LIVESTOCK DEVELOPMENT AND PASTORAL PRODUCTION ON COMMUNAL RANGLAND IN BOTSWANA

Richard White

THE BOTSWANA SOCIETY
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*Botswana Notes and Records* is the journal of the Botswana Society. The objects of the Society are the encouragement of interest in and research and scholarship on subjects in the fields of the Natural Sciences, the Humanities and the Arts, especially where such subjects relate to Botswana. The Society aims to cater for such wide interests as history, archaeology, the conservation of wildlife, anthropology, law, geology and biology. The journal is intended as a medium for the publication of research and articles of scholarship on Botswana and is published annually.
This paper
is dedicated with love and gratitude,
to my Father and to the memory of my Mother,
to whose long struggle as livestock farmers I owe a greater debt
than I can ever repay.
PREFACE AND ACKNOWLEDGMENTS

I was born and grew up on a small farm. My father had a job in town, but our income from the sales of cream and milk made a substantial contribution to the family budget. It paid for my and my brothers’ and sisters’ education.

We had about 20 cattle and many of my earliest memories involve them. To this day I can remember their names, their appearance, their individual temperaments and their relationships to each other. While I do not believe in the “Cattle Complex” so beloved of some writers about pastoralism, I think it is true that anyone who has grown up on intimate terms with cattle will always retain some affection for them.

My academic training is as an ecologist, but I have always been keenly interested in economics, and am fascinated by the interface between the two disciplines. I work as a consultant in rural development and have lived for the past ten years on a remote cattle post in Kgalagadi District. Some people would have it that I have buried myself beyond the reach of civilised human society, while others hold that to be a good thing. I maintain that this experience has given me a perspective on rural development and a depth of understanding of the issues which is exceptional. In any case, I value my quiet life in the desert.

I have long been interested in the cattle industry, and the issues which surround it. I have also disagreed for some time with the conventional view of the ecology of the communal grazing system. So, when Roy Behnke, on behalf of the Commonwealth Secretariat, asked if I would write a paper as part of its programme on the Management and Sustainable Use of Communal Rangeland in Africa, I accepted with alacrity. A rather shorter version was presented to a workshop entitled “New Directions in Africa Rangeland Management Policy” held at the Matopos Research Station near Bulawayo in Zimbabwe in January 1992. This version has been expanded to include new material and to cover the ecology of the rangelands which was dealt with in separate papers at that workshop.

The livestock industry is an emotive subject, but I have tried to be objective and to avoid sensationalism. I have also tried to describe complex scientific and economic issues in plain English, avoiding jargon, so that non-specialists can grasp them relatively easily. My aim is to present a balanced account of the issues surrounding livestock raising in the communal areas of Botswana and to appraise that part of the National Policy on Agricultural Development concerned with the livestock industry.

I am grateful to the Food Production and Rural Development Division of the Commonwealth Secretariat for financial support to writing this paper and for permission to publish this expanded version in Botswana.

I thank Bonnake Tsimako, Dr Louise Setshwaelo, Raymond Kwerepe, Anthony Mokgare and Jonathan Beynon of the Ministry of Agriculture for their time in answering my questions and their help in finding (and lending) reference material. Bonnake very kindly gave me a draft of her excellent and then unpublished report on the TGLP ranches. I have mined much information from it.
Dr Tsholofelo Diteko of the Veterinary Department kindly arranged for her staff to ferret out an enormous volume of livestock statistical data. Miss Mnopi of the Meteorological Department produced the Meteorological data included in the Appendix.

Roy Behnke and Rudi Jansen both gave me reference material. Both commented extensively on an early draft. I am indebted. Mark Phillips commented at length on the sections on ecology and degradation and suggested many improvements.

Tumpana Kebonang lettered all the maps for me, while Lucas Kingston generated the data on which figures 8.1.1 to 8.1.5 are based on his computer.

Sabrina Ettrick drew the diagrams and graphs and has deciphered my hieroglyphics so that others may understand what I have to say. Robert Barei of Agricultural Information Services sought out photographs and made admirable prints at short notice. Phil McCowan and David Bailey of Pula Productions printed my negatives to a high standard.

I am also grateful to the 600 water point owners and users I interviewed during the Kgalagadi Water points survey. Their comments gave me a grasp of the subject and its implications that I could not have obtained in any other way.

I must emphasise that while I have drawn factual material from many sources (and due to pressure of time, cribbed ruthlessly from the printed ones), the analysis and conclusions drawn are entirely my own.
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LIVESTOCK DEVELOPMENT AND PASTORAL PRODUCTION ON COMMUNAL RANGELAND IN BOTSWANA

1. INTRODUCTION

Botswana is a semi arid country of 581 000 square kilometres located in the interior of Southern Africa. In both pre-colonial times and the colonial era, livestock raising was the heart of the national economy, and it remains the heart of the rural economy today. Since independence in 1966, mining, manufacturing and tourism have become the main contributors to the national economy. Unlike other sectors of the economy, ownership and control of the means of production has remained in the hands of the indigenous people throughout. However, the total number of rural households owning livestock has stagnated while the proportion which own livestock has declined markedly since 1966. In 1989 Botswana producers on communal land owned 81.9% of the national herd, and they made up a substantial fraction of the commercial producers on freehold land who owned the remainder. There are close linkages between the two subsectors of the livestock production industry. Thus, the communal rangelands are of central importance to the livestock industry as a whole.

Concern has been expressed for many years over the apparent degradation of the communal rangelands due to overgrazing. A W Hodson writing in 1912 commented on the difficulties of finding adequate grazing for draught animals in the vicinity of settlements in the first decade of this century. In the late 1930's, following a severe drought accompanied by extensive livestock mortality, the Protectorate Government became concerned at the extent of apparent overgrazing and commenced rangeland research, followed by a number of livestock related development projects. After independence in 1966 the pace quickened, with more money being spent on research and development projects. The government introduced the Tribal Grazing Lands Policy, its first attempt to transform the system in 1975, followed by the "National Policy on Agricultural Development" in 1991 which has major implications for land tenure and access to and use of the communal areas.

2. PHYSICAL AND BIOLOGICAL ENVIRONMENT

Most of Botswana is a featureless, gently undulating plain at an average altitude of 1 050 m. Isolated hill features and rocky outcrops occur mainly in the east. The western part of the country is covered by thick layers of Kalahari Sands of aeolian origin. The sands may be over 100 m deep. In the east, geology is more varied and soils are mostly loams and sandy loams which are more fertile than the Kalahari Sands.
The climate is semi arid, with a mean annual rainfall ranging from 200 mm in the south-west to 700 mm in the North. Most rain falls during the summer months of October to April, often as localised showers and storms. Most cattle are kept between the 550 mm and 250 mm isohyets.

Incidence of rainfall is highly variable in both time and space, and potential evapotranspiration is high, averaging 1 800 mm a year.

Annual rainfall totals are also highly variable and droughts are a recurring hazard. Diurnal and seasonal temperature variations are large, and are more marked in the South West. Generally, Botswana experiences high daytime summer temperatures, and low nighttime winter temperatures. Average daily maximum temperatures are about 33 °C in January and 22 °C in July, with extreme temperatures about 10 °C higher. Average daily minimum temperatures are about 19 °C in January and 5 °C in July with extremes about 12 °C below these values.

Most of Botswana is covered with savanna which forms the main range resource for the livestock industry. There are extensive tracts of both broad leaved and Acacia-dominated tree and tree and shrub savannas. In the north east, Mopane dominated savanna woodland is locally important. There are smaller areas of steppe grassland in central Botswana.

The Okavango swamps and savanna woodlands of northern Botswana are not important to the livestock industry, except on the western and southern margins of the Okavango delta.

Water is a scarce and valuable resource in Botswana. Permanent surface water only occurs in the Okavango delta and Chobe/Linyanti river system in the north. Most of this is not accessible due to Tsetse-fly infestation. Elsewhere in northern and eastern Botswana, surface water is fairly widespread and moderately plentiful during the summer rains, and shallow wells in river beds and other localities can be sunk readily in the dry season.

In the two-thirds of the country covered by the Kalahari Sands the picture is very different. Apart from ephemeral pools in pans and fossil rivers, the area is almost devoid of surface water. Water is therefore obtained from either hand dug wells or boreholes. Localities where groundwater occurs at a shallow enough depth to allow well digging are widely scattered, and are often associated with perched aquifers in calcrete. Elsewhere in the Kalahari, water must be obtained from deep boreholes. Water is not easy to locate, due to the thick overburden of sand, and is often extremely saline. As a result, the success rate of borehole drilling is generally low, and may fall as low as one successful water strike in five holes drilled in the more difficult areas.

2.1 How Rangeland Ecosystems Function

With the exception of a small number of feedlots which exist to supply the demand for high grade beef in the towns, all livestock production in Botswana is based upon the utilisation of

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1 Readers wanting a more detailed treatment of this issue are recommended to read "Re-thinking Range Ecology" by Ray Behnke and Ian Scoones.
the natural rangelands. Misunderstandings about how these rangelands function are central to the ongoing dispute about the impact of the livestock industry on the environment.

2.1.1 The Conventional View

In the conventional view, as expressed by Stoddart, Smith & Box (1975), which I will call the "Trend and Succession" model, there is an orderly and predictable process of a succession of associations of plant species which replace each other. All plant communities start as bare ground, which is first colonised by weeds. Other species colonise to form a succession of associations (usually increasingly diverse and complex) which follow each other until a persistent stable and characteristic "climax" vegetation is achieved. If the climax is disturbed or simplified, the successional trend will cause the vegetation to return through the successional sequence to the climax, once the factor(s) causing the disturbance or simplification are removed. Grazing, fire and clearance for agriculture are all retrogressive factors which tend to reverse the succession. In natural rangelands, grazing by domestic livestock usually commences in the climax (or a near climax) association, and puts retrogressive pressure on the succession.

The objective of range management under this model is seen as balancing grazing pressure against the successional trend and so to maintain a stable sub-climax which will produce a steady (and profitable) flow of animal products to meet the requirements of the market. The carrying capacity is defined as the stocking density at which this can be achieved.

If the carrying capacity is exceeded, then the equilibrium between grazing pressure and the regenerative pressure of the vegetation will be upset, and the condition of the range will deteriorate by regression through the successional sequence. The model is summarised in diagrammatic form in Figure 2.1 below:

**FIGURE 2.1: RELATIONSHIP BETWEEN RANGE CONDITION AND DEGREE OF SUCCESION TOWARD OR RETROGRESSION FROM CLIMAX CONDITIONS**

![Diagram showing the relationship between range condition and degree of succession toward or retrogression from climax conditions.]

Source: Adapted from Stoddart, Smith & Box (1975)
This model has worked well on commercial ranches in temperate North American rangelands managed for beef production, where a relatively stable climate and market (for graded beef) have influenced the assessment of carrying capacity criteria to match that stocking rate which will maximise economic returns to such ranches. It is important to appreciate that carrying capacities obtained using this model are largely determined by economic rather than ecological factors.

The Trend and Succession model also contains a fundamental flaw in its ecological thinking - the assumption that the climax vegetation is necessarily "best". It is impossible to achieve sustained output from any ecosystem from the maximum population, neither from herbivores at ecological carrying capacity (see § 2.1.2) nor from virgin forest. In both these instances, output is in fact nil. In order to obtain a sustained output from any biological population, be it of animals or plants, it is necessary to reduce the population below its (potential) peak level and keep it at a lower level in order to enable its inherent tendency to increase to operate and so produce a surplus.

This flaw leads to the misplaced expectation that an agricultural production system which will not significantly affect the natural vegetation is possible. No-one expects arable farms to both produce crops and maintain the natural vegetation in its pristine state. (Nor is any reasonable person suggesting that arable farming is inherently destructive or degrading). It is surely unreasonable to expect livestock farming to have no impact on the natural vegetation, which the Trend and Succession model implies it should do.

2.1.2 An Ecological View

Wildlife biologists have developed a very different approach to the study of grazing ecosystems and the definition of carrying capacity. In this view, carrying capacity is defined as the maximum sustainable stocking rate which the system can support, and the trend is the tendency of the herbivore population to increase toward that stocking rate, often known as 'k' or carrying capacity constant or ecological carrying capacity. The ecological carrying capacity is defined as that stocking rate at which the population of herbivores is limited by the availability of forage.

The interactions between herbivores and the plants upon which they depend are summarised in Figure 2.2 below.

The curve represents all feasible combinations of plant and animal populations in a (hypothetical) grazing system. At the extreme right hand end the curve represents a situation in which there are no herbivores and a large plant population - the climax of the Trend and Succession model. As the animal population increases, the biomass of plants declines, until the animal population reaches the point at which it consumes the entire production of the plant population - the ecological carrying capacity.

It should be noted that all intermediate points on this curve represent sustainable (but unstable) combinations of plant and herbivore populations. These combinations can only be maintained by management action. Productivity is proportional to the slope of the curve. As the herbivore population increases, so output per animal declines, until output at k is nil. Similarly as the plant biomass increases, so output per unit falls.
Thus, on commercial ranches which have low animal populations and dense vegetation approaching climax condition, output per animal is high, with high calving rates, high sales of live animals, high weight gain and high fat percentage per animal. On the other hand, output per unit of biomass of the vegetation is low and so too is output per unit of land (Abel & Blaikie 1990).

At cattle posts managed for slaughter stock production in the extensively utilised communal areas, the stock owners are unable to closely control grazing pressure. Output per animal is rather less, reflected in a slightly lower calving rate, lower live sales, slower growth rates and a lower fat percentage on the carcase (i.e. lower slaughter grades). On the other hand, output per unit of plant biomass and output per hectare are both higher, although the range will be in a sub-climax condition.

In the intensively used communal areas where mixed agro-pastoral farming is practiced, stock owners have little opportunity to control grazing pressure and there is intense pressure on the land, due to the large numbers of people attempting to earn a living there. Calving and live sale rates are both significantly lower, while growth rates are relatively slow and most carcasses are relatively lean. On the other hand, milk output is high and further significant output in the form of draught power, home-consumption of meat (often from animals which die naturally) and direct transfers of live animals is obtained. While the vegetation may look in poor condition, scoring poor to fair on the Trend and Succession model, productivity per hectare and per unit of plant biomass are both high. The available evidence strongly suggests that livestock in this zone are both biologically and economically highly productive. Farmers obtain about $\frac{1}{2}$ of the calorific output of their herd from live animals which are sold (usually for slaughter). They obtain a further $\frac{1}{3}$ in the form of milk, which they consume.
themselves (or distribute locally) and the balance is made up of home consumption of meat, draught power and transfers of live animals, in that order. Since the live offtake rate amongst the agro-pastoralist mixed farmers varies between 5% and 7% and this represents % of calorific output, the farmers total calorific output is equivalent to an offtake rate for slaughter of between 15% and 21%, which is very high. Economic outputs broadly follow calorific outputs, but may be distorted in detail by assumptions about pricing. (Abel & Blaikie 1989, Abel et al 1987, Behnke 1987, De Ridder and Wagenaar 1984, Hubbard and Behnke in Hitchcock 1982). (See also § 8.2.1.2 below).

True nomadic pastoralists, on the Sahelian Model, who subsist entirely on the products of the living animal (such as milk, blood, traction and transport) and the meat of those that die of natural causes can push the stocking rate close to the ecological carrying capacity. It is profitable for them to exploit a large herd, even if individual animals are in poor condition and output per animal is low. Natural mortality in these systems is high, but is not an unmitigated disaster as the carcasses can be consumed after death.

Apart from nomadic pastoralism, all these models of rangeland livestock production operate in Botswana. As noted, while technically sustainable they are not biologically stable. They are maintained in an apparently stable equilibrium by economically-induced management decisions. The ranch manager knows that he can maximise returns to invested capital by keeping his stocking rate low and optimising output of high grade carcasses. While individual owners in the communal areas are unable to influence stocking rates, the collective decisions of all owners are determined by economic factors. The management objectives of large and small owners are different, so that they pursue different strategies with different consequences in terms of stocking rates, output per animal and so on. This difference is clearly visible when comparing cattle post areas and the agro-pastoralist mixed farming zone.

Both these models of grazing ecosystem behaviour are predicated on the idea that herbivore numbers are controlled by the availability of forage and that the biomass of plants (or availability of forage) is controlled by the number of herbivores. A negative feed-back loop such as this should produce a stable equilibrium between plant and herbivore populations.

In Botswana, and in many other semi-arid regions, this relationship is not at all obvious. Both plant and animal populations show marked oscillations and are anything but stable. In Botswana, these oscillations can be shown to be most closely correlated with rainfall, which is highly variable in space and time. In most of Botswana, available soil moisture is the limiting variable which controls plant growth. Since most soils are sandy, (with poor water retention capacity) and potential evapo-transpiration greatly exceeds rainfall, available soil moisture is determined by rainfall. As a result, plant biomass production, and hence forage availability is largely determined by rainfall, whose variability far exceeds any variation in grazing pressure due to changes in stocking rates.

Some workers, notably Ellis & Swift (1990) writing on Turkana district in Kenya, choose to describe such systems as non-equilibrium grazing systems. While it is true that primary production is non-equilibrual, the herbivore component of the grazing system interacts with the vegetation as if the system were a disturbed equilibrium moving to restore itself.

This can best be illustrated by re-drawing Figure 2.2 to show the effects of variable rainfall on the curve of feasible plant/animal combinations, and tracking the performance of a
herbivore population through the cycle of drought and wet periods. This is illustrated in Figure 2.3 below:

FIGURE 2.3 RELATIONSHIP BETWEEN PLANT AND HERBIVORE POPULATIONS IN A GRAZING SYSTEM WITH HIGHLY VARIABLE RAINFALL

How do we fit condition class into this system?

In Figure 2.3 I have labelled the feasibility curves Pluvial, Wet, Normal, Dry and Drought.

In a drought year, the biomass of plants and primary production (from plants) will both be very low and will therefore only support a small herbivore population. If the preceding season was wet, there may be both a higher population of herbivores and/or possibly a larger biomass of herbage (left over from the previous season) than the current season’s rainfall can support.
If this happens, the herbivores will first eat the surplus herbages, and they must then either migrate or die. If there is no surplus herbage at the beginning of the season, then they must migrate or die sooner.

In a pluvial (or exceptionally wet) year, the high rainfall will support a large biomass of plants, and high primary production from them. This in turn will support a large herbivore population. If the preceding season was drier, the plant biomass will increase and so will the population of herbivores.

These reactions to change are typical of the behaviour of a disturbed equilibrium. If, in the equilibrial situation described by Figure 2.2, the herbivore population is reduced below the feasibility curve, it will tend to increase towards it, and the plant biomass will also tend to increase. If the herbivore population is raised to a point above the feasibility curve, it will tend to decline and so too will the plant biomass.

Thus, we can view the variations in rainfall as changing the size of the equilibrium - high rainfall expands it while low rainfall shrinks it.

Since rainfall is so variable from one season to the next, it is unlikely that the intersect between the herbivore population and plant biomass will ever be on the feasibility curve. As a result, both herbivore populations and plant biomass will be in a state of constant flux as they tend toward the equilibrium position established by that season’s rainfall.

In Figure 2.3, the line (a) (b) (c) represents the interactions between a herbivore population and its forage resource through a drought/pluvial cycle. The lowest point represents the position at the end of a severe drought, with a low herbivore population and low plant biomass. As the drought breaks the plant biomass increases sharply, while herbivores initially increase slowly. A run of good years causes the herbivore population to increase at an accelerating rate, while the rate of increase of plant biomass declines slightly (curve a). A one year drought (curve b) causes a marked decline in plant biomass, but only a slight decline in herbivore numbers, while a sustained drought (curve c) causes both herbivore numbers and plant biomass to decline dramatically.

It is obvious that if managers impose a fixed "optimum carrying capacity" on such a system, the result will be inefficient, with wasted opportunities to exploit above average forage resources in good years and overgrazing, causing damage to the rangeland and possible livestock mortality in bad. In this situation, management must be opportunistic, seeking to maximise gains in good years and to minimise losses in bad.

2.1.3 The Importance of Livestock Mobility

Botswana’s rangelands are neither a uniform nor a uniformly productive environment. There is a high degree of spatial variability in soil fertility, and floristic composition, structure and nutritional value of the vegetation. Furthermore, there is great variability in both the temporal and spatial distribution of rainfall. 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.
Such highly productive areas may include seasonal wetlands and riverine zones, areas around pans, areas where rainfall has been higher or fallen earlier, areas where run-off may collect or where groundwater occurs at shallow depths, enabling plants to flush early in the season and areas without permanent surface water which can only be exploited seasonally.

If animals can move around the landscape and exploit these 'patches' of high productivity, which may not occur simultaneously, then a much higher stocking rate can be sustained than if the animals are sedentary. Most large wild herbivores in Botswana are highly mobile and pursue a nomadic grazing strategy. This enables them to maximise food intake in a difficult environment, and enables that environment to support larger populations. 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.

We can illustrate the benefits of such an approach by reference to the table below which represents the stocking capacities of the components of the grazing area of a hypothetical village at different seasons.

**TABLE 2.1 SEASONAL VARIATION IN STOCKING CAPACITY**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Season</th>
<th>Late dry early wet</th>
<th>Mid wet</th>
<th>Late wet early dry</th>
<th>Mid dry</th>
<th>Sedentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandveld without permanent water</td>
<td>500</td>
<td>2 500</td>
<td>4 500</td>
<td>1 000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Hardveld with permanent water</td>
<td>1 500</td>
<td>3 000</td>
<td>3 000</td>
<td>2 000</td>
<td>1 500</td>
<td></td>
</tr>
<tr>
<td>Riverine area</td>
<td>4 000</td>
<td>3 000</td>
<td>1 500</td>
<td>3 000</td>
<td>1 500</td>
<td></td>
</tr>
<tr>
<td>Total Capacity</td>
<td>6 000</td>
<td>8 500</td>
<td>9 000</td>
<td>6 000</td>
<td>3 500</td>
<td></td>
</tr>
</tbody>
</table>

The column marked sedentary indicates the maximum number of animals that could be kept if the animals were not moved between zones, i.e. if the zones were fenced off and managed by different managers. If the villagers move their stock, they can keep 6 000 animals, if they don’t they can only keep 3 500.

2.2 The Nature of Degradation

If misunderstandings about how rangeland ecosystems function are central to the dispute about the environmental impact of the livestock industry, so too are a lack of precision in the definition of degradation and of understanding of the processes that inhibit it.

2.2.1 What is Degradation?

I have chosen to follow the definition adopted by Abel & Blaikie (1989):

"Range degradation is an effectively permanent decline in the rate at which land yields livestock products under a given system of management". (p 113)
In this definition, degradation is equated to loss of productive capacity of the rangeland. Livestock numbers have increased steadily throughout this century, with only temporary setbacks due to drought. Once a drought breaks, losses are rapidly made good and are more than offset by high output during good years.

It is true that as stocking rates rise, output per animal slowly declines, but this too is more than offset by higher output per unit of land, so that total output rises. (De Ridder and Wagenaar, 1984, Abel and Blaikie, 1989).

In the longer term, average output and off-take greatly exceeds what can be achieved using a conservative grazing strategy as pursued by ranchers. Thus, far from causing a decline in productivity, increasing stock numbers have brought about higher yields of economic goods from the land. (Biot et al 1992).

The processes that are frequently described as degradation in the literature e.g. MoA (1991), Campbell & Child (1971) are not evidence of degradation by this definition, but symptoms of change. These processes include decline in wildlife populations, changes in species composition and vegetative structure of the rangelands and overall loss of plant (i.e. biomass) cover. While the outcome of these processes may not be visually attractive and could fairly be described as an aesthetic degradation of the rangelands, aesthetic and functional degradation are not one and the same.

### 2.2.2 Protective Mechanisms

The communal grazing system has a built in biological feedback mechanism which protects it. As livestock numbers increase, forage consumption also increases. When consumption starts to approach production, the amount of forage available to each animal will start to decline. Initially, this will lead to a reduction in the amount of fat deposited in the animals' bodies as a reserve. In mammals, conception is closely related to the level of body-fat reserves, so the calving rate will start to decline. Furthermore, in ruminants the level of milk production is linked to the level of forage intake in the period immediately before and after birth. If the mother is short of food at that time, there will be less milk available to the calf. As a result, the calf survival rate will also decline. Declining forage availability will also lead to slower growth rates and reduced milk production.

In Botswana, where animals water at a limited number of point sources and then range widely between water and grazing, the distance the animal must walk between water and pasture increases as the stocking rate increases. This takes an increasing toll of the weaker (mostly younger) animals, thus depressing output further.

The cumulative effect of these feed back processes is to cause population growth to slow down as the ecological carrying capacity is approached. The advent of drought will cause a large drop in forage availability (i.e. ecological carrying capacity falls), which will cause herd size to decline.

There is also an economic feed back mechanism at work. As output per animal declines, there eventually comes a point at which it is not worthwhile for any livestock owner to invest in additional animals because the marginal return on that additional investment is too low to justify it. This point always arrives before the ecological carrying capacity is reached (when
output per animal is nil) and it is the expected size of the return on capital invested at the margin that determines the economic carrying capacity for different enterprises.

Thus, commercial ranchers who expect a high return at the margin have a lower economic carrying capacity than subsistence agro-pastoralists who are willing to accept lower marginal returns to their investment.

This economic feedback mechanism ensures that the rational pursuit of economic objectives by communal area livestock producers protects their production system, just as the rational pursuit of a different set of economic objectives by commercial ranchers protects that production system.

3. LAND TENURE

Of Botswana’s approximately 581,730 square kilometres, 414,790 square kilometres (71.3%) is tribal land, 131,980 square kilometres (22.7%) is state land and the rest, (6%) is freehold land. About 290,000 km² 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.

3.1 Access to Land and Water in the Communal Areas

Under Customary Law, every tribesman 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. 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 or boreholes) or surface water sources (e.g. dams and hafirs) for his own use. These rights are heritable.

In practice, tribesmen have open access to grazing and natural surface water (virtually all of which is seasonal or ephemeral). Since the exercise of rights to arable or residential land or to develop artificial water sources may impinge upon the rights of others, a tribesman wishing to exercise his rights must apply to the Land Authority. Prior to 1970, the exercise of these rights was regulated by the chief, since 1970 their exercise has been regulated by the Tribal Land Boards, constituted under the Tribal Land Act of 1968. No fees are payable for the exercise of any customary right 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 and are undocumented. Since these rights are heritable (and a large number of the original grantees are still alive anyway) many people who have legitimate title to land have no documentary evidence to prove it.

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 is controlled by the grantee, who has the right to exclude other people. Thus arable fields and residential compounds may be (and usually are) fenced and the grantee may decline to allow another person to draw water from
an artificial water point. Many wells, dams and hafirs are shared, either because they were communally dug or because they are old and the original owner's descendants share them.

In addition to Customary Law and the 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.

Since well digging, dam-building and hafir digging, which are cheap, are only feasible in restricted areas, poor farmers are largely confined to these areas. The introduction of borehole technology (which is expensive and therefore only accessible to wealthier farmers) over the past sixty years has enabled wealthier cattle owners to effectively monopolise the development and exploitation of the new grazing areas opened up by borehole drilling. As a result, their herds have expanded greatly.

There used to be a significant number of "tribal" boreholes, latterly operated by the district councils. It has been government policy for many years to hand these over to syndicates to operate. Since many of these syndicates operate under inequitable conditions, in time poorer farmers are excluded and the boreholes end up being used by a minority of wealthy farmers. Very few of these boreholes are still open to the public.

The mechanism by which a large syndicate containing many poorer farmers as well as a few rich ones contracts to a small group of wealthy farmers is simple enough. The syndicate, persuaded by its wealthier and more influential members, adopts a policy of each member contributing equally to the cost of operating and maintaining the borehole rather than each animal being charged equally. In effect the poorer members subsidise the richer members of the syndicate and are impoverished thereby. Eventually they are compelled to withdraw as they cannot afford to remain. (White 1991).

This combination of unfavourable natural conditions, lack of access by poorer farmers to borehole drilling technology, and the rules and laws surrounding groundwater development rights effectively confines poorer farmers to those limited areas with shallow groundwater or surface water. While the number of people in these areas has grown rapidly, the number of animals has grown slowly, due to limited grazing resources. As a result, not only has the average number of animals per household declined, but large numbers of households without cattle and many without livestock of any kind have come into being. Small herd owners are particularly vulnerable during drought, and during each drought significant numbers of people lose all their livestock.

Taken together, these factors explain why ownership of cattle is becoming progressively more skewed and why a large and increasing number of farmers have no cattle at all. Without a truly fundamental - indeed revolutionary - change of policy, it is hard to see how this trend might be reversed, unless the price of cattle falls so low that they become more valuable for subsistence than for sale as slaughter animals.
4. HISTORY OF THE LIVESTOCK INDUSTRY

Domestic livestock have been reared in Botswana since at least the 4th century AD (Turner 1987), and they have been of major importance to the economy for at least a thousand years. Until recent times, livestock were kept wherever conditions were suitable, i.e. outside the Tsetse fly zone and areas whose ownership was the subject of political dispute, wherever surface water or shallow groundwater could be obtained.

The introduction of borehole drilling technology in the 1930’s has caused a tremendous expansion of the area where livestock raising is feasible, while the creation of Game Reserves, Wildlife Management Areas and other administrative devices has tended to impose further restrictions.

Cattle census figures started to be collected in the 1930’s and the growth of the herd since is illustrated by the Table below, and shown in more detail for the years 1965 to 1990 in Figure 4.1 overleaf:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NATIONAL CATTLE HERD</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1934</td>
<td>1 189 000</td>
<td>a</td>
</tr>
<tr>
<td>1939</td>
<td>671 000</td>
<td>a,b</td>
</tr>
<tr>
<td>1947</td>
<td>966 872</td>
<td>a</td>
</tr>
<tr>
<td>1954</td>
<td>1 140 000</td>
<td>b</td>
</tr>
<tr>
<td>1957</td>
<td>1 310 000</td>
<td>b,d</td>
</tr>
<tr>
<td>1965</td>
<td>1 481 000</td>
<td>c</td>
</tr>
<tr>
<td>1970</td>
<td>1 350 000</td>
<td>c</td>
</tr>
<tr>
<td>1975</td>
<td>2 017 000</td>
<td>d</td>
</tr>
<tr>
<td>1980</td>
<td>2 390 000</td>
<td>d</td>
</tr>
<tr>
<td>1985</td>
<td>2 933 000</td>
<td>d</td>
</tr>
<tr>
<td>1990</td>
<td>2 696 000</td>
<td>d</td>
</tr>
</tbody>
</table>

Key:
- a = Botswana National Archives
- b = LDP II Project Application
- c = MoA (undated)
- d = MoA 1991

Traditionally, people in Botswana have pursued a diversified domestic economy, whose major elements were arable farming, pastoralism and hunting and gathering. Botswana’s climate is marginal for arable agriculture and in dry years when crop yields were low, pastoralism and hunting and gathering became more important. In drought years, livestock might be traded for grain in the better watered areas to the south and east.

In the colonial era, wage labour in the South African mines and farms was added to the domestic economy and remittances were (and still are) used to buy cattle in good years and grain in bad. Markets for the sale of cattle for cash opened up in this period. In order to protect the livestock industry from disease and preserve its access to markets outside the protectorate’s borders the colonial administration established a Veterinary Department in 1905. This was the first Government department not to be primarily concerned with either administration or revenue collection.
The colonial era brought about a fundamental change in economic relations, not only between Botswana and its neighbours but within the country also. An increasingly rigid social stratification and the emergence of a new elite of wealthy commoners has enabled the new and old elites together to obtain a growing share of wealth and income. With the introduction of borehole drilling technology, these changes have enabled the combined elite to monopolise the development of new water sources and thus obtain an ever-growing share of the national herd. By 1974, half the rural population owned no livestock and the richest 5% owned half the cattle, while 45% of the rural population lived below the poverty datum line, (CSO 1975). By 1986 nearly 70% of the rural population did not own livestock and about 60% lived below the poverty datum line, (CSO 1988). Independently collected statistics, from the national population census and the agricultural census confirm this trend.

Between 1981 and 1991, the rural population grew from 775,000 people to 1,009,000 (CSO 1991). Over the same period, the number of households holding cattle declined from 57,700 to 50,300. (Source: Table 68, Ag Stats computer printout). Significantly, while the number of households with 20 cattle or less only declined from 27,900 to 26,900, those with 21 cattle or more declined from 29,800 to 23,500. Since the cattle population in 1991 was only 5% less than that in 1981, this must indicate a sharp increase in the skewedness of the distribution of ownership.

**TABLE 4.2 RURAL POPULATION BY AGRICULTURAL INVOLVEMENT AND CATTLE OWNERSHIP**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rural Population</th>
<th>Non-agricultural rural households</th>
<th>Agricultural households</th>
<th>Households</th>
<th>Households</th>
<th>Total Households with cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000 people</td>
<td>100 h/hold</td>
<td>'000</td>
<td>%</td>
<td>'000</td>
<td>%</td>
</tr>
<tr>
<td>1981</td>
<td>775</td>
<td>119</td>
<td>34.7</td>
<td>29.2</td>
<td>26.6</td>
<td>22.4</td>
</tr>
<tr>
<td>1991</td>
<td>1009</td>
<td>155</td>
<td>66.3</td>
<td>42.8</td>
<td>38.4</td>
<td>24.8</td>
</tr>
</tbody>
</table>

+ 234 + 36 + 316 + 13.6 + 11.8 + 2.4 - 1.0 - 6.0 - 6.3 - 9.8 - 7.4 - 16.0

Sources: CSO & Ag Stats Printout Table 68

In 1981, about 8,700 cattle-owning households were not involved in arable farming, and this number had grown to 10,700 in 1991. About 1,000 of these households were in the Western Region, where arable farming is very marginal (Source Table 68, Ag Stats printout). Most of the rest must represent urban dwellers owning cattle in the rural areas, and 40% of them owned over 40 head.

This indicates that in 1981, about 42% of rural households owned, or controlled cattle and that the proportion of rural households owning, or controlling, cattle had fallen to 26% by 1991. Nor was this decline in the economic status of the bulk of the rural population solely a consequence of drought but reflects a long term underlying trend which is exacerbated by drought, (Hay et al 1985).

The colonial period also witnessed the introduction of fenced, commercial ranches to Botswana. At the end of the 19th Century, the tribal chiefs in eastern Botswana agreed to
alienate the strip of land along the Transvaal border to enable a railway to be constructed to Rhodesia. In the event, the railway was built inland from the border (for engineering reasons) and the land was sold to white farmers, both to defray construction costs and to provide a cordon against territorial expansion by the Transvaal Boers. Early in the 20th Century, land was also alienated at Ghanzi for ranch development, in part to offer a barrier to German expansion from South West Africa. All these ranches were developed using private capital, and their owners were able to exploit their links with the Protectorate and South African Governments to obtain a privileged position in the livestock industry which their descendants still hold (See Ettinger, 1972 and Hubbard 1983).

The apparent success of these early ranch developments resulted in a high social status value becoming attached to ownership of a ranch, particularly among Batswana (Mazonde 1991). This status value has strong political implications which have influenced subsequent developments.

As noted previously, concern had been expressed as long ago as the first decade of this century about the shortage of grazing around settlements. In the late 1930's concern was more strongly expressed within the Government and the first pasture research experiments were laid down. But for the intervention of World War II, more concrete developments would have followed, but these had to wait for nearly ten years.

In 1948, the Bechuanaland Government obtained funds from the Colonial Development and Welfare Fund to commence drilling a series of boreholes for the livestock industry. Boreholes were drilled to create a series of Trek routes to enable cattle from the remotest districts to be driven to the line of rail or neighbouring territories for sale. Boreholes were also drilled, using these funds, to enable stock to be moved away from the overgrazed areas around existing waterpoints, into new and hitherto ungrazed areas. This programme was to continue until the mid 1960's, latterly known as the "drought relief boreholes" scheme and drawing on funds from the UN and Oxfam as well as the British Government. Today, virtually all these boreholes are in the hands of individual (or small groups) of wealthy cattle owners.

In 1949, the Colonial Development Corporation started a major programme of investment in Bechuanaland. Over the next few years, they developed a network of fattening and breeding ranches on Crown Land at Odiakwe, Nata and Pandamatenga in Northern Botswana and on the Molopo in the south, and refurbished the abattoir at Lobatse (constructed in the 1920's but never used due to South African opposition). The objectives were to provide new markets for Batswana owned cattle (both as weaners and finished animals) and to expand the size and efficiency of the cattle industry as a whole.

The northern ranches were an outright failure due to poor planning and bad management, and were progressively abandoned between 1955 and 1962. The Molopo ranch and the Lobatse abattoir were a success and still operate. The abattoir has been managed by the Botswana Meat Commission for many years, although the CDC still manages the ranch.

The re-opening of the Lobatse abattoir in 1955 led to the development of markets in the United Kingdom (and elsewhere in Europe) for Botswana beef. The need to protect these markets and the substantial investment in the abattoir led to further measures to protect the livestock industry against foot and mouth disease. These measures included annual
vaccination campaigns against FMD (and other economically important livestock diseases) and dividing the country into quarantine zones separated by fences.

Following the success of the Molopo Ranch, the government started to demarcate ranches on Crown Land, initially sold freehold and latterly leased, both on the Molopo and at Ghanzi and Xanagas. At Ghanzi, the old allocations were rationalised, and many new farms allocated, while at Xanagas and on the Molopo allocations were made on virgin land. Prior to independence, the Molopo and Ghanzi farms were allocated to white farmers while the Xanagas farms were allocated to coloureds. After independence allocations were "colour blind" but in practice, since few Batswana had adequate capital, most allocations were to whites. Allocations ceased on the Molopo in the early 1970’s, but a few farms at Ghanzi were allocated as late as 1989. In these allocations the state set stringent conditions for applicants, who had to demonstrate that they had adequate capital and managerial abilities to run the farms. In general, these farms have been a success, most are developed, adequately managed and profitable. While the Molopo farms were largely unpopulated, the Ghanzi and Xanagas farms were not. The Ghanzi farm area was occupied by a substantial population of hunter-gatherers and by a much smaller group of white (mostly Afrikaner) and coloured livestock farmers. The coloureds were allocated farms at Xanagas and the whites were sold freehold title to farms at Ghanzi. The needs of the hunter gatherer population, who were there first, were ignored. The results were unfortunate, with serious problems of squatting, stock theft and acute poverty with its associated social ills. Very large sums of money have had to be spent on resettlement and ‘development’ schemes of doubtful viability.

The Colonial Government introduced a Livestock Industry Development Programme in 1961. Its objectives were to develop, in cooperation with the Tribal Authorities, new deep boreholes for livestock watering which would relieve pressure on the existing communal water sources. The programme would also encourage reduced stocking rates on all water points, with livestock on new boreholes being restricted to 400 livestock units. The project received enthusiastic cooperation from the Tribal Authorities in the development of new water points, but cooperation in restricting stocking rates was not forthcoming, although agreed beforehand. Again, most of the boreholes drilled under this programme have ended up in private, often individual, hands.

5. POST INDEPENDENCE - THE FIRST DECADE

In 1968 government initiated planning for its first major post independence Livestock Development Project (LDP I), launched in 1973 and implemented over five years. It was intended that the development of commercial ranches in the west would test and demonstrate the benefits of fenced ranching by Batswana farmers, and pave the way for a national programme to enclose the unfenced commons on a large scale. The possibility of emulating the white commercial farmers had captured the imagination of the large herd owners who had at independence come to dominate the nation’s political system.

The project was intended to develop 30 cattle breeding ranches on a turnkey basis on virgin land at Ncojane in south west Ghanzi District, to transform 24 Karakul sheep posts around Bokspits in south west Kgalagadi into fully-fledged ranches, to develop 5 trek routes for moving livestock to the line of rail for slaughter and to develop 10 fattening and marketing ranches (to be operated by a parastatal).
None of these targets was achieved, only 23 cattle ranches and eleven Karakul farms were completed, while only 2 trek routes and five fattening and marketing ranches were built.

Of the 23 Ncojane cattle ranches only 21 were ever occupied, as two lacked usable water. The occupied ranches have, by any standard, been spectacularly mismanaged, all have been severely overgrazed, the farmers have failed to repay loans, maintain infrastructure etc. In one instance the owners abandoned the farm, in another they were evicted for mismanagement and non-repayment of loans. Of the 19 farms that are still occupied, only 7 still have a standing perimeter fence and only 5 farmers can be said to be attempting to manage their farms differently from cattle posts. A major factor in the poor performance of these ranches was the lack of commitment on the part of the allocatees due to the turnkey nature of the project. A second factor is that the owners retain grazing rights in the communal areas, and having exhausted the grazing in their ranches they simply move their stock onto the commonage.

These farms also did considerable damage to the nomadic populations of Wildebeest and Hartebeest, depended upon by a large proportion of the inhabitants of Western Botswana for part, at least, of their subsistence.

While the Bokspits Karakul farms have not been so badly mismanaged, the farmers have been unable to meet their loan repayments, largely due to poor project design and ineffective project management. The fact that the farmers had already committed their own resources to development of traditional "posts" has been a major contributor to this better outcome. However, by enclosing a substantial area of accessible communal grazing, the farm owners have been able to exclude the majority of stock owners from these areas. Since they retain grazing rights in the remaining communal areas, they have been able to move stock out of the farms onto the commonage when the farms' grazing is finished. When grazing on the commonage is finished, they can return to their farms, which other farmers cannot. As a result, the number of livestock owners declined by 57% between 1979 and 1989. Most of these ex-livestock owners are now destitute, (White & Frost in Hitchcock 1982, Adams et al 1990).

In 1972, the Government commissioned Chambers and Feldman 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 to make control of grazing, improved range management and increased productivity possible and to safeguard the interests of non-stock owners and small herd owners and the right of tribesmen to adequate land for subsistence.

The TGLP was based on a number of important assumptions, of which the most critical were:

- that serious overgrazing and degradation of the productivity of the rangelands was occurring,
- that neither improved management nor equitable access to resources were possible under the existing communal system,
- that properly managed ranches could carry double the number of stock and double output and profits without overgrazing.
that giving exclusive rights to individuals or groups would lead to better management of grazing,

that large numbers of stock would be moved to commercial areas, thus reducing the stocking rate of the communal areas,

that compulsory regulation of livestock numbers would be feasible in the communal areas,

that large areas of empty land existed to establish commercial areas and to reserve land for the future.

As we shall see later, none of these assumptions was to prove correct.

Under the TGLP, land was to be zoned as commercial, communal or reserved. At the outset, there was no cognisance of the land requirements of Botswana's large nomadic wildlife resource. In the draft zoning exercise which took place between 1976 and 1979, Wildlife Management Areas were included as a zone, but reserved areas were not. It had been found, in practice, that there was no spare or unused land in the country.

In the commercial areas, individuals or groups were to be given 50 year renewable leases to ranches (averaging 6 500 ha). They would operate on a commercial basis and apply modern management techniques - basically fencing and water reticulation. It was proposed that groups of small owners, those without ranches elsewhere and those from overstocked areas would receive priority. In the event, these latter proposals were not implemented, nor were all cattle owners in commercial areas actually required to take out leases.

Provisions were made to protect the interests of those who did not own the waterpoints they used, but the interests of those who did not own stock were omitted initially. This omission had to be made good later.

Finally it was proposed that rent collected from lessees in the commercial areas would be directed to the development of the communal areas. With rents set at 8 thebe (4¢ US) per hectare per year, and many of the 332 allocated ranches either not occupied or with the occupiers in arrears, the revenue generated has been negligible.

In the communal areas, Land Boards were to impose and enforce limits on the maximum number of animals which individuals or families could keep on specific pieces of communal land. This proposal was never implemented, as it rapidly became clear that it was not politically acceptable.

Individuals would not be allowed to develop new boreholes for livestock-raising in the communal areas, and existing individually owned boreholes would be made available to other users, and quotas of the number of livestock to be watered at any waterpoint would be imposed. Of these proposals, only the prohibition on developing individually owned boreholes was imposed, but it has latterly been relaxed to some extent.

Groups of small farmers would be encouraged to come together to develop water supplies in the communal areas and then to develop group ranches, with agreement from the whole community. Although government put a lot of effort into this aspect, virtually no
development of this sort was achieved. Put simply, individuals see little advantage in group formation for purposes beyond limited specific aims such as dip construction, and group cohesion is lacking in all long-term projects.

It was also proposed that communal areas that were too small and overcrowded would be enlarged. Despite the doubts expressed by Sandford in 1980, this has in fact been done in many instances by the expedient of dezonning commercial areas.

In 1975, Botswana acceded to the Lomé convention which gave Botswana’s exports, including beef, preferential access to the EEC. When the United Kingdom joined the EEC in 1974, Botswana stood to lose access to the UK market for its beef.

In the event, Botswana obtained better terms from the EEC than it had got from the UK. Botswana receives a subsidy on its beef sales to the EEC in the form of a 90% rebate on the EEC’s import levy. (This levy is the difference between the EEC’s intervention price under its Common Agricultural Policy and the world price).

The EEC had intended that this money should be used to fund development projects, but the government has always paid the money to the BMC which pays it out as part of its producers bonus. This bonus is a disbursement of BMC’s profits to the suppliers of cattle, many of whom are not producers but speculators.

The EEC has exacted a price for its generosity. It imposed its own very strict slaughter standards on the BMC for all carcasses for export to Europe. This had the effect of reducing the BMC’s maximum slaughter capacity. The EEC also insisted that Foot & Mouth disease precautions be intensified. In response, the government has greatly increased the number of quarantine zones together with their associated fences. Animals must be held in quarantine, in camps of restricted capacity, for a period before they can cross the fence into the next zone. These restrictions severely impede the movement of cattle to market and are a major constraint to offtake and efficient management. (Mazonde 1991).

The effects of these constraints are most severely felt during drought periods. Farmers are unable to market surplus animals promptly, so that these animals compete with the animals the farmers want to keep for the limited and declining forage resources. As a result, stock losses escalate rapidly.

6. IMPLEMENTATION OF THE TRIBAL GRAZING LANDS POLICY - THE SECOND POST INDEPENDENCE DECADE

6.1 The Zoning Exercise

Implementation of TGLP started in 1976 with the commencement of the zoning exercise. Although the White Paper had laid stress on the importance of the communal areas, in practice the emphasis was on delineating commercial areas. This is not surprising since almost all Land Board members, and many Civil Servants responsible for overseeing the programme, were big cattle owners who wanted ranches. In practice, no land was zoned as reserved, but the concept of Wildlife Management Areas (WMA’s) was introduced. By 1979, this exercise was largely completed, by which time the districts had been zoned as shown in Table 6.1 below.
### TABLE 6.1 LAND TENURE AND LAND-USE ZONES BY CATEGORIES AND DISTRICTS (shown in km²) 1979

<table>
<thead>
<tr>
<th>District Name</th>
<th>Tribal Land</th>
<th>State Land</th>
<th>Freehold Land</th>
<th>Surface Area</th>
<th>Commercial leasehold</th>
<th>Communal</th>
<th>WMA</th>
<th>National Parks Game &amp; Forest Reserves</th>
<th>Unzoned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>124,000</td>
<td>18,360</td>
<td>5,370</td>
<td>147,730</td>
<td>16,470</td>
<td>57,300</td>
<td>5,000</td>
<td>3,900</td>
<td>59,690</td>
</tr>
<tr>
<td>Chobe</td>
<td>2,900</td>
<td>17,900</td>
<td>Nil</td>
<td>20,800</td>
<td>2,900</td>
<td>2,900</td>
<td>600</td>
<td>14,400</td>
<td>Nil</td>
</tr>
<tr>
<td>Ghanzi</td>
<td>48,250</td>
<td>52,580</td>
<td>17,080</td>
<td>117,910</td>
<td>6,570</td>
<td>20,740</td>
<td>21,520</td>
<td>52,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Kgalagadi</td>
<td>73,420</td>
<td>27,030</td>
<td>6,490</td>
<td>106,940</td>
<td>8,500</td>
<td>31,490</td>
<td>34,360</td>
<td>26,100</td>
<td>Nil</td>
</tr>
<tr>
<td>Kweneng</td>
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<td>Nil</td>
<td>35,890</td>
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<td>19,790</td>
<td>6,600</td>
<td>2,700</td>
<td>Nil</td>
</tr>
<tr>
<td>Kgalengetu</td>
<td>7,960</td>
<td>Nil</td>
<td>Nil</td>
<td>7,960</td>
<td>Nil</td>
<td>7,960</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Ngamiland</td>
<td>91,490</td>
<td>17,640</td>
<td>Nil</td>
<td>109,130</td>
<td>6,300</td>
<td>31,840</td>
<td>17,650</td>
<td>6,190</td>
<td>47,150</td>
</tr>
<tr>
<td>North East</td>
<td>2,210</td>
<td>Nil</td>
<td>Nil</td>
<td>5,120</td>
<td>Nil</td>
<td>2,210</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>South East</td>
<td>820</td>
<td>Nil</td>
<td>980</td>
<td>1,780</td>
<td>Nil</td>
<td>790</td>
<td>10</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Southern</td>
<td>27,870</td>
<td>470</td>
<td>130</td>
<td>28,470</td>
<td>14,400</td>
<td>10,740</td>
<td>3,200</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>TOTAL</td>
<td>414,790</td>
<td>131,980</td>
<td>32,960</td>
<td>581,730</td>
<td>61,940</td>
<td>185,490</td>
<td>88,930</td>
<td>105,300</td>
<td>106,840</td>
</tr>
</tbody>
</table>

**Note:** Columns 1+2+3 = Column 4; Columns 5+6+7+8+9 = Column 1+2

**Source:** Sandford 1980, Hitchcock 1980 and 1982.

Unfortunately, it has not been possible to obtain more up to date information, but there have not been substantial changes. The unzoned areas have been largely divided between Wildlife Management Area and Communal, with some becoming commercial ranches in Ngamiland. Some commercial and WMA land has been re-zoned communal.

### 6.2 The Commercial Areas

Demarcation of ranch boundaries was undertaken by the Ministry of Agriculture and commenced in 1978 in areas already zoned commercial. The first ranches were allocated the following year, 37 on tribal land in Southern, Central and Ngamiland Districts by their respective Land Boards, as well as eight ranches on Stateland at Nata in Central District.

Allocations have continued fairly steadily since then, the most recent allocation being of 20 ranches in Central District in 1989 and 24 ranches in Ngamiland in 1990 (Botswana Daily News 1989/90). Altogether 310 TGLP ranches have been allocated, out of 476 demarcated, and about a dozen are still to be allocated. A very few of the allocated ranches have since been abandoned. The ranches were distributed as shown in the table below:

---

2 All these sources contain internal inconsistencies and disagree with each other. The above table constitutes the author's attempt to produce an internally consistent amalgam of these sources.
TABLE 6.2 DEMARCATED AND ALLOCATED RANCHES BY DISTRICT

<table>
<thead>
<tr>
<th>DISTRICT</th>
<th>RANCHES DEMARCATED</th>
<th>RANCHES ALLOCATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>81</td>
<td>73</td>
</tr>
<tr>
<td>Ghanzi</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Kgalagadi</td>
<td>64</td>
<td>31</td>
</tr>
<tr>
<td>Kweneng</td>
<td>137</td>
<td>37</td>
</tr>
<tr>
<td>Ngamiland</td>
<td>120</td>
<td>111</td>
</tr>
<tr>
<td>Southern</td>
<td>64</td>
<td>52</td>
</tr>
<tr>
<td>TOTAL</td>
<td>476</td>
<td>310</td>
</tr>
</tbody>
</table>

Source: Tsimako 1991

In 1980 it was assumed that there was sufficient land in the commercial areas to allow the demarcation and allocation of about 1 000 ranches. In the Chobe District, commercial farms were eventually allocated for arable farming. It was found elsewhere that there were substantial numbers of people living in or using the commercial areas. Many of these, including borehole owners, did not want to sign leases, and many areas initially zoned commercial were later found to be intensively used by people living in the communal areas. At adjudication meetings and during population surveys of the commercial areas the extent of such use became apparent and people registered objections to alienation of land for ranch development. The planners assumption that there were large areas of "empty" land has conclusively been shown to be false.

Nor has the granting of exclusive rights led to better management. In a recent study (Tsimako 1991) only 47% of ranches had a complete perimeter fence. Of the ranches allocated in 1979, only 58% have complete perimeter fences. Very few ranches have internal paddocking, firebreaks or reticulated water. Many ranches have no water supply at all, in many cases the owner(s) have not attempted to drill at all or have, at most drilled only one or two boreholes.

Almost all ranches are overstocked, or rather, the recommended stocking rate is exceeded. Most ranches were demarcated to a suitable size for 400 livestock units. In a sample of 15 ranches in Southern District, one had 270 head of cattle, all the others had more than 500, six had more than 800, three had more than 1 000 and the maximum was 1 244 on a 6 400 hectare ranch. In the N'ojane ranches, 69% were found to be overstocked in 1979, one to three years after occupation. In 1990, 58% of the 19 occupied ranches had over 400 livestock units, with a maximum of 1 600. Most of these farmers also kept cattle in the adjacent communal area, (Tsimako 1991).

Most ranches in practice operate as cattle posts. There is no attempt at rotational grazing and there is no water reticulation so trampling damage around water points is severe. There is no supplementary feeding, seasonal breeding is not attempted nor are vaccinations or other disease control measures attempted by farmers. Nor is infrastructure adequately maintained, so borehole breakdowns are frequent and fences are not kept up. At N'ojane, where the ranches were fenced before occupation, only seven of the 19 occupied ranches have an intact perimeter fence, (Tsimako 1991).
While administrative delays, loss of income due to drought and inflation have played a role, they are not in my opinion the main cause. Bekure (in Hitchcock, 1982) has shown that the internal rate of return on TGLP sized ranches is low. Moreover, as Carl Bro International (1982) have shown, herds of similar size and purpose perform equally well under either cattle post or ranch conditions with cattle post herds being much more profitable. (This issue will be dealt with in more detail later). Thus, the high costs of developing ranch infrastructure do not earn a worthwhile return. There are other problems too, notably the almost complete lack of group cohesion on group ranches, the fact that almost all ranchers have dual rights and can move animals between ranch and communal grazing at will and the fact that few ranch owners live on their ranch or employ a proper manager. All these factors tend to reduce the incentive and opportunity for good management.

6.3 The Communal Areas

The TGLP was funded by the Second Livestock Development Project, known as LDP II for short. At an early stage it became clear that the proposals for development of the communal areas were inadequate, and additional projects to meet the needs of the communal areas were designed and implemented. Although funded separately, they are of course part of the same policy thrust as the TGLP and in reality form an integral part of it.

The Group Development Programme was a direct outgrowth of the TGLP’s commitment to encouraging group-based development, including group ranching, in the communal areas. A great deal of money was spent on improvements to the extension services, mostly in the form of increased staffing. Farmers were encouraged to form Agricultural Management Associations, formal groups with proper constitutions, to pursue a variety of development projects from dip and spray-race development to the establishment of group ranches. With the exception of some of the smaller projects, such as spray-race construction and cream store construction, these efforts have not been very successful. The AMAs have problems of low participation in meetings, unwillingness to contribute funds (especially over the long term) and a high drop-out rate of members. Within the group ranches that have been established, members tend to operate independently despite higher costs and lower management efficiency. Despite these difficulties, Ministry of Agriculture has plans to develop two blocks of four group ranches in Ngamiland and Kweneng districts.

The Co-operative Movement, which long pre-dates the TGLP, was also strengthened and given additional support after 1975. The Co-operatives have about 30 000 members in 74 cattle-marketing cooperatives and supplied 22% of the total BMC throughput in 1988. According to Jacob (1990), about 8% of the cattle supplied to the BMC by the Cooperatives were supplied by 1% of the members. These bigger farmers supplied an average of 20 beasts each, while the remainder supplied an average of 2.3 beasts each. This latter group of small farmers thus supplied over 20% of the BMC kill.

The Communal Grazing Cell programme was an attempt to increase the productivity of cattle belonging to small farmers in communal areas. It was proposed to fence and paddock areas of degraded rangeland with a permanent water source. Local farmers could pay rent to graze up to a total of 300 weaners in each cell for two years. Only one grazing cell was ever completed, at Ntumbale in the North-East District, out of eight that were planned.
The main reasons for failure of the programme were largely due to lack of interest on the part of the farmers, although water development difficulties played a minor role. In most cases, communities refused to give up land for the cells. At Ntimbale, the project went ahead because farmers believed they would gain legitimate access to a permanent water source in a formerly inaccessible freehold grazing area. (Kejsper 1991)

The Ntimbale farmers did not use the cell as its planners intended. Most of the weaners brought in were heifers, which they did not sell but returned to the commonage to breed after the two year fattening period (D Tshosa pers. comm.).

The rejection of these grazing cells by the communities was entirely rational since:

- setting aside a piece of land for some farmers only where land was scarce was unacceptable,

- fattening animals for sale has a lower priority for small farmers than draught power (for growing crops), milk production or calf production, and

- farmers distrust long-term formalized commitments unless the direct benefits to themselves are substantial, obvious and reasonably certain.

The SLOCA project (Services to Livestock Owners in Communal Areas) instituted in 1979 provided funds to help farmers in Communal Areas with improved access to inputs, marketing, disease control, and essential infrastructure. The network of input supply centres was greatly expanded, and substantial funds provided to develop the cooperative marketing system (see above). Provision of deticking facilities, construction of drift fences (to separate livestock and arable activities during the crop season) and some assistance for groups of farmers to equip boreholes have been provided. This project also contained a smallstock element. Over 100 demonstration facilities were provided, with 1 600 beneficiary farmers. However, no improved management practices appear to have resulted, nor have offtake rates increased. The Ministry of Finance and Development Planning noted lack of extension support and shortage of funds as constraints to the achievement of these objectives.

However, the project should not be viewed as a failure. The improved marketing channels and the increasing number of cattle being sold by smaller farmers through the cooperatives have certainly increased these farmers’ incomes. Cheaper and more readily available veterinary requisites and other inputs and better veterinary services have almost certainly reduced mortality and enabled the farmers to increase their herd size and output. Certainly, the farmers believe that these outcomes of the project were a good thing and insofar as the project aimed to provide the farmers with what they wanted, it has been a success.

The Communal First Development Area programme was formulated in 1980 by the Ministry of Local Government and Lands to meet the needs it perceived for development of the communal areas. It was recognised that agriculture - livestock and arable - was both the major economic activity in all CFDA’s and the key to economic development. CFDA’s were identified in all ten districts. The objective was to implement coordinated and integrated development strategies, planned and managed at the local level. Although this programme has had some isolated successes, overall it has not achieved very much. A major reason has been a lack of active support from the Ministry of Agriculture, which does not mention the programme in its 1991 policy White paper (Kejsper 1991).
The National Land Management and Livestock Project, initiated in 1986, aims to promote improved management of rangeland and livestock in the communal areas. Implementation of a pilot project at Lerolwane on a former commercial ranch has started, and four further pilot projects are still at the planning stage. The Lerolwane community has raised funds to clean and re-equip the borehole. The Ministry of Agriculture has established firebreaks, a water catchment tank and fodder production plots. Doubts have been expressed that community interest may be limited to getting hold of the borehole and the land on this re-zoned commercial ranch (Keijser 1991).

The Government has itself admitted, in the 1985 White Paper on Land Tenure, "that the communal areas have been seriously neglected in favour of the commercial areas". Moreover, as can be seen from the short summary above, most of the interventions attempted by Government have not succeeded in bringing about the type of changes that Government wanted. The two initiatives that have brought about beneficial change in the communal areas, the Cooperative movement and SLOCA, did so on the farmers' terms because they basically set about providing what the farmers really wanted.

7. THE THIRD DECADE - MODERN TIMES

By 1987 it was clear that the TGLP was beginning to run out of steam. It had clearly failed to meet its stated objectives in either the commercial or communal areas. A number of reports were commissioned, notably by McGowan (1987 + 1988). At the same time a much wider reappraisal of the entire national agricultural policy was initiated.

In 1989, an Agricultural Sector Assessment (Edwards et al) was published by the Ministry of Agriculture. This paid considerable attention to overgrazing and degradation, having somewhat uncritically accepted that they were important issues. The assessment found that the pricing and marketing system encouraged accumulation, that the problems could best be addressed by the affected communities, that the TGLP ranches had exacerbated management problems in the communal areas and were themselves badly managed. They identified (pages 113/4) the underlying factors of poor performance of TGLP as:

- Lack of recognition of the problem of overgrazing and degradation by all farmers.
- Unwillingness to limit numbers of animals.
- Inadequate extension support.
- Inexperience of rural people in cooperative and group ventures.
- "Traditionally the objective of cattle management is accumulation rather than turnover".
- Lack of identification by participants with projects.
"TGLP introduced too many new concepts within too short a time to be absorbed simultaneously".

The report's principal recommendations for the livestock sector were:

- that the TGLP ranch programme should be restructured as originally intended by the 1975 White Paper, with emphasis on syndicates, improved management and the elimination of dual rights,

- that the tax system should be manipulated to discourage holding of live animals on the range and encourage sales,

- that a range assessment and monitoring methodology be developed to determine the optimum stocking rate,

- that local communities be given more power to manage their own resources, particularly in respect of grazing and limitations on herd size.

Other recommendations include improved extension assistance to group ranches, the linking of loans to management performance, strengthening the authority of Land Boards, identifying the social and economic reasons people own or want cattle to enable appropriate incentives to reduce overstocking to be designed, and improving the management of TGLP ranches through training, extension and the specification of minimum management qualifications.

This document was a major input to the National Policy on Agricultural Development of 1991. Significantly, as we shall see, it contained no recommendation for changes of tenure nor for expanding the TGLP nor for fencing communal lands. A draft "White paper on Land Management and Livestock" prepared in 1989 based on the McGowan Reports (1987 & 1988) was rejected. McGowan had found that expanding the number of TGLP ranches would have no impact on overgrazing in communal areas nor increase the productivity of the livestock industry.

It was also clear at this time that the Western part of the country, the so-called Kalahari Desert, had very different problems to the rest of the country. The Ministry of Agriculture commissioned a report, "Western Region Study" (Adams et al 1990) to examine the problems of that region. This report found that attempts to introduce commercial ranching to communal area farmers in the west had failed, and that farmers viewed fences merely as a means to prevent straying and compensate for the laxity of their herders. The farmers are not interested in controlled breeding, rotational grazing or any of the other elements of "improved" management. Since most owners are absentee, and syndicate cohesion is poor, it is virtually impossible either to deliver extension advice or to get the farmers to heed it. The report concluded that fenced TGLP ranches in Western Botswana may be neither economically viable nor environmentally sound.

The report found that the traditional cattle post system with its low overhead costs is the more rational and viable system.

The report therefore recommended that less effort be directed to persuading stock keepers to conform to a model of commercial ranching and more effort be devoted to improving cattle post management and in particular to minimising its deleterious effects. It suggested that this
might be achieved by spreading grazing pressure more evenly through better land use planning, more equitable access to grazing and water resources and by finding ways to adjust stock numbers to the variable carrying capacity, particularly during droughts. In particular, it proposed the establishment of community trusts to develop new grazing areas on an equitable basis along these lines. The trusts would be communally controlled and would introduce new practices such as rotational grazing, better veterinary care etc.

The report urged that this issue be carefully investigated before any further interventions were attempted. Regrettably, the Ministry of Agriculture declined to consider these recommendations.

In 1991, the Government published its White Paper on Agricultural Policy (National Policy on Agricultural Development). This deals with the entire agricultural sector, not only livestock. On livestock, it contains a brief outline of the history of the livestock sector from 1966. It goes on to say that although the cattle population has shown phenomenal growth, production and management indicators have been unimpressive and unsatisfactory despite substantial government inputs.

The White Paper then goes on to assert that the commercial sector has shown higher calving and offtake rates than the communal sector (while TGLP ranches do not differ from the communal areas), that there has been no increase in productivity, and that "phenomenal" growth in the national herd combined with a low offtake rate has led to range degradation and low productivity.

The White Paper concludes its findings by arguing that although the performance indicators show that the commercial farms are technically more efficient, "they are not necessarily economically more efficient." (Para 21, page 8). This is, to say the least, a remarkable admission, considering that the White Paper goes on to propose, as its sole new policy instrument, that a very large proportion of the communal areas should become fenced TGLP commercial ranches. We shall also examine the underlying assumptions in the final section, together with the likely consequences of the White Paper's proposals.

In the following sections we take a quick look at the past history of two case study areas and the likely impact of the new policy on them and then conclude with an appraisal of the new policy.
8. TWO CONTRASTING DISTRICTS

In this section we examine first the history of livestock raising in Kgalagadi District on the western sandveld and the Pelotshethla area of eastern Southern District on the eastern hardveld and assess the likely effects of the new policy on the livestock industry in these two very different areas.

8.1 Kgalagadi District

8.1.1 Background

Kgalagadi District is located in South West Botswana and is 106 940 km$^2$ in area. The climate is semi-arid, with rainfall varying from 210 mm a year in the extreme south west to 330 mm a year in the north east. Rain falls in the summer months from October to April, but is variable in both space and time and annual variation$^3$ ranges from 65% in the north east to 85% in the south west. Drought is a recurring feature of the climate. The entire district is located on the Kalahari Sands (Adams et al 1990).

Vegetation is mostly Acacia dominated tree or tree and shrub savanna, but broad-leaved tree savanna is found in the north east and shrub savanna in the south west.

Until 1975 most of the district was state land, except for 6 490 km$^2$ in the east, which was freehold. In 1976, most of the district, (73 420 km$^2$) was declared tribal land and a Tribal Land Board was constituted to administer it. Of the residual 27 030 km$^2$ of state land, 26 100 km$^2$ is National Park or Game Reserve and 930 km$^2$ are leasehold commercial ranches in the eastern part of the district.

Due to climatic and soil factors, arable agriculture has never been a major component of the district economy, although widely practised for subsistence. The economy has always been dominated by livestock raising, hunting and gathering. Sheep and goats dominate in the very dry south west around Bokspits, but cattle dominate the livestock industry of the rest of the district although cattle and goats are important throughout the district.

Apart from ephemeral rain-fed pools in pans and fossil river beds and occasional flash floods in the Molopo and Nossop rivers, Kgalagadi district is devoid of surface water resources.

In consequence, virtually all water for livestock use must come from exploitation of groundwater through wells and boresholes. Over most of the district the groundwater is too saline for use, as only very limited recharge can take place through the thick beds of Kalahari Sand.

Sweet (or useable saline) water can be found in those areas where the sand cover is thinner. Such aquifers can be found in the riverine gravels of the Molopo and Nossop rivers, in fractured Waterberg and Transvaal Quartzites which outcrop in the Khuis/Bogogobo, Tshabong and Omaweneno/Khisa areas and subcrop in a North-easterly direction from Khisa towards Kokotsha and at Mabuasehube. Fresh water can also be found in perched aquifers in

$^3$ Co-efficient of inter-annual variation
calcrite beds in the Matsheng area, around some larger pans in northern Kgalagadi and in some of the wider dune streets in the Bokspits area in the south west.

### 8.1.1.2 Livestock populations and distribution

The estimated cattle population on communal grazing land in the district has increased from 14,600 in 1934 to 52,400 in 1987. Available data on growth of the herd is given in Table 8.1.1 below.

**TABLE 8.1.1 CATTLE POPULATIONS IN Kgalagadi DISTRICT**

<table>
<thead>
<tr>
<th>DATE</th>
<th>S. KGALAGADI</th>
<th>SOURCE</th>
<th>N. KGALAGADI</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1934</td>
<td>8,700</td>
<td>2</td>
<td>5,900</td>
<td>1</td>
</tr>
<tr>
<td>1939</td>
<td>10,500</td>
<td>2</td>
<td>7,100</td>
<td>2</td>
</tr>
<tr>
<td>1949</td>
<td>11,756</td>
<td>1</td>
<td>6,596</td>
<td>1</td>
</tr>
<tr>
<td>1954</td>
<td>20,449</td>
<td>1</td>
<td>12,100</td>
<td>2</td>
</tr>
<tr>
<td>1962</td>
<td>22,624</td>
<td>1</td>
<td>15,300</td>
<td>2</td>
</tr>
<tr>
<td>1966</td>
<td>22,824</td>
<td>1</td>
<td>11,776</td>
<td>1</td>
</tr>
<tr>
<td>1973</td>
<td>35,500</td>
<td>2</td>
<td>17,951</td>
<td>1</td>
</tr>
<tr>
<td>1975</td>
<td>40,856</td>
<td>1</td>
<td>20,534</td>
<td>1</td>
</tr>
<tr>
<td>1978</td>
<td>48,600</td>
<td>2</td>
<td>29,433</td>
<td>1</td>
</tr>
<tr>
<td>1987</td>
<td>36,161</td>
<td>1</td>
<td>16,245</td>
<td>1</td>
</tr>
</tbody>
</table>

**Notes on Source:**

1 = Veterinary Census
2 = Estimate

**Note:**
The estimates are based on the fact that it was noted that the Southern Kgalagadi Cattle population represents 1.57% of the national population and that up to 1973, the Northern Kgalagadi population represented 0.88% of the national population.

Unfortunately, census data for smallstock is much less complete, but in 1987, the smallstock population was as follows:

<table>
<thead>
<tr>
<th></th>
<th>Sheep</th>
<th>Goats</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Kgalagadi</td>
<td>461</td>
<td>11,940</td>
</tr>
<tr>
<td>S. Kgalagadi</td>
<td>19,020</td>
<td>24,167</td>
</tr>
<tr>
<td>District</td>
<td>19,481</td>
<td>36,107</td>
</tr>
</tbody>
</table>

Expansion of the grazing area and water development are shown at 10 year intervals from 1950 onward in Figures 8.1.1 - 8.1.5.

In these maps, the intensively grazed area represents that area grazed throughout the year by all animals. The extensively grazed area represents that area used by the fitter animals in the dry season. Seasonal (wet season) grazing is not shown due to lack of accurate data.

Using the maps, and by interpolation of livestock population figures in Table 8.1.1 above, the growth in the livestock population and the grazing areas has been tabulated, as shown in Table 8.1.2 overleaf.
### TABLE 8.1.2 CATTLE POPULATION AND GRAZING AREAS IN KGALAGADI DISTRICT

<table>
<thead>
<tr>
<th>DATE</th>
<th>LIVESTOCK POPULATION</th>
<th>GRAZED AREA</th>
<th>GRAZING AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Exp Rate/yr</td>
<td>Area km²</td>
</tr>
<tr>
<td>1950</td>
<td>27 700</td>
<td>4.1%</td>
<td>12 950</td>
</tr>
<tr>
<td>1960</td>
<td>36 500</td>
<td>2.8%</td>
<td>14 550</td>
</tr>
<tr>
<td>1970</td>
<td>44 400</td>
<td>2.0%</td>
<td>20 700</td>
</tr>
<tr>
<td>1980</td>
<td>84 800</td>
<td>6.7%</td>
<td>23 950</td>
</tr>
<tr>
<td>1990</td>
<td>62 400</td>
<td>-3.1%</td>
<td>31 900</td>
</tr>
</tbody>
</table>

**Sources:** See text

As one might expect, the table shows that the rate of livestock population growth declined in drought periods as the grazing area per animal fell (i.e. as the stocking rate grew). More interestingly, the table clearly demonstrates that water development leading to expansion of the grazing area takes place as a response to drought rather than in anticipation of drought. When the drought breaks, the livestock population then responds by growing rapidly to utilise the available grazing.

It will be observed from Table 8.1.1 that cattle numbers stagnated in the south in the 1950s and from the maps that little expansion of the grazing area took place as little water development occurred. In the 1960s borehole development in the south got moving and it will be noted that livestock numbers showed little decline in the 1961-66 drought. In the north, where very little water development took place, numbers declined significantly, although the drought affected both the north and south equally, with an average rainfall deficit in excess of 20% (Bhalotra 1987).

The good rainfall years of the 1970s was accompanied by significant water development and expansion of the herd in the southern part of the district. In the north, the herd expanded on the existing water points, except at Kang where large numbers of animals were moved into Ghanzi District (to the north) from 1974 (Source: Author’s fieldwork 1981). When the drought struck in 1982, the northern herd suffered a catastrophic decline, of at least 50%, while the southern herd declined by about 25% (Source: Veterinary Census). The Kang farmers were compelled to move out of Ghanzi district in the early 1980s and suffered heavy losses in the drought as a result. (Source: Author’s interviews with farmers 1991 and Kgalagadi Land Board Minutes 1982-1985).

Between 1982 and 1987 the drought killed about 19 000 animals in Northern Kgalagadi and 12 500 in the South (Author’s estimate using Veterinary census data).
Kgalagadi District
Livestock Waterpoints and
Permanent Grazing Areas
Up to 1950

Figure 8.1.1

Sources
Base map 3 Director of Surveys & Lands
Data 4 Author's field work

Scale 1:250,000
KGALAGADI DISTRICT
LIVESTOCK WATERPOINTS AND
PERMANENT GRAZING AREAS
1980

FIGURE B.1.4

INTENSIVELY GRAZED
EXTENSIVELY GRAZED
WATER POINT

Sources:
Base map © Director of Surveys & Lands
Data: Author's field work

SCALE 1: 250 000
Kgalagadi District
Livestock Waterpoints and
Permanent Grazing Areas
1990

FIGURE 8.1.5

Intensively Grazed
Extensively Grazed
Water Point

Sources
Base map © Director of Surveys & Lands
Data: Author's field work
Kgalagadi District Rainfall Deficit 1981-1987

Figure 8.1.6

Sources:
Base map: © Director of Surveys & Lands
Data: Bhala (1987)
The drought also killed between 74% and 90% of the wild ungulates in the district (Sources: Adams et al 1990).\textsuperscript{4} At the beginning of 1988 the drought broke, with heavy rainfall in the two following seasons, and numbers started to rise.

\subsection*{8.1.1.3 Post drought recovery}

Sadly, an attempt to set up a National Range Monitoring Scheme in the late 1970s failed due to poor experimental design leading to insurmountable difficulties with the statistical treatment of data (Kwerepe pers comm). As a result, the only information available on the post-drought response of the vegetation is anecdotal.

One of the more striking features of the end of the drought was the rapidity with which the grazing recovered. In December 1987, the ground around my home in southern Kgalagadi, which is one kilometre from the borehole, was bare. By May 1988, the standing crop of grass was at the 1981 level and in May the following year it was higher than at any time since the mid '70s. At the Tshane exclusion trials in northern Kgalagadi, the average standing crop of grass and forbs was 541 kg/ha in March 1987 and had increased to 1,360 kg/ha in March 1988, an increase of 252% (Source APRU reports). No change in species composition has been noted (Kwerepe pers comm). This pattern was repeated all over the district. In the absence of large herbivores to eat the grass, there was a severe invasion of locusts in 1987/88 (the first since 1937, the end of a previous severe drought). In 1989, there was a massive rodent plague.

Since the drought broke, the district cattle herd has been increasing rapidly, at at least the national rate of 6% a year (Source Veterinary Statistics).

\subsection*{8.1.1.4 Livestock production and marketing strategies}

There are major differences in livestock production strategy between the different parts of the district.

In the extreme south west, around Bokspits the main activity is Karakul farming to produce pelts. In view of the remoteness of the area and the bad roads, this is a rational strategy. Unfortunately, there has been a major fall in the price of pelts since 1980, and the farmers have been hard hit. Attempts to shift the emphasis of production to slaughter stock are hampered by the high costs and physical difficulties of transport over bad roads. This area is adjacent to South Africa, where the infrastructure is much better developed. The farmers therefore sell almost their entire output to South Africa. The government forbids this, so they smuggle, and the extent of sales is not documented.

\textsuperscript{4} In Adams et al (1990) I compared the 1978-1980 wildlife census with the 1986/37 census, which showed a 74% decrease. However, there are serious anomalies, and using my own road counts for the period 1978-80 and 1986-88 as an index, I am led to believe that the 1978-80 count underestimated populations by about 50%.
In the rest of the southern part of the district, the main activity is now the production of weaners (± 20 months) for sale to the freehold farmers of the Molopo, in the extreme east of the district. The freehold farmers hold regular cattle purchasing forays into the district, which are well advertised, and farmers bring their animals to the sale pens and negotiate sales individually. Prices at weaner sales are generally about 80% of prices paid by the BMC for oxen raised on communal lands, and the animals are transported to the freehold farms (an average distance of about 200km) by truck. The freehold farmers can afford to pay relatively high prices as at 20 months a weaner will not only put on some skeletal growth, but also flesh out and put on fat at the low stocking rates on the commercial farms. Producer prices for fat animals (most of which come from the commercial farms) are inflated by a cross subsidy which penalises lean animals (most of which come from the communal areas) (McGowan 1987). Due to constraints of time, I have not been able to obtain the data from the inter-zonal removal permits. I estimate that about 3 000 animals a year are currently sold by this route, from examination of sale records at the customary courts.

There is some production of slaughter stock, but the long distances, bad roads and difficulties with trekking due to lack of water limit this. However the Southern Kgalagadi Marketing Cooperative treks an average of 600 animals to the Lobate abattoir a year. A few larger farmers also trek or truck their own animals to Lobatse, and an unknown but substantial number are smuggled over the border into South Africa.

In the north, on the other hand, livestock producers have always produced adult oxen for slaughter. Oxen are preferred for two reasons. First, they are harder and can withstand the rigours of a long trek much better than younger animals. Secondly, they can be used as draught animals for a few years before being sold. In 1987, Veterinary permits were issued to move 2 713 animals from Northern Kgalagadi to Lobatse, 300 by truck and 2 413 on foot. Freehold farmers from the Molopo have tried to buy weaners in Northern Kgalagadi on several occasions, but without noticeable success.

The reason for the difference between northern and southern Kgalagadi appears to be related to water. In the south, there are about double the number of animals per water point that there are in the north. Most waterpoints in the south are boreholes, while almost all waterpoints in the north are hand-operated wells. Thus, southern farmers experience more competition for water, for which they must pay cash, while the lower opportunity cost of labour in the north is combined with less competition for water. As a result, southern farmers find that it pays them to sell young animals at a discount while northern farmers find it profitable to hold on to their animals until they mature. (Sources: Authors field work 1990-1991, White 1991).

Throughout the district, milk is an important product from the herds. Most is consumed within the households that own and take care of the animals. Where there are cash buyers, surplus may be sold either as mudila (thick sour milk) or, in the south, as rom (thick sour cream). In relative terms, milk is more important to the owners of small herds than the owners of large ones. The importance of draught oxen is declining and they are now used mainly by a minority of farmers in the northern part of the district. They have been replaced by donkeys, although mules are quite widely used in the south.
In the past, cream production was a major activity in Southern Kgalagadi. In the late 1920's the protectorate government instituted a policy of encouraging cream and butter production as South Africa had closed her border to cattle and beef exports from the protectorate. This continued until the early 1960's when the Veterinary Department decided that cream and milk should be fed to calves to promote beef production, and strangled the trade by delaying the issue of movement permits (Egner, pers. comm.). This was not easy in Kgalagadi because there are no border posts on the Botswana side of the frontier.

The trade started in Kgalagadi in 1954 when the South African Railways started a weekly bus service. In 1955 7,600 gallons of cream were exported and this rose to 36,300 gallons in 1961. Exports slowly fell after 1963, but the trade did not die until the bus service was discontinued in 1984 (Source: National Archives & Authors observation).

8.1.2 Previous Development Interventions

8.1.2.1 Before Independence

As elsewhere in Botswana, apart from the establishment of a Veterinary Department, government development assistance to the livestock industry started with borehole drilling. The first boreholes in Kgalagadi were drilled in 1948, but at first the success rate was low. Government drilled boreholes for use by the public were operated by the tribal administration at this time. The Government also helped equip a number of open wells with windmills, and gave a subsidy to two groups to drill or equip boreholes in the late 1940's.

By 1955, there were five government boreholes, one tribal borehole, two private boreholes, and seven equipped wells. Livestock owners were permitted to water livestock at two of the government boreholes (which were mainly to supply government employees). Two of the government boreholes were to supply water for livestock on trek from Ghanzi.

By 1965, there were six government boreholes and 13 tribal boreholes in use, with a further four tribal boreholes that were equipped later. Only four of the tribal boreholes were in the Northern part of the district. No further tribal boreholes were drilled and in 1970-72 they were handed over either to the district council or to syndicates. Six tribal boreholes were taken over by the district council for public water supplies. Two of the syndicates elected to buy the boreholes outright, the rest were given the use of the boreholes. Of these, one was abandoned as too salty, one collapsed, three of the syndicates are still 'open' syndicates and four have been privatised.

After 1965, no further tribal boreholes were drilled in the district. This compelled those who wanted a borehole to drill their own. By 1990, about 300 private boreholes had been drilled in the southern part of the district, but only 50 had been drilled in the north. (Source: Author's fieldwork 1990/91).
8.1.2.2 LDP I

The first Livestock Development Project (LDP I) implemented between 1973 and 1978 affected the district in two ways. Firstly, the Karakul sheep farms component was located in the extreme south west of the district around Bokspits, and secondly an attempt was made to establish a trek route from Bokspits, through the southern part of the district, to join the Ghanzi-Lobatse trek route. This latter failed, as all the boreholes drilled were too saline.

The Karakul farms part of the project was a success for the eleven farmers or groups who got farms. They had all developed traditional posts around boreholes prior to the project. The planned 24 ranches could not be developed as new water sources could not be found and some post-owners declined to participate.

The farms are based on boreholes located along the Molopo and Nossop fossil rivers. Since the boreholes were fairly close together, the farms have a narrow river frontage and stretch back up to 15 kilometres from the river. Only two farmers have found useable water away from the river and one other managed to reticulate water away from the river. In consequence, the farms are difficult to manage, had high fencing costs and much of the grazing cannot be used efficiently. This has reduced the farmers incomes and almost all of them have had difficulty in meeting loan repayments.

The impact on the rest of the community has been severe. Because the farms are close to the villages and communal water points, they enclosed grazing which had been used by the community. As a result, within three years of the completion of the farms, a decline in stock holdings by the community was observed (White, in Hitchcock 1982). The situation was made worse by the severe drought of the 1980s. Not only would the commoners' animals have used the farm grazing at such a time if they could have, and as they had before the fences were erected, but also the farmers exercised their dual grazing rights to compete with the commoners on the communal grazings while excluding them from the farms. When the accessible grazing within the farms was exhausted, the farmers moved animals on to the commonage to allow their farm grazing to recover. When the communal grazings were exhausted, they moved their animals back to the rested farm grazing, leaving the commoners with exhausted grazings and nowhere to go.

The results of this were inevitable. Between 1979 and 1989, the number of animals on the Bokspits commonage declined by 58%, while the number of owners declined by 57% according to the veterinary census statistics. There is no alternative livelihood in Bokspits, and most of these ex-stockholders are now destitute (Adams et al 1990).

8.1.3 The TGLP (The Tribal Grazing Lands Policy)

The precursor of implementation of the Tribal Grazing Lands Policy in the district was the Tribalisation of 73 420 km² of its land, 69% of the total, in late 1976. As a result, the district started to implement TGLP later than other districts. Initially, the Tribal land was zoned as follows:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Area (km²)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>7 750</td>
<td>10.3%</td>
</tr>
<tr>
<td>Communal</td>
<td>31 490</td>
<td>42.9%</td>
</tr>
<tr>
<td>W M A</td>
<td>34 360</td>
<td>46.8%</td>
</tr>
</tbody>
</table>
PLATE 1.

Cattle of the indigenous Tswana breed are extremely well adapted to Botswana’s harsh environment. They are able to gain weight under conditions in which exotic breeds will lose weight. APRU studies have shown that under optimal conditions they show calving rates and rates of weight gain that are as high or higher than for any exotic breed.

Under drought conditions they show lower weight loss and mortality rates than exotic breeds due to their ability to walk long distances between water and grazing, low water requirement and ability to supplement their nutrition by browsing. Under extreme conditions they need only drink every third day and can occasionally go three clear days without water. The animals require minimal husbandry from their owners and are thus well adapted to the customary low-input management system. However, they respond well to improved husbandry practices such as provision of salt and bone meal or supplementary feeding during drought.

The breed is a general purpose animal, being useful for draught as well as beef production and giving a fair yield of milk which has a high butterfat content.

(Ag Info)
PLATE 2

The Tswana sheep is a small, fat-tailed hair sheep typical of indigenous Southern African breeds. Work at Lobu field station in Southern Kgalagadi shows that as a meat-producer it out performs all but F1 hybrids with the South African Dorper breed, and that in general hardihood and survivability it out performs all comers. The Karakul flocks of the Bokspits area were started by crossing indigenous ewes with Karakul rams imported from South Africa and Namibia, and still retain a large indigenous genetic component.

Like the Tswana cow, the Tswana sheep requires minimal husbandry but responds well to quite modest additional inputs. Sheep are most common in South-west Kgalagadi district, but are found in small numbers throughout Botswana. They are becoming increasingly popular among small farmers, largely due to their ability to survive and multiply during drought.

Despite the evidence that the indigenous breed is better adapted than any exotic breed for smallholder production, the Ministry of Agriculture continues to promote the Dorper breed by selling subsidised rams. This policy was described by Adams et al (1990) as an example of exactly the wrong sort of subsidy - one which is not economically justified and encourages a bad practice.

(Author)
PLATE 3

According to the Agricultural Statistics the number of goats in Botswana has increased from 638 000 in 1980 to 2,092 000 in 1990. Part of this apparent increase may be due to more emphasis being put on small stock in recent years. The goat is the small-holder’s animal par excellence in Botswana, the rapid growth in numbers is due to their low water and feed requirements, because they are browsers and do not compete with other livestock and because flocks grow rapidly during drought. This latter attribute results from goats being prone to disease during periods of high rainfall and because the availability of browse does not decline significantly in a drought, because trees and bushes are deeper rooted than grasses.

Most goats in Botswana are of the indigenous breed. As with sheep, the Ministry of Agriculture is promoting the Boer goat by offering farmers subsidised rams. The rationale for this is hard to comprehend, as the Boer goat is genetically similar to the indigenous animals, so that there are minimal benefits of heterosis. The crosses are less disease resistant than the indigenous breed and grow no faster, although they do grow bigger. In a number of instances, farmers who have received subsidised Boer goat rams have immediately sold them at a profit for slaughter (Adams et al 1990).

(Author)
PLATE 4

Donkeys, of which there are about 160,000 in Botswana, are the main source of draught power and an important mode of transport for poorer people. Donkeys have become increasingly important in recent years for plough-draft, they are also used, as here, to transport water. This combination of uses enables many poorer households not only to plough but also to remain at their lands and tend their crops throughout the season.

Since donkeys are only useful to poorer households, their price remains relatively low so that their owners can afford an asset which is only used intermittently.

Donkeys are extremely hardy, and require so little husbandry as to appear to thrive on neglect. They are able to utilise very coarse herbage which minimises competition with other livestock. Nevertheless demands are heard from wealthier cattle farmers that the number of donkeys should be reduced, as has been done in Bophuthatswana where they were simply shot. Such a step would seriously damage the household economies of many poorer people.

(Author)
In contrast to donkeys, horses are extremely valuable animals - a good horse is worth much more that a good cow. Horses are an essential tool in the effective management of a large cattle herd. Cattle can be collected and herded far more efficiently from horseback than by men on foot or even mounted on donkeys. Trekking cattle over long distances is much easier if one or more of the drovers is on horseback. Horses also make the necessary task of killing predators such as lions, wild dogs etc easier and safer for those involved.

(Ag Info)
PLATE 6

Hand dug wells, which may be up to 30m deep but are usually much shallower, are the main source of water for livestock on the communal grazing lands. In this panoramic view of the wellfield at Tsabong in Kgalagadi district, it will be seen that several of the wells are inside fenced yards (centre) while others are unfenced (behind). Where many animals or several owners water at the same well, an efficient means of excluding animals which are not entitled to water is necessary. Watering cattle by hand is extremely hard physical work. The small boy armed with a whip has an important job - chasing off other people’s animals, so ensuring that his elders do no more work than is absolutely necessary.

(Author)
PLATE 7

In parts of Eastern Botswana on granitic rock, intermittent sand rivers are an important component of the landscape. Water flows under the surface of the sandy river bed throughout the year, and access can be obtained by digging a shallow pit in the river bed. The best sites are just upstream of rock bars, where numerous pits may be clustered. The brush fencing, which will be washed away in the next flash flood, serves two purposes. It excludes other farmers animals and prevents the large numbers of animals which mill around in the vicinity from collapsing the pit walls. Water is lifted out of the pit by buckets which are discharged into a trough. In the old days, a hollowed out Molopii (Boscia albitrunca) log was used, nowadays a 200 litre drum cut in half suffices.

(Author)
PLATE 9

In large areas of the Sandveld, cattle are watered at boreholes such as this one near Mahutsane in West Ngwaketse. High yielding boreholes may water very large numbers of animals. All such boreholes are surrounded by a devastated sacrifice zone which varies in size depending on the number of animals being watered. The existence of these sacrifice zones is often taken as evidence of desertification. It is noticeable that the sacrifice zone remains constant in size over time if the number of animals being watered remains constant. The sacrifice zone is better seen as part of the price, along with the cost of drilling and equipping boreholes, that has to be paid for a productive livestock industry in a region where water is scarce and water source development is expensive.

(Ag Info)
PLATE 10

For the great majority of cattle owners in Botswana, milk is the most important single product they obtain from their herds. Most cattle owners are mixed agro-pastoral farmers for whom the products of the live animals are more important than proceeds from sales.

Such farmers take about 35% of the calorific output of their herds as milk, compared to about 33% as sales of live animals for slaughter. Obviously, for owners of smaller herds, milk is relatively more important than for owners of big herds.

(Ag Info)
In this photograph we see the other major product of the live animal - draught power. Although the use of oxen for plough draught is declining (they are being replaced by donkeys and tractors), draught power is still a major output of the animals owned by the agropastoralists.

The woman walking in front of the team is broadcasting seed from the calabash in her hands. This is a well-trained team, the voortoper (carrying the whip) is walking beside the animals rather than leading them by the nose.

(Ag Info)
This photograph, or its clone, has been published many times over the past half-century to illustrate the supposed advantages of fenced commercial ranches over the unfenced commonage.

On the left, inside the ranch fence, we observe a much denser cover of grasses, while in the communal area to the right the grass cover is extremely sparse. This is supposed to indicate the benefits of fencing the communal range.

What this photograph really shows is the impact of low stocking rates in the commercial ranch compared with high stocking rates on communal land. The communal land has a much higher output of useful products and supports more people per hectare than the fenced commercial ranch. There is virtually no reputable scientific evidence that the higher stocking rates on communal land in this area (West Ngwaketse) is leading to a long-term (or any) loss in the underlying productive capacity of the land, while there is quite a lot of evidence that the current stocking rates have virtually no such impact.

In limited areas, e.g. the Nokaneng flats and along the Boteti, trampling damage caused by large numbers of animals moving between grazing areas and water points may be causing unsustainable rates of loss of very fertile soils.

(Author)
PLATE 13

These two photographs were taken six months and a few metres apart. That on the left was taken in October 1987 and shows the impact of the long drought - leafless trees, no grass and dwarf shrubs in evidence. That on the right was taken the following March and shows dense grass completely obscuring the dwarf shrubs and cattle in excellent condition.

Readers should compare these photographs with Plate 12 and note the rapidity with which the grazing recovers after a drought and observe the greater variation wrought by rainfall than that wrought by differences in the stocking rate.

(Author)
PLATE 14

This borehole at Vergenoeg, about 8km north of Tsabong in Kgalagadi district was drilled and equipped in 1962 and abandoned in 1969. By 1979, when I first visited the site, the natural vegetation had re-colonised the sacrifice zone. The vegetation around the borehole was for all practical purposes indistinguishable from that in the surrounding area. The nearest waterpoint is now six kilometres away.

The only exception was that the immediate vicinity was heavily trampled because cattle still came to rest and chew the cud at the old borehole. In 1992 they still do, although it is most unlikely that any living animal ever watered there. Cattle are great creatures of habit and animals continue to follow the movement patterns learnt from their mothers and grandmothers as calves at foot.

(Authors)
PLATE 15

Cattle are primarily bulk, unselective grazers. In drought years on the common grazings when the grasses become depleted the animals are compelled to seek other food sources. Browse is extremely nutritious, being rich in protein and minerals, and the cattle eat it to optimise their nutritional intake at a time when inadequate fodder of very low quality is otherwise available. These animals are eating *Molhauwe Diospyros lycioides*, other important browse species include *Motlopi Boscia albitrunca*, *Morethwa Grewia flava* and *Sikhi Acacia hebeclada*.

APRU investigations suggest that browsing is unimportant - but all their work to date has been carried out on research ranches with low stocking rates.

(Author)
The ultimate regulator of livestock numbers on the communal grazings is death. If we are to improve the lot of the small farmer, it is essential that we transfer unplanned deaths on the range to the abattoir. The rigid and inflexible nature of the marketing system is a major contributor to mortality.

Provision needs to be made to enable farmers to de-stock quickly in a drought and re-stock quickly afterwards so that they can pursue an efficient opportunistic strategy in herd management.

(Author)
8.1.3.1 Commercial Areas

It was expected that between 90 and 100 ranches could be demarcated. In the event, conflict with wildlife migration routes, and pre-existing rights led to many ranches being dezonned, a good number before demarcation took place.

A total of 64 ranches were demarcated in five blocks, of which 31 have been allocated and 20 dezonned. One allocatee has surrendered his allocation while no applications where received for some ranches and one has been reserved for an Agricultural Management Association to apply. Of the 31 allocations, one was to an AMA, 14 were to syndicates and 15 to individuals. Some of the syndicates have since split up, and two of the farmers have formed a partnership to develop their farms together as a game farm.

The state of development of these ranches is shown in the Table below:

<table>
<thead>
<tr>
<th>TABLE 8.1.3 TGLP RANCH DEVELOPMENT IN KGALAGADI 1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOCK</td>
</tr>
<tr>
<td>Tshane</td>
</tr>
<tr>
<td>Werda</td>
</tr>
<tr>
<td>Makopong</td>
</tr>
<tr>
<td>Tsabong</td>
</tr>
<tr>
<td>Middlepits</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

Source: Authors' fieldwork 1991

8.1.3.2 Communal Areas

The group development programme achieved very little in Kgalagadi. Of four TGLP ranches reserved for AMAs, two were never applied for, one AMA promptly disintegrated and one took seven years to agree a constitution and register itself. (Source: Kgalagadi Land Board Minutes 1977-1990).

Successful cattle marketing co-operatives have existed for many years at Tshane and Tsabong, serving Northern and Southern Kgalagadi respectively.

Groups of wealthy and influential farmers formed Farmers Associations at Werda and Bokspits in the 1960's to develop and operate livestock boreholes. While that at Werda collapsed after a few years, that at Bokspits has survived and flourished. It drilled two successful boreholes and developed an original water reticulation scheme at Tsane-tsane, involving nearly 20 km of pipeline and five water points. This enabled them to both rotate grazing and spread grazing pressure more evenly, as well as to separate different classes of animal and to exercise some control over breeding. Unfortunately, during the drought the farmers and their association had insufficient funds to maintain the system, and it has fallen into disrepair.
SLOCA funds were used to extend the network of livestock advisory centres and input stores in the district. Funds were also provided to the co-operatives to enable them to expand their services to their members. SLOCA funds were also used to build a number of reticulation schemes similar to that at Tsane-tsane. These were not a success as the livestock specialists did not understand the (relatively simple) water engineering problems involved. Of five schemes built, only one was useable in 1991 (and that was not used regularly).

In the Matsheng villages, the Village Area Development Programme, an offshoot of LDP I under the Ministry of Local Government and Lands, initiated a pioneering effort to prepare a communal area land use plan in close consultation with the communities concerned. By means of an extended dialogue with the villagers, conducted through the medium of Kgotsa meetings, an acceptable land-use and development plan was hammered out.

The District Council adopted the land use plan and designated the Matsheng villages as the district’s Communal First Development Area. Due to bureaucratic dawdling at central government level, the resources and manpower necessary to implement the plan were only made available after long delays and in a piecemeal fashion. As a result, not only was the plan not implemented either in full or in the co-ordinated manner that it should have been, but the villagers lost faith in the Government’s willingness or ability to help them.

8.1.4 Water point distribution and grazing pattern

The number of places in Kgalagadi with high-yielding water sources and which therefore have an adequate supply of water is limited.

Water points with high yields occur along the Molopo and Nossop rivers, at Tsabong, in the Omaweneno/Khisa area, in the Matsheng villages and at Kang. The great majority of animals in the district are watered at these waterpoints, almost all of which are communally used. Livestock walk long distances, usually between 15 and 20 kilometres to reach their grazing areas after watering. Farmers using these water points are already disadvantaged. Those in the Tsabong area owned an average of 30 cattle in 1975-1980 and their herds grew at a rate of 2.4% a year (Jerse 1981).

Toward the periphery of these grazing areas there are private boreholes belonging to the richer cattle owners, most of which are saline and low-yielding. Since the land around these private boreholes is grazed by cattle which drink at the communal water points, the animals which drink at the private boreholes must walk further out into the bush, away from the communal water point, to graze. Despite these difficulties, farmers using these water points have marked advantages. In the Tsabong area, they owned an average of 135 cattle apiece and their herds grew at a rate of 11.5% a year between 1975 and 1980 (Jerse op. cit).

In times of drought, when grazing is scarce, all animals must walk further from their water point to obtain grazing. It is not unusual for animals to walk over 25 kilometres between water and the area where they graze in drought periods.
Although outsiders often think otherwise, animals do not graze randomly around their water points. Each herd has a mahulo, an area of land to which they are attached and which forms their home range. The boundaries of the mahulo are arranged radially, like the spokes of a wheel, around the water points. A mahulo is not a territory, and the mahulo of different herds commonly overlap. Naturally, the farmers know the mahulo of their herds. In a big herd, the sub-herds within the herd may have different mahulo.

Transhumance was once widely practised in the district. Today, it is still commonly practised in the Bokspits area and uncommonly in the Matsheng area where it is in decline. Generally, the practise is restricted to years of better rainfall. In the Bokspits area, good rains bring on extensive fields of Tsamma melons (Citrullus lanata) in the Sandveld away from the river which the farmers exploit by moving themselves and their flocks and herds to them. They camp on the melon fields and when one is exhausted, move to the next. The melons can satisfy the water requirements of both man and beast, and people may stay three or four months before returning to their permanent water point. In the Matsheng area, pans may hold ephemeral pools of rain water for a few weeks. People move out with their herd to exploit this water and the surrounding grazing. When the water is exhausted, they return to their permanent water point. Herders do not usually return to the same place the following year if it is also wet, but go somewhere else.

In the rest of the district, the animals may practice their own "transhumance", moving out to pans with pools of rainwater up to 40 km from their home water point. They can remain there, untended, for several weeks, until the water is exhausted and they come home. Young male animals frequently stray at this time.

The practice is an excellent one, it allows remote and rich grazing which is not otherwise accessible to be exploited. At the same time, it rests the heavily used grazing around the home water point. The reasons for its decline are probably associated with the rising opportunity cost of labour - still relatively low in Bokspits and the Matsheng area. In addition, many cattle are now watered from boreholes rather than wells. Watering cattle from a well is hard physical work and herd boys welcomed the opportunity to spend a few weeks loafing around in the bush guarding cattle and hunting.

In Kgalagadi (and the rest of western Botswana) fencing is not generally used or needed to control grazing. In the TGLP and Neojane Ranches fences are seen by ranchers as a means to limit straying, to exclude commoners' cattle and to compensate for the laxity of herdboys. Grazing is controlled by the distribution, yield, seasonality and reliability of water points. As the Bokspits farmers have demonstrated at Tshane-tshane, grazing can be controlled by deliberately manipulating the availability of water in time and space.
8.1.5 The likely impact of the new Agricultural Policy

The new National Policy on Agricultural Development proposes to permit individuals and
groups to fence the grazing land around their boreholes. This policy is likely to have
profound and unintended effects in Kgalagadi District. If the owners of the private boreholes
which ring the communal water points are allowed to fence in the surrounding grazing, this
will have the following effects:

a. The amount of grazing available to livestock which utilise the communal water
   points will be greatly reduced (probably by at least half).

   As a result, the animals which use the communal water points, which belong to the
   poorer farmers and make up half the district herd will have less grass to eat. They
   will produce fewer calves and will overgraze the available land much more
   seriously. Because the herds produce fewer calves, the farmers will have fewer
   animals to sell or to replace losses due to natural mortality. They will become
   poorer.

b. On the other hand, the richer farmers who own the private boreholes won't be able
   to benefit, because their boreholes have too little water which is often too salty.

   As a result, the grazing around their boreholes will be under utilised as there is too
   little water to support the livestock which can be grazed there. The borehole owners
   will therefore be unable to develop the land properly.

c. In times of drought, the fences will prevent the movement of animals between water
   and grazing.

   As a result, more damage will be done to the range and more livestock will die than
   would otherwise be the case. The fences will also inhibit the beneficial practice of
   transhumance in good years.

This prognosis is not fanciful. All these effects have been observed as a result of the
enclosure of the Bokspits farms under LDP 1. There is no reason to suppose that more
widespread enclosures will not have similar effects.
8.2 The Pelotshetlha Area

8.2.1 Background

The Pelotshetlha area is located in south-eastern Botswana and covers an area of 710 km$^2$. The climate is sub-arid, with an average annual rainfall of 516 mm a year at Kanye, a few km to the North. Annual totals have ranged between 105 mm in 1953/54 to 971 mm 1966/67. Most rain falls in the summer months between October and April, but distribution in both space and time is variable, with an annual variation of 55%.$^6$ Droughts are frequent, with rainfall falling below 60% of the mean in 11% of seasons between 1926/7 and 1982/83.

The area is 'hardveld' with soils located on the rocks from which they are derived. The important rock types are Kanye Volcanics and granites overlain by sandy loams of varying depth, conglomerates overlain by shallow loamy sands, tuffs and shales overlain by generally deeper and heavier soils (although texture and depth are variable) and dolomites overlain by shallow loamy sands over a calcrite pan. A map of the area showing underlying geology follows as Figure 8.2.1.

Vegetation is mostly broad leaved tree and shrub savanna. These savannas are usually quite open, due to a long history of human use. Woody canopy cover exceeds 20% in only 32% of the area, while 20% of the area is arable (about half of this is fallow) and 6% is open grassland with woody cover under 2%.

The area is part of the Ngwaketse tribal territory and has always been communal land. Up to 1970, land was administered by delegated headmen answerable to the Chief at Kanye. Since 1970, administration has been in the hands of a tribal land board.

Outward wage-labour migration is an important factor in the district economy, leading to a severe shortage of household labour. Wages are the largest single source of household income. The agricultural economy of the area is dominated by agro-pastoralism, with virtually all households engaged in livestock raising and almost all in arable farming. Almost all households own cattle, although 10% do not manage them themselves while about two-thirds of households own smallstock. Cattle are much more important economically than smallstock, as a source of both subsistence and of cash.

Water sources are widespread in the area. Surface water sources include ephemeral streams, pans, dams and numerous small haffirs. There is an extensive re-charging dolomite aquifer in the western part of the area, exploited by wells and boreholes, while more scattered boreholes occur in the central part of the area. Due to unsuitable rock formations, groundwater is scarce in the North East, East and South of the area.

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$^5$ I have drawn heavily on Abel et al, 1987 and Flint 1986 for sections 8.2.1 to 8.2.3

$^6$ Inter annual coefficient of variation
Key: Groundwater potential (after Sekwale, 1983)
1 - poor, 0-3 m³/hr borehole yield
2 - poor to fair, 3-7 m³/hr borehole yield
3 - good, >10 m³/hr borehole yield

2. Dolerite
1. Kanye volcanics
1. Thamaga granite
1. Kgale granite
1. Nthantihe granite
1. Mmathethe granite
3. Dolomites
3. Chert breccia
2. Black reef quartzite
2. Tuffs + shales
2. Conglomerates
2. Shales
2. Greywackes

FIGURE 8.2.1 Geology of the Pelotshelha Area
(Source: Abel et al 1987)
8.2.1.1 Livestock Population and distribution

Unfortunately, I have not been able to obtain accurate data on the numbers of livestock in the Pelotshetlha area over the years. However, numbers have increased over the years (and continue to do so) with temporary periodic decreases caused by droughts. The main causes of growth in numbers are socio-economic and include:-

- Government policy has favoured the cattle industry and supported it with effective veterinary services and high prices for slaughter cattle

- Many Batswana earn wages, in towns or in South Africa, which are invested in cattle because returns are good, alternatives are lacking and cattle are needed for subsistence

- The human population is growing and more people need more cattle

- Small herds are expensive to maintain, although outputs usually exceed the value of inputs. Larger herds have a positive cash flow, so there is a strong incentive to increase herd size

- Borehole development has made dry season watering easier and improved access to dry season grazing.

Conversion of grazing land to arable has caused the stocking rate and grazing pressure on the remaining grazing land to grow relatively rapidly. This has led to ecological change, notably a decline in grass cover and biomass, an increase in woody canopy cover and enhanced soil loss rates. These changes have been quite marked on the granites and Kanye Volcanics, but barely detectable on other rock types which are more resilient.

Cattle are moved into or out of the area depending on conditions both locally and in adjacent areas, while smallstock are more sedentary. Between October 1982 and October 1984 cattle numbers fluctuated from an initial 14 500 to a peak of 36 000 in March 1983 and then fell to 9 700 at the end. Smallstock numbers showed much less variation. These changes are shown in more detail in Table 8.2.1 in Section 8.2.3.

8.2.1.2 Agricultural Production Strategies

In common with most of the Eastern Hardveld, almost all farmers in the Pelotshetlha area are engaged in Agro-pastoralism or traditional mixed farming. Their production strategy involves spreading risks between crops and livestock production. Arable farming offers rather modest returns in good years, with a high risk of failure due to drought. The returns from livestock are much more reliable, but most households have insufficient livestock to meet subsistence requirements. Half the cattle are owned by 17% of households, while the poorer 50% of households own 17% of the cattle, and the poorest 24% of the farming population own only 4% of the herd. Median herd size is 20 animals. While 60% of the herd consists of cows and heifers, oxen make up 27% of herds in the 15 to 30 size class, but only 11% of herds larger than 45 head.
Both off-farm income and crop yields are strongly correlated with herd size. Although cattle are the major source of draught power for ploughing, the relationship is not a direct one. Cattle are the major index of household wealth, and members of wealthy households have better job opportunities due to better education and higher social rank. In addition, wealthy households can invest more heavily in both farm equipment and tillage operations and are less constrained by either labour or draught-power shortages through their ability to hire from outside the household.

The relative values of outputs from cattle were as follows:

<table>
<thead>
<tr>
<th>Output</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>35%</td>
</tr>
<tr>
<td>Meat</td>
<td>19%</td>
</tr>
<tr>
<td>Draught Power</td>
<td>6%</td>
</tr>
<tr>
<td>Gifts out</td>
<td>7%</td>
</tr>
<tr>
<td>Cash Sales</td>
<td>33%</td>
</tr>
</tbody>
</table>

Milk from cattle made up 10% of the calorific intake of the farming community and meat represented 5% of intake. Milk and meat from smallstock represented 2% of calorific intake. Most meat came from animals which had died of natural causes.

In households with small cattle herds, domestic consumption of in kind livestock products was particularly important, while for those with larger herds, cash sales were relatively more important. Herds under 30 head tended to have a negative cash flow, i.e. they consumed more cash than they generated, but economic returns to capital and labour were positive.

Most cattle sales were of mature oxen (64%) and cull cows (25%) and 75% of sales were to the BMC. Two local co-operatives handled 70% of sales to the BMC.

8.2.2 Previous Development Interventions

8.2.2.1 Before 1975

Prior to 1975, the Pelhotshetlha area was not singled out for development assistance in any particular way. It did benefit from its proximity to Kanye, the district headquarters, through better access to extension support. This is reflected in better uptake of government recommendations on agricultural practices.

The colonial government supported tribal efforts to build dams and drill boreholes in the area, and after independence the Government continued to support communal efforts.

Most water development was undertaken by individuals and small groups (often family based). In the western part of the area, on the dolomites, this consisted of well digging (mostly by larger herd owners). Elsewhere, farmers constructed numerous haffirs to trap and store surface run-off.
8.2.2.2 After 1975

In 1975, the government established the Integrated Farming Pilot Project at Pelotshetla. The project was set up to test a range of "improved" technological and management packages and radical policy innovations for agriculture and to pilot an intensive integrated approach to area development. The "improved" packages - including APRU recommendations for "minimum acceptable levels of cattle management" - were soon found to be less than appropriate to the realities of the communal situation. As a result IFPP was forced to change and become an area-based Farming System Project with emphasis on investigation and description of the communal set up.

As such, the Pelotshetla area has been well studied and also well supplied with extension advice, veterinary services and other inputs. Many Ministry of Agriculture programmes have been intensively promoted and tested, notably the adoption of recommended cattle husbandry practices, the formation of smallstock management groups and the formation of farmers committees.

About half the project extension staff are engaged on livestock work, and there has been substantial expenditure on water development (boreholes, dams and haffirs) and livestock handling facilities.

The uptake of recommended practices such as supplementary feeding with salt and bonemeal, internal parasite control and tick control has been higher than regional and national averages. It is not clear to what extent this reflects IFPP impacts or previous practice or the favourable geographical location of the area. A major constraint to improved practices is that they require higher inputs of both cash and male labour - both of which are very short in most households. As a result, these practices are more frequent in larger herds which belong to wealthier households.

TGLP has had very little impact in the area. Very few cattle were moved out of the area to new ranches. SLOCA did have an impact - it made inputs and veterinary requisites more easily accessible and strengthened the two local co-operatives. In 1982-84 50% of all cattle sales from the area were made through the co-ops.

8.2.3 Water Point Distribution and Grazing Pattern

The distribution of water points is shown in Figures 8.2.2 - 8.2.4 overleaf. Boreholes and wells are permanent water sources and are concentrated in the western and central parts of the area.

Dams, which are semi-permanent water points, are concentrated in the north-central part of the area, while Pans and haffirs which are seasonal water points are widespread except in the western part of the area.

Broadly speaking, at the end of the dry season in October cattle are watering at permanent water points and grazing those areas which have higher grass cover, mostly on the dolomite and tuffs and shales in the western and central part of the area.
By January, farmers will start to move cattle out of the arable lands area (see Fig 12 overleaf) and most cattle will move onto the Kanye Volcanics and granites on the Northern and Eastern Margins and in the Malau Hills, to use the rather limited grasses (which are of good quality) while the seasonal water supplies in these areas last.

Usually, both grass and water will not last for long after the end of the rains in April, and animals will start to move to semi permanent and permanent water supplies in the northern and western part of the area and to utilise the abundant grazing of the dolomite and tuff and shale areas.

After harvest in July, large numbers of animals move into the arable area, and eat both crop residues and the reserved grazing inside the drift fences. The animals will remain in these areas until after planting in January the following year.

Events at the beginning of the 1980's drought are described in some detail by Abel et al (1987).

Livestock population estimates based on aerial surveys for the period November 1982 to October 1984 are shown in Table 8.2.1 below:

**TABLE 8.2.1 LIVESTOCK NUMBERS AT PELOTSHELTHA**

<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
<th>$N^2$ of Cattle</th>
<th>$N^2$ of Smallstock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct</td>
<td>1982</td>
<td>14 500</td>
<td>10 800</td>
</tr>
<tr>
<td>Jan</td>
<td>1983</td>
<td>33 600</td>
<td>13 000</td>
</tr>
<tr>
<td>Mar</td>
<td>1983</td>
<td>36 000</td>
<td>18 500</td>
</tr>
<tr>
<td>May</td>
<td>1983</td>
<td>14 000</td>
<td>11 200</td>
</tr>
<tr>
<td>Jul</td>
<td>1983</td>
<td>18 000</td>
<td>10 500</td>
</tr>
<tr>
<td>Oct</td>
<td>1983</td>
<td>15 300</td>
<td>15 500</td>
</tr>
<tr>
<td>Mar</td>
<td>1984</td>
<td>12 500</td>
<td>6 500</td>
</tr>
<tr>
<td>May</td>
<td>1984</td>
<td>14 000</td>
<td>11 200</td>
</tr>
<tr>
<td>Jul</td>
<td>1984</td>
<td>13 200</td>
<td>16 000</td>
</tr>
<tr>
<td>Oct</td>
<td>1984</td>
<td>9 700</td>
<td>12 300</td>
</tr>
</tbody>
</table>

Notes:
Source Abel et al 1987
All estimates are ± 10% @ 95% confidence limit

This table is of interest in that it tracks livestock numbers through the onset of the 1980's drought. Good early season rains in the area in November and December 1982 encouraged many farmers in surrounding areas to move cattle into the Pelotselthla area. Rainfall in the period January to April 1983 was poor and most of these animals were moved out to the west between March and May 1983.
**FIGURE 8.2.2** Contours of distance from boreholes and wells
(Source: Abel *et al* 1987)

- **Boreholes**
- **Wells**
- **IFPP HQ**
- **Town**
- **Roads**
- **Contours of distance from water point in km.**

Date: November 1983
FIGURE 8.2.3 Contours of distance from dams
(Source: Abel et al 1987)
FIGURE 8.2.4 Contours of distance from pans and hafirs
(Source: Abel et al 1987)
FIGURE 8.2.5 Topography, drainage, roads and drift fences
(Source: Abel et al 1987)
There was very low rainfall in the 1983/84 rainy season (320 mm) and the number of cattle in March 1984 was 35% of the total a year earlier. After the middle of the dry season (July), cattle which had not migrated out of the area started to die in significant numbers.

Smallstock numbers fluctuated much less than cattle numbers whilst following a broadly similar pattern.

During these fluctuations, cattle distribution differed from the more normal pattern. In the early 1982/83 wet season, cattle were concentrated in areas of good grass cover, especially where there was some woody cover. High densities were observed in dolomite areas as well as on the granites and Kanye Volcanics.

During the dry season, from June - October 1983, cattle densities were highest in areas of tall grass, good grass cover and open areas in the western and central part of the area. Numbers in woodland were low. Numbers were higher near permanent water sources, such as wells and boreholes and lower near temporary or semi-permanent water sources (most of which were dry by this time).

During the drought, cattle concentrated in areas with good grass cover in the western, northern and southern part of the area, with some animals in the central area, close to permanent water.

Condition of cattle throughout this cycle appeared to be correlated with high biomass of grass, irrespective of quality.

Drift fencing is used at Pelotshetla to exclude cattle from the arable land areas during the crop season. Of the cattle owned by residents of the arable lands area 14% of the herds, comprising 20% of the cattle population stay inside the drift fence. These animals must be closely herded in the crop season to prevent crop damage. Most (72%) of the herds, comprising 58% of the cattle population are moved out of the arable area for the crop season, except for a few milk cows and calves. A further 4% of herds, which make up 11% of the cattle population are kept permanently outside the arable area in the Pelotshetla grazing area. The other 10% of herds, comprising 11% of cattle owned in the Lands area, are kept outside the Pelotshetla area altogether.

The grazing pattern is, however, quite clearly controlled by the availability of water. In the wet season the animals exploit grazing in areas with seasonal water points and in the dry season they exploit grazing in areas with permanent water points. By the end of the dry season 83% of cattle are being watered at boreholes, where fees must be paid. The scale of fees is regressive, so small herd owners pay more per animal than large herd owners. During the rainy season, most boreholes and wells are deserted.

8.2.4 The likely impact of the New Agricultural Policy

The new agricultural policy needs to be examined against a background in which both human and livestock populations are increasing, while opportunities for alternative livelihoods are growing at a slower rate. As a result, land which is already showing signs of deterioration will be required to support increasing numbers of people.
At the same time, traditional communal management has almost disappeared, so decision making is now strongly individualistic. In eastern Botswana, identifiable communities below the level of the tribe do not exist and the boundaries of tribal identity are becoming more blurred with each passing year. Furthermore, national social, economic and political trends do not favour communal schemes.

Privatisation into small units would be neither technically efficient nor socially equitable—even ranch size units of 50-100 km² would suffer technical difficulties due to inadequate access to all necessary types of resource. It is noticeable that in the early stages of the 1980s drought the Pelotshetlha area first of all absorbed grazing pressure from herds moving in from less advantaged areas and later cattle from the area migrated to areas with better grazing and water. Even the Pelotshetlha area itself is not self contained and self sufficient in a serious drought. Further privatisation could be expected to exclude substantial numbers of people from access to land.

Abel et al (1987) while aware of these constraints, found that there were technical and social reasons why relatively large areas of agro-pastoral land should come under coordinated management by defined communal groups. These groups would have territorial rights, the power to regulate stock numbers and other agricultural practices and introduce technical improvements. The new agricultural policy enshrines these ideas.

They recommended that regulation of livestock numbers should aim to track a fluctuating carrying capacity. This is at variance with the new agricultural policy which proposes to establish a single carrying capacity for each area.

In order to overcome the constraints to viable communal management, promote social equity and encourage broad acceptance of the proposals, Abel et al make a number of suggestions. These include:

- a progressive management fee to make it economic to manage cattle in smaller herds
- assurance schemes and/or stock bonds to encourage destocking in drought
- manipulating quotas and prices at the BMC to encourage sales (and restocking) at appropriate times
- Government buying and restocking programmes to accelerate responses to drought and post drought conditions.

The new agricultural policy is devoid of such proposals. Without them, the new policy is not likely to be acceptable in practice, and will have little impact in communal areas, such as Pelotshetlha, on the eastern hardveld.
9. CAN THE NATIONAL POLICY FOR AGRICULTURAL DEVELOPMENT WORK?

The stated objectives of the policy relevant to the livestock sector are:

- to improve food security at national and household level
- to diversify sector production to generate more income earning opportunities
- to increase output and productivity
- to increase opportunities for employment and self employment
- to provide a secure and productive environment for those engaged in the industry
- to conserve productive resources for the future.

The policy aims to achieve these objectives by:

- allowing farmers, where feasible, to fence livestock farming land, either as individuals, groups or communities to improve productivity of the livestock subsector and ensure sustainable use of range resources.
- improving extension services with emphasis on artificial insemination.
- assisting communities with fencing and water development.
- encouraging cooperatives to improve quality of service and management.
- improving the quality of livestock by encouraging the use of exotic breeds, stud farming and expanding the artificial insemination service.

While no reasonable person can quarrel with the objectives of the policy, the validity of some of the assumptions which underlie the proposed means for achieving it is doubtful. These are considered below.

9.1 Biological Assumptions

The White Paper makes the following biological assumptions:

- severe rangeland degradation has occurred and continues,
- there has been no increase in productivity,
- that an "ideal carrying capacity" exists,
- that stocking rates must be reduced,
- that exotic breeds are more productive than indigenous,
- that the commercial sector is technically (i.e. biologically) more efficient than the communal sector,
- that fenced areas are technically more productive than unfenced.

These assumptions are examined in turn below.
9.1.1 Degradation and Productivity

The idea that widespread overgrazing is leading to severe degradation of rangeland has been reiterated so often as to become dogma. There is, however, very little sound scientific evidence to support it.

The arguments used to support the proposition are that serious soil erosion is taking place and that the floristic composition and vegetation structure of the rangelands is changing.

Measurement of soil loss in Botswana shows that gross soil losses are small and are proportional to the amount of run-off (L & WMP, 1991). Even in the most vulnerable areas, the rate of soil loss due to overgrazing is only slightly elevated above that due to climatic, land form and geological factors. Actual rates of soil loss in Botswana are very low e.g. 0.08 mm a year in the Shashe Catchment in North East District (Stewart Scott 1987) - allegedly the most seriously degraded district in Botswana. Biot (1991) shows that soil loss rates on slopes in the similar but less heavily used Mahalapswe catchment are higher than this, but that the residual soil life in his study area still exceeded 400 years. Application of Biot's criteria to the entire Shashe Catchment in North East District suggests that it has a residual soil life of about 4 500 years. This clearly indicates that most soil erosion is localised and involves redistribution of productivity within catchments rather than outright loss.

Changes in floristic composition and vegetation structure due to intensive grazing by livestock are well documented in Botswana. However, there is no documented evidence that this change is leading to a loss in productivity, although grasses classified as "desirable" decline in frequency. When land use changes from grazing of a stable sub-climax by wild animals to livestock production, such changes are both inevitable and necessary. Wild herbivore grazing systems are closed, in that energy and nutrients cycle within the system. However, livestock production systems are open, products are exported from the system, while grazing pressure is generally higher, so climax species which are not well adapted to intense grazing decline and other species which are tolerant of intense grazing increase. A shift in equilibrium must follow such profound changes. There is no clear link between change in grassland species composition and livestock productivity (Abel & Blaikie, 1990).

The most telling argument against degradation is that productivity, in terms of meat output per animal, has not declined. It has increased. While dressed carcass mass at slaughter, calving and offtake rates have not changed since 1966, the average age of cattle at slaughter has declined from seven years of age in 1966 to four years of age in 1990 (Setshwaelo pers. comm.).

If degradation had occurred since 1966, we would expect to see lower calving rates, lower offtake rates, lower dressed carcass mass and greater age at slaughter. We see nothing of the sort.
9.1.2 Carrying Capacity and Stocking rates

The White Paper assumes that a constant "ideal" carrying capacity exists, albeit one that varies with ecological conditions in different parts of the country.

Botswana’s climate is very variable, and rainfall varies greatly from year to year. As a result, the amount of forage available also varies. Adopting a fixed stocking rate means that forage (and productive opportunity) will be wasted in wet years, and overgrazing will occur in dry years. As Abel & Blaikie (1990) show, a tracking strategy is both technically and economically more efficient.

Furthermore as Bell (1985 quoted in Behnke & Scoones 1991) says: "the only embracing definition of carrying capacity is: 'that density of animals and plants that allows the Manager to get what he wants out of the system'. Thus, any specific definition of carrying capacity must be expressed in relation to a particular objective, and it must be defined very precisely since there are no 'natural' stability points in such interactive systems that act as foci for self-defining concepts". Since carrying capacity varies with the specific objectives of the manager(s), it must be defined in relation to production strategy and output objectives. For the same parcel of land, carrying capacity will differ for commercial fatstock production, subsistence lean meat production, dairy production and draught power production.

There is a widespread misconception that lowering the stocking rate will increase both output per animal and output per hectare, which is wrong. APRU research has shown that lowering the stocking rate raises productivity per animal, but it does so at the price of reducing productivity per hectare. By doing so, it reduces the ability of the pastoral production system to support people.

As Abel and Blaikie (1990) point out, this misconception poses a real threat to the livelihood of the many rural Batswana who own too few cattle to meet their needs. By accepting it, the White Paper accepts that the livestock industry must support fewer people. This is in conflict with the policy’s objectives. In the absence of any cogent evidence that degradation is occurring at an unacceptable rate, it cannot be justified.

9.1.3 Desirability of Exotic Breeds

APRU research has shown that indigenous breeds of livestock perform as well as or better than exotic breeds in terms of liveweight gain per hectare. While F1 hybrids between Tswana cattle and exotics show marked increases in liveweight gain due to heterosis, breeding between F1 hybrids, which is common, is highly undesirable. It introduces instability into the gene pool. This may cause loss of beneficial adaptation among the indigenous breeds.

9.1.4 Technical efficiency of Commercial and Fenced Farms

The White Paper (page 7, para 16) states that the commercial sector achieves a calving rate of "about 70%" while in the communal sector it "is barely above 50%". This is untrue. According to the Ministry of Agriculture’s statistics, for the ten years from 1980 to 1989 inclusive, the average calving rate in the communal sector was 57% and in the commercial
sector it was 59%. The White Paper further notes that the performance of the TGLP ranches does not differ from cattle posts in the communal areas.

The White Paper also states that offtake rate from the commercial farms, at 17% is higher than that from the communal areas at about 8%. Three points need to be made here.

Firstly, the agricultural statistics almost certainly significantly underestimate offtake, particularly for the communal areas. According to the 1989 agricultural statistics report (MoA 1990), net sales (gross sales less purchases) were 186 000 animals and home slaughter 46 000 animals giving an estimate of 232 000 animals. The BMC slaughtered 123 000 animals in 1989 (BMC 1989 & 1990), and I estimate that 148 000 cattle were slaughtered for domestic consumption using CSO estimates of beef consumption per capita (CSO 1986), after allowing for consumption from natural mortality. This suggests that total slaughter was about 270 000 animals. On this basis the national offtake rate rises from 9.1% to 11.4%.

Secondly, the agricultural statistics indicate a natural mortality rate which averages 14% in non-drought years over the period 1980-89. This is much higher than the mortality rate in closely observed herds over the same period (Carl-Bro 1982). It should be noted too, that most animals which die in the communal areas are skinned and eaten and not wasted.

Thirdly, while the commercial farmers sold 174 000 animals in 1989, they bought at least 95 000 from the communal areas for fattening and resale (Source Ag. Stats). Many commercial farmers do not operate breeding herds, but operate fattening ranches or simply speculate - a quite different category of farming. The two sectors are in fact managed for different objectives and use different means to achieve them. The communal herd is a breeding herd, while a large part of the commercial herd is a fattening operation for weaners and stores. Valid comparisons of technical performance between the sectors cannot readily be made.

There are good reasons to believe that the error in the offtake statistics lies in the communal areas statistics as there are independent checks on the commercial areas (notably from the BMC). Total offtake from the communal areas in 1989 was:

- sales to Commercial Sector 95 000
- home slaughter 41 000
- sales for slaughter 67 000

Giving a total of 203 000

This is equivalent to an offtake rate of 9.7%, while the offtake rate in the commercial sector was 16%. Carl Bro noted a similar discrepancy in recorded offtake rates in 1982.

Experience with the TGLP so far shows, as the White Paper admits, that there is little difference between the average performance of TGLP ranches and average performance in the communal sector. There are, of course, some well run TGLP ranches. There are also well run cattle posts which achieve performance and output well ahead of the average. One communal area producer whom I know runs 700 cattle and sells an average of 120 slaughter animals a year - an offtake rate of 17%. This is as good as any similar operation in the commercial, freehold sector. Hubbard (in Hitchcock 1982) showed that for herds of similar
size, there was hardly any difference in performance between freehold commercial farms and unfenced communal area cattle posts.

It is important to appreciate that the existing commercial farms represent the privileged pinnacle of the existing cattle industry. With a pricing system that unfairly favours them, privileged access to marketing channels and a land resource that can be used as security for borrowed money, they are in a position to cream off and exploit opportunities to which only a tiny minority of communal area producers have access. If the planners achieve their aim and convert most of the commonage to commercial farms, it will not be possible for a commercial sector encompassing over 50% of the national herd to have the same comparative advantage as the present commercial sector which encompasses 17% of the national herd. As a result, the present high output parameters of the commercial sector will decline toward the level of the national average. If the planners succeed in eliminating the commonage altogether, they will also eliminate the comparative advantage of the commercial sector.

9.2 Social and Economic Assumptions

The White Paper makes the following social and economic assumptions:

- Giving farmers exclusive rights to a tract of land and allowing them to fence it will motivate them to improve livestock and range management and raise productivity,

- That TGLP succeeded in demonstrating that fenced ranches are more productive than communal area cattle posts,

- Land Boards will be able to enforce stock limitations and reduce stocking rates,

- That neither increases in productivity nor improved range management are possible on communal rangeland,

these assumptions are examined in turn below.

9.2.1 Exclusive rights motivates farmers to better management, TGLP succeeded in demonstrating superior productivity of fenced ranches.

In section 128 (Gov’t Paper № 1 version) the White Paper states "Despite problems during implementation TGLP demonstrated that fenced farming is much more productive than communal management systems". Section 16, discussing performance indicators states "... TGLP ranches which were established to manage cattle commercially are hardly different from the communal areas or simple cattle posts in this respect". And later "... the TGLP ranches have fared very poorly, yet they were provided with credit, ranch extension advice etc.".

In fact, as McGowan (1988) convincingly demonstrates, TGLP ranches have failed to meet their objectives, and at least 75% of those which received NDB loans are unlikely to operate profitably. By implication, the average internal rate of return of the TGLP ranches must be
negative. Even the more optimistic projections do not suggest an internal rate of return in excess of 9% (Bekure in Hitchcock 1982). This compares unfavourably with the internal rate of return on cattle posts which average about 12% (Carl Bro 1982, Bekure (op cit)) and the cost of borrowing capital, currently about 15% (Mazonde 1991). The TGLP ranches have been sustained either by state subsidy (most notably the failure of the National Development Bank to collect either repayments or interest on the outstanding loans) or by cross-subsidy from the ranchers' business enterprises or employment income (McGowan 1988). Both McGowan and Edwards et al (1989) state that there is no evidence to show any increase in productivity of TGLP ranches since 1982, when their productivity was the same as communal area cattle posts.

Mazonde (1991) writing about the commercial ranches of the Tuli Block, argues that cattle ranching as an autonomous enterprise is not viable for beef production alone, and never has been. He points out that the settler farmers were compelled to engage in additional enterprises, such as cattle speculation or operating trading stores in order to operate profitably.

He also argues that ranches operated by members of the national elite depend on inside information and the privileges associated with office to succeed. He maintains that these ranches cannot be fairly described on their merits as truly efficient or successful as enterprises.

9.2.2 Land Boards will be able to enforce stock limitation

Central Government has had the legal power to enforce stock limitations since 1972 (Agricultural Resources Act). For political reasons it has never chosen to exercise this power. If Central Government, with all its resources, is unable to enforce these regulations, it is unreasonable and cynical to expect Land Boards to do so.

9.2.3 That neither increases in productivity nor improved range management are possible on communal rangeland.

Productivity in the communal sector is already high as Carl Bro 1982, and de Ridder and Wagenaar 1984 show. Further increases in productivity will be difficult to obtain, and are likely to be incremental rather than dramatic.

As discussed earlier, APRU research has shown that as stocking rate increases, output per head declines while output per hectare increases. At Morapedi ranch, in S E Botswana stocking cattle at 4 ha per L S U gave a higher liveweight gain per ha (15.7 kg/yr) than stocking at 8 ha per L S U (12.9 kg/ha/yr). High productivity per animal which may require fencing to exclude other stock, can only be achieved at the price of reduced productivity per hectare (Abel & Blaikie 1990). In fact, fencing has nothing to do with productivity which is primarily related to stocking rate, multiplicity of use and mobility of the herd.

Range management is not necessarily related to fencing either. The worst abuses of rangeland in Botswana have occurred in fenced farms, as at Ncojane (Kgosidintsii in Hitchcock 1982). Moreover, as the Bokspits Farmers Association demonstrated at Tsane-tsane, good range management is possible without fencing.
9.3 Unstated Assumptions

Although they are not stated explicitly, there are four questionable implied assumptions which underlie much of the White Paper's thinking. They are:

9.3.1 All farmers should want to engage in beef production.

Most smaller herd owners in the communal areas pursue a diversified strategy. They are mixed farmers (agro-pastoralists) who engage in both arable agriculture and livestock production. They keep livestock for at least three reasons, milk production, draught power and sale for cash or home slaughter. Flint (1986), shows that in the Pelotshethla area, cash sales represent 33% of the value derived from cattle, while meat, milk and draught power consumed in the household represent 60% of the value derived from the herd. The value of subsistence outputs will exceed the income from sales in smaller herds. When cows with calves are milked for human consumption, there is less milk for the calf, which grows more slowly, so beef production is hindered. Animals are not fit to use for draught until they are four years old, and having gone to the expense of training them it pays to keep them for some years. For optimal beef production, cattle should be sold at three to four years old.

It appears that most livestock owners in Botswana are small-scale, agro-pastoralists. Gearing livestock policy solely to beef production criteria is totally inappropriate to their needs. Moreover, as Tapson (1991) points out for Kwazulu, Botswana farmers have access to other sources of cash income and may not need a regular cash income from sales. Many individuals invest cash earnings in the purchase of cattle to expand their herds.

9.3.2 Communal area farmers are not commercially oriented.

The fact that the great majority of farmers in the communal areas make substantial sacrifices in order to increase the size of their herd is taken by many to indicate that they are not commercially oriented. However, as Behnke (1987) has so eloquently pointed out, the first pre-requisite for a commercial livestock operation is a big herd. In fact, as Behnke points out, building up a large herd is the first step on the road to commercial livestock farming, and virtually all Batswana farmers are somewhere on that journey.

9.3.3 Communal Management is feasible in the Communal Areas

There have been a few attempts at large scale communal management schemes in Botswana. The Matsheng Land-use plan, described in a preceding section is one such. All have failed so far because they received insufficient technical, financial, administrative and political support. The new agricultural policy does propose an increase in technical support and may bring increased political support from central government. However, it ignores the essential financial and administrative elements and offers no new ideas on how local political support can be attracted.

The prognosis for the new agricultural policy in the communal areas (as it is now formulated) cannot be good. The long term national socio-economic trend is away from communal management and toward individualistic management. The policy offers no ideas on how this
long term trend might be reversed. As noted in section 8.2.4, identifiable communities below the tribal level no longer exist in Eastern Botswana. Traditional communal management mechanisms have largely disappeared.

The financial costs of supporting integrated development projects with a real chance of success are likely to be high. Large amounts of scarce technical and administrative manpower will be needed too. Returns to this investment of increasingly scarce financial and manpower resources will be low. Adoption of a fixed carrying capacity is both technically and economically inefficient and will reduce returns even further.

Most critically, serious thought has not been given to the sort of institutions that need to be built at the local level to make such management feasible, generate enthusiasm among farmers and mobilise local political support. Without such institutions the chances of success are negligible. Community Trusts (as proposed in Adams et al) represent one possibility, there are others.

9.3.4 Commercial Ranches are more profitable than Communal Farming

Although most herds on commercial ranches are no more productive than herds in the communal areas, their owners earn higher profits. The reason lies in the price structure of the Botswana Meat Commission (BMC).

The BMC sells most of the meat it produces to the EEC as dehoned beef. Botswana receives a quota under the Lomé Convention because the EEC produces insufficient lean, industrial beef to meet demand, although it produces, and exports, a large surplus of fat graded beef. Large quantities are sold by the EEC at prices far below the cost of production to countries such as Zaire and South Africa which were once important markets for the BMC.

According to McGowan (1987), the EEC buys beef from Botswana in only two grades, with only a narrow price differentiation between grades. However the BMC buys cattle in five grades with a wider price differentiation. As a result, the difference in earnings from carcasses of the different grades is narrow while the differential between the purchase price is wider. An index of relative values is shown in Table 9.3.1 below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Super</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>Index of product value</td>
<td>1.02</td>
<td>1.01</td>
<td>1.00</td>
<td>0.99</td>
<td>0.93</td>
</tr>
<tr>
<td>Purchase price index</td>
<td>1.17</td>
<td>1.08</td>
<td>1.00</td>
<td>0.93</td>
<td>0.84</td>
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</table>


Since the communal area farmers are unable to control stocking rates in the way that commercial ranches can, they produce virtually no super grade carcasses and very few first grade. The commercial farmers, on the other hand, by virtue of their ability to control stocking rates, produce virtually no third or fourth grade carcasses and relatively few seconds.
Thus the BMC buys super and first grade carcasses, which are produced almost exclusively by freehold commercial farmers, at 17% and 8% more than the norm, but sells them for only 2% and 1% more than the norm respectively. The BMC pays for this by buying third and fourth grade animals at 7% and 16% less than the norm while it sells them for only 1% and 7% less respectively.

This transaction represents a substantial cross subsidy by communal area producers almost all of whom are Batswana to the commercial ranchers, many of whom are expatriates.

9.4 Ecological Implications

The major ecological impacts of the policy will fall on the grazing areas used by communities. Whether communities elect to fence or not, fencing by syndicates/groups and individuals will exclude community owned livestock from areas where they now graze. In some districts, they will be excluded from a large part of their present grazing area. This will compress the community’s herd into a reduced grazing area. This effect has close parallels with the compression of elephant populations into National Parks, (Laws et al 1970), and will have similar results - habitat degradation, reduced calving percentage, reduced growth rates and higher mortality, leading in time to a decline in herd size.

In the areas fenced by individuals and syndicates/groups, there will be little change. If the TGLP is a realistic precursor, they will continue to manage their land and cattle as they have in the past.

9.5 Social Implications

The main social impact of the policy will be on the small herd owners in the communal areas. The productivity and size of their herds will decline. They already have too few animals to meet their needs and they will be impoverished. It is most likely that a decline in the population of cattle will be accompanied by a fall in the number of herd owners, as has happened at Bokspits, so that some people will be dispossessed completely. This will very likely lead to increased destitution, as the rural poverty rate is rising.

On the other hand the individuals and syndicates/groups who have fenced out communal cattle will, in most cases, be able to increase their herds to use the grazing formerly eaten by communal cattle. This will increase their incomes, but at a price. Fencing is expensive, it has to be paid for in the first instance and maintained thereafter. As the Carl Bro report demonstrated in 1982, and McGowan in 1988, fenced TGLP farms are less profitable than unfenced cattle posts for this reason and a substantial proportion (if not all) of the increased income will have to be spent on fencing.
9.6 Economic Implications

If the experience of TGLP is a guide, granting exclusive rights to individuals and groups outside the areas used by communities will not lead to any significant increase in marketed output. What will happen is that cattle ownership will become even more skewed than it is now, many small owners will experience a decline in herd size and a few big ones will experience an increase.

Quite apart from the social costs of increased rural poverty and destitution, a large investment in fencing will be needed to achieve this. A fair comparison of the Commercial and Communal modes of production would suggest that the gap between the technical performance of the two systems is smaller than the Ministry of Agriculture supposes, and that the economic performance of the communal system may equal or exceed that of the commercial system. The Ministry of Agriculture admits in the White Paper (para 21, page 8) that the commercial sector is "not necessarily economically more efficient than the traditional/communal sector." In fact, as shown in section 9.2.1 TGLP ranches are economically less efficient than the communal sector, and Hubbard (in Hitchcock 1981) shows that only the very largest commercial ranches (those with over 5 000 head) were more efficient. For smaller operations, there was no difference in efficiency.

If this is so, then the poor performance of TGLP and the reluctance of TGLP ranchers to manage their farms any differently from cattle posts is simply explained. More importantly, the changes proposed in the White Paper cannot then be justified, as the costs both direct and indirect, will greatly outweigh any possible benefit which might accrue.

9.7 Can it Work?

Philosophically, the "New" Agricultural Policy is not new at all. It is merely a new verse in an old song - the wish of the planners and a minority of livestock owners to force the livestock industry to conform to a model of commercial beef production on fenced ranches.

What is new is that the explicit target is the inhabited commonage, and hence the scale of the planner’s ambitions is vastly greater. The planners no longer want to supplement the commonage but to eliminate it.

While the planners of both LDP I and TGLP really had no idea what the outcome might be, the planners of the 1991 policy have no such excuse. Both LDP I and TGLP have conspicuously failed to meet their objectives. The reasons for failure are not hard to see.

Firstly, commercial beef production on fenced ranches is not economically superior to beef production (or mixed pastoral farming) on the open communal range. More importantly, it is less financially profitable for all but the largest and most efficient producers.

Secondly, almost all the important assumptions upon which the 1991 policy and its predecessors are based are demonstrably false, as shown above.

Thirdly, both LDP I and TGLP failed because they neither addressed the real needs of the vast majority of Botswana’s cattle farmers nor accorded with their development objectives.
As such, the 1991 policy represents the triumph of blind hope over reasonable expectation. My analysis suggests that if implemented, the policy will:

- require an enormous investment in fencing,
- not lead to any increase in productivity, marketed output or efficiency,
- reduce the number of people who can earn their livelihood by livestock farming, and thereby increase rural poverty,
- further concentrate ownership of livestock and access to land in the hands of a minority,
- increase the rate and severity of range degradation in the residual communal areas and have little impact on range condition elsewhere.

These outcomes are at variance with the policy’s stated objectives.

I do not wish to suggest that nothing should be done. Far from it. Something should be done urgently to improve the situation of the majority of livestock farmers. It would make better sense to build upon solid foundations of success, as represented by SLOCA, than to reinforce failure, as represented by TGLP which is discredited.

New ideas need to be developed and tested. The community trust proposal merits further consideration as does the use of water reticulation schemes as a means to develop under used grazing areas and to control and manage the grazing pressure therein.

There are many boreholes drilled at public expense which are now privately controlled and from which the public are excluded. Effective action can and should be taken to make these boreholes accessible to the public once again and to ensure that they are operated in an equitable manner in the future. This step alone would greatly ease the growing constraints on access to water and grazing under which the majority of livestock farmers now labour.

Pula!
# APPENDIX

## RAINFALL DATA FOR SELECTED WEATHER STATIONS

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