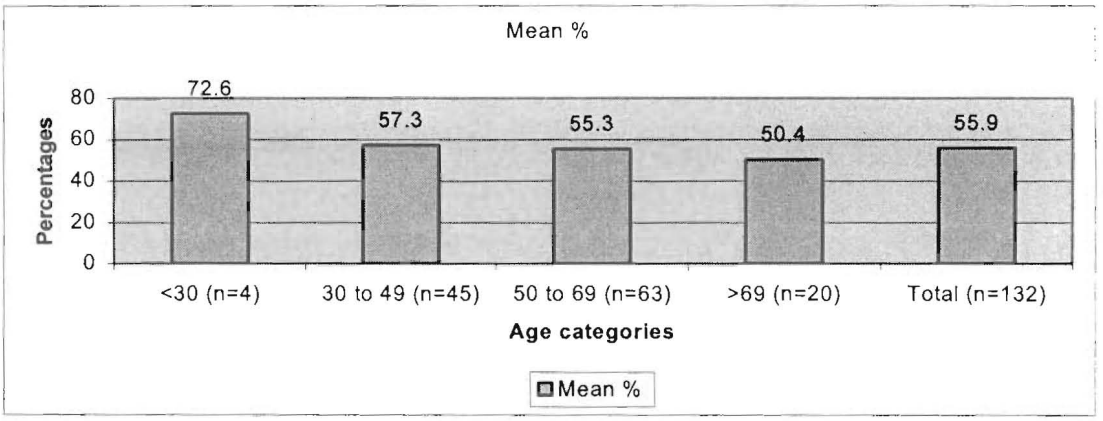


Figure 6. 2: Respondents' mean calving percentage according to age group, 1996

As far as the influence of education is concerned, Table 6.6 indicates that the calving percentage is not related to the level of education (r = -0.054; p= .566). For example, the mean calving percentage of respondents with no formal education is 60 percent while that in the more educated groups is even less (50.3 and 59.7 percent. The frequency distribution in Table 6.6 shows a similar pattern.

Table 6. 6: Percentage distribution of respondents according to education and calving percentage, 1996

Calving %	Respondents according to education categories							
	None		1-7 years		> 7 years		Total	
	n	%	n	%	n	%	N	%
< 25	7	13.0	7	14.9	2	13.3	16	13.8
26-49	13	24.0	16	34.0	2	13.3	31	26.7
50-100	34	63.0	24	51.1	11	73.4	69	59.5
Mean		60.0		50.3		59.7		56.0

The relationship between respondents' herd size and their calving percentage indicate an average of 56 percent (Table 6.7). With the exception of the biggest herds (more than 300 head) there is a tendency for calving percentages to decrease with increasing herd size ($r = -0.253$; $p = .006$). The reason for the decrease in calving percentages is that of low bull/cow ratio. On the contrary, with the exception of the biggest herds (more than 300 head) there is a tendency for calving percentages to increase with decreasing herd size. The reason for the higher calving percentage in the smaller herds is that they usually keep more bulls and large numbers of uncastrated animals roaming around.

Table 6. 7: Percentage distribution of respondents' calving percent based on herd size, 1996

Herd size	Respondents' calving percentage						Mean
	< 25		26 - 49		50 - 100		
	n	%	n	%	n	%	
< 20	3	7.0	11	25.6	29	67.4	64.2
20 – 50	3	8.8	12	35.3	19	55.9	53.3
51 – 100	5	31.3	3	18.8	8	50.0	49.4
101 – 150	2	28.6	1	14.3	4	57.1	47.7
151 – 300	3	27.3	4	36.4	4	36.4	43.5
> 300	-	-	1	16.7	5	83.3	61.0
Total	16	13.7	32	27.3	69	59.0	55.9

6.3 CATTLE OFF-TAKE

The livestock industry plays a vital role in Botswana's economy. For it to produce the desired result, the overall off-take should be in the range of 15 percent or more per annum in order to increase the profitability and to relieve pressure from the range (National Development Plan 8:248).

The livestock population in Botswana is relatively high while off-takes are less than ten percent (Sigwele & Khupe, 1996:32). Düvel & Afful, (1994:136) have also indicated that, for stock numbers to be constantly kept within the limits of the ecologically possible carrying capacity, most farmers will, from time to time, have to sell some of their cattle/stock.

When calculating off-take rates, it is often ignored that cattle are also used for consumption, traditional customs of cattle transfers among relatives, payment of bride price, etc. These can be considered as non-commercial off-take (Van der Jagt, 1993:36). The offtake calculation was based on viable cattle sold or slaughtered per cattle bred, in order to give an indication of the effectiveness of the cattle farming industry.

Most of the farmers (53.8 percent) included in the survey did slaughter or sell in the twelve months, preceding the interview. Table 6.8 indicates the number of stock slaughtered or sold, according to ranch type.

Table 6. 8: Distribution of respondents according to percentage off-take and ranch type, 1996

Off-take %	Respondents per ranch type								Total	
	Individual ranch		Syndicate ranch		Community ranch		Communal ranch			
	N	%	n	%	n	%	n	%	N	%
< 15	9	56.2	16	59.3	12	57.1	34	50.0	71	53.8
15-20	1	6.3	3	11.1	-	-	11	16.2	15	11.4
> 20	6	37.5	8	29.6	9	42.9	23	33.8	46	34.8
Total	**16**	**100**	**27**	**100**	**21**	**100**	**68**	**100**	**132**	**100**
Weighted Mean	**17.5**		**16.4**		**23.2**		**17.9**		**18.4**	

The findings are that, all the ranch types had a total mean off-take of 18.4%. It is not surprising to find that the mean off-take for group/syndicate ranch was the lowest. Low off-take particularly for group ranch has been attributed to poor management and the need to build large herds for other reasons, which are sociological. Equally important is the fact that, individual; community and communal ranches do have the highest economic returns in terms of off-take rates.

Only 34.8 percent of respondents had their off-take greater or above 20 percent. This percentage is higher in the community and individual ranches, whilst lower in the group/syndicate, and communal ranches. High off-take particularly for community ranch has been attributed to the fact that during the survey, respondents from the community ranch were busy constructing the perimeter fence for their ranch and as a result had to sell their stock in order to raise funds for buying fencing materials.

The fact that individual and communal ranches had the same percentage off-take, indicate that, there is no distinct difference in attitude towards cattle rearing between communal area pastoralists and individual ranchers. Generally, communal area cattle owners, do not keep cattle for commercial beef production, but keep cattle as a source of long term survival.

The general view held by Ministry of Finance and Development Planning (1997/98–2002/03) is that offtake in communal ranches areas has remained low (8%) compared to 17% in commercial areas (individual) seems not to be correct based on these findings (Table 6.8). That is, both communal and individual ranches had a mean percentage off-take of 17.9% and 17.5% respectively.

As indicated above the low off-take on the group/syndicate has been attributed to poor management because animals used to be herded and now the herding system has collapsed, and has not been replaced by more efficient management system like fencing. This has resulted in cattle going astray and the owners being unable to sell them, as they don't know where they are.

Even though the numbers of percentage off-take are high in the individual, community and communal ranches there is need to note that, development of

improved management has and will continue to be a gradual process and producers will require sound advice from the extension service to encourage them to adopt efficient livestock and range management practices as well as increasing cattle offtake to relieve pressure from the range (Tsimako, 1991:31).

Even though, destocking does not coincide with the respondents' tradition of cattle rearing, Chambers & Feldman (1973:70) does note that, the higher the income earned from cattle the greater the incentive by producers to increase their off-take and improve their management.

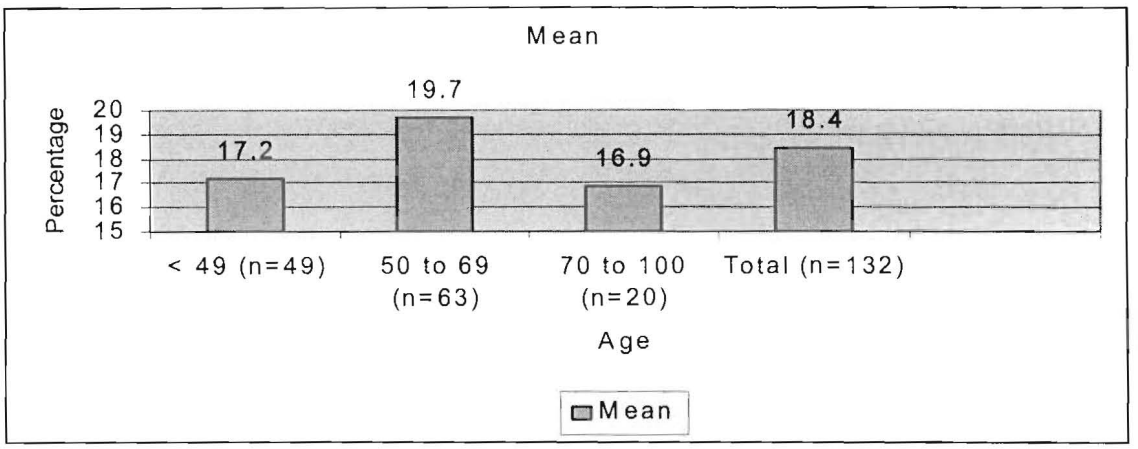


Figure 6. 3: Mean percentage distribution of respondents according age group and percentage off-take, 1996

The findings in Figure 6.3 indicate that the mean percentage off-take increases and decreases as age increases. The mean off-take percentages of the different age categories of farmers show a clear tendency ($r = -0.030$; $p= 0.735$) for middle age farmers to have a higher off-take. A possible reason for this high off-take percentage is that middle age respondents tend to be in need of having more cash to buy more cattle than older respondents due to their tendency of accumulating cattle.

As far as educational influence on off-take is concerned Table 6.9 indicate that mean percentage off-take is not related to the level of education. There is a clear tendency for off-take percentages to decrease with increasing educational level ($r=0.001$; $p= .990$). This does not confirm the assumption that educated farmers produce for sale and those with no formal schooling do not. Virtually all cattle owners both sell and

use cattle for other purposes (food, bridewealth, ceremonial feasts, ritual and exchange).

Table 6. 9: Percentage of respondents according to education and percentage off-take, 1996

Off-take	Respondents according to education							
	None		1-7 years		> 7 years		Total	
	n	%	n	%	n	%	N	%
< 10	36	56.2	21	42.9	13	72.2	70	53.4
10-20	8	12.5	7	14.2	-	-	15	11.5
>20	20	31.3	21	42.9	5	27.8	46	35.1
Total	64	100	49	100	18	100	131	100
Mean	19.0		20.0		12.8		18.5	

The relationship between respondents' herds size and the percentage off-take is shown in Table 6.10. There is a tendency for off-take percentage to increase with increasing herd size(r=0.068; p= .435), with the exception of the bigger herds (greater than 300 heads). These findings indicate that there is a tendency for respondents with small herds to keep cattle as a source of long-term survival rather than for commercial beef production.

Table 6. 10: Percentage distribution of respondents' cattle off-take according to herd size, 1996

Off-take	Respondents per herd size													
	< 20		21-50		51-100		101-150		151-300		> 300		Total	
	N	%	n	%	n	%	n	%	n	%	n	%	N	%
< 10	30	55.6	18	50.0	9	52.9	4	57.1	6	50.0	4	66.6	71	53.8
10-20	7	13.0	4	11.1	2	11.8	1	14.3	-	-	1	16.7	15	11.4
>20	17	31.5	14	38.9	6	35.3	2	28.6	6	50.0	1	16.7	46	34.8
Total	54	100	36	100	17	100	7	100	12	100	6	100	132	100
Mean	17.5		19.7		19.4		19.1		22.1		6.8		18.4	

The survey found substantial differences among respondents' herds' size in terms of percentage off-take. That is, the smaller the herd sizes the lower the off-take and the bigger the herd sizes the higher the off-take. Peters (1994:159) indicated that, where cattle play such multiple roles in production and social reproduction, a simple assessment of a farmer as commercial or subsistence if he sells more or less than a certain proportion of his herd (harvest) is misleading.

6.4 MORTALITY OF CALVES AND LIVESTOCK

Stock mortality rate in a herd has a depressing effect on the economic result of a farming enterprise. Bembridge (1984:363), quoting Carstens (1971:112), indicates that cattle deaths have a significant effect on the profitability of cattle farming, and the mortality rate in a herd is a direct reflection of management efficiency. Although stock diseases cannot be eliminated completely, sound management and effective disease control can lead to a significant reduction of stock mortality.

The general situation concerning stock mortality will consists of two parts (calf mortality and livestock mortality) which will be dealt with separately based on ranch types, age, educational attainment and herd size. The situation concerning calf mortality based on ranch types is as shown in Tables 6.11.

Table 6. 11: Percentage distribution of respondents' calf mortality according to ranch types, 1996

Calf mortality	Respondents per ranch type (%)									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	n	%
0 – 1	7	43.7	9	33.3	15	71.4	40	58.8	71	53.8
2 – 4	6	37.5	11	40.7	3	14.3	15	22.1	35	26.5
> 5	3	18.8	7	26.0	3	14.3	13	19.1	26	19.7
Total	16	100	27	100	21	100	68	100	132	100
Weighted mean	4.1		18.7		23.9		16.9		16.9	

Even though the majority of the respondents (Table 6.11) did not lose any of their calves through death during the twelve months preceding the interview, the findings indicate that the mean percentage calf mortality is 16.9 percent. This percentage is somewhat lower on the individual and communal ranch, whilst higher on the community, and group ranches. A possible reason for this high calf mortality on these two ranches is that most respondents have lost their calves through death during the twelve months preceding the interview due to drought.

Figure 6.4 examines the mean distribution of respondents according to age group and calf mortality. There is a positive correlation (r=0.157; p= .073) which indicates that the mean calf mortality rate tends to increase as age also increases. A probable reason why older farmers tend to have a higher mortality in their herds is because they are often absent due to their involvement in other business or activities and are consequently less exposed to extension or in a position to oversee management operations necessary for success (Tsimako, 1991:27).

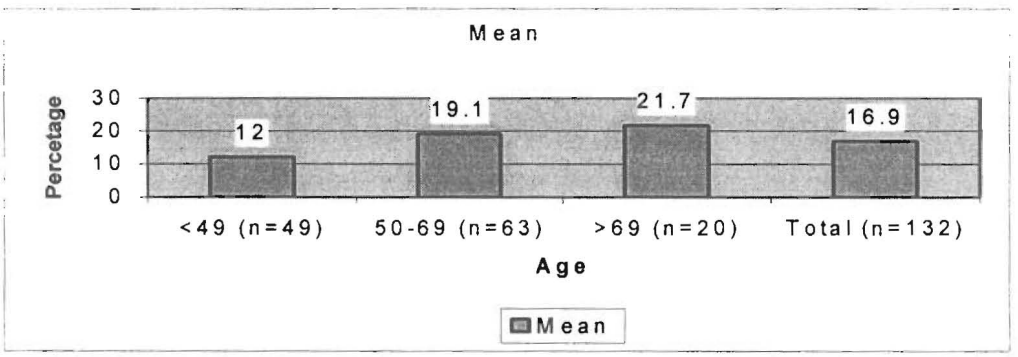


Figure 6. 4: Mean distribution of respondents' calf mortality according to age group, 1996

As far as the influence of education is concerned Table 6.12 indicates that educational level is negatively correlated to calf mortality (r= -0.190; p= .029). The findings also indicate that 53.4% of the respondents did not lose any of their calves for the last twelve months that is, 1995/96. This means that a higher level of education is associated with a lower calving mortality. The low mean calf mortality of the 7.0 calf mortality for the respondent with the highest

level of education (more than 7 years), 15.6 for the middle group (1-7 years) and 20.7 for the farmers with no formal education support this relationship.

Table 6. 12: Percentage distribution of respondents' calf mortality according to education attainment, 1996

Calf mortality	Respondents' educational attainment							
	None		1- 7 years		> 7 years		Total	
	n	%	n	%	n	%	n	%
None (0)	39	60.9	20	40.8	11	61.1	70	53.4
Low (1-4)	12	18.8	17	34.7	6	33.3	35	26.8
High (>5)	13	20.3	12	24.5	1	5.6	26	19.8
TOTAL	64	100	49	100	18	100	131	100
Weighted mean	20.7		15.6		7.0		16.9	

The influence of respondent's herd size on calf mortality in Table 6.13 indicates the tendency for the mean calf mortality to decrease with increasing herd size (r= -0.169; p= .053). These findings indicate that there is a tendency towards lower calf mortality on categories with bigger herds. This therefore, indicates that there is a likelihood that the present herding practices practised by respondents with smaller herds are seriously disadvantageous to the calves because of the competition between animals and people for milk (Gulbrandsen, 1980:178-179).

Table 6. 13: Percentage distribution of respondent's number of calf mortality according to herd size, 1996

Calf mortality	Herd size (%)									
	< 20		21 - 50		51- 150		> 151		Total	
	n	%	n	%	n	%	n	%	n	%
None (0)	39	62.9	15	44.1	11	45.7	6	50.0	71	53.8
Low (1-4)	13	21.0	11	32.4	8	33.3	3	25.0	35	26.5
High (> 5)	10	16.1	8	23.5	5	20.8	3	25.0	26	19.7
Total	62	100	34	100	24	100	12	100	132	100
Weighted mean	19.7		18.3		12.4		6.8		16.9	

The second part of this section discusses livestock mortality based on ranch types, age, educational attainment and herd size.

Table 6. 14: Percentage distribution of respondents according to ranch types and percentage livestock mortality, 1996

Stock mortality (%)	Respondents per ranch type								Total	
	Individual ranch member		Syndicate ranch member		Community ranch member		Communal ranch member			
	n=16	%	n=27	%	n=21	%	n=68	%	N	%
< 1	10	62	17	63	12	57	38	56	77	57
1 – 20	6	38	7	26	5	23	16	24	34	25
21 – 40	-	-	1	4	2	10	7	10	10	8
41 – 60	-	-	-	-	2	10	3	4	5	4
> 61	-	-	2	7	-	-	4	6	6	6
Mean		1.6		6.4		15.5		15.3		11.8

Even though most of the respondents (57 percent) did not loose any of their stock through deaths during the year 1995/96, the findings indicate that the mean percentage is somewhat lower on individual and group/syndicate ranches, whilst higher percentages are found on the communal and community ranches. The findings regarding the better performance of individual ranches correspond with those found in respect of calf mortality and suggest that respondents from individual ranches seem to have an idea about the practise of modern methods of husbandry like disease control.

While stock mortality is perceived to be taking place at a low rate from both ranch types, the community and communal had higher losses when compared to group/syndicate and individual ranching and as such the type of ranching system, therefore, seem to have an influence on livestock mortality.

In addition, the conclusion by the Ministry of Finance and Development Planning (1997/98 – 2002/03:228) that high stock mortality is being experienced in communal areas as compared to individual ranches is being supported by the findings in the survey.

The influence of respondents' age on large livestock mortality is shown in Figure 6.5. There is negative correlation (r= -0.076; p= .387) which indicates that the mean livestock mortality tends to decrease as age increases. That is there is a tendency for the older farmers to have a smaller mean stock mortality. Given the high average calf mortality rate above for older farmers due to poor management, one would expect to find a lower average livestock death rate for older farmers. The causes of calf mortality could be due to predators, stillbirths and theft and as such lead to most of the cows left without calves.

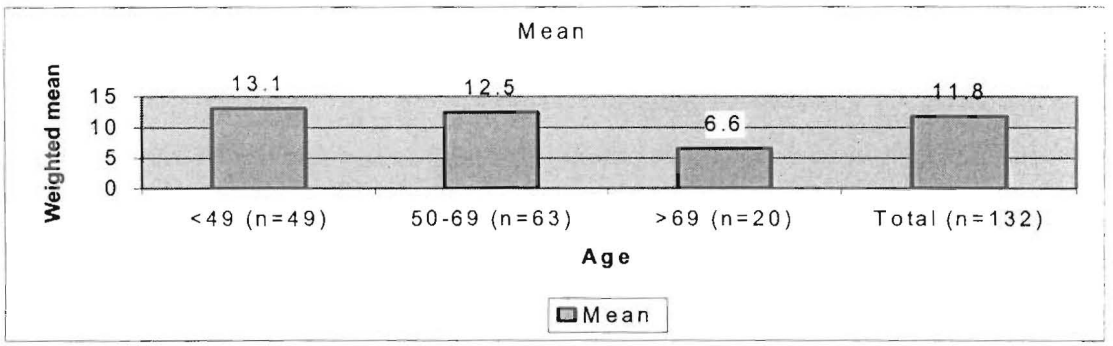


Figure 6. 5: Mean distribution of respondents' livestock mortality according to age group, 1996

As far as the influence of education is concerned Table 6.15 indicates that stock mortality was negatively correlated (r= -0.116; p= .184) with respondents' level of education. Respondents with more education (more than 7 years) had low stock mortality compared to respondents with less education. There is a similar tendency as mentioned above with calf mortality that a higher level of education is associated with a lower stock mortality.

The influence of respondent's herd size was negatively correlated (r= -0.003; p= .974) with stock mortality (Table 6.16). Respondents with bigger herds had low stock mortality than those with small herds. A similar reason mentioned above concerning herd size and calf mortality by Gulbrandsen (1980) could be the cause of this high livestock mortality for respondents with small herds.

Table 6. 15: Percentage distribution of respondents according to education and percentage large stock mortality, 1996

Stock mortality	Respondents according to educational attainment							
	None		1 – 7 years		> 7 years		Total	
	n	%	n	%	n	%	n	%
< 1	35	53.8	25	51.1	13	72.2	73	55.3
1 – 20	26	40.0	23	46.9	5	27.8	54	40.9
> 20	4	6.2	1	2.0	-	-	5	3.8
Total	65	100	49	100	18	100	120	100.0
Weighted mean	15.6		10.8		2.0		11.9	

Table 6. 16: Percentage distribution of respondent's number of large stock mortality according to herd size, 1996

Stock mortality	Herd size (%)									
	< 20		21 - 50		51- 150		> 151		Total	
	n	%	n	%	n	%	n	%	n	%
< 1	32	51.6	19	55.9	16	66.7	6	50.0	73	55.3
1 – 20	30	48.4	12	35.3	7	29.1	5	41.7	54	40.9
> 20	-	-	3	8.8	1	4.2	1	8.3	5	3.8
Total	62	100	34	100	24	100	12	100	132	100
Weighted mean	17.2		10.7		3.9		3.6		11.8	

6.5 SUMMARY

Results in Chapter 6 revealed that the majority of respondents did not know or have an idea of what their calving percentage was. It appears that management between the community, group and individual ranching farmers and communal ranching farmers with regard to knowledge about calving percentage of their stock does not differ in any way.

Another production or efficiency parameter such as offtake rates indicates that individual and community ranches had the highest offtake while group and communal ranches had the lowest offtake with regards to cattle sold. A possible reason for the

low offtake is that of keeping cattle as a source of long term survival that is, animals were sold to meet specific cash needs (marriages, funerals, etc.), rather than to maximise income after own consumption requirements have been met.

The findings also suggest that, even though calf mortality and livestock mortality tend to be higher in the group/syndicate, community and communal ranches and lower in the individual ranch, higher level of education was also associated with a lower calving and stock mortality. Based on this, there is a difference between the respondents based on different ranch type when considering the number of cattle losses (livestock mortality) and calves losses (calf mortality) respectively through deaths (mortality rate). Mortality rate is therefore; more pronounced in communal, community and group/syndicate ranch types than in individual ranch.

The production or efficiency parameters have been discussed based on the type ranching systems management practised by livestock farmers. This therefore, suggests that attention need to be focused on the livestock management practices. This issue is the focus of the next chapter.

CHAPTER 7

LIVESTOCK MANAGEMENT PRACTICES

7.1 INTRODUCTION

Implementation of acceptable livestock management practices by livestock farmers can result in increased productive performance, reduced mortality and increased growth rate (production efficiency). This chapter deals with aspects of the livestock management practises that are aimed at increasing the production performance (higher production rates). These aspects are management, disease control, parasite control, supplementary feeding, breeding, castration and dehorning. The underlying assumption is that, the more individual ranches are more favourable for emerging stock farmers and consequently their practice adoption will tend to be on a higher level.

7.2 MANAGEMENT

The most effective ranch management system is assumed to be one where the owner is resident and active on the ranch. The owner obviously should have the greatest incentive to ensure good management, as his financial interests are directly at stake (Ministry of Agriculture, 1980:140). However, it is a feature of cattle raising in Botswana that the owner is frequently absent from the cattle herd, and that he relies on illiterate and unskilled labour to care for the animals (Ministry of Agriculture, 1980:140).

A factor assumed to have an influence on the livestock management is the degree of involvement in the management as reflected in ownership which in turn could be dependent on the ranch type. Findings regarding respondents' involvement in management (ownership) are analysed in Table 7.1.

Table 7. 1: Frequency distribution of respondents according to ranch types and their managerial involvement (ownership) in cattle rearing, 1996

Manager's/ type of involvement	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Owner male herder	15	93.7	25	92.6	20	95.2	58	85.2	118	89.4
Owner female herder	-	-	1	3.7	-	-	2	3.0	3	2.3
Hired herder	1	6.3	1	3.7	1	4.8	8	11.8	11	8.3

According to Table 7.1 the majority of respondents (91.7 percent) indicated that they are owner male/female herders of their stock followed by hired herder (8.3 percent) and owner female herder (2.3 percent) respectively. This means that only 8.3 percent of the respondents do have hired herders to look after their stock. The percentage is somewhat higher on the communal (11.8%).

Figure 7.1 examines the relationship between farmers' managerial involvement (ownership) and their educational level.

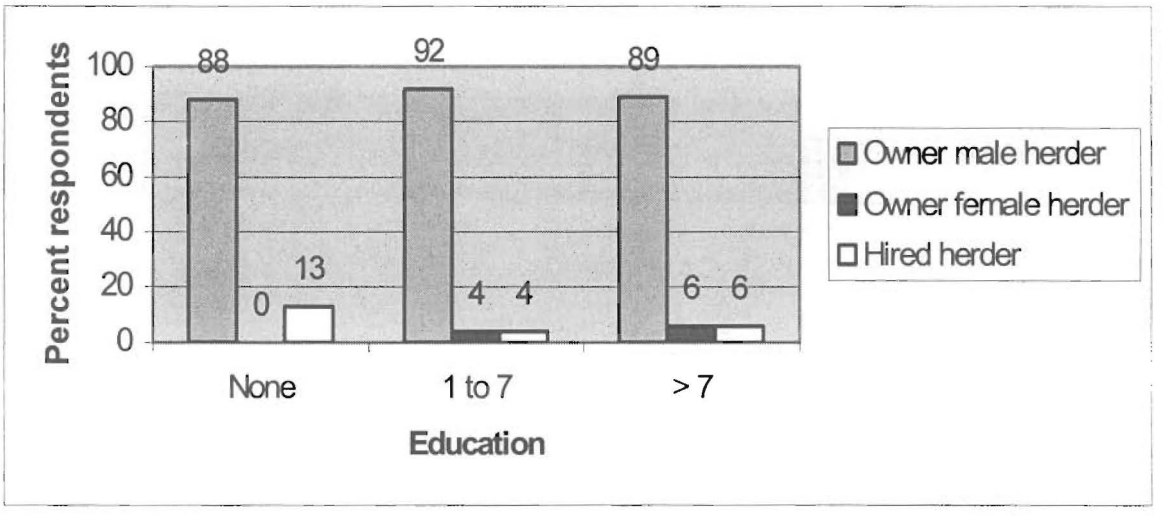


Figure 7. 1: Percentage distribution of respondents according to their managerial involvement (ownership) in cattle rearing and their education level, 1996

contribute toward their attractiveness, but on the negative side are the high costs associated with fencing, borehole drilling and water reticulation, etc.

7.3 DISEASE CONTROL

The adoption or implementation of regular health control measures for livestock disease remains the responsibility of the individual livestock owner, if the aim is to reduce losses and improve production. The maintenance of health in beef cattle is important for many reasons and can be summarised as follows (MoA, 1980:48):

- Production losses due to deaths and to sub-optimal performance of diseased animals are major causes of loss to the individual farmer;

- As an exporting country Botswana has to ensure that its products are acceptable to the importing country. These countries are always concerned about the possible importance of diseases, which might endanger their own livestock industries.

Diseases can be grouped into two categories, namely those controlled by the government, usually free of charge and those which are the sole responsibility of the farmer as individual. Table 7.2 shows the adoption behaviour per specific disease according to ranch type.

There is no significant difference between the ranch types concerning the government controlled or subsidised diseases and those diseases for which the farmer is solely responsible. However, there does appear to be a tendency for ranchers from individual and group ranches to observe the recommended adoption behaviour somewhat better in a few cases such as Blackquarter, Brucellosis and Lumpy skin than the community and communal ranches. The opposite is also true in the case of Foot and Mouth and Heartwater. These divergent tendencies and the fact that they are not significant do seem to indicate that ranch type is not an incentive for better disease control.

Table 7. 2 Percentage distribution of respondents according to ranch type and the frequency of inoculation for various cattle diseases, 1996

Diseases	Respondents per type of ranch									
	Individual		Group		Community		Communal		Total	
(a) Government controlled Diseases										
Foot &mouth	n	%	n	%	n	%	n	%	n	%
Not at all	15	93.7	18	66.7	9	42.9	34	50.0	76	57.6
Once a year	1	6.3	5	18.5	5	23.8	13	19.1	24	18.2
♣More than once	-	-	4	14.8	7	**33.3**	21	**30.9**	32	**24.2**
Anthrax										
Not at all	-	-	3	11.1	1	4.8	11	16.2	15	11.4
♣Once a year	8	**50.0**	14	**51.9**	10	47.6	31	45.6	63	**47.7**
More than once	8	50.0	10	37.0	10	47.6	26	38.2	54	40.9
Blackquarter										
Not at all	1	6.3	1	3.7	1	4.8	6	8.8	9	6.8
♣Once a year	9	**56.2**	15	**55.6**	5	23.7	29	42.6	58	**44.0**
More than once	6	37.5	11	40.7	15	71.5	33	48.6	65	49.2
Brucellosis										
Not at all	1	6.3	3	11.1	-	-	7	10.3	11	8.3
♣Once a year	10	**62.4**	16	**59.3**	7	33.3	32	47.0	65	**49.2**
More than once	5	31.3	8	29.6	14	66.7	29	42.7	56	42.5
Rabies										
Not at all	6	37.4	10	37.0	3	14.3	16	23.5	35	26.5
♣Once a year	5	31.3	11	**40.7**	8	**38.1**	26	**38.2**	50	**37.9**
More than once	5	31.3	6	22.3	10	47.6	26	38.3	47	35.6

Table 7.2: Continued

(b) Individual controlled diseases										
Botulism										
Not at all	-	-	3	11.1	1	4.8	8	11.8	12	9.1
♣Once a year	6	37.5	14	**51.9**	9	**42.8**	26	38.2	55	**41.7**
More than once	10	62.5	10	37.0	11	52.4	34	50.0	65	49.2
Heartwater										
Not at all	11	68.7	13	48.2	13	61.9	26	38.2	63	47.7
♣Once a year	3	18.8	8	**29.6**	4	19.0	23	**33.8**	38	**28.8**
More than once	2	12.5	6	22.2	4	19.1	19	28.0	31	23.3
Lumpy skin										
Not at all	8	50.0	12	44.4	13	61.9	44	64.7	77	58.4
♣Once a year	6	**37.5**	10	**37.1**	2	9.5	14	**20.6**	32	**24.2**
More than once	2	12.5	5	18.5	6	28.6	10	14.7	23	17.4
Pasteurelloses										
Not at all	-	-	8	29.7	6	28.6	20	29.4	34	25.8
♣Once a year	8	**50.0**	12	**44.4**	9	**42.8**	28	**41.2**	57	**43.2**
More than once	8	50.0	7	25.9	6	28.6	20	31.4	41	31.0

♣ = Recommended behaviour

The findings in Figure 7.1 indicate that respondents with higher formal education do not have more hired herders (6%) than the respondents with lower level of education. In fact the latter tended to have more (13%), but this relationship is not significant (r=0.081; p=0.358). The use of hired herders is also not a function of household size as shown by the non-significant correlation between household size and use of hired herders (r= -0.031; p= 0.724).

Another involvement factor that can be expected to have an influence on the management is whether the managers are residing on the ranch. Observations during the survey indicated that very few owner herders reside on the ranch. This was not formally recorded but it is supported by Tsimako's (1991:27) findings that almost all-individual and group ranches have no resident owner. She argues that absentee management by stockowners makes it difficult for the ranchers to receive extension advice and to effectively oversee technical and management operations necessary for successful running of the ranches.

In order to determine the labour requirements for the different types of ranches, the respondents were asked to rank the ranch types according to labour requirements. The findings expressed as mean weighted values are presented in Figure 7.2.

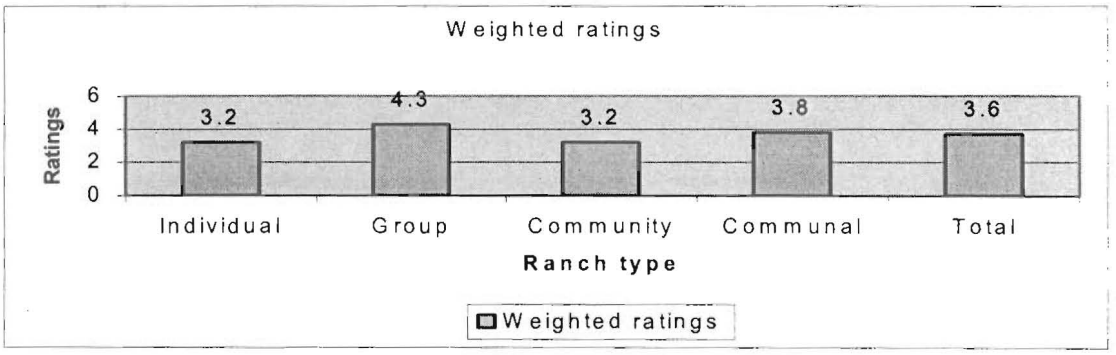


Figure 7. 2 Respondents' labour ranking order according to ranch types, 1996

From the findings it appears that farmers perceive the group (4.3) and communal ranches (3.8) to have the highest labour requirements, with individual and community ranches having the lowest (3.2). The low labour requirement of the latter are likely to

The general level of disease control is poor as indicated in Figure 7.3. None of the diseases has the percentage farmers that apply control measures in the recommended way above 50 percent. In fact the average for all the diseases is a mere 37.9 percent. The degree of adoption of government controlled or a subsidised control disease is somewhat better (40.6 percent) than those diseases for which the farmers are solely responsible (34.5 percent).

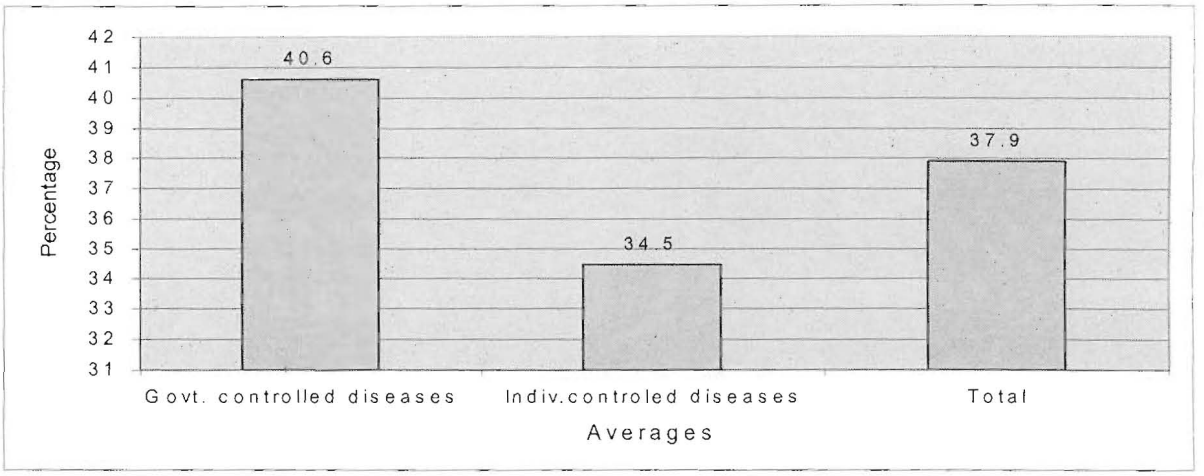


Figure 7. 3: Disease control expressed as mean weighted percentage of government and individual controlled diseases, 1996

Observations during the survey indicated that farmers' lack of understanding, lack of information and distance to the nearest source of veterinary supplies and the nearest crush pen are some of the more serious impediments of the fuller use of veterinary services and recommended practice (Devitt, 1982:24).

7.4 PARASITE CONTROL

External and internal parasites are a cause of considerable losses in livestock production. In order to assess the degree of livestock owners' implementation of tick control, respondents were asked to indicate how often they dip/spray their cattle for ticks. The findings are summarised in Table 7.3.

Table 7. 3: Frequency distribution of respondents according to dipping/spraying behaviour and ranch types, 1996

Frequency of dipping/spraying	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Not at all (1)	5	31	11	41	5	24	11	16	32	25
Once a year (2)	3	19	6	22	5	24	14	20	28	21
Two times a year (3)	3	19	3	11	4	19	15	22	25	19
Three times a year (4)	2	12	5	19	4	19	12	18	23	17
*> three times a year (5)	3	19	2	7	3	14	16	24	24	18
Total	16	100	27	100	21	100	68	100	132	100
Weighted average	2.7		2.3		2.8		3.1		2.8	

*= Recommended behaviour

The findings in Table 7.3 indicate that only 18 percent of the respondents do practice dipping/spraying at the recommended frequency of more than three times per year. The percentage seems to indicate that dipping/spraying is observed more by ranchers from communal, community and individual ranches than group ranchers. Again the differences between the ranch types is minimal. If anything the adoption of the communal and community ranchers is somewhat better. Their weighted average is 3.1 and 2.8 respectively (out of a minimum of 5 scale points) as compared to the 2.7 and 2.3 of the individual and group ranchers respectively.

The relationship between the recommended practice adoption and educational attainment (Figure 7.4) is not statistically significant which does indicate that educated farmers do not control parasite (ticks) better than the less educated farmers ($r= -0.098$; $p= 0.265$). The findings from the mean weighted percentage seem to indicate that farmers with no formal education perceive dipping/spraying cattle for ticks as a more important adoption practise than their educated counterparts. This could be an indication that the current recommendations may not be very appropriate, in other words that too high dipping frequency are recommended.

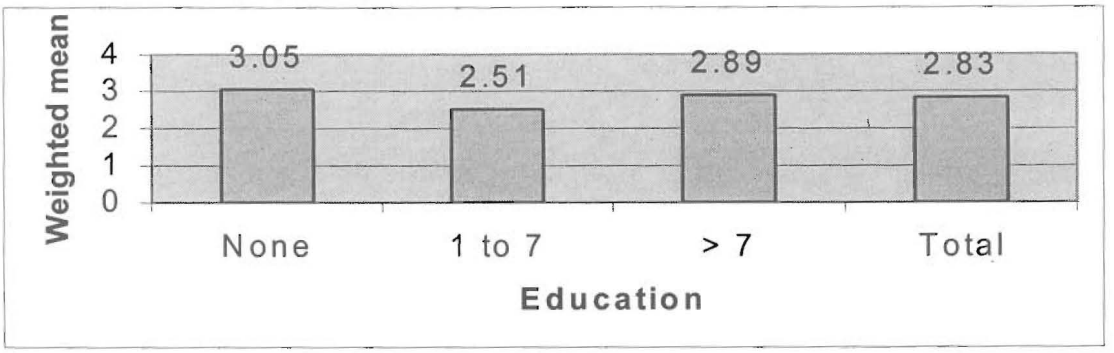


Figure 7. 4 Respondents' mean weighted percentage for dipping/spraying according to their level of education, 1996

Respondents were also asked to indicate whether, apart from the dipping/spraying method, they hand dress their cattle for ticks. The results are summarised in Table 7.4.

Table 7. 4: Percentage distribution of respondents according to hand dressing for ticks and ranch type, 1996

Frequency of hand dressing	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Never (1)	5	31	11	41	3	14	10	15	29	22
Seldom (2)	4	25	6	22	5	24	10	15	25	19
Sometimes (3)	3	19	8	29	8	38	23	34	42	32
Often (4)	1	6	1	4	2	10	12	17	16	12
*Very frequent /often (5)	3	19	1	4	3	14	13	19	20	15
Total	16	100	27	100	21	100	68	100	132	100
Weighted average	2.56		2.07		2.95		3.12		2.80	

*=Recommended behaviour

According to the findings in Table 7.4 only 15 percent of the respondents do follow the recommended adoption behaviour of very frequent hand dressing cattle for ticks, and this percentage varies with the different ranch types. The data also shows that 63 percent of the ranchers from various ranch types do hand dress their stock for ticks, but not following the recommended practise adoption behaviour. The weighted averages indicate that farmers from communal and community ranches make more use of hand dressing for ticks than group and individual ranchers.

With the difference between ranches being small, the question arises as to whether other determinants have a bigger influence on practice adoption (Figure 7.5).

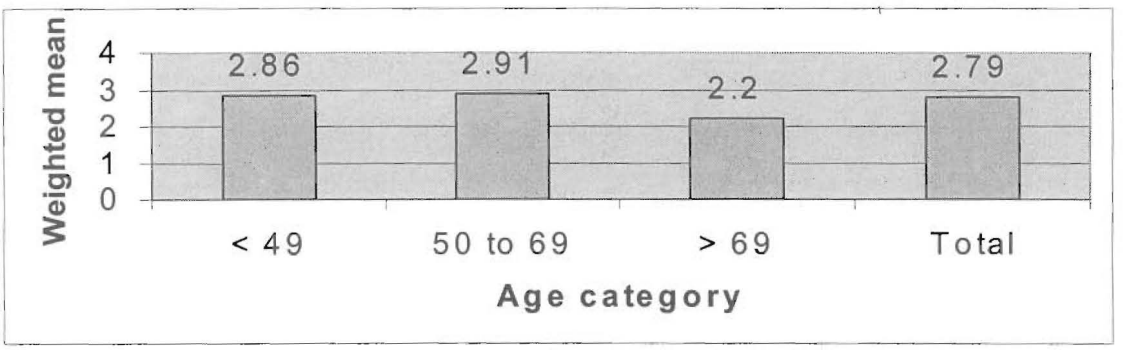


Figure 7. 5: Mean percentage distribution of respondents according to hand dressing for ticks and age group, 1996

As far as age is concerned, the findings in Figure 7.5 indicate that the management or practice adoption of the young category of farmers is no better than that of the older category (r= -0.132; p= 0.130). It does seem as if the older farmers (70 years and older) are less inclined to hand dress their cattle, but this could be attributed to the physical effort involved in hand dressing.

The relationship between tick control (using hand dressing) and education is reflected in Figure 7.6 and show how the perceived practise adoption clearly decreases with a higher level of education (r= -0.209; p=. 016).

It does not appear as if hand dressing is done at the expense of dipping and this further supports the finding that more educated farmers control ticks less frequently and this raises the concern that there might be justification for this and that the frequency recommendation is not very appropriate.

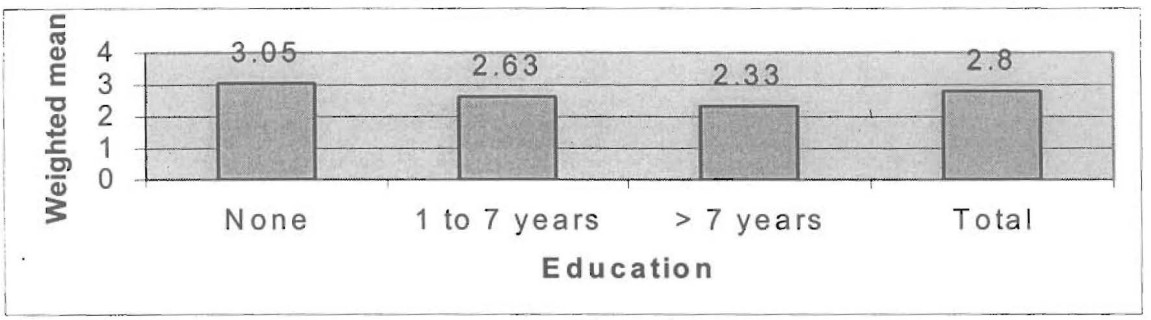


Figure 7. 6: Weighted mean distribution of respondents according to hand dressing for ticks and their level of education, 1996

Another practice investigated was the control of internal parasites in livestock. Table 7.5 summarises the information gathered from respondents regarding the control of internal parasites.

Table 7. 5: Percentage distribution of respondents according to participation in internal parasite control and ranch type, 1996

Internal parasites control	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	N	%	n	%	n	%	n	%	N	%
Yes (3)	5	31	15	56	10	48	20	29	50	38
Partially (2)	3	19	2	7	2	10	4	6	11	8
Not at all (1)	8	50	10	37	9	42	44	65	71	54
Total	16	100	27	100	21	100	68	100	132	100
Weighted mean	2.19		1.82		1.95		2.35		2.16	

The findings in Table 7.5 seem to indicate that the importance of internal parasite control as an effective part of livestock management is not appreciated, at least among the respondents. Control of internal parasite is probably not seen as an outstanding activity that can contribute towards higher livestock production since 54% of the respondents do not use the practice at all and 8% do it partially. Noteworthy is that, according to the weighted means, individual and communal livestock farmers tend to practise better internal parasite control than those livestock farmers in group and community ranches, but the difference show that there is a statistically significant relationship (r= 0.180; p=. 039) which occurred by chance between internal parasite

control measures by ranch type at F-test of 4.334 with a p-value 0.039. It appears that livestock farmers from the communal ranch tend to practise better internal parasite control than their counterparts from individual, community and group ranches.

As far as the influence of education is concerned Figure 7.7 indicates that internal parasite control was low, that is, there was a weak and negative relationship with regards educational attainment (r=0.073; p= .403).

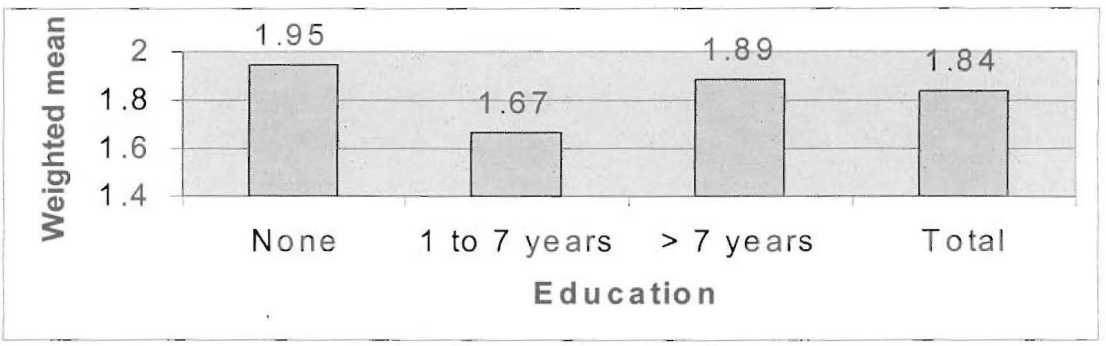


Figure 7. 7: Weighted mean distribution of respondents according to participation in internal parasite control and their level of education, 1996

The findings clearly show that internal parasite control tends to be practised better by livestock farmers with no formal education than their counterparts with less and more education. The assumption is that educated livestock farmers seem less inclined to practice the adoption of internal parasite control due to the expenses encountered in buying drugs

Finally, the evidence above indicates that a sizeable portion of educated respondents in fact does not consider parasites control as the most important cause of losses in livestock production.

7.5 SUPPLEMENTARY FEEDING

Lack of nutrition can be a primary limiting factor for animal performance. In order to cater for both quantity and quality of food to increase animal performance, supplementary feeding has to be practiced.

Even though most of the respondents on all ranch types do provide their livestock with minerals in winter and summer, the findings in Table 7.6 indicate that most of the respondents on different ranch types do not feed supplementary fodder crops at all. Supplementary feeding of minerals is pronounced more in the individual, group and communal ranches than in the community ranch. The reason for community ranchers not providing supplementary feeds might be due to inequitable contributions, which are not based on the number of cattle that are owned or kept.

Table 7. 6: Frequency distribution of respondents according to ranch type and the number of times fodder and mineral is provided to animals, 1996

Supplementary feeds	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	N	%	n	%	n	%	n	%	N	%
Fodder crops										
Concentrates										
Not at all	11	68.7	10	37.0	12	57.1	43	63.2	76	57.6
Sometimes	2	12.5	14	51.9	4	19.0	19	27.9	39	29.5
Regularly	3	18.8	3	11.1	5	23.9	6	8.9	17	12.9
Stover										
Not at all	11	68.8	23	85.2	16	76.2	58	85.3	108	81.8
Sometimes	1	6.2	3	11.1	4	19.0	7	10.3	15	11.4
Regularly	4	25.0	1	3.7	1	4.8	3	4.4	9	6.8
Hay										
Not at all	16	100	24	88.9	11	52.4	59	86.8	110	83.3
Sometimes	-	-	1	3.7	1	4.8	2	2.9	4	3.0
Regularly	-	-	2	7.4	9	42.8	7	10.3	18	13.7

Table 7.6: Continued

Supplementary feeds	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	N	%	n	%	n	%	n	%	N	%
Lucerne										
Not at all	15	93.8	25	92.6	21	100	63	92.7	124	93.9
Sometimes	1	6.2	2	7.4	-	-	3	4.4	6	4.5
Regularly							2	2.9	2	1.6
Minerals										
Salt										
Not at all	1	6.3	7	25.9	4	19.0	13	19.1	25	19.0
Sometimes	5	31.3	17	63.0	10	47.6	40	58.8	72	54.5
Regularly	10	62.4	3	11.1	7	33.4	15	22.1	35	26.5
Bonemeal and salt										
Not at all	4	25.0	12	44.4	7	33.3	23	33.8	46	34.8
Sometimes	4	25.0	13	48.2	7	33.4	32	47.1	56	42.4
Regularly	8	50.0	2	7.4	7	33.3	13	19.1	30	22.8
Rumevite										
Not at all	4	25.0	7	25.9	14	66.7	19	28.0	44	33.4
Sometimes	4	25.0	14	51.9	5	23.8	33	48.5	56	42.4
Regularly	8	50.0	6	22.2	2	9.5	16	23.5	32	24.2

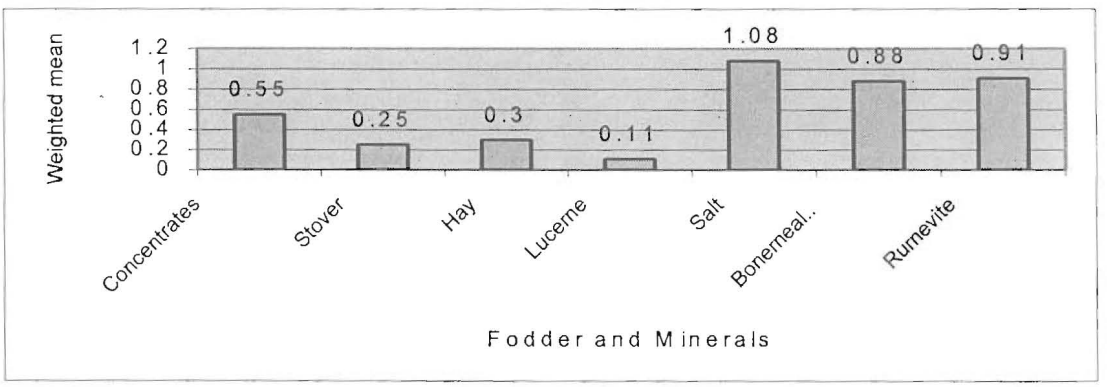


Figure 7.8: Respondents assessment of supplementary feeding efficiency, expressed as weighted mean, of fodder and minerals, 1996

According to Figure 7.8 respondents were found to be partly not interested in the use of fodder crops as supplementary feeds and more interested in providing their livestock with minerals like salt, bonemeal and salt and rumevite. The reason might be that they are not aware of the importance of supplementary feedings (both fodder and minerals) as a way of raising the livestock reproductive performance (Gulbrandsen, 1980:177).

7.6 BREEDING METHODS

The breeding method used by the animal breeder is an additional way that the genetic composition of the herd may be changed (Ministry of Agriculture, 1980:104).

In order to determine the type of breeding method used, the respondents were asked to indicate whether they do practise artificial insemination on their ranches.

According to Table 7.7, the majority of respondents (80 percent) indicated that they do not practise artificial insemination. Those that do practise artificial insemination are those on individual and group ranches, which seems to indicate that artificial insemination is more acceptable to farmers on individual and group ranches.

Table 7. 7: Frequency distribution of respondents according to the adoption of artificial insemination and ranch types, 1996

Frequency of artificial insemination	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	N	%	n	%	n	%	N	%
Not at all (1)	7	43	20	74	21	100	58	85	106	80
Sometimes (2)	3	19	7	26	-	-	8	12	18	14
Always (3)	6	38	-	-	-	-	2	3	8	6
Weighted mean	1.94		1.26		1.00		1.18		1.26	

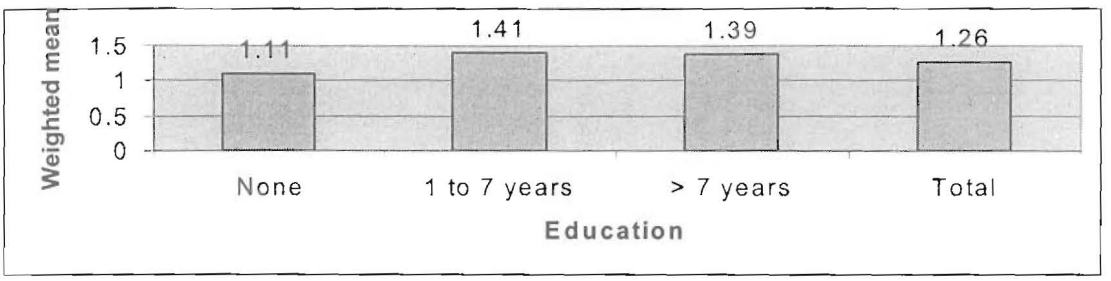


Figure 7. 9 The adoption of artificial insemination by respondents in different education categories, expressed as mean weighted values, 1996

As far as the influence of education is concerned Figure 7.9 indicates that there is a statistically significant relationship between the two sets of categories (education and artificial insemination), (r=0.209; p= .016). For example artificial insemination is practised more as the educational level of the respondents increases.

Again respondents were asked to indicate what type of animal breeding system they do practise in their grazing areas. The findings are as indicated in Table 7.8.

Table 7. 8: Frequency distribution of respondents' breeding system practised according to ranch type, 1996

Types of breeding	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	N	%	n	%	n	%	N	%
Continuous (1)	10	62.4	22	81.5	13	61.9	42	61.8	87	65.9
*Bulling season (2)	3	18.8	2	7.4	1	4.8	4	5.9	10	7.6
Not applicable (3)	3	18.8	3	11.1	7	33.3	22	32.3	35	26.5

*=Recommended breeding system

The findings in Table 7.8 indicate that 65.9 percent of the respondents practise continuous mating breeding system in their different grazing ranch type. Only 7.6 percent of the respondents use bulling season breeding system. The percentage is somewhat higher in the individual and group ranches while lower in the communal and community ranches. The difference is due to the management practised in the communal ranch and also the community ranch. On both these types of ranches cattle

are not confined but roam all over and consequently the implementation of a breeding season by an individual is not possible.

As far as the influence of education is concerned Figure 7.10 indicate that there is no significant relationship between the breeding system practised by respondents and their level of education (r= -0.060; p= .494). This seems to indicate that education has nothing to do with the type of breeding system livestock farmers would prefer to practise or adopt.

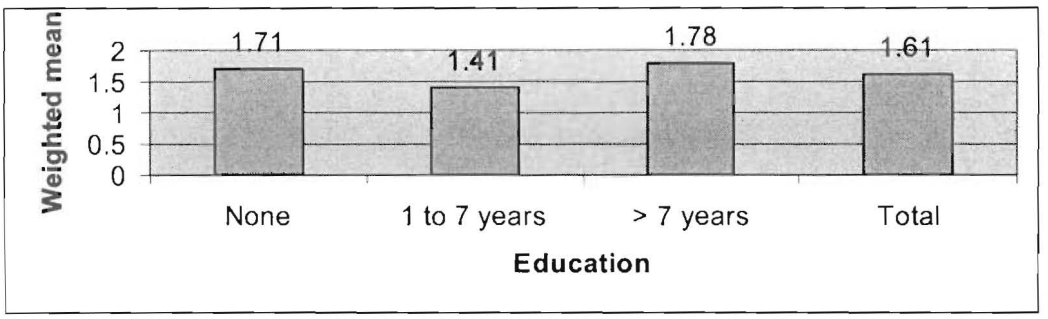


Figure 7. 10: The adoption mean of breeding system by respondents in education categories, expressed as mean weighted values, 1996

7.7 CASTRATION

Castration assists management by preventing indiscriminate breeding and castrated males are normally more docile than bulls (Ministry of Agriculture, 1980:146).

In order to establish whether and at what age farmers do castrate their stock, respondents were asked to indicate at what age they do castrate their animals.

The findings from Table 7.9 indicate that 50.8 percent of the respondents do castrate their animals at the age of less than five months and a further 37.1 percent before 9 months. This percentage is somewhat higher in the group and individual ranchers whilst lower in the communal and community grazing system. This seems to indicate that the management practised in communal and community ranches where cattle roam all over makes the castration less effective unless practised by all ranch members.

Table 7. 9: Frequency distribution of respondents' age castration of animals according to ranch types, 1996

Age/Months of castration	Respondents per ranch types									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
13-16 months	-	-	1	3.7	-	-	-	-	1	0.8
9-12 months	1	6.3	1	3.7	1	4.8	12	17.6	15	11.3
*5-8 months	5	31.2	8	29.6	11	52.3	25	36.8	49	37.1
< 5 months	10	62.5	17	63.0	9	42.9	31	45.6	67	50.8

*=Recommended age

As far as the influence of education is concerned Figure 7.11 indicates that most of the respondents are aware of the importance of livestock castration at an earlier age (r= 0.053; p= .543). The differences between none and formal education is minimal. If anything the adoption practice of the respondents with more than 7 years of formal education is somewhat better

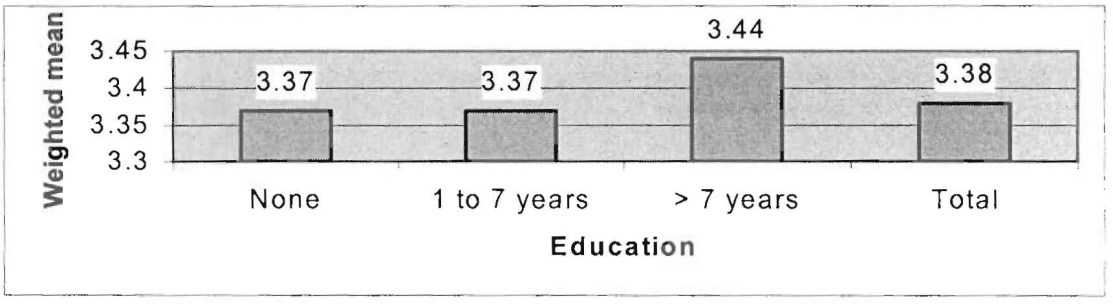


Figure 7. 11: Weighted mean distribution of respondents' castration age of their stock and educational attainment, 1996

Regarding castration all ranchers seem to be aware and interested in the practise adoption, even though some of them do castrate their animals or calves at an older age of more than five months.

7.8 DEHORNING

Dehorned cattle are more easily managed, less liable to injure each other and require less watering space (Ministry of agriculture, 1980:146).

Table 7. 10: Frequency distribution of respondents according to dehorning age of their animals and ranch type, 1996

Age/Months of dehorning	Respondents per ranch types									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
13-16months	-	-	-	-	-	-	1	1.5	1	0.8
9-12 months	1	6.2	4	14.8	1	4.8	14	20.6	20	15.2
*5-8 months	3	18.8	11	40.8	11	52.3	27	39.7	52	39.3
< 5 months	12	75.0	12	44.4	9	42.9	26	38.2	59	44.7

*=Recommended age

The findings in Table 7.10 indicate that 44.7 percent of the respondents do dehorn their stock at the age of less than 5 months and a further 39.3 percent before 9 months. This percentage is somewhat higher in individual and group ranches while lower in community and communal ranches. These findings indicate that most of the respondents from the community and communal ranches are still not aware of the importance of dehorning in terms of increasing the animal body growth rate (Gulbrandsen, 1980:175).

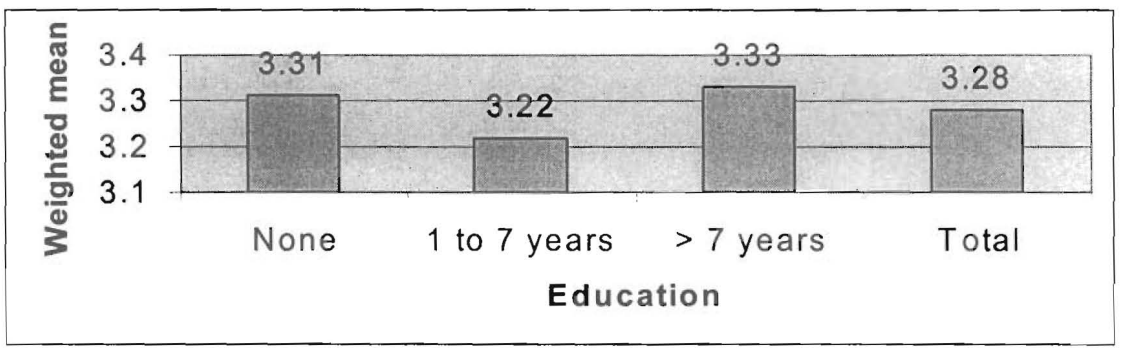


Figure 7. 12: Weighted mean distribution of respondents' dehorning age of their stock and educational attainment, 1996

The influence of respondents' education on the age at which they do dehorn their livestock is shown in Figure 7.12. With the given adoption and minimum variation among respondents, the effect of factors like age and education is not likely to be apparent. This explains the low correlation of 0.007 between education and the adoption of dehorning.

Judging by the number of respondents who have indicated that they do dehorn their animals at the age of less than five months and before nine months, it can therefore be assumed that livestock farmers do appreciate the practice adoption of innovation.

7.9 SUMMARY

In summary it appears that most of the respondents are owner male/female herders of their stock (91.7%), while hired herders to look after their stock was somewhat higher on the communal (11.8%). The findings also indicate that respondents with higher formal education do not have more hired herders than the respondents with lower level of education. The use of hired herders is also not a function of household size. In respect of labour requirements, farmers perceive the group and communal ranches to have the highest labour requirements.

The level of disease control is poor, even though, the degree of government controlled or a subsidised disease is somewhat better (40.6%) than those diseases for which the farmers are solely responsible (34.5%). With respect to dipping/spraying the findings indicate that the adoption practice is somewhat better observed by ranchers from communal and community ranches. The findings also seem to indicate that farmers with no formal education perceive dipping/spraying cattle for ticks as a more important adoption practice than their educated counterparts. As far as hand dressing is concerned farmers from communal and community ranches make more use of hand dressing for ticks than group and individual ranchers. The findings also indicate that older farmers (70 years and older) are less inclined to handdress their cattle, while more educated farmers control ticks less frequently. In respect of internal parasite control, individual and communal livestock farmers tend to practice better internal

parasite control than those livestock farmers in group and community ranches. The findings also show that internal parasite control tend to be practised better by livestock farmers with no formal education than their counterparts with less and more education.

Most of the respondents on different ranch types do not feed supplementary fodder crops at all, while supplementary feeding of minerals is pronounced more in the individual, group and communal ranches than in the community ranch. However, it appears that respondents were found to be partly not interested in the use of fodder crops as supplementary feeds and more interested in providing their livestock with minerals like salt, bonemeal and salt and rumevite.

Regarding the type of breeding method used, respondents seem to indicate that artificial insemination is more acceptable to farmers on individual and group ranches. The findings also indicate that artificial insemination is practised more as the educational level of the respondents increases. Again, the findings indicate that livestock farmers do practice continuous breeding system in their different grazing ranch type and that education has nothing to do with the type of breeding system livestock farmers would prefer to practice or adopt.

With respect to castration the percentage is somewhat higher in the group and individual ranchers whilst lower in the communal and community grazing system. The influence of education indicate that most of the respondents are aware of the importance of livestock castration at an earlier age even though the adoption practice of the respondents with more than 7 years of formal education is somewhat better. In respect to dehorning, respondents indicated that they do dehorn their stock at the age of less than 5 months and before 9 months. Based on percentage, individual and group ranches are somewhat higher while community and communal ranches are lower. Furthermore, it is important to recognize that education has no influence on the age at which respondents do dehorn their livestock. It can therefore be assumed that livestock farmers do appreciate the practice adoption or innovation.

What this chapter indicates concerning livestock management practices is that most of the livestock farmers do practice poor livestock management. In more concrete terms,

given the fact that most livestock farmers do practice poor management, the chapters that follow are based on the possibility of facilitating better management through fencing and whether this will lead to the acceptability of stock reduction by livestock farmers.

CHAPTER 8

ACCEPTABILITY OF STOCK REDUCTION

8.1 INTRODUCTION

The livestock industry is the dominant agricultural production activity in Botswana and is generally referred to as the mainstay of the country's economy (Kwelagobe, 1996). This important industry is experiencing a continuous decline, which is manifested in low growth in production indicators such as calving percentage, off-take rates, mortality, sales and others, particularly in open communal areas, and this in spite of concerted efforts from the Government to improve the livestock sector through the encouragement of better husbandry methods (Government Paper No.1, 1991 and Kwelagobe, 1996).

The major reason for the decline in production is the rapid deterioration of natural resources, which is attributed to the over exploitation of the rangelands due to overstocking and overgrazing (Balopi, 1996 and Kwelagobe, 1996).

Numerous writers, including Baker (1980), Sandford (1983), Tsimako (1991) and Düvel & Afful (1994), have elucidated the problem of overstocking. According to Düvel & Afful, (1994) quoting (Bembridge & Tapson, 1993), a vicious cycle of land and cattle deterioration has been initiated in Southern and Central Africa over the past four to five decades by the expansion of arable areas and a rapid increase in human and livestock population resulting in overgrazing, erosion and deterioration of natural rangelands (veld). These and other writers, such as Roe (1988), Shepherd (1989), McKean (1992) and Keijsper (1992:47) agree that while overstocking may not be the entire cause of range degradation and soil erosion, it is a contributing factor, and perhaps the major one.

Tsimako (1991:23) traced back the general dislike for the idea of stock reduction to the early years of the Tribal Grazing Land Policy (TGLP) consultation campaign. In those years concerns were raised that, if conservation laws were put into practice, they

may harm the TGLP because farmers would fear to obtain ranches thinking that they could be used as a means of imposing stock reduction.

Whether farmers will decide to reduce their stock will depend largely on how they perceive and interpret the practice of stock reduction and whether it is perceived to be reconcilable with their needs. This reasoning is based on the field theoretical understanding of behaviour (Lewin, 1951) and the behaviour analysis model developed from it (Düvel, 1991).

8.2 REASONS FOR KEEPING CATTLE

Needs represent the basic motives governing human behaviour, and can also be expected to be critical in understanding decisions regarding livestock production and stocking rates. The reasons for keeping livestock are expected to reflect the individual's needs either directly or indirectly (Düvel, 1991). Of particular importance is whether these judgements are compatible with stock reduction; something that cannot be expected to be the case if the respective objectives can be achieved with more rather than less livestock (Düvel & Afful, 1994:88).

The answers given by respondents in response to an open-ended question regarding their reasons for keeping cattle should be particularly valid in revealing respondents' needs, since they are expected to reflect what is uppermost in their minds and were provided without any prior influence.

According to the findings of the survey (Table 8.1) based on an open-ended question regarding the reasons for keeping cattle, 86.7 percent of the respondents mentioned *source of cash* as the main reason for keeping cattle. This percentage applies more or less equally to every ranching system. The percentage is somewhat lower for respondents on community ranches (70%) but they again were more inclined to mention the reasons of business or commercial uses.

This means that the reasons of keeping cattle as a source of cash apply more or less equally to the respondents on all the various ranch types. The data also show that individual and group ranchers are not more commercial oriented than their

community and communal counterparts, which again seems to indicate that the individual and group ranches are not necessarily a stimulus for more commercial production.

Table 8. 1: Main reasons (goals) for keeping cattle based on grazing systems (N = 128*)

Reasons	Respondents per ranch type								Total	
	Individual		Group		Community		Communal			
	n	%	n	%	n	%	n	%	N	%
Source of cash	14	87.5	25	92.6	14	70	58	89.3	111	86.7
Business commercial	2	12.5	2	7.4	3	15	2	3.1	9	7
Have more cattle	-	-	-	-	2	10	1	1.5	3	2.3
Draught power	-	-	-	-	1	5	1	1.5	2	1.6
Source of milk	-	-	-	-	-	-	2	3.1	2	1.6
Source of meat	-	-	-	-	-	-	1	1.5	1	0.8
Tradition	-	-	-	-	-	-	-	-	-	-
TOTAL	16	100	27	100	20	100	65	100	128	100

*Missing cases = 4

In addition to an open-ended question regarding the reasons for keeping cattle, respondents were also asked to select the most important reason from a list of alternatives based on the ranch type. These findings are summarised in Table 8.2.

As was the case with the open-ended question, the provision of *source of cash* (34.7%) features as the most important reason for keeping cattle, closely followed by *ceremonial feast* (29.1%) and then *source of wealth* (7.9%), *payment of lobola* (7.9%) and *milk* (6.3%). In these findings open-ended questions can be regarded to be more accurate and reliable than the selection of reasons from a list of alternatives, since they are expected to reflect what is uppermost in their minds, and were provided without any prior influence (Düvel & Afful 1994:88).

Table 8. 2: Some respondents' most important reasons (goals) for keeping cattle rated according to importance and based on grazing systems (N = 127*)

Reasons	Respondents according to grazing systems									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Source of cash (1)	5	35.7	13	48.2	6	30	20	30.3	44	34.7
Ceremonial feast (2)	4	28.7	6	22.2	6	30	21	31.8	37	29.1
Source of wealth (3)	1	7.1	3	11.1	-	-	6	9.0	10	7.9
Pay *lobola* (4)	1	7.1	-	-	2	10	7	10.6	10	7.9
Source of milk (5)	2	14.3	2	7.4	3	15	1	1.5	8	6.3
Draught power (6)	-	-	-	-	2	10	4	6.1	6	4.7
Source of manure (7)	-	-	1	3.7	-	-	4	6.1	5	3.9
Prestige/status (8)	1	7.1	-	-	1	5	3	4.6	5	3.9
Commercialise farming (9)			2	7.4					2	1.6
TOTAL	14	100	27	100	20	100	66	100	127	100

*Missing cases = 5

The findings in Table 8.3 indicate that respondents with herd size less than twenty keep cattle so that they can pay for their lobola, while those with 21 to 50 herd size were more concern about keeping cattle for draught power. The data also show that respondents with 51 to 150 and greater than 150 herd size were more concerned about keeping cattle as a source of wealth.

These findings largely resemble those of Düvel & Afful (1994) in that the purpose of cash takes the first position, something that varies significantly from the findings of earlier research (Hundleby, 1991), where "cash" seldom achieved a higher ranking than third position. It therefore seems as if the use of cattle as a source of cash is becoming more important. The wide variety of reasons for which cattle are kept, especially for cultural reasons, emphasises that the importance of cattle has not declined. In fact, the more cattle are kept, the better these needs can be fulfilled; something that is not reconcilable with cattle reduction.

Table 8. 3: Some respondents' reasons (goals) for keeping cattle based on herd size (N = 127)

Reasons	Respondents according to herd size									
	< 20		21 - 50		51 - 150		> 151		Total	
	n	%	n	%	n	%	n	%	n	%
Source of wealth	2	3.39	2	5.9	3	13.04	2	18.18	9	7.08
Source of milk	3	5.09	2	5.9	1	4.35	2	18.18	8	6.30
Source of manure	1	1.70	2	5.9	1	4.35	-	-	4	3.15
Pay lobola	7	11.86	2	5.9	-	-	1	9.10	10	7.87
Draught power	2	3.39	3	8.8	1	4.35	-	-	6	4.72
Prestige / status	4	6.78	-	-	1	4.35	-	-	5	3.94
Ceremonial feast	21	35.59	11	32.4	4	17.39	4	36.36	40	31.50
Source of cash	18	30.50	11	32.4	12	52.17	2	18.18	43	33.86
Commercialise farming	1	1.70	1	2.9	-	-	-	-	2	1.58
Total	59	100	34	100	23	100	11	100	127	100

*Missing values = 5

8.3 GOAL ACHIEVEMENT

Goals and aspirations can be regarded to be the means through which the individual satisfies his needs and, as such, are expected to have an important bearing on behaviour regarding livestock production (Düvel, 1991).

Respondents' views regarding the most important factor contributing to increased stock production are summarised in Table 8.4. According to these findings (Table 8.4) it appears as if stock reduction is need compatible since it is rated by 51.6 percent of the respondents as the most important factor contributing to improved stock production.

Respondents on individual and group ranches rate stock reduction somewhat lower and place, relative to the community and communal ranches, a higher value on the quality of cattle. These findings, if reliable, suggest that stock reduction should, in general, be acceptable.

Table 8. 4: Distribution of respondents, on different grazing systems, according to their views of the factor contributing most to increased production or income (N = 126*)

Contributions	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Stock reductions	7	46.7	12	44.4	12	57.1	34	54	65	51.6
Keep more cattle	3	20	5	18.5	4	19.1	11	17.5	23	18.2
Have better cattle	5	33.3	6	22.2	-	-	9	14.2	20	15.9
Improve grazing	-	-	4	14.9	3	14.3	6	9.5	30	10.3
More suppl. feeding	-	-	-	-	2	9.5	3	4.8	5	4
TOTAL	15	100	27	100	21	100	63	100	126	100

*Missing cases = 6

A similar but open-ended question regarding respondents' opinions as to how they would improve their livestock production over the next few years (Fig. 8.1) gave a completely different, and probably more reliable and valid picture.

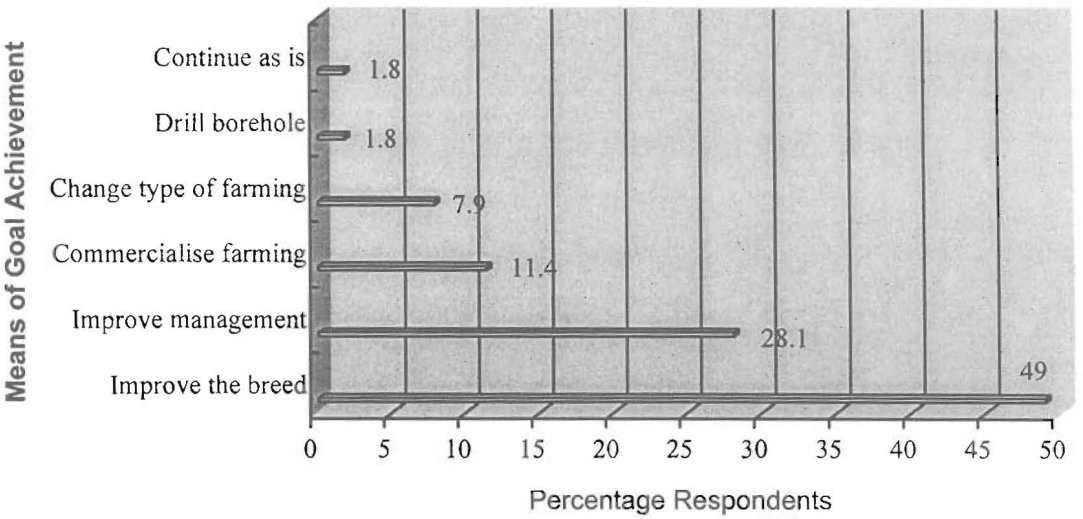


Figure 8. 1: Respondents' perceived means of realising their goals concerning the improvement of livestock production (N=114)

The responses show that improving the breed and management are the two methods mentioned by 77,1 percent of the respondents, while stock reduction does not feature at all.

The variation between the ranch types based on respondents' perceived means of realising their goals concerning the improvement of livestock production is summarised in Table 8.5. The perceived reason to improve the breed and management as a means of realising their goals concerning the improvement of livestock production applies more or less equally to the respondents on all the various ranch types. The data also show that individual and community ranchers prefer commercial farming more than their counterparts from group and communal ranches, which seems to indicate that the individual and community ranches can be a stimulus for commercial production.

Table 8. 5: Distribution of respondents, on different grazing systems, according to their perceived means of realising their goals concerning the improvement of livestock production (N=114)

Means of goal achievement	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	N	%	n	%	N	%
Improve the breed	8	50.0	14	60.8	12	63.2	22	39.3	56	49.1
Commercialise farming	5	31.2	1	4.4	3	15.7	4	7.1	13	11.4
Improve management	3	18.8	7	30.4	2	10.5	20	35.7	32	28.1
Drill borehole	-	-	-	-	1	5.3	1	1.8	2	1.8
Change type of farming	-	-	-	-	1	5.3	8	14.3	9	7.8
Continue as is	-	-	1	4.4	-	-	1	1.8	2	1.8
Total	16	100	23	100	19	100	56	100	114	100

*** Missing cases = 18**

The conclusion drawn from the above indicate that livestock farmers from individual and community ranches are more interested in commercial farming which in a way may influence the adoption behaviour of stock reduction. The data also indicate that some livestock farmers from communal ranch are more than willing to change type of farming (14.3%), which seems to indicate that they are willing to adopt other practise behaviour.

8.4 STATUS

Düvel & Afful (1994:132), maintain that the incompatibility of stock reduction with status can be a serious hindrance to the implementation of stock reduction if status is dependent on stock numbers.

The social function attached to cattle in the form of a large herd size is of significance to farmers due to the fact that, it is usually associated with social status. Most of the respondents regardless of ranch type do associate status with the number of cattle an individual own (0-39 cattle low status, 40-100 cattle medium status and more than 100 cattle high status). To establish the relationship between cattle numbers or herd size and socio-economic status, the respondents were requested to indicate whether herd size contributes to, or is associated with low socio-economic status, based on a 3-points scale with 3 indicating positive or yes, 2 indicating partially and 1 indicating negative or no (Fig. 8.2).

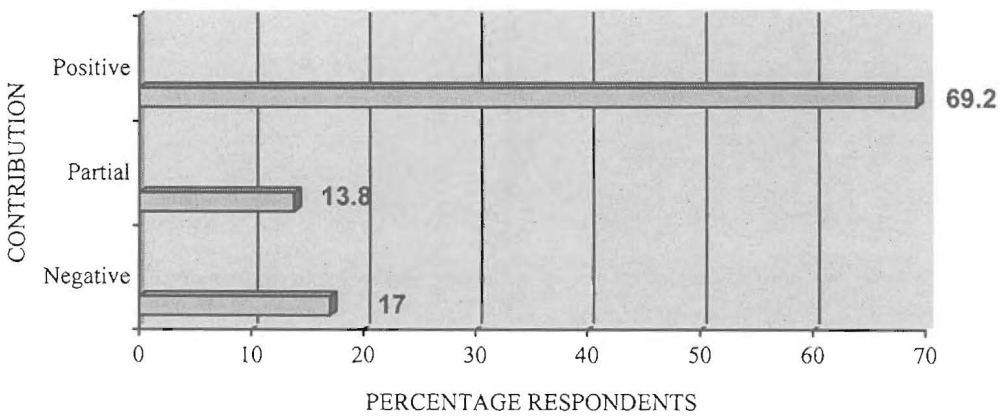


Figure 8. 2: Respondents' perceptions of the contributions of herd size or stock numbers to status within the community (N = 130)

According to Fig. 8.2 most of the respondents (69.2%) indicated that status depends on the number of cattle that people own, while a further 13.8% agree that the number of stock partially contributes to the status of an individual.

Table 8.6 illustrates the contribution of the herd size or cattle numbers to status. The data indicate that community ranchers were less convinced of the contribution of herd size to status than their counterparts from individual, group and communal ranches. These findings also confirm that the communal members are most conscious of the contribution of the herd size or cattle numbers to status.

Table 8. 6: Distribution of respondents, on different grazing systems, according to their perceptions of the contributions of herd size or stock numbers to status within the community (N=130)

Contribution	Respondents per ranch type									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
No/Negative (1)	3	20.0	4	14.8	7	33.3	7	10.5	21	16.2
Partially (2)	4	26.7	5	18.5	-	-	8	11.9	17	13.1
Positive (3)	8	53.3	18	66.7	14	66.7	52	77.6	92	70.7
Total	15	100	27	100	21	100	67	100	130	100

* Missing values = 2

Figure 8.3 relates educational level of respondents to the contribution of the herd size or cattle numbers to status. The findings indicate that respondents with no formal education had a positive view of the contribution of the herd size or cattle numbers to status followed by those with one to seven years of formal education. The data also indicate that livestock farmers with more than seven years of formal education were less convinced of the contribution of the herd size or cattle numbers to status.

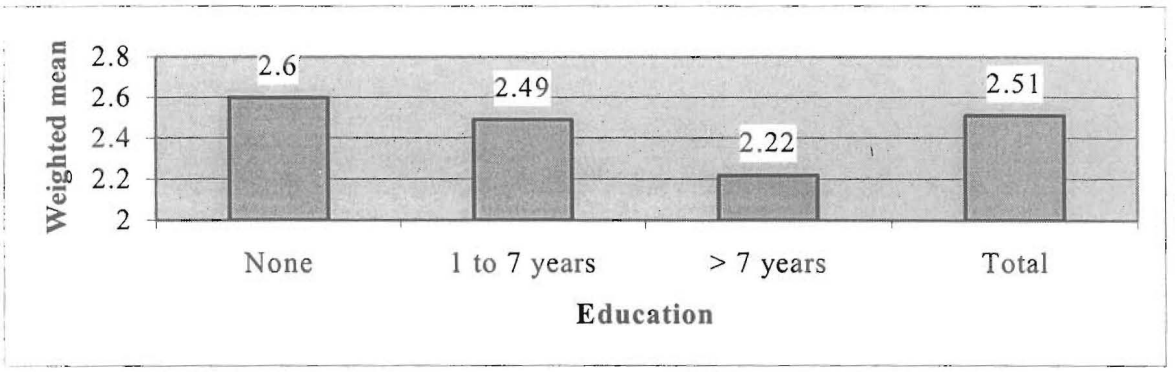


Figure 8. 3: Contribution of the herd size or cattle numbers to status expressed as weighted mean and based on educational level (N = 132)

8.5 STOCK PRODUCTION PROBLEMS

Problems are need-related in the sense that they usually represent constraints en route to the goal. These constraints can temporarily over-shadow the goal(s) in the sense that the attention is temporarily diverted to the problem with the immediate objective being to overcome the problem. It is for this reason that problems as a form of a need are an appropriate point of departure for any extension or persuasion strategy, and that the recommended innovation should, be compatible with or lead to a solution of the perceived major problem (Düvel, 1991).

The responses in reaction to a question as to whether the major stock farming problem was lack of land or too many cattle or any other problem, which then had to be named, are summarised in Fig. 8.4. It is hardly surprising that farmers do not perceive overstocking as a major problem of stock farming. As Fig. 8.4 shows, most farmers (65%) regard drought as the most serious problem of stock farming. Overstocking, if perceived as a problem, is attributed more to the lack of land than to the keeping of too many cattle.

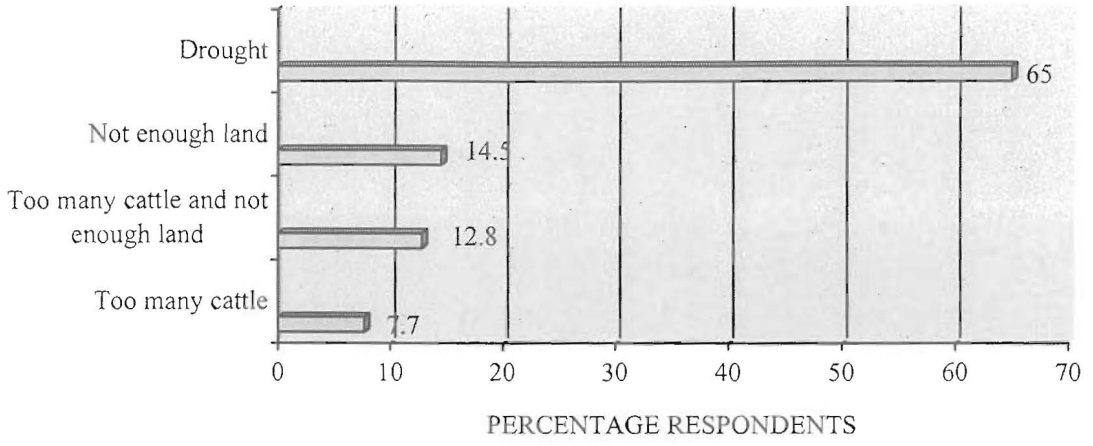


Figure 8. 4: The most important stock farming problems as perceived by respondents (N=117)

The findings in Table 8.7 indicated that livestock farmers from individual ranches perceive or consider not enough land as their most important stock-farming problem. The reason is being that of wanting to accumulate more cattle. On the other hand, community ranchers also feel that too many cattle and not enough land are the two-second most important problems for them with regard to livestock production.

Table 8. 7: Distribution of respondents, on different grazing systems, according to their perception of the most important stock farming problem N=117)

Livestock farming problems	Respondents per ranch type									
	Individual		Group		Communit y		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Too many cattle	-	-	2	7.4	5	26.3	2	3.6	9	7.7
Not enough land	4	26.7	2	7.4	3	15.8	8	14.3	17	14.5
Too many cattle & not enough land	1	6.6	1	3.7	4	21.1	9	16.1	15	12.8
Drought	10	66.7	22	81.5	7	36.8	37	66.0	76	65.0
Total	15	100	27	100	19	100	56	100	117	100

* Missing values = 15

The findings in Table 8.8 indicate that respondents with no formal education are more concerned about having too many cattle as their most important problem of stock

farming than their educated counterparts. The data also indicate that respondents with more than seven years of formal education were more concerned about not having enough land as their most important stock farming problem and less concerned about having too many cattle.

Table 8. 8: Distribution of respondents' problem of sock farming according to their educational attainment, (N = 117)

Livestock farming problems	Respondents per educational attainment							
	None		1 – 7 years		> 7 years		Total	
	n	%	n	%	n	%	n	%
Too many cattle	7	12.07	2	4.55	-	-	9	7.69
Not enough land	9	15.52	5	11.36	3	20.00	17	14.63
Too many cattle & not enough land	8	13.79	6	13.64	1	6.67	15	12.82
Drought	34	58.62	31	70.45	11	73.33	76	64.96
Total	58	100	44	100	15	100	117	100

* Missing values = 15

Respondents were also requested to place in rank order based on their perception of the most serious problems out of a list of problems. The responses relating to the most important problem are shown in Table 8.9.

Table 8. 9: The frequency distribution of respondents (on different types of ranches) according to their perception of the stock farmer's most serious problem (N=128*)

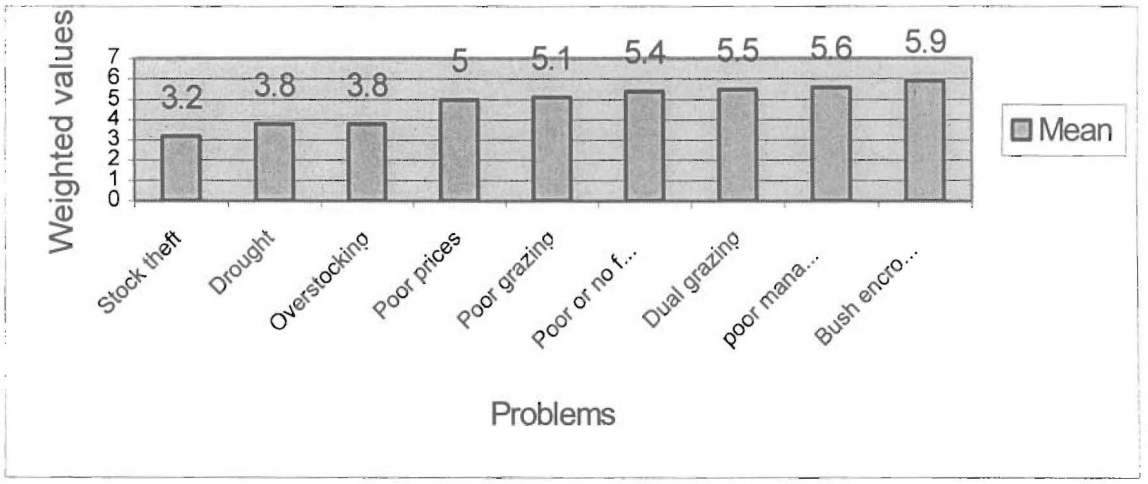
Problems	Respondents per type of ranch									
	Individual		Group		Community		Communal		Total	
	n	%	n	%	n	%	n	%	N	%
Drought	4	30.7	6	22.2	4	19.1	11	16.3	25	19.5
Stock theft	1	7.7	4	14.8	5	23.8	10	14.9	20	15.6
Overstocking	2	15.4	4	14.8	2	9.5	10	14.9	18	14.1
Dual grazing	1	7.7	1	3.8	3	14.3	10	14.9	15	11.7
Poor management	1	7.7	6	22.2	3	14.3	4	6	14	10.9
Bush encroachment	2	15.4	3	11.1	1	4.7	6	9	12	9.4
Poor prices (selling)	-	-	1	3.7	3	14.3	7	10.5	11	8.6
Poor grazing	1	7.7	2	7.4	-	-	4	6	7	5.5
Poor or no fencing	1	7.7	-	-	-	-	5	7.5	6	4.7
TOTAL	**13**	**100**	**27**	**100**	**21**	**100**	**67**	**100**	**128**	**100**

*Missing values = 4

Again drought features as the most important problem and placed in the first position by 19.5 percent of the respondents. Only 14.1 percent of the respondents regard overstocking as the priority problem within the given list, and this percentage hardly varies within the different grazing system categories. Community ranchers perceive this even less of a problem, but they experience more problems with stock theft (23.8%), which is overall perceived as the second most important problem, (15.6% respondents).

The mean weighted value in Figure 8.5 indicate that stock theft is seen as the outstanding serious problem in stock farming while drought is placed as second most serious problem in stock farming followed by overstocking.

The fact that stock reduction is not perceived as a possible solution to livestock production problems is a matter of great concern since it further emphasises the difficulty of successful interventions in this regard.



* Weighted values based on a 10-point scale with 1 = highest serious problem and 10 = lowest serious problem.

Figure 8. 5: Weighted value of the most important problems as perceived by respondents (N=117)

8.6 RANGELAND PROBLEM PERCEPTIONS

The need for or acceptability of stock reduction is necessarily dependent on whether, according to respondents' perception, the grazing is currently overstocked and/or whether its current condition is in a poor state.

One indication of whether overstocking is likely to be a concern, is whether they are aware (enlighten or literate) of their current stock numbers (Table 8.10).

According to Table 8.8 the large majority of respondents have no knowledge (41 percent) or only a limited knowledge (50 percent) of the correct number of cattle. It is only the individual ranchers that have a fairly good knowledge of the present number of cattle kept on their ranches. These findings seem to indicate that the potential need for stock reduction is somewhat undermined by respondents' ignorance of the current stock numbers.

Table 8. 10: The frequency distribution of respondents according to their knowledge of the number of stock kept on the grazing system

Knowledge of cattle Numbers	Respondents on different types of ranches									
	Individual		Group		Community		Communal		Total*	
	n	%	n	%	n	%	n	%	N	%
No knowledge	-	-	1	4.6	7	33.4	42	66.7	50	41
Some knowledge	8	50	20	90.8	12	57.1	21	33.3	61	50
Good knowledge	8	50	1	4.6	2	9.5	-	-	11	9
TOTAL	**16**	**100**	**22**	**100**	**21**	**100**	**63**	**100**	**122**	**100**

*Missing cases = 10

In order to test whether respondents tended to overrate the current grazing condition, they were asked to rate their grazing. These ratings were compared with those of enumerators, accepting that the enumerators' rating represented a more objective rating of the current grazing condition.

The findings summarised in Fig. 8.6, clearly show that respondents tend to perceive their grazing in a much better condition than the enumerators did. Whereas 76% of the respondents rate their rangelands to be in a very good condition not a single ranch is assessed by enumerators to be in a very good condition.

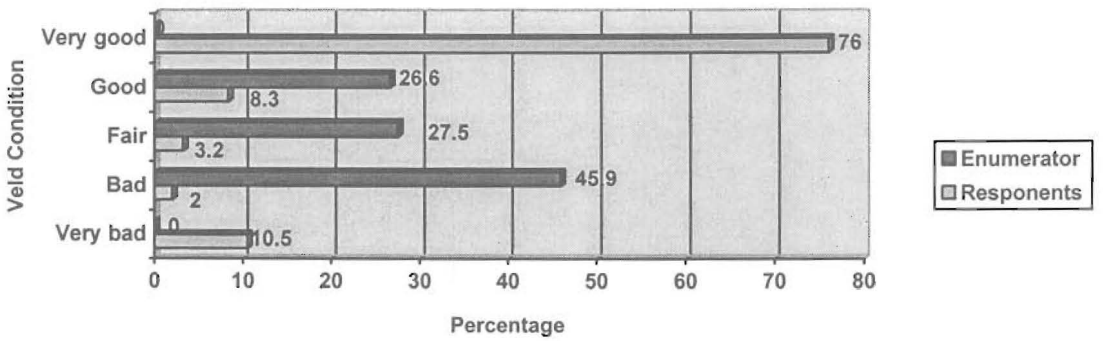


Figure 8. 6: The comparative rating of veld condition by respondents and enumerators (N = 132)

The differential perception or misperception is particularly conspicuous in the case of the more common communal and community ranches. These comparisons are shown in Fig. 8.7, which summarises the average percentage ratings of enumerators and respondents regarding the veld condition on the different types of ranches.

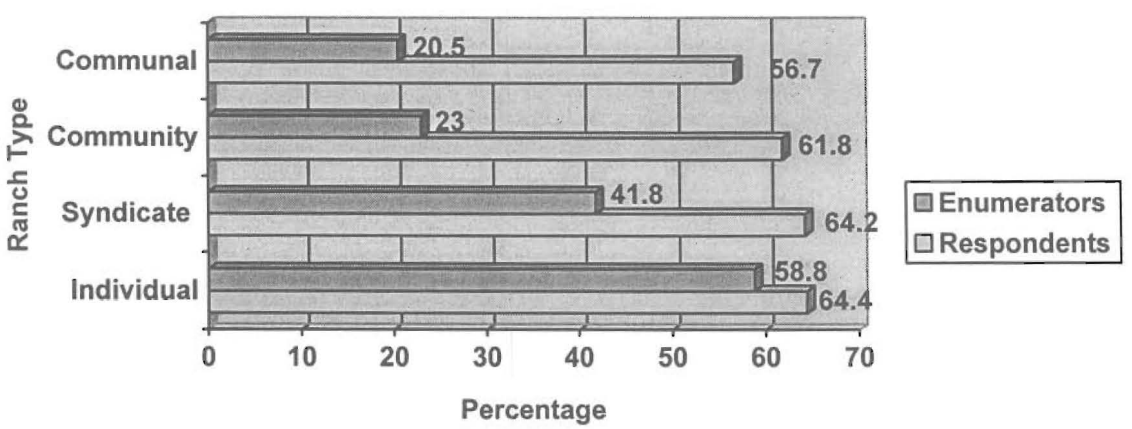


Figure 8. 7: A comparison of respondents' and enumerators' average assessment (expressed as a percentage) of the grazing condition of the various types of ranches

These findings suggest that respondents largely overrate the veld condition and that their misperception results in an undermining of their potential need tension regarding veld improvement. In other words, the potential need for rangeland improvement is reduced by respondents overrating or misperception of the current condition.

8.7 ALTERNATIVE SOLUTIONS TO POOR GRAZING CONDITION

The above findings suggest that respondents' need for veld improvement is limited or even absent. This being the case, the obvious challenge from extension is to bring about disillusionment among the farmers regarding the real condition of the natural rangeland. However, even when this is achieved, the reduction of stock is not likely to just happen. The reason for this is, as Table 8.11 indicates that the prominence of stock reduction as a means of improving the rangeland condition is low compared to other alternatives.

Table 8. 11: Respondents' average assessment* of different solutions according to their effectiveness and acceptability in improving rangeland conditions

Solutions for improving grazing condition	Effectiveness	Acceptability
Rainfall (n=123)	4.02	4.68
More grazing cells (n=122)	3.59	3.95
More camps (n=122)	3.48	3.83
Stock reduction (n=123)	3.25	3.20
Stock removal (n=122)	3.09	3.12
Rotational grazing (n=122)	2.36	2.52

* *Rating based on a 5-point scale with 5 = highest effectiveness and acceptability and 1 = lowest effectiveness or acceptability.*

Both from an effectiveness and acceptability point of view, stock reduction is ranked only in fourth position out of a total of six alternatives. More rainfall, more grazing cells and more camps are far more attractive alternatives. The fact that the perception of farmers on individual or group ranches is not much more favourable, indicates just

how big and difficult this task is of improving and maintaining the natural grazing resources through the promotion of stock reduction.

8.8 SUMMARY AND CONCLUSION

Sustainable stock production in Botswana is dependent on the maintenance and improvement of the natural grazing, for which purpose the reduction of stock numbers is essential. For extension this will be an extremely difficult and challenging, if not impossible, task, because of the unacceptability of stock reduction, of which overwhelming evidence has been provided in this paper. Stock reduction is clearly not reconcilable with respondents' needs, goals and perceived means of achieving them. A contributory factor is the farmers' misperception of the condition of their natural grazing and consequently the fact that the seriousness of the problem is not appreciated. Even if the problem was appreciated, stock reduction is not perceived as the appropriate and acceptable solution.

It is, as a first step, important that the difficulty and the almost impossible nature of this extension challenge is appreciated. Ultimate success will depend on whether it will be possible to create new incentives and needs with which stock reduction is compatible.

CHAPTER 9

INTENTIONS REGARDING FENCING OF COMMUNAL GRAZING AREAS FOR FACILITATING BETTER MANAGEMENT

9.1 INTRODUCTION

A large proportion of beef production in Botswana is raised from the communal farming systems which account for 85% of the national herd (Makobo Kahiya, Macala, Tlhalerwa, & Tacheba, 1996). The uncontrolled management of these communal grazing lands is, according to Makobo *et al.* (1996), not only unproductive, but has led to unprecedented range degradation and poor livestock performance. The authors also indicated that productivity indicators such as births, off-take etc. show that performance in the unfenced areas is below that of fenced situations.

The poor performance of the livestock sector has necessitated fencing of the current communal grazing areas as advocated by the National Policy on Agricultural Development (1991). It was regarded as a step towards addressing the environmental and economic problems associated with, or emanating from, poor management of communal grazing areas. Keijsper (1992), White (1993), Monu (1995) and Southern District Fencing Team Presentation (1996) agree that, while fencing may not be the entire solution of poor management of communal grazing, it is a contributing factor, and perhaps the major one.

The idea of better management of the most priceless resource, namely the land, can be traced to the early years of launching the Grazing Land policy (Sir Seretse Khama, 1975). In those years concerns were raised that, to get the best results, the improved management system must start with fenced areas of land.

The successful promotion of fencing as a means to facilitate better management will depend largely on farmers' needs and perceptions and on a thorough understanding of all the influencing socio-economic factors. This study investigates the acceptability

of fencing in the context of different ranching systems as perceived by farmers in some parts of Botswana.

9.2 PREFERENCE REGARDING DIFFERENT MANAGEMENT

In Botswana, fencing has been seen as the key to increasing range productivity (Sandford, 1993:138-139). According to Tsimako, (1991:28-29) farmers are aware of the need to adopt better methods of livestock management. They appreciate the usefulness of fencing accompanied by management and provision of water as this also facilitates the selection of good breeding animals.

In order to determine the usefulness of fencing, farmers were asked to choose out of a series of alternatives, the ranch system they preferred most.

Table 9. 1: Frequency distribution of respondents (percentage) on different grazing systems according to their most preferred ranching systems, 1996 (N=131)

Grazing systems	% Respondents per ranch type				
	Indivi-dual	Group	Com-munity	Com-munal	Total
	(n=15)	(n=27)	(n=21)	(n=68)	(N*=131)
Individual ranch	100.0	63.0	33.3	42.6	51.91
One small cell camp used alone as and when wanted	-	3.7	4.7	13.2	8.5
Small grazing syndicate with four camps rotated	-	7.4	14.3	5.9	6.9
Part of communal with four camps rotated (group)	-	3.7	4.8	7.4	5.3
Communal divided into four camps rotated	-	11.1	4.8	8.8	7.6
Total communal divided into four camps unrotated	-	2.4	4.8	4.4	4.6
Communal rotated through controlled water access	-	3.7	14.3	13.2	9.9
Present communal grazing	-	-	19.0	4.4	5.3

* Missing = 1

According to Table 9.1, the majority of respondents (51.91 percent) rate the individual ranch, as the most preferred grazing system. This applies to respondents

on all ranching systems, although those on group or syndicate and especially on individual ranches are clearly more outspoken.

From a conservation point of view, it is encouraging that the percentage respondents preferring systems that imply no form of rotation is only 18.4 percent. On the other hand it cannot be ruled out that the attraction of the individual ranch may lie in the individual management. In this context it is also noteworthy that 8.5% of the respondents preferred a one-camp cell, that allowed no rotation but in which the individual could otherwise do as he/she pleases.

The rating of the individual ranch varies considerably when it is assessed from a preference, production, management or conservation point of view. This is illustrated in Figure 9.1 for the various respondent categories.

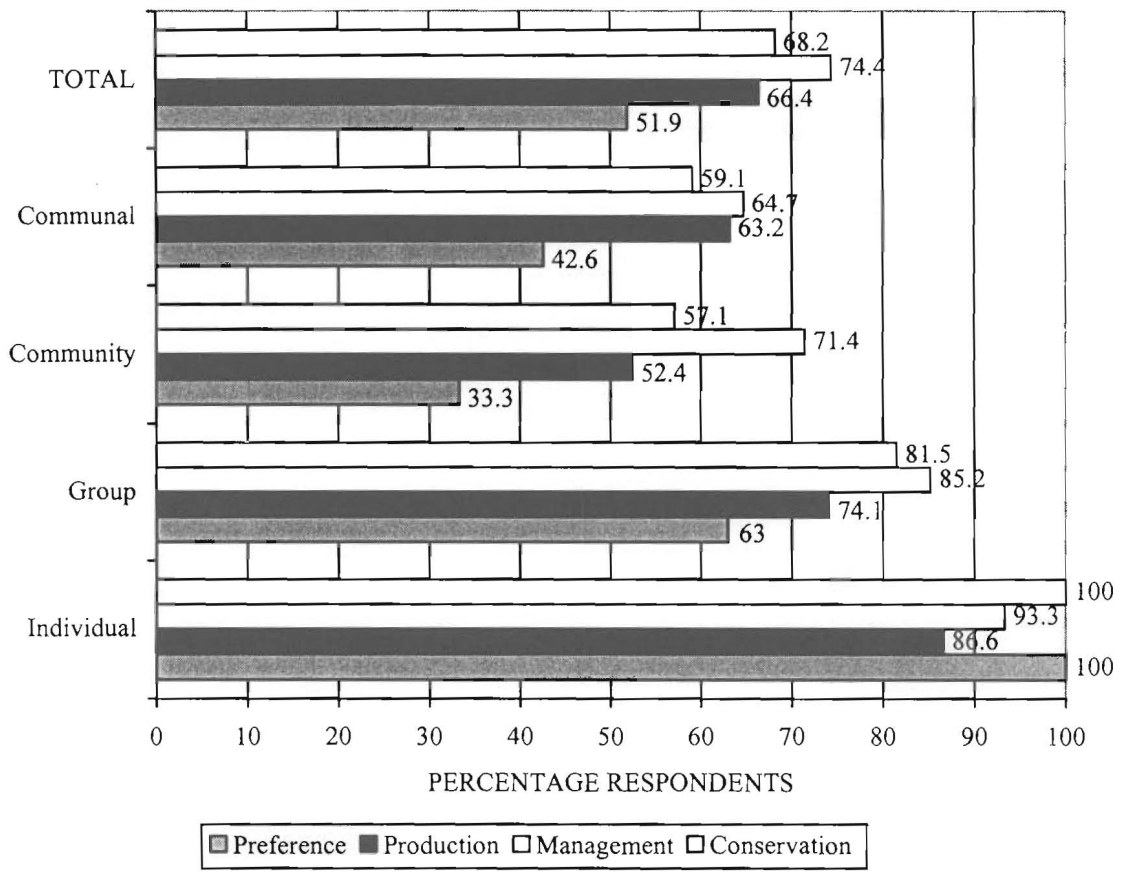


Figure 9. 1: The percentage respondents on different ranches, nominating the individual ranch as their first choice from a preference, production, management and conservation point of view

Although the majority of respondents on individual and group ranches prefer the individual ranch to other types of ranches, the perceived attractiveness of the individual ranch lies especially in the advantages that it has from a management point of view. On the other hand more than half of the respondents from communal and two thirds from community ranches choose other ranches than individual ranch as their first choice from a preference point of view and this resulted in having a relatively low preference when compared to production, management and conservation concentrations.

Table 9.2 represents a further analysis of community and communal ranch respondents regarding their first choice of different types of ranches using criteria of preference, production, management and conservation

Table 9. 2: The distribution of respondents (percentages) on community and communal ranches according to their choice of ranches (classified into rotation categories) in terms of preference, production, management and conservation considerations

Ranch Type	Grazing System	Prefe-rence	Produc-tion	Manage ment	Conser-vation
Community	Indiv. ranch (rotated)	33.3	52.4	71.4	57.1
	Other ranch (rotated)	38.2	28.5	14.2	42.9
	No rotation	28.5	19.1	14.3	-
Communal	Indiv. ranch (rotated)	42.6	63.2	64.7	59.1
	Other ranch (rotated)	35.3	23.6	19	25.7
	No rotation	22.1	13.2	16.3	15.2

Although only 33.3 and 42.6 percent respectively of the community and communal ranchers mention the individual ranch as their first choice from a preference point of view, it features much more prominently in the light of production, management and conservation considerations. The big discrepancy between these and the preference rating seem to indicate that for a fair number of respondents on community and communal ranches there must be more important considerations than production, management and conservation. This may also be the reason why 28.5 and 22.1

percent of the community and communal ranchers preferred grazing systems making no provision for rotation whatsoever.

9.3 FUTURE INTENTIONS CONCERNING THE RANCHING SYSTEMS

Intentions can be regarded as means through which the individual satisfies his/her needs and, as such, can be expected to have an important bearing on behaviour regarding fencing of grazing areas (Düvel, 1991:78). The acceptability of the ranch situation was tested by a closed-ended question in which respondents were asked to indicate what their future intentions were, with regard to fencing of communal grazing areas (Table 9.3).

Table 9. 3: Future intentions of farmers regarding the different ranching systems, 1996 (N = 124)

Future Intentions	% Respondents per type of ranch				
	Indi-vidual (n=10)	Group (n=27)	Com-munity (n=20)	Com-munal (n=67)	*Total* (N=124)
To become group/syndicate ranch member	-	48.1	10.0	52.2	40.3
To become syndicate and communal ranch member	-	3.8	15.0	10.4	8.9
To become community ranch member	-	-	30.0	6.0	8.1
To become community and communal ranch member	10.0	-	5.0	4.5	4.0
To become communal ranch member adjoining other ranch systems	-	-	15.0	3.0	4.0
To become individual ranch member	90.0	48.1	25.0	17.9	31.5
To become individual and communal ranch member	-	-	-	6.0	3.2

The intentions regarding future ranching systems vary very significantly between the different ranch categories. The individual ranch respondents all, with a single exception, want to stay what they are. About half of the group or syndicate ranchers intend becoming ranchers on an individual ranch while the remainder want to remain group ranchers.

Amongst the community and communal ranchers the intentions are more varied. 25% of community ranchers want to become individual ranch members and a further 25%

group or syndicate ranchers. The biggest group (30%) intend remaining what they are, whilst a significant number (20%) appear to have limited or other unknown aspirations, in the sense that they want to revert back to communal ranching.

The communal ranchers have either more aspirations or are more discontent with their situation than the community ranchers. More than 60 percent of them want to participate in a group/syndicate ranch and 23.9 percent even want to own an individual ranch.

In general it appears as if the group and individual ranches with the associated fencing component appeal to the community and communal ranchers and is largely compatible with their needs. There is, on the other hand, an unmistakable indication that the communal and community systems still have an appeal. However there is no reason why the group or syndicate concept cannot be accommodated without displacing communal grazing rights.

9.4 GRAZING FEES AND COSTS

Lease rentals payable to local authorities in return for the exclusive grazing rights have been set at a sub-economic level of four thebe per hectare per year or P256.00 per year for a 6,400 hectare ranch (Tsimako, 1991:29). This is not realistic in financial terms and consequently not sustainable.

It is assumed that what respondents are prepared to pay as lease rental could give some indication of the value they attach to the grazing. The respondents were asked how much they are prepared to contribute as grazing fee i.e. per grazing animal per year. These results are summarised in Table 9.4.

According to the results (Table 9.4), most of the respondents (32.6%) are prepared to contribute less than one pula per head of cattle per year. 86.7 percent of all respondents are not willing to pay more than P20 per year, which emphasises the long path towards sustainable stock production. Only 23.1 and 26.1 percent of the respondents respectively, onthe individual and group ranches are prepared to pay more than P40. It is striking that there is no direct relationship between the degree of

infrastructure (fencing) on the ranches and the grazing fee that individuals are prepared to pay. For example, communal ranchers (who have no fencing) are prepared to pay more than community ranchers who have at least a boundary fence. Similarly, group ranchers tend to be prepared to pay more than individual ranchers.

Table 9. 4: Frequency distribution of respondents on different ranch types according to the grazing fee they can pay, 1996 (N=98)

Grazing fee (per head of cattle/ Year)	% Respondents per type of ranch				
	Individual (n=13)	Group (n=23)	Community (n=21)	Communal (n=41)	Total (N*=98)
< P1.00	76.9	8.7	61.9	17.1	32.6
P1.00 – P10.00	-	30.4	33.3	34.1	28.6
P11.00 – P20.00	-	17.4	4.8	48.8	25.5
P21.00 – P40.00	-	17.4	-		4.1
> P40.00	23.1	26.1	-		9.2

* Missing = 34

It is possible that the responses were somewhat distorted in the sense that the respondents could have thought that their responses could be held against them and ultimately used to determine the grazing fee. A somewhat more reliable and valid response could be expected in reaction to a question about the maximum fee that the respondent would be prepared to pay. These findings are shown in Table 9.5.

In this case it is noteworthy that the better the infrastructure (fencing, etc.) of the ranch type, the higher the maximum fee that respondents are prepared to pay. 60 percent of the individual ranchers are prepared to pay a maximum fee of more than P100.0. Somewhat disturbing from a sustainability point of view is that 20 percent of the individual ranchers and 39.1 percent of the group or syndicate ranchers are still not prepared to pay a maximum fee of more than P10 per head of cattle per year. The fact that grazing is regarded as a natural resource which relies on the amount of rainfall per season, and that there are no stock limits per ranch, livestock farmers seem tom put less value on the grazing.

Table 9. 5: Frequency distribution of respondents (on different types of ranches) according to the maximum grazing fee they are prepared to pay for grazing in the current situation (N=97)

Maximum grazing fee	% Respondents per type of ranch				
	Individual (n=10)	Group (n=23)	Community (n=43)	Communal (n=43)	Total (N*=97)
P1.00 – P10.00					
P11.00 – P40.00	-	17.4	23.8	9.3	13.4
P41.00 – P99.00	20.0	34.8	14.3		13.4
P100.00 and above	60.0	8.7	9.5		10.3

* Missing = 35

9.5 PERCEPTIONS OF SOME ASPECTS OF COMMUNAL, COMMUNITY, GROUP/SYNDICATE AND INDIVIDUAL RANCHES

In this section some of the beliefs or perceptions that farmers have about the communal, community, group/syndicate and individual ranches are elicited by means of questions regarding their advantages and disadvantages. These advantages and disadvantages can be associated with positive and negative forces, the balance of which is decisive in determining the attractiveness and ultimately the decision making and adoption concerning the grazing systems (Düvel & Afful, 1994:144).

9.5.1 Advantages and disadvantages of communal ranching

As indicated above, advantages are associated with positive forces and, in order to be perceived as attractive or positive, they have to be need related in one way or the other (Düvel & Afful, 1994:146). As for disadvantages, Düvel & Afful (1994:149) referred to them as associated to the goal object or as constraints encountered *en route* to its achievement or implementation.

Respondents were asked to identify or name the most important advantages and disadvantages of every ranch type. Those relating to the communal grazing system are summarised in Table 9.6.

The free use of bulls by everybody is perceived by respondents on all ranch types to be the outstanding advantage. On the negative side is the uncontrolled breeding (mentioned by 28.0%) and poor grazing management (43.9%). Respondents on all ranch types share the latter disadvantage more or less equally, while uncontrolled breeding is a disadvantage that the individual and group ranchers are more aware of.

Table 9. 6: The advantages and disadvantages of communal grazing system as expressed by respondents on different types of ranches, 1996

	% Respondents according to grazing systems				
	Indivi-dual (n=16)	Group (n=27)	Com-munity (n=21)	Com-munal (n=68)	Total (N=132)
Advantages (N = 48)					
Free use of bulls by everybody	31.3	22.2	38.1	30.9	30.3
Large number of herds can be reared	6.3	-	4.8	1.5	23
Less labour required	-	3.7	-	1.5	1.5
Drift fence can be constructed	-	-	-	1.5	0.8
Farmers share ideas	-	-	9.5	-	1.5
Disadvantages (N = 115)					
Uncontrolled breeding	43.8	55.6	19.1	16.2	28.0
Poor grazing management	50.0	18.5	61.9	47.1	43.9
Livestock theft high	-	11.1	9.5	20.6	14.4
Cattle travel long distance for grazing and water	-	-	-	1.5	0.8

Respondents on all ranch types are aware of more disadvantages than advantages regarding the communal grazing system. As Figure 9.2 illustrates, the imbalance of disadvantages (negative forces) over advantages (positive forces) is smallest in the case of community ranchers, which confirms why such a large percentage (30%) of this group has intentions of not moving out of community ranching (see Table 9.3). However, in general it seems as if the communal ranch does not appear very attractive to respondents, since the disadvantages far outnumber the advantages.

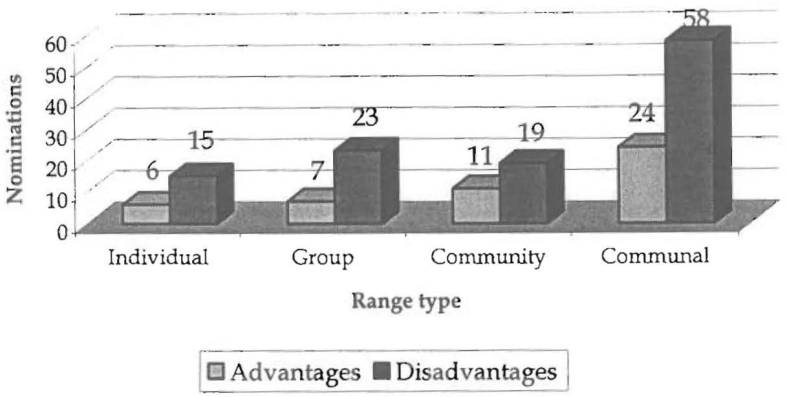


Figure 9. 2: Number of advantages and disadvantages of communal grazing system as expressed by respondents on different types of ranches

9.5.2 Advantages and disadvantages of the community ranch

Community ranches were intended for small cattle owners in the communal areas and were to be communally operated. Respondents' opinions regarding the advantages and disadvantages of a community-grazing ranch are summarised in Table 9.7.

Table 9. 7: The advantages and disadvantages of community grazing system as expressed by respondents on different types of ranches

Advantages and disadvantages	% Respondents per type of ranch				
	Indivi-dual (n=16)	Group (n=27)	Com-munity (n=21)	Com-munal (n=68)	Total (N=132
Advantages (N = 101)					
Good veld and stock management	68.8	85.2	57.1	75.0	73.5
Co-operation maintained by members	-	3.7	4.8	1.5	2.3
Less cattle theft	-	3.7	-	-	0.8
Disadvantages (N = 62)					
Poor veld and stock management	50.0	40.7	66.7	29.4	40.2
No co-operation between members	6.3	14.8	-	-	3.8
Livestock theft high	-	-	9.5	2.9	3.0

As shown in Table 9.7 the outstanding advantage of the community grazing ranch is that it allows for good veld and stock management; a view that is shared by 73.5 percent of the respondents. Two constraints are no co-operation between members

(mentioned by 3.8%) and high livestock theft (3.0%). This former disadvantage is a bigger concern for the group ranchers (14.8%) than for the individual ranchers (6.3%). As far as the constraints of high livestock theft are concerned the reverse tendency seems to occur. The overlapping between advantages and disadvantages is due to the vested interest of accumulation of large sock numbers by livestock farmers as a whole.

Judging by the number of advantages and disadvantages, it is obvious that the community ranch is perceived to be more acceptable or attractive than the communal ranch (Figure 9.3). Only the community ranchers were aware of more disadvantages than advantages. The possible reason for this is that the community ranchers were disillusioned by their experience, namely that the subdivision into camps on the community ranch did not materialise.

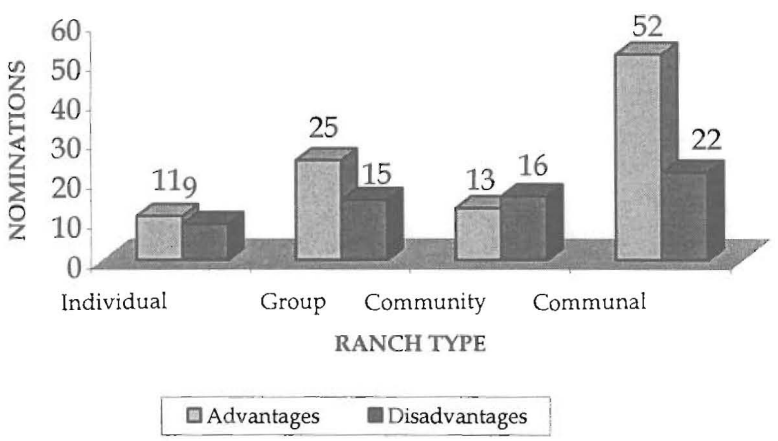


Figure 9. 3: Number of advantages and disadvantages of community grazing system as expressed by respondents on different types of ranches

Respondents on other ranches were probably less aware of this and consequently had a better perception of what they understood to be a community ranch.

9.5.3 Advantages and disadvantages of the group/syndicate grazing ranch

Group formation has been encouraged among small farmers with the hope that they can gain through the sharing of facilities and resources and consequently can achieve what individuals cannot do on their own (Tsimako, 1991:20).

Table 9.8 gives a brief overview of the advantages and disadvantages of the group/syndicate ranch.

Table 9. 8: The advantages and disadvantages of the group/syndicate grazing ranch as expressed by respondents on different types of ranches, 1996

Advantages and Disadvantages	% Respondents per type of ranch				
	Indivi-dual (n=16)	Group % (n=27)	Com-munity (n=21)	Com-munal (n=68)	Total (N=132)
Advantages (N = 102)					
Good veld and stock management	68.8	77.8	57.1	75.0	72.0
Co-operation maintained among members	-	-	-	4.4	2.3
Less stock theft	-	3.7	-	1.5	1.5
Less contribution (money) for members	-	-	9.5	-	1.5
Disadvantages (N=52)					
Poor veld and stock management	31.3	48.2	38.1	26.5	33.3
Co-operation not maintained between members	18.8	18.5	4.8	4.4	9.1
Expensive to start and maintain	6.3	-	-	-	0.8

The outstanding advantage of group/syndicate ranches is that they allow for good veld and stock management. Seventy-two percent of the respondents shared this view. Somewhat contradictory is the fact that a large percentage (33.3%) mentioned this advantage also as a disadvantage. This even applies to the group ranchers (48.2%), who tend to be more outspoken than the others about this aspect. The reason for the phenomenon that what is supposed to be perceived as the main advantage, namely

good veld and stock management, is perceived by a significant percentage of respondents to be the major disadvantage (especially by the group ranchers) is a disappointment or disillusionment regarding the actual outcome of the group/syndicate ranch. The improvement of veld and stock did not materialise because of poor management (absentee management, overstocking, non-maintenance of fencing). Another problem or disadvantage mentioned by 9.1 percent of the respondents, but particularly by the individual ranchers (18.8%) and group/syndicate rancher (18.5%), is the problem of lacking co-operation between members.

According to Figure 9.4, which presents a comparison of the number of advantages and disadvantages as perceived by respondents on the different types of ranches, the advantages still outweigh the disadvantages, but the poor performance has probably made this ranch type less attractive for outsiders.

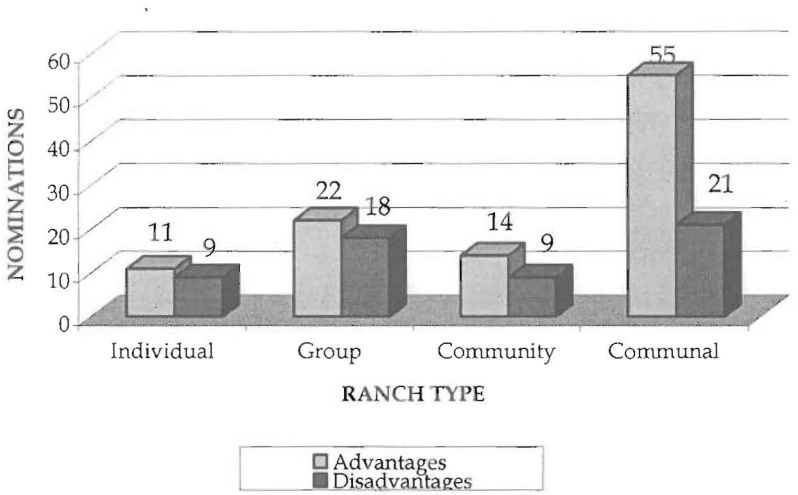


Figure 9. 4: Number of advantages and disadvantages of the group/ syndicate grazing ranch as expressed by respondents on different types of ranches

9.5.4 Advantages and disadvantages of an individual grazing ranch

In order to get the best results from improved management, the fencing of individual ranches should, according to Khama (1975), be encouraged, with the hope that correct stocking rates and paddocking will permit some rotational grazing and halt deterioration, allow the grass to improve, and provide standing hay for the season.

As shown in Table 9.9 the outstanding advantage of the individual ranch is that it allows for good veld and stock management; a view that is shared by 93.2 percent of the respondents. The two main constraints are the required knowledge and management skills (mentioned by 26.5%) and the costs to start and maintain it (25.0%). This latter disadvantage is a bigger concern for the community (38.1%) individual (25.0%) and communal ranchers (23.5%) than for group ranchers (18.5%). As far as the constraints of knowledge and management skills are concerned the individual ranchers are most aware of them. Awareness of this problem does appear to occur with implementation, but does not seem to be a serious deterrent for outsiders. Compared to the costs, this attribute is less of a constraint and thus not such a strong negative force as far as adoption is concerned. Seen in this light, the relative small imbalance of advantages (positive forces) over disadvantages (negative forces) as summarised in Figure 9.5, is misleading and can the conclusion be made that only the costs stand in the way of implementation.

Table 9. 9: The advantages and disadvantages of an individual grazing ranch (on different types of ranches) as expressed by respondents, 1996

Advantages and disadvantages	% Respondents per type of ranch				
	Indivi-dual (n=16)	Group (n=27)	Com-munity (n=21)	Com-munal (n=68)	Total (N=132)
Advantages (N = 125)					
Good veld and stock management	100.0	100.0	95.2	88.2	93.2
Less cattle theft	-	-	4.8	-	0.8
Good for rich farmers	-	-	-	1.5	0.8
Disadvantage (N = 73)					
Lack of knowledge and management skills	50.0	33.3	28.6	17.7	26.5
Expensive to start and maintain	25.0	18.5	38.1	23.5	25.0
Land not enough for everybody to own a ranch	-	3.7	-	-	0.8
Difficult to get loans	-	-		5.9	3.0

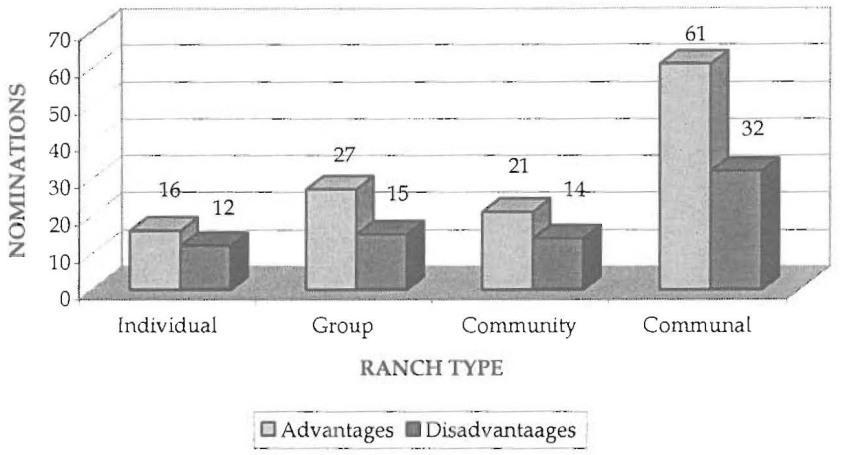


Figure 9. 5: Number of advantages and disadvantages of an individual grazing ranch as expressed by respondents on different types of ranches

9.6 SUMMARY AND CONCLUSION

The fencing of communal grazing areas and the establishment of ranches can potentially, given the correct management, curb the degradation of natural rangelands. This implies the adoption of fencing and good management practices.

As far as the acceptability of various ranch systems are concerned, there is a clear preference gradient from the individual ranch, followed by the group/syndicate ranch and then the community and communal ranches.

The preference sequence was supported by preference ratings, the ratio of perceived advantages to disadvantages, and expressed future intentions. In all cases the individual ranch was the most acceptable, but the lack of land and high costs rule it out as a solution. The group or syndicate ranch offers possibilities but disappointment and disillusionment regarding the poor results due to bad management have negatively affected its attractiveness. Other constraints, that will have to be overcome is lacking co-operation, and a tendency to perceive the ranch system as only a means to basic stock management rather than improved veld management. The erection of fences to enable the implementing of a ranching system is obviously no solution without improved management of both stock and techniques.

CHAPTER 10

CONCLUSIONS AND RECOMMENDATIONS

This study has been necessitated by the continuing belief that fencing of the current communal grazing areas as advocated by the national policy on agricultural development (1991) can be a step towards addressing the environmental and economic problems associated with the degradation of natural rangelands in Botswana. The main purpose of this investigation, therefore, was to gain insight into the reasons of overstocking or the reasons for non-adoption of recommended stocking rates. The assumption that the ultimate problem revolves around behaviour, led to the implementation of a model for adoption behaviour analysis (and change), developed by Düvel (1991) and leading to the research hypotheses of this study.

The pilot nature of this research and the limited research resources enforced an approach of which the results have limited extrapolating value but could serve as indicator and stimulate further investigations.

The need to find a solution to the countrywide problem of overstocking prompted the simultaneous investigation of alternative approaches other than the fencing of communal grazing areas. These types of traditional ranches or communal grazing areas formed the bases of a random sample involving livestock farmers from Lerolwane, Sekhutlane and Mabule in the Southern Region of Botswana.

As far as Hypothesis 1 is concerned, namely that *land users have no need to improve their resources or natural grazing because they overrate the condition of grazing or underrate the seriousness of the degradation, they do not know what optimum or good grazing is or looks like, there is no pressure from the community to conserve or properly manage their grazing (norms are not compatible with proper conservation management) and there is no pressure from government (legislation is not perceived to be enforced)*, the findings provide supportive evidence.

The evidence indicates that respondents tend to perceive their grazing in a much better condition than the enumerators did, that is, they rated their rangelands to be in very good condition while not a single ranch was assessed by enumerators as being in a very good condition. More importantly, and this applies to the rating of grazing condition, is that respondents tend to overrate the condition of their grazing or underrate the seriousness of the degradation. This implies that they do not know what optimum or good grazing is or looks like, as there is no pressure from the community or government to conserve or manage the grazing properly.

The hypothesis (Hypothesis 2) that (*land users have no need for improved grazing management; the implementation of grazing management systems (rotational grazing or resting) and consequently the different camping systems*) was tested by means of several sub-hypotheses.

Hypotheses (2.1.2 and 2.1.3) stating that *land users are unaware of what good management is and that they believe the present management is good or good enough (that is, overrate the management of open communal grazing)* is supported by the fact that most of the respondents on all ranch types perceive the free use of bulls by everybody to be the outstanding advantage of communal grazing system. The majority of the respondents rated the individual ranch as the preferred grazing system. The attraction of individual ranch may lie in individual management. In this context it is also noteworthy that 8.5 percent of the respondents preferred a one camp cell, which allowed no rotation but in which the individual could otherwise do as he/she pleases.

In general it appears as if the group and individual ranches with the associated fencing component appeal to the community and communal ranchers and is largely compatible with their needs. There is, on the other hand, an unmistakable indication that the communal and community systems still have an appeal. However there is no reason why the group or syndicate concept cannot be accommodated without displacing communal grazing rights.

The misperception or over-estimation (hypothesis 2.1.1) was confirmed in all cases, that is, in relation to veld condition, knowledge about stocking rate and veld

management. The veld condition is overrated by 76 percent of the respondents, while 91 percent of respondents had no knowledge or only had a limited knowledge of the correct number of cattle kept on their ranches.

In almost all cases there are clear indications of a relationship between misperception and the degree or rate of overstocking. These relationships imply that the bigger the misperception or the overrating of an efficiency aspect like veld condition, veld management, the higher the degree of overstocking tends to be.

From this follows that these misperceptions represent important constraints. They decrease the potential need for the improvement of veld, veld management and stock condition. These constraints can be overcome or the adoption of the recommended stocking rates enhanced, by disillusioning the respondents as far as their real condition of veld, veld management and stock condition is concerned, thereby increasing their need tension. Care should, however, be taken that the disillusionment is done tactfully without public exposure of the individual, in order to prevent the mobilisation of defence mechanisms.

Hypotheses (2.1.1 and 2.1.2), assuming that *land users are unaware of the advantage of proper management and the production advantages of the alternative systems or perceive the different alternative systems as less acceptable or prominent than their current system is* supported by the fact that most of the respondents (89 percent) do manage their animals on remote control basis. This type of management had also lead to poor management practices of controlling diseases, internal and external parasites (Chapter 7).

Furthermore, most of the farmers in different ranch types do not even bother about supplementary feeding of their stock. Regarding the breeding method used the findings have shown that most of the farmers (80 percent) regardless of ranch type do practise the old type of management, namely continuous mating. Finally the results have also demonstrated that livestock farmers are aware and do appreciate the importance of the practice adoption namely castration and dehorning.

Hypothesis 2 also state that *respondents are aware of the advantages and disadvantages or constraints that prevent the implementation of proper grazing management and the different systems* and the findings provide the evidence. The evidence, indicate that respondents are aware that fencing allows for good veld and stock management; a view that is shared by 93.2 percent of all the respondents. The two main constraints regarding fencing are the required knowledge and management skills (mentioned by 26.5) and the costs to start and maintain it (25.0%). Compared to costs, the attribute is less of a constraint and it is presumably not such a strong negative force as far as adoption is concerned.

Closely related to and even depending on the perception of the present condition or efficiency is the aspiration scope, which according to Hypothesis 2.2 (tested by means of several Hypotheses) was assumed to be insufficient. The aspiration scope, representing the difference between the present level and the level respondents aspired to achieve, was measured in respect of veld condition and stock condition and found to be a potential constraint to stock reduction in both cases. The fact that the perception of farmers on individual and group ranches is not much more favourable, indicates just how big and difficult this task is of improving and maintaining the natural grazing resources through the promotion of stock reduction.

From a behaviour theoretical point of view, needs are probably the basic and critical issue. In fact all motives and incentives of change can hardly qualify as such, if they are not in some way or other need compatible. In view of this, Hypothesis 2.2.1, assuming a perceived incompatibility of stock reduction with farmers' needs and problems, is of particular importance. This hypothesis was tested on the basis of the reasons for keeping cattle and the nature of goal achievement. The findings provide convincing evidence in support of this hypothesis, namely that stock reduction is by and large incompatible with respondents' needs. There are numerous examples of this hypothesised incompatibility. The reasons given for keeping cattle emphasise their tremendous importance for the small farmer. This importance revolves mainly around financial considerations. These financial reasons as well as others not related to agriculture, are in essence not compatible with stock reduction. On the contrary, they call for more stock and are thus incompatible. The other most important goal concerns "an increase in herd size" (Hypothesis 2.2.2), which received 69.2 percent of the

respondents, and as such provide evidence that stock reduction is not compatible with their needs. In a more direct question regarding plans to achieve their goals, 77.1 percent of the respondents mentioned improving the breed and management as the two methods associated with better grazing management, while stock reduction did not feature at all. This is possibly the underlying explanation why production and performance oriented projects have not been able to stem the tide of overstocking. Tsimako (1991:31), in reporting on the performance of the Tribal Grazing Land Policy Ranches, found that it led to an increase in cattle numbers and a reduced offtake, leaving the overstocking problem unsolved.

Further evidence of the perceived incompatibility of stock reduction with respondents' needs was found in an analysis of their knowledge of the number of stock kept on the grazing system. Judging by the response to the question about whether the respondents are aware of the current stock numbers, the majority of the respondents (91 percent) had no knowledge or only limited knowledge of the correct number of cattle explaining why overstocking or the high stocking rate is not perceived as a problem.

Even if respondents had a good perception of stock reduction (which appears not to be the case), its implementation would seriously be curtailed if other alternatives were perceived as more prominent or attractive. This hypothesis (Hypothesis 2.2.1) namely that land users are aware of other alternatives which they perceive to be more attractive like hope or rely on better rain was supported by the findings. In response to an open ended question concerning the major stock farming problem, most of the farmers (65 percent) mentioned drought as the most serious problem of stock farming. Overstocking, if perceived as a problem, is attributed more to the lack of land than the keeping of too many cattle.

Evidence concerning the hypothesis that respondents are *unaware of the advantages of stock reduction* (Hypothesis 2.2.2) was not as apparent. This applies more particularly to the hypothesised unawareness of the advantages. Optimal with a view to implementation would be a multitude of highly attractive advantages as they represent potential positive forces of change or adoption. These however are lacking.

For example, from effectiveness and acceptability point of view, stock reduction was ranked in fourth position out of a total of six alternatives.

The single most prominent disadvantage is "less stock" (Hypothesis 2.2.3) and encompasses the opposite of everything that respondents see as the purpose of keeping stock. The conspicuously few attributes of stock reduction mentioned here can be interpreted as the result of limited reflection and consequently limited knowledge concerning stock reduction and its implications.

A serious constraint preventing the implementation of stock reduction is the expected inequity of any such measures. It does seem as if the resistance to stock reduction could be largely overcome if community acceptable measures could be implemented whereby sacrifices are equitably distributed, and not exploited by some. Other constraints serving as restraining forces to the adoption of recommended stocking rates are droughts, unavailability of acceptable investment alternatives, low sale prices of cattle, the stock number related status symbol and the favoured custom of loaning cattle (Fig 10.1).

These findings not only provide supportive evidence of the validity of most of the research hypotheses, but also corroborate the value of the Düvel-model (1991) used for conceptualisation and analysis purposes. It provides, even in a cross-cultural context, for the effective identification of a wide range of causes that, in all likelihood, are relevant to the problem of continued overstocking in many parts of the country.

RECOMMENDATIONS

1. *Guidelines for a local programme of change*

The findings of this study not only seem to explain behaviour, that is, provide reasons for the resistance against stock reduction, but they also provide a basis for effecting change. Figure 10.1 gives an overview of the factors or most important forces relevant in overstocking or stock reduction.

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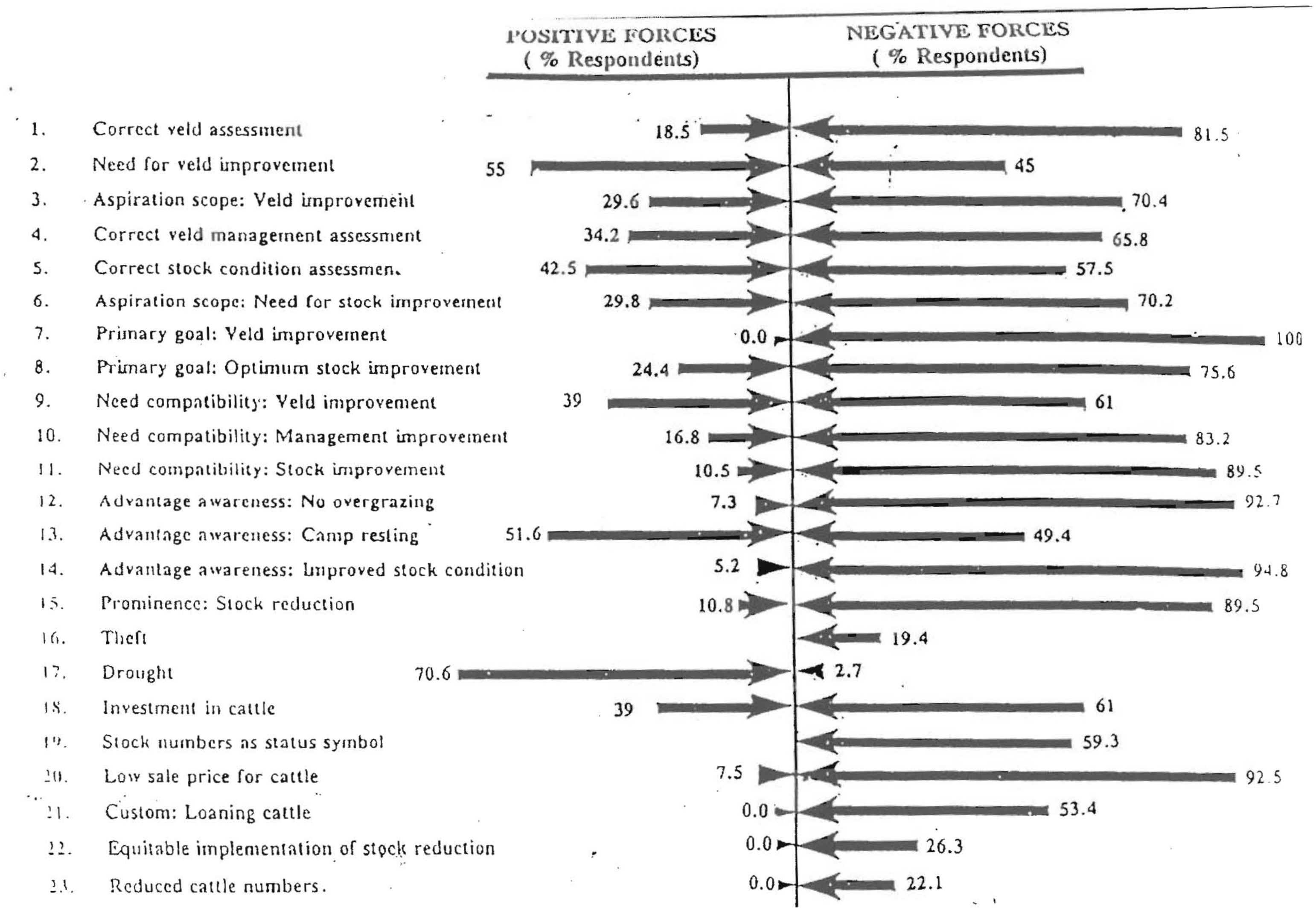

Figure 10.1: An overview of positive and negative forces pertaining to stock reduction

(From Düvel and Afful, 1994:164)

The imbalance of negative or restraining forces over the driving or positive forces explains why stock reduction does not occur, or why recommended stocking rates are not adopted. From a behaviour–theoretical point of view the obvious and appropriate approach is a systematic weakening or reduction of the negative forces as well as strengthening of the positive forces, or the introduction of new positive forces.

The presentation of the field forces in Figure 10.1 is not a puristic one from a theoretical point of view, in the sense that a lacking need is strictly speaking an absent of positive force and not the prevalence of negatives force. The purpose here is to illustrate the imbalance, and for that reason the absence of a positive force (e.g. a need) is shown as a negative force. Constraints, on the other hand, which cannot become positive, have no reciprocal opposite (positive) force.

In view of the overwhelming imbalance of negative over positive forces, the challenge facing extension is obvious, namely to systematically address and change of the various forces, that is, the forces that can meaningfully be changed. This implies more emphasis on message identification and message development focused on the so-called "force field" Figure 10.1); an approach that should find expression or be reflected in the content and objectives of extension programmes. In other words, an extension programme based on the findings of this study (summarised in Figure 10.1), would consist of the systematic addressing of the different forces. These actions would then represent the specific objectives of the programme, and would also be the focus of intermediary evaluations. For every specific objective, extension methods are decided upon, and then activities identified. Subsequently the time allocations can be made and the work calendar drawn up.

Since the psychological forces (perceived needs and perceptions) often tend to vary significantly between the different districts, it stands to reason that the forces as presented in Figure 10.1 and involving all respondents, need to be adapted to the different districts, and preferably even separately for the group ranches and communal areas. Such an inventory of forces, which can even be determined for small groups and individuals, will enable the extensionist to identify and formulate his/her message in an appropriate or situation specific manner, that is in accordance with the force field of a specific target audience. This places into perspective the traditional

overemphasis of extension methods, which are but a vehicle for getting the appropriate message across.

The presentation of forces in absolute terms in Figure 10.1, that is, as the number or percentage of respondents to which they apply, rather than their relative strengths, is a purposeful simplification tot the cattle farmers. It is based on the reasoning that a specific force within a target group should be addressed regardless of whether it pertains to relatively few or many audience members.

Extending the research horizon

The findings that perceptions, needs and knowledge tend to vary significantly between regions/districts, emphasises the situation-specificness of the research and consequently the possibility or likelihood that the findings do not apply in other regions with different societies, customs and cultures. It is also against this background that some of the recommendations are made with apprehension and are essentially provisional, but also that an urgent recommendation is made for an expansion of this research to other cultures and areas.

However, the framework provided by this research can, although some refinements and adaptations are necessary, provide the basis for such follow-up research. Ultimately situation surveys along these lines will have to be undertaken as precondition for situation-specific extension programmes or promotion campaigns.

The nature of the identified field force (determinants of behaviour) also highlights the need for more appropriate technical-economic research. As far as veld or rangeland management is concerned subject specialists are presently questioning many previously accepted guidelines. Specialists like White (1993:62), indicated that if there is no consensus on the basic problem and its seriousness and urgency then range management is not necessarily related to fencing either. The worst abuses of rangeland in Botswana have occurred in fenced farms, while good range management is possible without fencing), there is certainly a need for more research and especially appropriate research. The appropriateness should, above all, relate to economically

and ecologically supportive evidence pertaining to the various field forces of the rural or farming community.

More research also needs to be done into the acceptability of the group/syndicate and community ranch without displacing communal grazing rights. This study has shown that group/syndicate and community ranches are in general acceptable, appear to be more attractive alternatives and also seem to perform better from both a production and conservation point of view. Behind the motive to join a group or community ranch, is a clear economic motive (understandably more prevalent among the bigger herd owners), the realisation of which is usually at the expense of the communal ranch and its ranchers. The alleviation of grazing pressure on the group or community ranch due to more land allocation (at the resentment of the less fortunate) and not through stock reduction, is bound to translocate and to worsen rather than reduce the general problem of overgrazing. In view of this, the only real purposes of the group or community ranch lies presently in its training and demonstration value. Some of the many questions to which research has to provide answers are: How effective are group or community ranches for training and demonstration purposes, and how can they be made more effective with this purpose in mind? Is the better performance and better knowledge of group or community ranchers not only the result of an extension service that provides more incentives and other support services? Does the appeal of the group ranch lie in its collective nature or its perceived production or economic advantages? How can this concept be expanded in a way that is not only equitable and generally acceptable, but also cost-effective and in line with the emerging individuality of the small-scale farmer?

As far as the theoretical base of the study is concerned, the behaviour analysis model developed by Düvel (1991) and used in this study, has, with this research, stood its first of cross-cultural application. However, some new research challenges have been identified, especially as far as the reliable measurement of "field forces" is concerned.

Increasing the attractiveness of stock reduction

As mentioned earlier, the outstanding impression gained from the findings of this study (summarised in the psychodynamic force field in Figure 10.1) are the

predominant negative forces. However from a psychodynamic point of view, the removal of all negative forces cannot bring about change, unless there are at least some notable positive forces. Positive forces are by nature need related, and this is where the main cause for non-adoption lies. Stock reduction, in general, is incompatible with farmers' primary goals (which are mainly of a financial nature), their secondary goals and/or the means of achieving them. How can the attractiveness be increased?

It is with this in mind, that the already mentioned recommendations concerning the necessity for appropriate research have been made. The nature and type of questions to which research has to provide answers and acceptable evidence, is dependent on the perspective and perception of the farmer and his world of reality. Therefore, in order to be effective, such research will have to be empathetic and thus participative in the true sense of the word.

In view of the obvious limitations to a significant increase in the production or economic incentive of stock reduction (exacerbated by the unavailability of situational-relevant and acceptable evidence from research), other alternatives will have to be pursued. The obvious challenge lies in the exploitation of new or latent needs, which are compatible with stock reduction, or for the achievement of which more acceptable alternatives than an increase in stock numbers can be provided. One example would be, although a long-term endeavour, to create conservation related symbols through a gradual change in norms. The utilisation and expansion of the already world-wide pressure aimed at protecting and conserving the environment could be very effective. Other possibilities emerging from the results of this study are the creation of more attractive investment alternatives, and the improvement of marketing facilities and infrastructure.

Parallel strategies aimed at the removal or reduction of negative forces should also be launched. They are potentially effective, not only because they can reduce the relative imbalance of negative over positive forces, but also because the removal of negative forces tends to reduce the overall force-dynamic tension, making the individual more open and accessible to other messages. One of the major negative forces that should be addressed is the resentment against inequitable stock reduction campaigns. It is

believed that a community, if encouraged to accept ownership of development and if empowered to do so, can come up with and implement solutions that are based on consensus and general acceptance. These could include raising the grazing fees to market related levels, ultimately aimed at a more equitable sharing or redistribution of the benefits that accrue from communally owned resources.

Other possibilities include a more equitable allocation of grazing rights and perhaps a commercialisation of the grazing rights. Whatever the solution, it will only be a solution if it is the local community's solution. This leads to the next recommendation.

Encouragement towards a facilitative and participative approach to the problem of overstocking

A facilitative approach aimed at maximum participation and involvement of the local community is, because of the appropriate addressing of needs and the commitment of the community as a result of involvement, more effective than the traditional technology-transfer models. Another reason why the participative approach is particularly appropriate is that it is reconcilable with the ultimate objective of development, namely *help towards self-help*. Even organisations with a predominantly promotional task and responsibility are, for the reasons mentioned, well advised to pursue their goals through and with local communities.

Over and above proper training, this will demand appropriate structures; the most important of which is an effective linkage system as suggested and described by Düvel (1994). The most essential feature of such a structure is an overarching, co-ordinating council or forum, representing the whole community and functioning as its mouthpiece, and accepting full responsibility for the development of the community as a whole. Its main function should be to identify, initiate, commission and co-ordinate all development priorities and actions. Development actions in the form of programmes are commissioned to nominated or coopted members of the community who, with the facilitation, help, guidance and support of a development agent, accept responsibility for the implementation of programmes and actions, and for regular report-back to the central council.

Düvel and Afful (1994:171) did indicate that, in decision- making concerning stocking rate, perhaps more than with other management practices the conflict between production (and all its variations) and conservation becomes evident. This conflict implies, at least between certain levels, that the promotion of one is bound to occur at the cost of the other. As such the conflict necessarily implies also a conflict between the interest of the individual and the interest of the community, between the interest of the present generation and future generations, and sometimes even between survival of our own children and survival and wealth of later generations. Solutions have to be found, and these solutions inevitably have to be compromises. To find these and to have them implemented requires the concerted efforts of all concerned, but especially those of the communities. They need to be helped to find and implement their *own* solutions.

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