DEVELOPMENT AND MONITORING OF THE ATAMELANG BARUI POLAR COOPERATIVE BEEF RANCH

BY

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CHAPTER 1

INTRODUCTION

Agriculture is of prime importance to every nation. Agricultural development is needed in almost every country of the world today. The race between increasing population and mankind's food supply is real and grim. Agriculture is the only way in which mankind is able to produce the food on which the very lives of humans depend (Matjie 1984) citing Mosher (1966). This situation led to the establishment of a co-operative beef ranch, in the former Bophuthatswana, where the members of the cooperative would apply the correct farming practices in order to produce beef of a high quality and at the same time be a model for farmers on the adjacent leased farms and in the Ganyesa communal grazing area.

The Polar Co-operative Beef Ranch was started in Ganyesa area in 1977. From information from the members of the Co-operative, the Ranch started well but the level of management declined considerably over time. When the Ranch was inspected in 1993, there were obvious problems with respect to the management of livestock and the grazing system being applied. Although the grazing capacity of the veld on the Ranch had not yet been determined, the number of livestock relative to the size of the farm was quite small, indicating that the poor condition was not due to high stocking rates but that there were other factors, which contributed to that situation.

Considering the situation prevailing on the Beef Ranch, it was necessary that special attention should be paid to the Ranch in order to ensure that the original objectives would be realized.

1.1 Problems and motivation for study

The regional extension pasture specialists, visited the Ranch and reported that the farm, which was quite large, had been physically planned and that this plan had been

implemented. It was observed, however, that the condition of many of the cattle, especially the old cows, was very poor and most of them exhibited symptoms of mineral deficiency.

There was a general complaint from the participants that the Department of Agriculture had not helped to solve the water problem on the Ranch. It was also claimed that the Extension Officer, who was responsible for the Beef Ranch, was responsible for the loss of some cattle. These issues appeared to have discouraged and demoralized the participants. The situation, therefore, required urgent attention.

1.2 Problem and objectives

The problem investigated concerned the various factors which influenced the administration, management, effectiveness and efficiency of the project.

The objectives of the research were:

(i) to study the Co-operative Ranch, including the characteristics of members of the Co-operative, to determine implications for the agricultural development.

ii) to study the Ganyesa area and the characteristics of people of Ganyesa area (communal grazing area), where the members of the Cooperative Beef Ranch reside, to determine whether the members could have been influenced by the fact that they reside in the communal grazing area and also have livestock in the communal grazing area.

(iii) to investigate the communication of farming practices to the members on the ranch.

(iv) to make recommendations for improving the management of the Co-operative Ranch and communication of recommendations.

1.3 Research hypothesis based on objectives

The study objectives were based on the following assumptions:

(i) That the poor condition of some of the cattle was due to poor management by the participants.

(ii) That the fact that the members of the Co-operative Ranch resided in the Ganyesa communal grazing area, had a great influence on the way the members of the Cooperative Ranch managed the Ranch.

(iii) That there was a lack of training of the members of the Ranch by the Extension Officer and other agents of change.

(iv) That there was a lack of interpersonal and mass contacts by the Extension Officer to motivate the members of the Ranch who did not feel that the project was theirs and that they were, therefore, responsible for the sound management of the Ranch.

(v) That the extension officer was not committed to ensuring the correct management of the Cooperative Ranch.

CHAPTER 2

Range condition and livestock production in Southern Africa

2.1 Introduction

The ability of ruminants to convert forage into edible products for humans is a well known phenomenon, upon which economic livestock production is often based. The availability of the forage is, in turn, dependent upon, among other factors, the types of soils, climate and management practices. In the drier (arid and semi-arid) areas of the world, there is a limitation on rainfall, which is very erratic and inadequate, consequently affecting plant growth and yield. Both the state and productivity of rangeland are determined by the amount of rainfall in that particular year (Mazengera 1993) citing Sandford (1983).

Before discussing the range condition and livestock production on the ABPCBR, it is necessary to highlight the range condition and livestock production in Southern Africa.

2.2 Range condition in Southern Africa

Range condition has been defined as the "state of health" of vegetation (Tainton 1981; 1988; Hurt and Bosch 1991). Trollope et al. (1990) preferred to describe veld condition relative to some functional characteristics, normally sustained forage production and resistance to soil erosion. Du Toit et al. (1991) stated that South Africa, as a result of a generally low and unreliable rainfall, steep topography in the better-watered areas, restricted irrigation potential and large tracts of shallow and/or infertile soil, has only limited potential for arable production.

According to the 1989 R.S.A year book (Anon 1989) only 12% of the land area is suitable for arable production - the remainder is rangeland. This rangeland is a major resource for multipurpose systems. It provides the main fodder for the national cattle and small stock herds. The grasslands of the central highlands and Lesotho are the catchment area for the major river systems of South Africa, and the range supplies many opportunities for eco-tourism, which has an influence in the quality of life for a rapidly - growing urban population. The rangelands of Southern Africa vary in composition from subtropical Savanna and Grasslands to arid shrub steppe. These rangelands have co-evolved with large numbers of indigenous game - both grazers and browsers and have proved remarkably resilient to utilization by domestic livestock. Nevertheless, concern has been expressed at the retrogression of Southern African rangelands (Du Toit et al. 1991). This retrogression has been characterized by seemingly irreversible vegetation change; an increase in the density of the woody components at the expense of the herbaceous component; the encroachment of undesirable exotics and habitat degradation as a result of soil erosion. Du Toit et al. (1991) reported that for decades various commissions of inquiry, eminent ecologists and range scientists have supported the view of vegetation degradation in different parts of South Africa.

It is further reported by Du Toit et al.(1991) that in 1923 the Drought Commission, investigating the deterioration of vegetal cover, found "that since white man has been in South Africa, enormous tracts of the country have been entirely or partially denuded of the original vegetation". Citing reports of early travellers, De Klerk (1947) came to the conclusion that a large section of the Southern Orange Free State must formerly have consisted of grassveld and that shrub was steadily encroaching northwards. In a discussion on the instability of vegetation in South

Africa, Acocks (1975) suggested that major changes, such as the disappearance of forest and shrub forest and the development of very extensive "near-deserts" in the west, were taking place. Comparing the 1953 vegetation boundaries of Acocks with 1972 satellite imagery, Jarman & Bosch (1973) hypothesized that Arid Karroo vegetation had spread some 70 kilometers into the valuable grassland over the previous twenty years. Surveys undertaken during 1983, over some 1,4 million hectares in the Eastern Transvaal, revealed that the condition of vegetation, over more than half this area, was very poor (Du Toit et al. 1991).

It was stated by Aucamp (1981) that the agricultural resources of any country are used to meet the varied needs of its people and, in particular, their food and fibre needs. However, since the manner in which these resources is used will inevitably have a direct bearing on their future productive capacity, it is important that in the process of utilizing them, they are not degraded. Aucamp et al. (1992) stated that there can be no doubt that the welfare of any country, and particularly that of a developing one, is strongly linked to the productive capacity of its agricultural resources. This is so, since the growing populations which characterize developing countries will inevitably make increasing demands on these resources and, in doing so, encourage expansion of agricultural use into increasily marginal, and often sensitive areas. Citing Erasmus (1990), Aucamp et al. (1992) stated that in both the commercial and communal agricultural sectors of a country like South Africa, the sensible utilization of the resource base remains central to the prosperity of the country and its people and further stated that in spite of this need, the current condition of the agricultural resources over much of the South African land surface is apparently very much poorer than some 200-300 years ago, and it appears to be degrading further at an accelerating rate. The extent and the seriousness of this

problem in both the commercially - owned and communally - farmed rangelands has frequently been alluded to, in local literature spanning a number of decades (Anon. 1923; Scott 1951; Bayer 1955; Acocks 1975), despite frequent pleas and occasional attempts to take effective measures to reverse this trend.

South Africa's natural rangeland is increasingly exploited for economic gain and the veld condition is deteriorating as a result (Fouche et al. 1985). They further indicated that droughts, with the concomitant short-fall of grazing, are prevalent in South Africa because of its geographical location and climate. It is, therefore, important for the stock farmers to adapt management systems, according to their own specific soil types, vegetation, topography, climate and objectives.

Owen-Smith (1985), citing Du Toit (1981), wrote that, it has been estimated that more than one million hectares within the bushveld region of South Africa has become so densely wooded that there is little grass accessible to cattle even in seasons of normal rainfall and that animal production has been adversely affected by bush encroachment on a further six million hectares. In addition Snyman & Fouche (1993) reported that the eco-systems of the arid and semi-arid areas of Southern African are subject to an erratic moisture supply, which result in substantial and unpredictable flunctuations in plant production, changes in the basal cover and botanical composition. Snyman & Fouche (1991) indicated that, with rapidly increasing demands to use land more economically and efficiently, procedures which result in maximum production over the years, yet still minimize the stress on livestock and vegetation, especially during droughts, are urgently needed.

The condition of rangelands in Southern Africa is traditionally assessed by herbaceous community composition (Foran 1976; Thrash et al. 1993). This is a good indicator of the ability of rangelands to produce forage for large grazing herbivores (Trollope 1990a, 1990b). Grazing, trampling, dung and urine deposition by large herbivores can affect herbaceous composition of rangeland (Novellie 1988; Edroma 1989). Surface water is often a nucleus of herbivore concentration (Young 1970; Child et al. 1971) and high levels of herbivore impact, decreasing with distance from water, then occur (Van der Schijff 1957; Lange 1969). The provision of drinking water for large herbivores may, therefore, influence herbaceous composition (Foran 1980; Tolsma et al. 1987) through selective grazing of preferred species, trampling, dung and urine deposition.

It has also been indicated by Aucamp (1990) and Smit & Rethman (1992), that since the introduction of domestic livestock, large areas of natural veld in South Africa have undergone radical changes and continue to do so. In most cases these changes are detrimental as they result in lower grazing capacity, soil erosion and general degradation of the environment.

In addition to the report by Anon. (1923) on veld deterioration and soil erosion in South Africa, Duvel & Scholtz (1992) have indicated that numerous investigations have been launched and recommendations made and implemented. Financial aid was made available to facilitate the erection of soil conservation works, and legislation passed making provision for the prosecution of land users exploiting and destroying natural resources. Furthermore, extension and research services were initiated, state aid schemes were made available during periods of drought and stock reduction schemes were implemented. All these actions were, according to various reports (Roux 1966; Scotney 1984; Anon. 1984), unable to

effectively stem veld retrogression. No baseline comparison is available, but according to the most extensive survey (De Klerk 1987), about 63% of the veld is rated as being in a fair or poor condition in terms of species composition and basal cover. This figure, based on ratings by extension personnel, seems conservative or overoptimistic compared with those of a veld or range specialist (Anon. 1984). It consequently seems doubtful whether country wide, and based on the above subjective ratings, more than 20% of the veld-under commercial production-is in good condition.

Motsamai (1990) found that in Lesotho, the lowlands are the most densely populated zone, and are where most cultivation occurs. Severe degradation has scarred this part of the country, with extensive dissection being common place, due to gully erosion. High intensity, short duration rainfall, events, coupled with light soils and poor land husbandry practices have contributed to extensive erosion. It is further stated by Motsamai (1990) that Lesotho stands out prominently in the world with its severe soil erosion problem. The Lesotho conservation division (Anon 1988) has reported average annual erosion rates of 20 tons per hectare from crop land and 18 tons per hectare from rangelands. These represent a total soil losses of 15,4 million tons per annum from crop land and 23.4 million tons per annum from rangelands. The satellite pictures depict a very clear delineation of the international boundary between Lesotho and the neighbouring country. A straight fence line is also very clearly discernable. There is a stark contrast between vegetation cover and land practices of the two countries.

Mamba & Khumalo (1990) report that in Swaziland the major problem facing communally grazed rangelands is a poor perception of the causes and effects of environmental degradation amongst traditional pastoral societies.

Management of grazing lands is the expression of the human society living on them. It reflects human adaptation to biological, economic and political environments over a long period. Range improvement programmes which fail to take into account these three aspects are unlikely to produce tangile positive results. Mamba & Khumalo (1990) indicate that there is adequate evidence to suggest that soil erosion is caused mainly by overgrazing. This statement indicates that the condition of the veld in Swaziland has been degraded.

The report by Mache (1990), from Zimbabwe, states that a recent soil erosion survey based on detailed analysis of nearly 8 500 aerial photographs indicate that slightly more than 1,8 million hectares of land was degraded. This is a conservative estimate since erosion must be fairly advanced before it is clearly visible on photographs (Whitlow 1987). This survey shows that the most extensive and severe erosion occurs within the communal lands where 1,3 million hectares or 83% of the eroded land is found. In contrast, erosion in the commercial farming areas is less than nine percent.

The 1990 summary report on Botswana (Anon 1990) indicates that there is some deterioration, which is a result of overstocking in certain areas, especially in the eastern part of the country where most livestock are concentrated. Localized overgrazing in Western Botswana and in some wild life areas has also been observed. Further deterioration is taking place in the sand veld due to introduction of livestock in this region. Even the hard veld is threatened with degradation if the livestock population is not reduced. Tribal grazing land policy ranches have rapidly expanded into communal rangeland, mainly in connection with water development in communal areas undertaken by Government.

Highlighting the trend of the veld condition in parts of the areas of South West Africa, Boonzaier et al. (1990), citing Kotze et al. (1987) and Diergaardt (1989), indicated that a shift from communal grazing to rotational grazing system under individual land tenure is the proposed answer to land degradation in Namibia and Namaqualand.

In the Northern Cape Province, portions of which now fall under the North West Province, Fourie, Redelinghuys and Opperman (1984) have indicated that veld deterioration is mainly as a result of overestimating the grazing capacity of the veld and incorrect grazing management. This statement, therefore, indicates that the condition of the veld has declined from the normal state. Fourie et al. (1984) also state that Mallo's (1973) survey of the Vryburg extension district, which aimed at determining the influence of the stocking rate and veld management system on the basal cover and botanical composition of the veld in the Northern Cape (now part of North West Province), indicated that the carrying capacity of the area is over-estimated by as much as 100%, and 97% of the farmers do not apply any recognized grazing system.

2.2.1 Reasons for deterioration of rangelands in Southern Africa

Barnes (1992) wrote that veld degradation, either directly or by implication, has been attributed to one or more of the following factors:

(i) Overstocking

(ii) Excessive use of fire, that is, too frequent burning and stocking too soon after burning in spring.

(iii) Stocking with sheep without simultaneously stocking, in terms of mature animals, of at least one head of cattle to seven sheep.

(iv) Failure to provide sufficient paddocks. It is held that this leads to:

- excessive concentration of livestock in favoured areas, with subsequent localised degradation and;
- an inability to apply recommended grazing systems, involving short periods of stay and relatively long periods of absence.

In contrast Aucamp et al. (1992) wrote that the basic cause of veld deterioration is the growing human population which makes increasing demands on the resource and in so doing encourages expansion into marginal and often sensitive areas.

Owen-Smith (1985), citing du Toit (1981), wrote that large areas in the Bushveld had become so densely wooded that there was little grass accessible to cattle. This indicates that one of the causes of veld deterioration in Southern Africa is bush encroachment and consequently the reduction of the grass component of the vegetation that affects grazers. This statement is corroborated by Fouche et al. (1985) who maintained that the main cause of veld deterioration is veld management rather than inadequate rainfall.

Young (1970) and Child et al. (1971) indicate that the surface water is often a nucleus of herbivore concentrations and high levels of herbivore impact, decreasing with distance from water. This indicates that if water supply is inadequate, cattle tend to graze in the vicinity of the water point resulting in overutilization of the area near the water point and underutilization of the areas far from the water. This situation is area selective grazing which may affect the species composition and basal cover on the average.

It is stated by De Klerk (1987) and Duvel & Scholtz (1992) that according to an extensive survey, about 63% of the veld is rated as being fair or poor in condition in terms of species composition and basal cover. This figure, based on the rating by extension personnel, seems overoptimistic compared with those of range specialists. They conclude that it is doubtful that more than 20% of the veld under commercial production is in good condition. This situation, therefore, indicates that the farmers, and extension personnel, are over-optimistic when evaluating the condition of the veld. Duvel & Scholtz (1992) further list other causes of veld deterioration as poor veld management and non-adoption of recommended grazing practices or principles.

Mamba and Khumalo (1990) report that the main cause of veld deterioration in Swaziland is overgrazing and list secondary causes as:

(i) A steady increase in both human and livestock populations resulting from advances in veterinary and human health disciplines which have led to intensified pressure on rangeland.

(ii) Growth of agri-business in the country, which contributes substantially to increasing pressure on rangeland.

(iii) Land tenure system, which does not hold anyone responsible for exploiting the rangelands.

(iv) Use of untimely an indiscriminate fires, resulting in increased soil loss and reduced soil fertility.

(v) Steady growth of fuel wood requirements for rural communities and urban dwellers.

In the 1990 summary report (Anon. 1990) from Botswana, it is stated that the main cause of land degradation is overgrazing which is caused by remote control management by livestock owners who reside in towns and the Tribal Grazing Land Policy ranchers who are still allowed to graze animals on communal rangelands.

According to the statements and reports given, it is clear that the main cause of veld deterioration in most countries of Southern Africa is overgrazing.

2.3 Livestock production in Southern Africa

In describing livestock production in Southern Africa, use is made of data from F.A.O. (Anon. 1991). These data indicate not only the total number of the different livestock species and their production but the total population as well as the number that is active in agriculture and the extent of the area that is used for agriculture. Table 2.3.1 indicates the land use in some of the countries of Southern Africa.

Table 2.3.1: Land use in some of the countries of Southern Africa.

Year and extent of area (1000ha units) and % area

	1975		1980		1985		1990	
BOTSWANA	**1000's**	**%**	**1000's**	**%**	**1000's**	**%**	**1000's**	**%**
Land area	56673	100	56673	100	56673	100	56673	100
Arable land	1330	2.0	1360	2.5	1360	2.5	1380	2.5
Rangeland	33000	58.0	33000	58.0	33000	58.0	33000	58.0
Forest and Woodlot	11060	20.0	11012	19.5	10960	19.5	10710	19.5
Other land	11283	20.0	11301	20.0	11353	20.0	11383	20.0
MALAWI								
Land area	9408	100	9408	100	9408	100	9408	100
Arable land	2260	24	2360	25.0	2350	24.9	2390	25.4
Permanent crops	18	0.2	20	0.2	26	0.3	26	0.3
Rangeland	1840	20.0	1840	20.0	1840	20.0	1840	20.0
Forest and Woodlot	4830	51.3	4731	50.0	4180	44.4	3630	38.5
Other land	460	5.8	517	5.0	1012	10.7	1519	16.0
LESOTHO								
Land area	3035	100	3035	100	3035	100	3035	100
Arable land	372	12.2	292	9.6	300	9.9	320	10.5
Rangeland	2000	66.0	2000	66.0	2000	66.0	2000	66.0
Other land	663	21.8	743	24.4	735	24.1	715	23.5
NAMIBIA								

Land area	82328	100	82328	100	82328	100	82328	100
Arable land	652	0.8	655	0.8	660	0.8	660	0.8
Rangeland	38000	46.2	38000	46.2	38000	46.2	38000	46.2
Forest and Woodlot	18570	22.5	18420	22.4	18270	22.2	18120	22.0
Other land	25106	30.5	25252	30.7	25397	30.8	25547	31.0
SWAZILAND								
Land area	1720	100	1710	100	1720	100	1720	100
Arable land	167	9.7	185	10.8	160	9.3	200	11.6
Permanent crops	3	0.2	4	0.2	4	0.2	4	0.2
Rangeland	1143	66.5	1102	64.1	1120	65.1	1185	68.9
Forest and Woodlot	105	6.1	103	6.0	104	6.1	104	6.1
Other land	302	17.6	326	19.0	332	19.3	227	13.2

ZAIRE								
Land area	226760	100	226760	100	226760	100	226760	100
Arable land	6910	3.1	7050	3.1	7200	3.2	7250	3.2
Permanent crops	540	0.2	550	0.2	600	0.3	610	0.3
Rangeland	15000	6.6	15000	6.6	15000	6.6	15000	6.6
Forest and Woodlot	179280	79.1	177610	78.3	175960	78.0	174310	77.0
Other land	25030	11.0	26550	11.7	28000	12.3	29590	13.0
ZAMBIA								
Land area	74339	100	74339	100	74339	100	74339	100
Arable land	4993	6.7	5100	6.9	5180	7.0	5260	7.1
Permanent crops	7	0.01	8	0.01	8	0.01	8	0.01
Rangeland	30000	40.4	30.000	40.4	30.000	40.4	30.000	40.4
Forest and Woodlot	29900	40.2	29548	40.0	29200	39.3	28850	38.8
Other land	9439	12.7	9683	13.0	9951	13.4	10221	13.7
ZIMBABWE								
Land area	38667	100	38667	100	38667	100	38667	100
Arable land	2465	6.4	2465	6.4	2650	6.9	2720	7.0
Permanent crops	59	0.2	74	0.2	84	0.2	92	0.2
Rangeland	4856	12.6	4856	12.6	4856	12.6	4856	12.6
Forest and Woodlot	20330	52.6	19930	51.5	19530	50.5	19130	49.5
Other land	10957	28.3	11342	29.3	11547	29.9	11869	30.7

OUTH FRICA								
and area	122104	100	122104	100	122104	100	122104	100
rable and	12570	10.3	124490	10.2	12355	10.1	12360	10.1
ermanent rops	822	0.7	814	0.7	814	0.7	814	0.7
angeland	81740	66.9	81420	66.7	81378	66.6	81378	66.6
orest nd oodlot	4150	3.4	4150	3.4	4515	3.7	4515	3.7
ther and	22822	18.7	23280	19.1	23042	18.9	23037	18.9

* Permanent crop = Land planted to fruit trees.
* Other land = Land occupied by pans etc.

Table 2.3.1 indicates that the extent of the area under rangeland is quite large in Swaziland (66%), Lesotho (65%), Botswana (58%) and South Africa (67%) (Anon 1991). Local statistics (abstract of agricultural statistics 1993) indicate that 82,3% of the land is under artificial and natural pasture in South Africa. The condition of grazing in these countries has on the average been shown to be poor. This indicates that while the areas under rangeland in these countries are fairly large, they have been badly managed. Table 2.3.2 indicates the extent of the agricultural land in the R.S.A. according to the local statistics.

SOUTH AFRICA								
Land area	122104	100	122104	100	122104	100	122104	100
Arable land	12570	10.3	124490	10.2	12355	10.1	12360	10.1
Permanent crops	822	0.7	814	0.7	814	0.7	814	0.7
Rangeland	81740	66.9	81420	66.7	81378	66.6	81378	66.6
Forest and Woodlot	4150	3.4	4150	3.4	4515	3.7	4515	3.7
Other land	22822	18.7	23280	19.1	23042	18.9	23037	18.9

* Permanent crop = Land planted to fruit trees.
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Table 2.3.4: Sheep and goats numbers in R.S.A. (1000) according t local statistics. (Abstract of agricultural statistic. 1993).

Year	Sheep		Goats	
	R.S.A. (1000)	Total including "National States" (1000)	R.S.A (1000)	Total including "National States" (1000)
1975	30989	33838	2315	5271
1976	30985	31661	2353	4051
1977	31961	32450	2459	3663
1978	31788	32238	2652	3896
1979	31203	31644	2692	4249
1980	30753	31259	2729	4122
1981	30743	30968	2758	3902
1982	30671	30911	2861	4136
1983	29121	29362	2774	4126
1984	27789	-	2779	-
1985	27110	-	2794	-
1986	26988	-	2880	-
1987	26993	-	2990	-
1988	27688	-	2944	-

Table 2.3.2 indicates that in the R.S.A, the extent of Rangelan during 1988 was 72,192,000 ha and tables 2.3.3 and 2.3.4 indicate th cattle, sheep and goats numbers expressed in M.L.U. as being 885213 M.L.U. This indicates that the stocking rate on average wa 8ha/M.L.U. This figure appears to be reasonably fair but considerin the condition of the veld, as indicated in the literature, the vel in certain areas of the R.S.A. has been overgrazed.

Table 2.3.5: Total popula[illegible] opulation and econo[illegible] ation (Anon 1991)

Country	Year	Population (1000) Total	Agricultural	Economic Active population (1000) Total	Population in Agric.	% in Agriculture
BOTSWANA	1975	755	590	278	217	78.1
	1980	902	633	325	228	70.3
	1985	1083	723	374	250	66.7
	1989	1257	801	419	266	63.6
	1990	1304	820	431	271	62.8
	1991	1351	841	444	276	62.1
LESOTHO	1975	1187	1045	597	525	88.0
	1980	1339	1154	662	571	86.2
	1985	1538	1279	735	611	83.2
	1989	1723	1389	802	644	80.4
	1990	1774	1412	820	653	79.6
	1991	1826	1440	838	661	78.8
NAMIBIA	1975	482	373	216	167	77.4
	1980	563	417	244	180	74.1
	1985	664	467	275	194	70.3
	1989	761	511	305	204	67.1
	1990	788	523	313	207	66.3
	1991	817	535	321	210	65.5
SWAZILAND	1975	482	373	216	167	77.4
	1980	563	417	244	180	74.1
	1985	664	467	275	194	70.3
	1989	761	511	305	204	67.1
	1990	788	523	313	207	66.3
	1991	817	535	321	210	65.5
ZAMBIA	1975	4841	3624	1665	1242	74.9
	1980	5738	4203	1850	1355	73.5
	1985	7006	4984	2277	1620	71.1
	1989	8142	5650	2622	1819	69.4
	1990	8452	5827	2716	1872	68.9
	1991	8777	6011	2818	1930	68.5
ZIMBABWE	1975	6143	4612	2466	1851	75.1
	1980	7126	5190	2869	2090	72.8
	1985	8292	5851	3311	2336	70.6
	1989	9406	6457	3710	2547	68.6
	1990	9709	6617	3815	2600	68.2
	1991	10020	6780	3921	2654	67.7
SOUTH AFRICA	1975	25301	6891	9124	2255	24.7
	1980	28270	5198	9853	1626	16.5
	1985	31569	5530	11313	1776	15.7
	1989	34507	5414	12559	1763	14.0
	1990	35282	5375	12889	1755	13.6
	1991	36071	5369	13233	1760	13.3

Table 2.3.5 shows that in the economically active population of th countries mentioned above, there is an increase in the number of th population active in agriculture from 1975 to 1991, except for Sout Africa, although the proportion involved in agriculture has decline in all countries. The reason for the declining proportion involve in agriculture might be that some farmers are not interested i agriculture because of poor land tenure system i.e. the farm being to small to make a reasonable living from it or there is no secure tenur system.

It is also shown in Table 2.3.5, that South Africa has the lowes percentage of the population active in agriculture. The reason migh be that in the less developed and developing areas of South Africa most of the people work in the urban areas and leave farming to ol people and women. This situation might result in poor management c livestock and ultimately low production.

Table 2.3.6: Cattle slaughtered for beef and veal (1000 head) and th carcass production in 1000kg (Anon.1991)

	1979-81		1989		1990		1991	
Country	1000s	Prod. Kg 1000s	1000s	Prod. kg 1000s	1000s	Prod. Kg 1000s	1000s	Prod. kg 1000s
Botswana	190	42750	231	51975	195	43875	162	36450
Lesotho	71	15975	85	19125	86	19350	87	1957
Malawi	79	17775	90	20250	99	22275	103	23175
Namibia	196	44100	170	38250	179	40275	195	43875
South Africa	3018	679050	2875	646875	2934	660150	3082	693450
Swazi-land	74	16650	57	12825	65	14625	65	14625
Zaire	149	33525	180	40500	185	41625	188	42300
Zambia	186	41850	224	50400	234	52650	244	54900
Zimbabwe	521	117225	376	84600	409	92025	400	90000

Table 2.3.6 shows that South Africa had the highest carcass productic while Lesotho, Malawi and Swaziland are markedly lower compared with othe countries.

Table 2.3.7: The number of sheep slaughtered for mutton and lamb in 100 head and carcass production in 1000kilogram (Anon 1991).

	1979-81		1989		1990		1991	
Country	1000's	Prod. Kg 1000s	1000's	Prod. kg 1000s	1000's	Prod. Kg 1000s	1000's	Prod. kg 1000s
Botswana	40	600	58	870	60	900	62	930
Lesotho	357	5355	420	6300	425	6375	430	6450
Malawi	21	315	50	750	55	825	58	870
Namibia	893	13395	680	10,200	700	10500	3300	49500
Swazi-land	12	180	13	195	13	195	13	195
Zaire	224	3360	255	3825	260	3900	265	3975
Zambia	7	105	14	210	15	225	16	240
Zimbabwe	48	720	46	690	41	615	35	525
South Africa	9916	148740	9900	148500	9860	147900	10020	150300

Table 2.3.7 shows that South Africa is the highest producer of mutton and lamb, followed by Namibia and Lesotho. Other countries such as Zambia Swaziland, Malawi and Botswana have a very low carcass production. The reason for low production might be, the poor management of livestock o poor adaptation of sheep in other countries which ultimately results i lower production. Table 2.3.8 indicates the number of goats slaughtere in 1000 head and the carcass production in 1000 kg.

Table 2.3.8 Goats slaughtered in 1000 head and carcass production in 1000 kg.
(Anon 1991)

	1979-81		1989		1990		1991	
Country	1000's	Prod. Kg 1000s	1000's	Prod. kg 1000s	1000's	Prod. Kg 1000s	1000's	Prod. kg 1000s
Botswana	237	3555	417	6255	460	6900	460	6900
Lesotho	257	3855	340	5100	350	5250	360	5400
Malawi	202	3030	270	4050	300	4500	330	4950
Namibia	313	4695	360	5400	370	5550	490	7350
South Africa	1817	27255	2020	30300	2030	30450	2040	30600
Swazi-land	145	2175	150	2250	155	2325	155	2325
Zaire	796	11940	964	14460	1138	17070	1155	17325
Zambia	87	1305	156	2340	159	2385	162	2420
Zimbabwe	357	5355	710	10650	720	10800	735	11025

Table 2.3.8 shows that South Africa is the highest producer of goa meat, followed by Zaire and Zimbabwe. Table 2.3.8 also indicates tha South Africa produces less goat meat than mutton. This illustrate the tendency, amongst the people of South Africa, to prefer mutton t goat meat. In most bushveld areas, it is desirable to keep more goat than sheep, in order to utilize the woody component of the vegetation People should therefore, be motivated to eat more goat meat tha mutton in the bushveld areas.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the social aspect of the methodology e.g. the choice of the study area, orientation and planning of the study, information sources, questionnaire objective and design, sampling procedure, interviewing procedure, reliability of the results and data analysis. The chapter also describes the technical aspect of the methodology eg. the procedure of determining the bush density as well as the grasss species composition and grazing capacity on the farm at Atamelang Barui Polar Co-operative Beef Ranch.

3.1 Social aspects

3.1.1 Choice of the study area

There are at present three Co-operative Beef Ranch projects in the Western Region of the North West Province. There is one Co-operative Beef Ranch in the Kudumane (Kuruman) district, one in the Taung district and the third one is Atamelang Barui Polar Beef Ranch in the Ganyesa district. Atamelang Barui Polar Beef Ranch was the first to be established. From information from one of the members of the Co-operative, a promising start was not sustained and the condition of both livestock and veld declined. The Department of Agriculture was concerned that the other two projects might also decline and it was desirable to identify the problems which had caused the decline in the condition of both livestock and veld at Polar Beef Ranch.

Atamelang Barui Polar Beef Ranch was, therefore, chosen to investigate the reasons for such a decline, to develop and monitor the project, to upgrade the level of management and to ensure that the members made a reasonable and sustainable living. The information obtained from the development of this project could then be used to improve the other two ranches and also to help the farmers of the adjacent leased farms as well as those in the communal grazing areas.

3.1.2 Orientation and planning of the study

In addition to a research survey conducted on the Polar Beef Ranch, a survey was conducted on the Ganyesa Communal Grazing Area (GCGA) because the Co-operative members resided in Ganyesa and their residence in the communal grazing area might have affected their management of the Beef Ranch.

On the GCGA, a meeting was convened with the Senior Agricultural Extension Officer and his subordinates to clarify the purpose of the survey. Such information could help them, as extension officers, to improve the management practices of the farmers. The Senior Agricultural officer discussed the issue with the Tribal Authority and an initial superficial survey of the whole Ganyesa area was conducted together with the Senior Agricultural Extension Officer. This was followed by an indepth survey of the GCGA in 1996 in which five extension officers participated.

On the Atamelang Barui Polar Co-operative Beef Ranch, a meeting was convened with the members, and the responsible extension officer, at which the purpose of the survey was explained. It was indicated that the information obtained would help the farmers improve their farming practices on the Beef Ranch. An initial survey of the ABPCBR, which was conducted with the help of the responsible extension officer was followed by an indepth survey in 1995.

3.1.3 Information sources

Existing publications, books, journals, pamphlets and reports were consulted on climate, soil types, vegetation formations, veld types and grazing capacities. Information from farmers was obtained by questionnaires, discussions with groups and individual farmers. The maps on the GCGA, leased farms in Ganyesa and ABPCBR were obtained from the planning section of the Department of Agriculture in the

North West Province. Much information was obtained from the extension officers working in the GCGA, leased farms and the extension officer responsible for the ABPCBR. Some of the information was also obtained from observations in the different grazing camps on the CBR.

3.1.4 Questionnaire objectives and design

There were two questionnaires and these were designed as follows:

(i) The first questionnaire for the farmers of the GCGA
(ii) The second was for the members of ABPCBR.

The questionnaires design aimed at assessing the attitudes, values, perceptions and beliefs of the respondents. The questions were simple to understand. Most of the questions were of the open ended type, which give the respondents an opportunity to express their views in their own words. The questionnaires were evaluated at follows:

(a) In the G C G A, the questionnaire was tested by interviewing six farmers, who were chosen at random by the members of the community and were not part of the sample group.

b) On ABPCBR, the questionnaire was tested with two herdsmen on the ranch to determine whether the respondents understood the questions.

3.1.5 Sampling procedure

The members of ABPCBR reside in G C G A. Most of the people of Ganyesa have been living in the area for a long time and the community can be regarded as homogeneous as regard culture, income and education. To save time and expense it was considered that 20% of the heads of households (30 farmers) in the G C G A would be adequate as a sample group. This statement is corroborated by Steyn (1982) citing Bureau of Market Research (1977), that

several research studies on the income and expenditure patterns of Black households in several National States have been conducted and reliable results have been obtained by interviewing as little as three percent of the population.

For the purpose of this study, any person having land and/or livestock (disregarding the size of the land and the number of livestock) was regarded as a farmer. A random sample was taken from a list of the heads of households. ABPCBR had only 14 members and all of them were interviewed.

3.1.6 Interviewing procedure

Personal interviews were conducted by the extension officers who were thoroughly trained. There were five extension officers who conducted the interviews in the GCGA and three extension officers on ABPCBR. The extension officers were visited regularly during the interview period for at least one day per week. The average period spent with each respondent was one hour.

3.1.7 Reliability of the results

Every effort was made to explain to the respondent, the objective of the survey and questions were phrased in such a manner that the respondents would know exactly what was wanted. The respondents were given the opportunity to be at ease and express their views in full. Each respondent was interviewed separately to maintain the confidential nature of the interviews.

3.1.8 Data analysis

The data was coded by hand for computer processing.

3.2 Technical aspects

3.2.1 Determination of bush density on the farm at ABPCBR

A survey of tree density has been conducted on twelve sites. The tree density (tree units/ha) was determined according to Trollope (undated). The procedure of determining bush density (Trollope undated) is illustrated as follows:

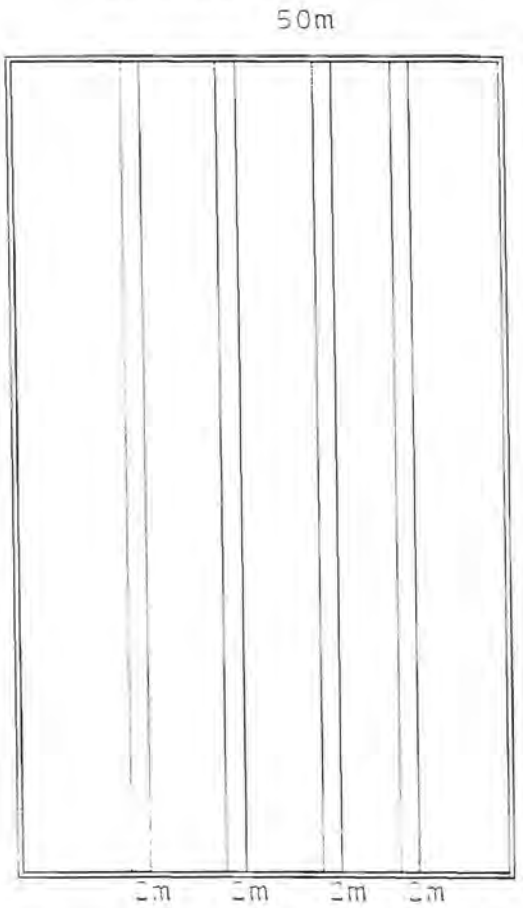

Figure 3.1: The site for determining bush density

In each identified site , an area of 0,5ha (50mx100m) which is representative of the area, was assessed. Four transects each 200m² (2mx100m) were measured. The number of trees in each transect (200m²) was determined, using a two metre staff. The total number of trees in the four transects was calculated by adding all the trees in the four transects together.

The number of trees in a 800m^2 area (four transects) was then expressed per hectare e.g. If the number of trees in the four transects (0.08ha in area) was 120, it would mean that the number of trees per hectare was 1500. Table 3.1 indicates the tree density on the twelve representative sites. (Sites nos 1 to 12 on the map appendix D).

Table 3.1: Tree densities on twelve sites on the Co-operative Beef Ranch, 1995

Sites	Tree/ha	% Trees less than 1 metre	% Trees more than 1 metre	Total %
1	950	0.0	100.0	100
2	800	6.5	93.5	100
3	1250	5.0	95.0	100
4	1500	38.5	61.5	100
5	1600	54.0	46.0	100
6	1700	56.5	43.5	100
7	1600	53.0	47.0	100
8	1050	9.5	90.5	100
9	1250	60.0	40.0	100
10	450	52.0	48.0	100
11	600	50.0	50.0	100
12	1060	8.0	92.0	100

3.2.2 Determination of the grass species composition and grazing capacities on the farm at the ABPCBR

The grass species composition and grazing capacities on nine areas of the ranch were determined.

The technique used to determine the grazing capacity was that used by Jones and Olivier (undated) - of the Glen Agricultural Institute, in determining the G.C. in the Ganyesa district. This is the same as the one used by van der Westhuizen and Pansegrouw (undated pamphlet) to determine the veld condition and grazing capacity in the De Wetsdorp district. Other techniques such as those recommended by Mentis (1983), Stuart-Hill et al. (1986), Hurt and Hardy (1989) and

Hardy and Tainton (1993) were also considered, but this one has been found to be suitable for use by the E.O's and farmers (appendix A.1).

At each site an area of approximately 0,1 ha (30m x 30m) was assessed. In this area, the grass species composition was determined using the Tidmarsh wheel with 200 points being evaluated in each site. The strikes on living material at soil surface were used to determine the basal cover, while the nearest species to the wheel point were used to determine the percentage species composition. The total score of the grazing value was determined by multiplying the percentage of each grass species by the factor indicating the grazing value of that species. The species composition, the total score (grazing value) and the grazing capacity on each site are illustrated in Tables 3.2 to 3.7, using the key species technique of Jones and Olivier (undated) (appendix A.1).

Table 3.2: Grass species composition, basal cover, total score and grazing capacity on sites nos. 1 to 4 on the map-appendix C, 1995.

Species name	%	W Factor	sample site score	Bench mark score
Anthephora argentea	-	10	-	
Anthephora pubescens	-	10	-	
Asthenatherum glaucum	-	10	-	
Brachiaria nigropedata	-	10	-	
Digitaria eriantha	-	10	-	
Panicum coloratum	-	10	-	
Schmidtia papphohoroides	-	10	-	
Stipagrostis uniplumis	-	10	-	
Subtotal highly desirable				
Eragrostis lehmanniana	28	7	196	
Eragrostis trichophora	-	-	-	
Eragrostis rigidior	6	7	42	
Subtotal desirable	34		238	
Aristida stipitata	-	4	-	
Aristida meridionalis	-	4	-	
Eragrostis pallens	-	4	-	
Pogonathria squarrosa	-	4	-	
Subtotal less desirable				
Aristida adscensionis	-	1	-	
Tragus berteronianus	8	1	8	
Aristida congesta	58	1	58	
Schmidtia kalahariensis	-	1		
Subtotal undesirable	66		66	
Veld condition score			304	855
Basal cover %			2.0	

Grazing capacity = $\frac{\text{Bench mark score}}{\text{sample site score}} \times$ Grazing capacity of the area ha/M.L.U.

$= \frac{855}{304} \times 10$

= 28.1 ha/M.L.U

Table 3.3: Grass species composition, basal cover, total score and grazing capacity on site No.5 on the map-appendix C, 1995.

Species name	%	Grazing value	sample site score	Bench mark score
Anthephora argentea	-	10	-	
Anthephora pubescens	-	10	-	
Asthenatherum glaucum	-	10	-	
Brachiria nigropedata	-	10	-	
Digitaria eriantha	-	10	-	
Panicum coloratum	-	10	-	
Schmidtia papphohoroides	2	10	20	
Stipagrostis uniplumis	4	10	40	
Subtotal highly desirable	6		60	
Eragrostis lehmanniana	27	7	189	
Eragrostis trichophora	-	-	-	
Eragrostis rigidior	-	-	-	
Subtotal desirable	27		189	
Aristida stipitata	-	4	-	
Aristida meridionalis	-	4	-	
Eragrostis pallens	-	4	-	
Pogonathria squarrosa	-	4	-	
Subtotal less desirable				
Aristida adscensionis	-	1		
Tragus beterteronianus	-	1	-	
Aristida congesta	67	1	67	
Schmidtia kalahariensis	-	1		
Subtotal undesirable	67		67	
Veld condition score			316	855
Basal cover %			2.0	3.2

Grazing capacity = $\frac{\text{Bench mark score}}{\text{sample site score}}$ x Grazing capacity of the area ha/M.L.U.

= $\frac{855}{316}$ x 10

= 27 ha/M.L.U.

Table 3.4: Grass species composition, basal cover total score and grazing capacity on site No.6 on the map-appendix C, 1995.

Species name	%	W Factor	sample site score	Bench mark score
Anthephora argentea	-	10	-	
Anthephora pubescens	-	10	-	
Asthenatherum glaucum	-	10	-	
Brachiria nigropedata	-	10	-	
Digitaria eriantha	-	10	-	
Panicum coloratum	-	10	-	
Schmidtia papphohoroides	4	10	40	
Stipagrostis uniplumis	6	10	60	
Subtotal highly desirable	10		100	
Eragrostis lehmanniana	15	7	105	
Eragrostis trichophora	-	-	-	
Eragrostis rigidior	8	7	56	
Subtotal desirable	23		161	
Aristida stipitata	3	4	12	
Aristida meridionalis	8	4	32	
Eragrostis pallens	7	4	28	
Melinus repens	7	4	28	
Pogonathria squarrosa	8	4	32	
Subtotal less desirable	33		132	
Aristida adscensionis	-	1	-	
Tragus berteronianus	-	1	-	
Aristida congesta	19	1	19	
Schmidtia kalaharensis	15	1	15	
Subtotal undesirable	34		34	
Veld condition score			327	355
Basal cover %			2.8	3.2

Grazing capacity = $\frac{\text{Bench mark score}}{\text{sample site score}}$ x Grazing capacity of the area ha/M.L.U.

= $\frac{355}{327}$ x 12

= 13 ha/M.L.U.

Table 3.5: Grass species composition, basal cover, total score and grazing capacity on site No.7 on the map-appendix 2, 1995.

Species name	%	W Factor	sample site score	Bench mark score
Anthephora argentea	-	10	-	
Anthephora pubescens	-	10	-	
Asthenatherum glaucum	-	10	-	
Brachiria nigropedata	-	10	-	
Digitaria eriantha	-	10	-	
Panicum coloratum	-	10	-	
Schmidtia pappohoroides	-	10	-	
Stipagrostis uniplumis	-	10	-	
Subtotal highly desirable				
Eragrostis lehmanniana	44	7	308	
Eragrostis trichophora	-	7	-	
Eragrostis rigidior	-	7	-	
Subtotal desirable	44		308	
Aristida stipitata	-	4	-	
Aristida meridionalis	-	4	-	
Eragrostis pallens	-	4	-	
Pogonathria squarrosa	11	4	44	
Subtotal less desirable	11		44	
Aristida adscensionis	-	1	-	
Tragus berteronianus	-	1	-	
Aristida congesta	45	1	45	
Schmidtia kalahariensis	-	1	-	
Subtotal undesirable	45		45	
Veld condition score			397	855
Basal cover %			2.5	3.2

Grazing capacity = $\frac{\text{Bench mark score}}{\text{sample site score}}$ x Grazing capacity of the area ha/M.L.U.

= $\frac{855}{397}$ x 10

= 21.5 ha/M.L.U

= 22 ha/M.L.U.

Table 3.6: Grass species composition, basal cover, total score and grazing capacity on site No.8 on the map-appendix C, 1995.

Species name	%	W Factor	sample site score	Bench mark score
Anthephora argentea	-	10	-	
Anthephora pubescens	6	10	60	
Asthenatherum glaucum	-	10	-	
Brachiria nigropedata	12	10	120	
Digitaria eriantha	10	10	100	
Panicum coloratum	-	10	-	
Schmidtia papphohoroides	20	10	200	
Stipagrostis uniplumis	16	10	160	
Subtotal highly desirable	64		640	
Eragrostis lehmanniana	25	7	175	
Eragrostis trichophora	-	-	-	
Eragrostis rigidior	-	-	-	
Subtotal desirable	25		175	
Aristida stipitata	-	4	-	
Aristida meridionalis	-	4	-	
Eragrostis pallens	2	4	8	
Pogonathria squarrosa	3	4	12	
Subtotal less desirable	5		20	
Aristida adscensionis	-	1	-	
Tragus berteronianus	-	1	-	
Aristida congesta	8	1	8	
Schmidtia kalahariensis	-	1	-	
Subtotal undesirable	8		8	
Veld condition score			843	855
Basal cover %			3.0	3.2

Grazing capacity = $\frac{\text{Bench mark score}}{\text{sample site score}}$ x Grazing capacity of the area ha/M.L.U.

= $\frac{855}{843}$ x 10

= 10 ha/M.L.U

Table 3.7: Grass species composition, basal cover, total score and grazing capacity on site No.9 on the map-appendix C, 1995.

Species name	%	W Factor	sample site score	Bench mark score
Anthephora argentea	-	10	-	
Anthephora pubescens	6	10	60	
Asthenatherum glaucum	-	10	-	
Brachiria nigropedata	3	10	30	
Digitaria eriantha	-	10	-	
Panicum coloratum	-	10	-	
Schmidtia papphohoroides	20	10	200	
Stipagrostis uniplumis	18	10	160	
Subtotal highly desirable	47		470	
Eragrostis lehmanniana	42	7	294	
Eragrostis trichophora	-	7	-	
Eragrostis rigidior	2	7	14	
Subtotal desirable	44		308	
Aristida stipitata	-	1	-	
Aristida meridionalis	2	4	8	
Eragrostis pallens	-	4	-	
Pogonathria squarrosa	2	4	8	
Subtotal less desirable	4		16	
Aristida adscensionis	-	1	-	
Tragus berteronianus	-	1	-	
Aristida congesta	3	1	3	
Schmidtia kalahariensis	-	1	-	
Subtotal undesirable	3		3	
Veld condition score			799	855
Basal cover %			3.0	3.2

Grazing capacity = $\frac{\text{Bench mark score}}{\text{sample site score}}$ x Grazing capacity of the area ha/M.L.U.

= $\frac{855}{799}$ x 10

= 10,7 ha/M.L.U
= 11 ha/M.L.U

CHAPTER 4

CLIMATE SOILS AND VEGETATION OF GANYESA DISTRICT

Since Ganyesa district falls within South Africa, in order to discuss the climate, soils and vegetation of Ganyesa, use will be made of the climate, soils and vegetation of South Africa.

4.1 Climate

In discussing the climate of Ganyesa district, use has been made of the climatic regions in South Africa and general summary of their characteristics (Schulze 1994). According to Schulze (1994), the South African Weather Bureau has partitioned South Africa into 15 climatic regions as shown in Figure 6.1. This division into regions is based firstly on geographic considerations, more particularly the prominent mountain ranges (great escarpment), which constitute the main climatic divides.

Fig. 4.1: Climatic Regions / Klimaatstreke

Ganyesa district falls under Regions Ss and Sn: southern and northern steppe (Schulze 1994). This is a semi-arid region receiving on the average about 250mm of rain in the west to 500mm on its eastern boundary. The rainfall comes mainly in showers and thunderstorms falling in the

summer months of October to March, the peak of the rainy season being March or February. On average up to 10 rainy days per month may be expected during the peak of the season, whilst during the usually dry and sunny winter months unsettled weather may occur on only one or two occasions per month.

Hail is sometimes associated with the thunderstorms and occurs mainly in early summer (November). Although these storms may sometimes be very severe and cause much damage, they usually cover relatively small areas.

Air temperatures are subject to large diurnal and seasonal variation; in January the average daily maximum lies between 30°C and 33°C and in July it is about 17°C. The average minimum temperatures are of the order of 15 c in January and 0°c in July.

The period during which frost can be expected lasts for about 150 days (May to September) in the south of this region and for about 100 days June to August) in the north.

Winds are usually North-Westerly attaining their maximum speed in the afternoon; during thunderstorms, strong and gusty south westerly winds of short duration are a common feature and occasional cold snaps are accompanied by unpleasantly cold southerly winds for a day or two.

4.2 Soils of Ganyesa area

Regarding the soils of Ganyesa area, use will be made of the soils occurring in South Africa. These are many, occurring in the different land types. Use will, therefore, be made of the land types of the maps - Bray, Morokweng, Mafikeng and Vryburg (1984) - Nos. 2522, 2622, 2524 and 2624 respectively.

The greater proportion of Ganyesa district is covered by the Ae3 land type and a smaller proportion by the Ah6 land type.

4.2.1 Soil forms and soil series

The soil forms occurring in both land types are very similar. In the Ae3 land type, the following soil forms and soil series occur:

Soil form		Soil series
Hutton	-	Shorrocks, Makatini and Mangano.
Willowbrook	-	Sarasdale and Chikinya
Rensburg	-	Rensburg
Milkwood	-	Graythorne
Shortlands	-	Kinross

In the Ah6 land type, the following forms and soil series occur:

Soil form		Soil series
Hutton	-	Mangano, Shorrocks, Roodepoort, Zwartfontein and Portsmouth.
Clovelly	-	Sandbury, Blinkklip, Annandale, Denhere and Makuya.
Avalon	-	Boetmelk
Milkwood	-	Graythorne
Willowbrook	-	Chinyika

NB. In the Memoirs of the Land type maps (1984), the soils have been classified according to the South African soil classification system (A Binomial system for South Africa, published by the Department of Agricultural Technical Services, Republic of South Africa 1977).

4.2.3 Agricultural value of soils occurring in the Ae3 and Ah6 land types

i) Hutton

- These soils are well drained and aerated and therefore have a lower long term average yield potential than yellow soils due to drier soil conditions.
- Drainage of these soils is very good and are excellent irrigation soils.
- These soils can be used for all dry-land crops in areas where rainfall is sufficient.
- Due to the dry conditions of these soils, dry-land wheat production is not recommended in summer rainfall areas, especially on sandy soils.

ii) Clovelly

- In some areas, especially the North West Free State, the soils are sensitive to erosion because of the fine sand fraction and clay horizons in the subsoil.
- If these soils are deep, the drainage is good.
- Nitrogen leacnig usually occurs on sandy Clovelly soils.
- Clovelly soils are usually poor in natural plant nutrients.
- These soils can be used for most summer crops under dryland conditions.
- Wheat can be produced on dryland in the summer rainfall areas but the subsoil must preferably have a clay percentage of more than 10%.

iii) Rensburg

- The soils store water in the root zone.
- Drainage is poor and can lead to water logging in the rainy season.
- These soils normally have a high clay percentage
- They are very sensitive to trampling by stock. The best use of the soils is to be left in their

natural state and no cash crops are recommended on these soils.

(iv) Shortlands

- These soils are usually dry.
- Grain sorghum and sunflower produce well under dryland conditions on these soils.
- In the low rainfall areas, these soils must be left for natural grazing.
- The soils can do well under irrigation.

(v) Avalon

- The soil climate is wet.
- Because of the wet soil climate of these soils, they are suitable for dryland wheat production in the summer rainfall areas.
- These soils have a higher potential compared to other soils due to more water available in the deeper layers.
- If these soils contain fine sand, they may be prone to erosion.
- Compaction is a problem on sandy Avalon soils.

(vi) Willowbrook and Milkwood

- These soils should be left in their natural state.
- These soils are sensitive to trampling by animals.
- No cash crops are recommended.
- These soils normally have a high clay percentage (Hillel 1982).

4.3 The vegetation of Ganyesa area

In describing the vegetation of Ganyesa area, use is made of the vegetation of South Africa. The vegetation of South Africa has been classified according to five formations (Acocks 1953) as follows: Grassland formation, Savanna

formation, Karroo formation, forest formation and Macchia (fynbos) formation. Ganyesa area is situated in the Savanna formation.

4.3.1 **Savanna formation**

The Savanna vegetation has developed in the more tropical regions of the country where the rainfall is seasonal (with a pronounced dry period in winter) and where temperatures are generally higher. It is composed of an upper stratum of rather low trees, many of which may provide useful browse, scattered in a grass-dominated undergrowth. Tree density varies greatly from conditions approaching forest at the one extreme, to open grasslands at the other. Most of the trees are deciduous. Throughout these Savanna areas there is a delicate balance between the tree and grass components of the vegetation (Tainton 1981). Tainton (1981) indicated that Walker and Noy-Meir (1979) and Walker (1980) have discussed the relationship between the tree and grass component of the vegetation in some detail. They worked from the assumption that the grass plants have a relatively shallow root system and, therefore, extract the moisture and nutrient requirement largely from the upper soil layers, but that the trees have both shallow and deep roots. Trees and grasses, therefore, compete for moisture and nutrients in the upper soil layers. Here the grasses are the more efficient competitors because of their more extensive root systems. However, at depth, the trees operate without competition. For this reason, the trees once established, form a natural component of the vegetation and will survive even in a vigorous grass sward, the ratio between the two depending on the amount of subsoil water available. However, should the density of the grass layer decline, for any reason, then runoff increases and infiltration of water into the upper soil layers is reduced

considerably, but water may still flow into the subsoil layers along quickflow channels or as stem-flow. This gives a decided advantage to the tree component which then becomes more competitive and increasingly able to suppress the grass. Once begun, this process of increasing tree density accelerates as the density of the grass component is subjected to increasing competition from the trees. If unchecked, such communities may become almost grassless (Tainton 1981).

There are six categories of Savanna vegetation formation. Of these, the Kalahari thornveld and bushveld, Transvaal sour bushveld and Transvaal mixed bushveld are represented in the North West Province and are described as follows:

4.3.1.1 **Kalahari thornveld and bushveld**

The Kalahari thornveld and bushveld lies north of the Orange River in a zone of 370-500 mm rainfall, the climax vegetation is thought to be Acacia erioloba Savanna, Olea - Tarchonanthus bush or luxuriant forms of Acacia bush, depending on the soil type of the area concerned. Acacia erioloba is the most prominent tree over large areas in association with other Acacia species (A. tortilis, A. mellifera sub sp. detinens, A. haematoxylon) and with species such as Tarchonanthus camphoratus, Grewia flava, Boscia albitrunca, Dichrostachys cinerea and Olea africana.

The ground layer varies widely from an arid type which includes Karroo shrubs (eg. Rhigozum trichotomum) and the desert grasses (e.g. Stipagrostis uniplumis, Schmidtia kalahariensis in the west, through to a mesophytic grass layer (eg. Themeda triandra, Heteropogon contortus) in the east. A number of poisonous plants (Geigeria ornativa, Tribulus

terrestris, Ornithoglossum viride, Urginea sanguinea, Dipcadi glaucum and others) occur in this vegetation type and may cause serious stock losses (Tainton 1981).

4.4 The present vegetation of Ganyesa communal grazing area

This area falls into the Kalahari thorn veld type (No.16, Acocks 1988). The common tree and shrub species include, A. erioloba, A. karroo (mainly in the valleys), A. mellifera subspecies detinens, A. hebeclada, A. haematoxylon, B. albitrunca, D. cinerea, Ziziphus mucronata, Grewia flava and Tarchonanthus camphoratus. Due to overgrazing in some areas there is a tendency for bush encroachment especially A.mellifera and D.cinerea. The tree density has been determined in some of these bush encroached areas and found to be 1500 to 2000 trees per hectare. This has reduced the grazing capacity of these areas tremendously.

The common grass species include S. uniplumis, Eragrostis lehmanniana, Aristida meridionalis, S. kalahariensis and A. congesta subspecies congesta. In some parts of the area, which are better managed, Anthephora pubescens and D. eriantha have also been identified. Due to overgrazing, however, many areas do not progress beyond the E. lehmanniana stage of succession.

Due to the fact that the greater proportion of Ganyesa area is not divided into grazing paddocks, livestock tend to concentrate in the vicinity of the residential area and this area is heavily overgrazed. The dominant grass species in such overgrazed areas is A. congesta.

Ganyesa area as a communal grazing area is also faced with a problem highlighted by Khumalo (1990) that the land tenure system in the communal grazing areas does not hold any one responsible for "mining" or exploiting the rangeland. Due to this land tenure system and the high livestock population, the communal grazing area of Ganyesa is generally heavily overgrazed.

4.5 The vegetation and veld condition of Ganyesa leased farms

According to Bophuthatswana Land Act No. 39 of 1979, leased land is land that has been given to a person, who is a citizen of Bophuthatswana, by the State for rent for a specific period.

The vegetation on Ganyesa leased farms is similar to that described in the communal grazing area except that in some of the leased areas, the veld is better managed and as a result some of the highly desirable grass species such as A. pubescens and D. eriantha are also found. Some of the leased farms were rented to farmers in the same condition in which the State bought them from the owners, while others were developed before allocation. The result is that some farmers can practise rotational grazing systems with ease, because the infrastructure is available, while others do not have sufficient paddocks to practise such systems. One of the conditions of leased farms is to keep the number of livestock to the grazing capacity of the farms but the farmers often ignore this condition because on most of these farms, the number of livestock exceeds the grazing capacity of the farms. The issue of the correct stocking rate is included in the farmers lease contract. It should, therefore, be easy for the Government to ensure that the farmers abide by this rule, but it is not implemented.

CHAPTER 5

SPECIFIC SITUATION IN GANYESA DISTRICT

5.1 Historical background

Ganyesa area is inhabited by the Ba-rolong tribe of the Tlou and Tau clan. The Ba-rolong tribe which at present is residing at Ganyesa originated at Thaba-Nchu. Due to wars and faction fights some of the Ba-rolong tribe left Thaba-Nchu and moved Northwards. Of these some moved in the North-easterly direction and ultimately landed at Mafikeng and others moved Northwards until they settled at Ganyesa. Their first chief at Ganyesa was Chief Abram Letlhogile. He was succeeded by Chief Thibogang Letlhogile who was succeeded by Chief Kegakilwe Letlhogile, the present chief (Letlhogile 1997 personal communication).

5.2 Agro-ecological situation

Ganyesa district comprises GCGA and South African Developmental Trust Farms (SADT). ABPCBR is one of these trust farms. The Ganyesa district is primarily suited for livestock production, although some farmers do have small areas of dryland cropping. During periods of good rains farmers obtain good crop yields especially of maize and groundnuts, but this only occurs once in four or five years. During periods of drought these exposed patches of land are susceptible to wind erosion. Although the farmers are aware of the problem of wind erosion in their lands, they persist in cultivating these lands in the hope that they will get good rains and a good crop yield.

Mr S Letlhogile, Private bag x518, Ganyesa, 8613.

Most of the GCGA is not planned and farmers practise continuous grazing. The increase in these small patches and hence the area under cultivation increases the problem on the grazing area, which is already overutilized due to a high stocking rate.

5.3 Social aspects of the members of the community of Ganyesa district

5.3.1 Introduction

This chapter discusses the social aspects of the community. The main aim was to examine the characteristics of the community and to ascertain whether these characteristics have an influence on the farming activities of the members of the Beef Ranch, because they belong to the larger community.

5.3.2 Personal factors

Personal factors include sex, marital status, occupational status, age and level of education.

5.3.2.1 Sex and marital status

The proportion of the sexes in the population has an important consequences. Where there is a disproportion of one or other, the normal opportunities for marriage are reduced for the majority group (Seobi 1980) citing Nelson (1955). Table 5.1 shows the distribution of the leaders of the community of Ganyesa village according to sex and marital status.

Table 5.1 Distribution of the leaders of the community of Ganyesa village according to sex and marital status, 1996, (n=30).

Category	No.	%
Married men	27	90
Single men	-	-
Widowers	-	-
Widows	3	10
	30	100

It can be seen from table 5.1 that the majority of the leaders of the community (90%) are married and can make decisions, and should, therefore, have a chance of being successful in farming.

5.3.2.2 Occupational status

The occupational status of the community has important social consequences. The mere absence of the men for the greater part of the year is invariably reflected in the cultural operations of the land and the resultant low yields. Even though the responsible male plans his visits to his home in such a manner that it coincides with the ploughing and planting season, agriculture suffers. It allows no preparatory cultivation, nor does it enable him to take advantage of the favourable rainfall. It necessitates leaving the major part of the work to the women and juniors.

There can be no organised system of working. The standard of agriculture, therefore, is lowered and there can be no development (Low 1982), quoting Schapera (1947). Table 5.2 shows the distribution of the leaders of the community of Ganyesa village according to occupational status.

Table 5.2: Distribution of the leaders of the Ganyesa village according to occupational status, 1996, (n=30).

Category	No.	%
Permanently at home	26	87
Permanently away	Nil	Nil
Monthly commuter	2	7
Weekly commuter	1	3
Daily commuter	1	3
	30	100

Table 5.2 shows that the majority of the leaders (87%) are permanent residents. The opportunity for farmers to improve their farming activities by information from newsletters, farmer colleagues or even training from the extension officers is, therefore, very good.

5.3.2.3 Age

Chronological age has an impairing effect on physical ability, which is of great importance on family holdings. Figure 5.1 shows the distribution of the leaders of the community of Ganyesa village according to age.

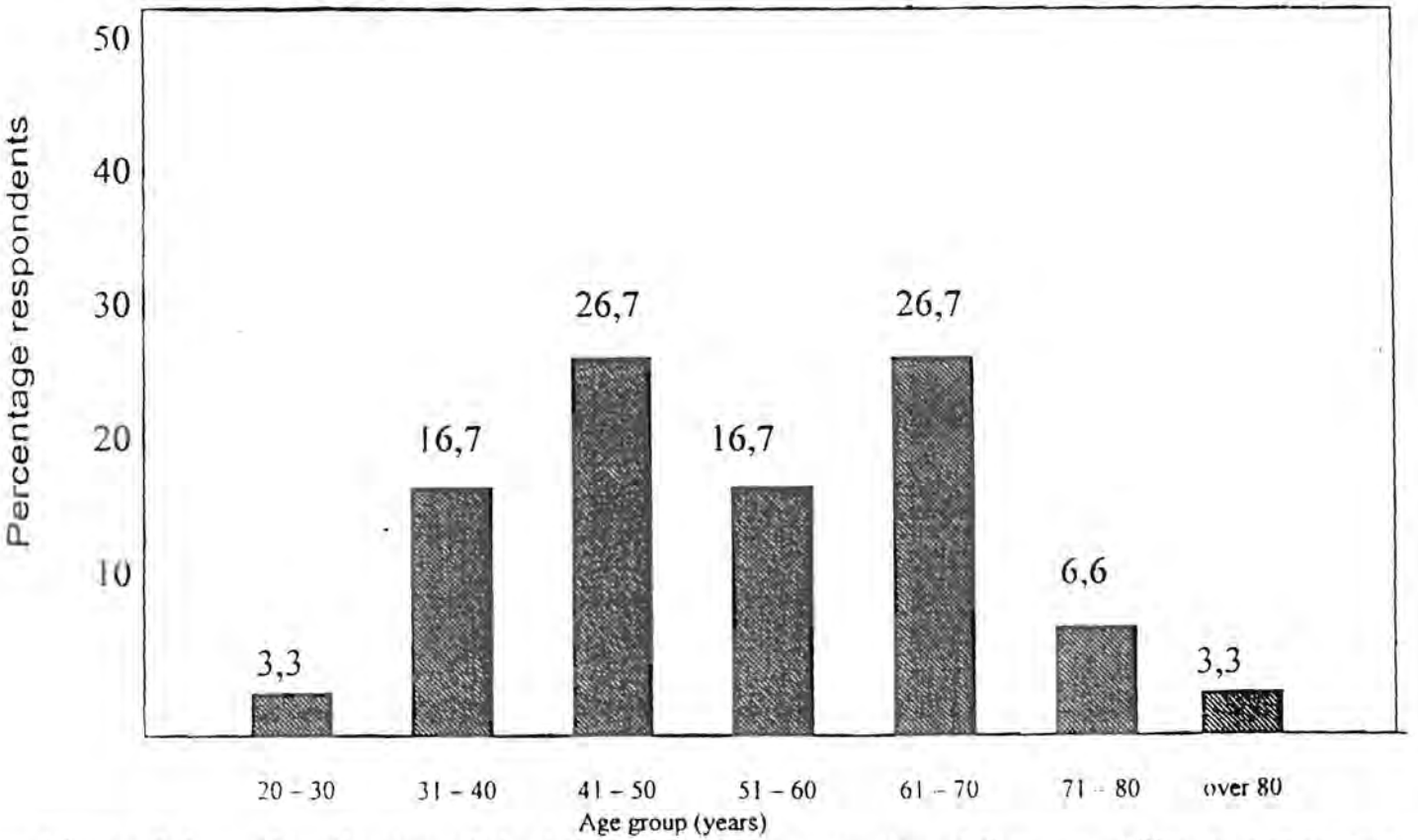

Figure 5.1: Distribution of the leaders of the community of Ganyesa Village according to age, 1996, (n=30)

Figure 5.1 shows that 70% of the leaders of the community of Ganyesa village were between 41 and 70 years of age. It also shows that 90% of the leaders of the community were between 20 and 70 years of age with only 43% of the leaders being between 41 and 60 years of age which is still a physically productive age to make a success in farming.

5.3.2.4 Level of education

Education plays a very important role in agriculture. Tshenkeng (1985) citing Bembridge (1953) states that education is regarded as a basic human need, which, in turn, is seen as a means of meeting other basic needs and accelerating overall development through training workers at all levels. Figure 5.2 shows the distribution of the leaders of the community of Ganyesa village according to the level of education.

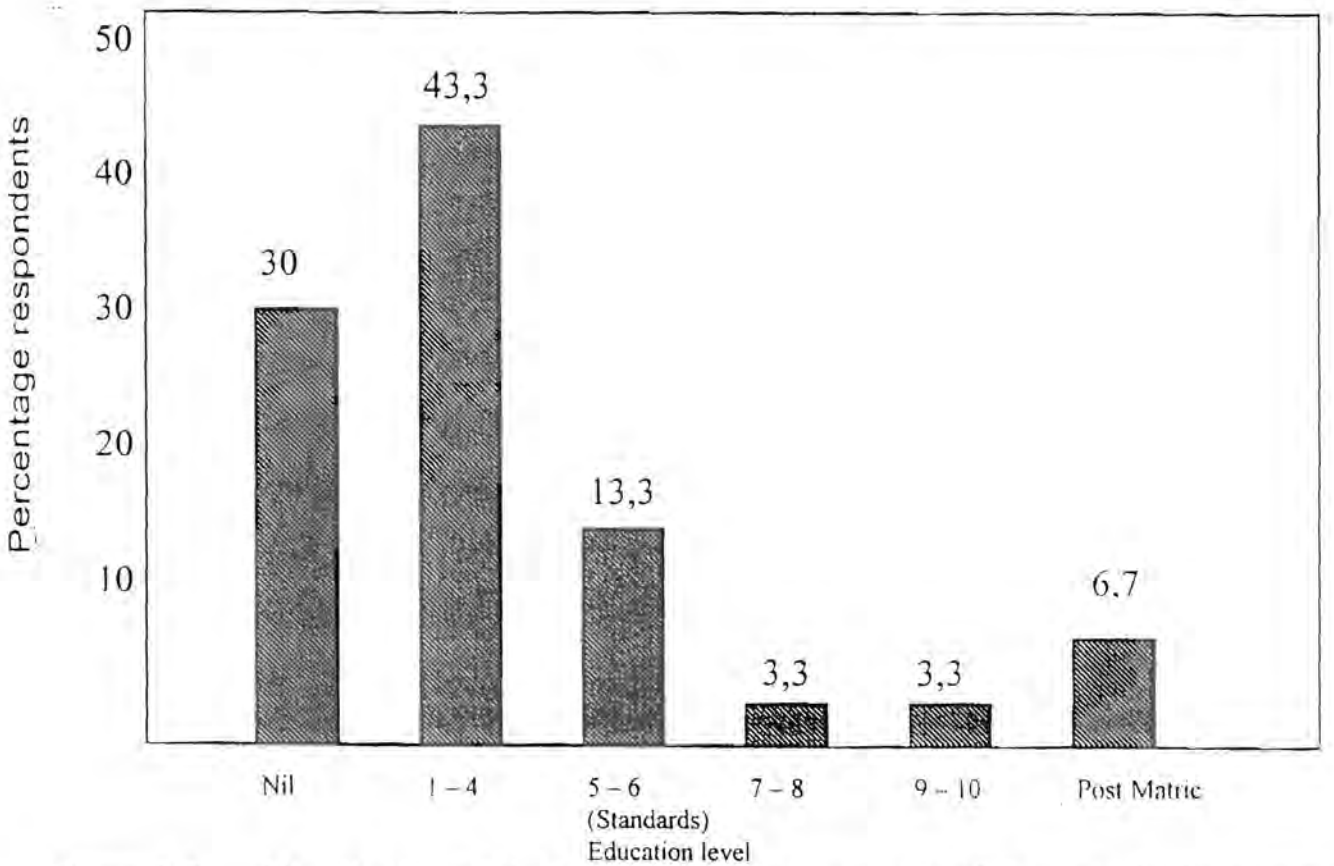

Figure 5.2: Distribution of the leaders of the community of Ganyesa Village according to level of education, 1996 (n= 30)

Figure 5.2 indicates that 43,3% of the leaders of the community of Ganyesa village had a level of education of between Std I and Std 4, and all those leaders when tested, showed that they could read and write Setswana quite well. This shows that they would not experience any problem in reading magazines or newsletters written in Setswana. Only 30% of the leaders of the community had no schooling. The rest of the leaders (27%) were quite literate and would be able to read magazines such as a Farmers Weekly and newsletters written in English.

5.3.3 Leaders of the community of Ganyesa village who own livestock

It was found that 93% of the leaders of the community of Ganyesa village owned livestock and that only two percent (2%) did not own livestock. The number of livestock owned ranged from five M.L.U. to more than hundred M.L.U. per family. This situation shows that nearly all leaders of the community own livestock and that the head of the family especially a male, regards himself as a man if he owns livestock even if the livestock number is only a few. This tendency is the main reason for overstocking in this community. Overstocking is actually not caused by farmers keeping large numbers of livestock but that there are many families, each having a small number of livestock that ultimately result in overstocking and, therefore, the deterioration of the veld.

5.3.4 Agricultural situation

5.3.4.1 Problems with the management of livestock

Livestock are an important form of security for the family. Livestock provide the family with meat, milk and draught power for haulage of manure and kraal compost, which is essential for the maintanenance of soil fertility and crop yields (Theisen 1976). The

problems encountered in the management of livestock include: Death of calves after birth and marketing infrastructure.

5.3.4.1.1 Death of calves at birth

When interviewed on the death of calves at birth, 67% of the members of the community indicated that they did not experience any problem of the death of calves at birth while 33% stated that they did. When questioned on the number of calves which died at birth during the past twelve months, the answers ranged from 2 to 7 calves. The cause of death was indicated to be drought, i.e. cows having insufficient milk to feed the calves, as well as cows having difficulties in calving. All the reasons mentioned for the death of calves at birth were due to the fact that there was no specific mating season in Ganyesa area with the result that some cows calved during winter when the condition of the veld was at its poorest.

5.3.4.1.2 Marketing infrastructure

Livestock marketing could be one of the means to reduce the problem of overstocking which is the major problem in the rural areas but from observation, it was not the case in the Ganyesa area. Table 5.3 shows the distribution of the leaders of the community of Ganyesa village according to participation in livestock sales.

Table 5.3: Distribution of the leaders of the community of Ganyesa village according to participation in livestock sales, 1996, (n=30).

Category	No.	%
Livestock auctions and speculations	6	20
Livestock auctions	23	77
Abattoirs	1	3
	30	100

Table 5.3 indicates that the majority of the leaders of the community of Ganyesa village (77%) sell their livestock at the livestock auctions. When asked whether they were satisfied with the price offered, most of them (67%) stated that they were not satisfied with the price. They mentioned that the two major reasons for low prices were that there were few buyers at the auctions bidding for a large number of livestock offered for sale and this resulted in low prices, and the other reason being that the cattle were in poor condition. Although the majority of the members of the community stated that there were few buyers at the auctions, it was observed that the prices for livestock were very low during winter, because cattle were in poor condition.

5.3.4.1.3 Dipping of cattle

The major part of the Ganyesa area is best suited to livestock production. Livestock, therefore, constitute the major part of the farming enterprises. Crop production on a small scale is only being practised in the valley that runs through the main Ganyesa village. In livestock production systems, dipping amongst other factors, plays a very important role in keeping livestock, especially cattle, free from ticks which affect the condition of livestock. When interviewed on the frequency of dipping, the majority (47%) stated that they dip only once a year, and a few leaders (10%) stated that they never dip their cattle.

5.3.4.1.4 Feeding of cattle

A major constraint on ruminant animal production in both commercial and communal production systems in Southern Africa is the low intake during the dry winter months. Feed resources are scarce and generally of poorer quality during winter (Kadzere 1995).

The condition of grazing in Ganyesa area is poor, especially during winter. While the area is semi-arid, the situation is aggravated by overgrazing, which is caused by overstocking. This situation necessitates the feeding of livestock (at least with crop residues) especially during winter. When interviewed, the majority (83%) indicated that they feed their cattle during winter and that they feed mainly crop residues (maize and groundnuts).

5.3.4.1.5 Reasons for keeping cattle

Cattle play an important role in family security. Table 4.4 indicates the major reasons for keeping cattle.

Table 5.4: Distribution of the leaders of the community of Ganyesa village according to major reasons for keeping cattle, 1996, (n=30).

Category	No.	%
Milk	7	23
Ceremonial slaughter	2	7
Source of manure	1	3
Milk and source of cash during times of need.	17	57
Prestige and status	1	3
It is easy to invest in cattle	2	7
	30	100

It can be seen from Table 5.4 that the majority (57%) keep cattle for milk and source of cash during the times of need, such as sending children to boarding schools or universities.

5.3.4.1.6 Total number of cattle in Ganyesa village

When interviewed on the total number of cattle, nearly all leaders of the community (97%) indicated that they did not have any idea of the total number of cattle. A few (3%) tried to guess the answer, but they also, did not know. This shows that the farmers farm without having the knowledge of the number of livestock that are actually kept.

5.3.4.1.7 Discussion

The problems mentioned by members of the community of Ganyesa village were: insufficient milk for the calves after calving; the poor condition of the veld in Ganyesa area (excluding South African Developing Trust farms), the situation being worse in winter when grass is also dry. There is no fixed breeding season and cows often calve during the winter, when the nutritive value of the veld is very poor. The calving season should, therefore, be controlled so that cows calve during the summer season.

The low prices at livestock auctions is often caused by too few buyers and poor condition of cattle. The main reason for low prices is often because farmers sell during winter, when they realize that the cattle will not be able to survive the critical winter period. It is very important, therefore, that farmers should be motivated to sell their livestock before the winter and before cattle lose condition. It is also necessary for the extension officers to determine the number of livestock to be sold, so that they can timeously invite buyers to the auctions, basing their invitations on the number of cattle to be marketed.

From these interviews, it is evident that the farmers are not used to dipping their cattle regularly. It is essential that farmers be motivated to dip their livestock regularly.

The farmers feed their cattle during winter with crop residues. It has been deduced from the poor condition of livestock that the quantity and quality of such residues is limiting. It will be necessary to motivate the farmers to monitor the amounts fed to cattle. It has been observed that the farmers do not know the number of livestock in the area. It is, therefore, desirable that the farmers should be educated on the extent of the grazing area and the number of livestock (mature livestock units - M.L.U) that may be kept in a sustainable manner.

5.3.4.2 Problems with the management of communal veld

5.3.4.2.1 Farmers perception of the veld condition

The veld condition plays an important role in livestock production. If the veld condition is poor, the performance of livestock and hence income, will be unsatisfactory. Leaders in the community were asked to indicate the veld condition with respect to its ability to maintain livestock, especially during the critical winter season. Their response is reflected in table 5.5

Table 5.5: Distribution of community leaders of Ganyesa village according to their perception of the veld condition, 1996, (n=30).

Category	No.	%
Poor veld condition	7	23
Fair veld condition	14	47
Good veld condition	9	30
	30	100

Table 5.5 indicates that the majority of the community leaders (77%) perceived that the veld was in a fair to good condition. When asked to indicate why they regarded the veld to be in a fair to good condition, they based their judgement on the availability of grass and not on the predominant grass species.

5.3.4.2.2 The recommended stocking rate in Ganyesa area

Stocking rate is the most important variable in grazing management. If stocking rate is not near the proper level, then regardless of other grazing management practices employed, objectives will not be met (Walker 1995). The community leaders were asked to indicate the recommended stocking rate for their area but none of them knew. This indicates that community members do not relate the stocking rate to livestock performance.

5.3.4.2.3 Grazing systems

The community leaders were asked to indicate whether they prefer cattle to graze continuously in one camp or the veld be divided into small camps which may be grazed in a rotation. The majority (70%) indicated that they prefer the rotational grazing system while only a few (13%) stated that they prefer the continuous grazing system and the remainder did not express any opinion. From these responses it may be deduced that they feel that the rotaional system holds certain benefits.

5.3.4.2.4 Problems of veld fire

Uncontrolled fires can cause a great damage to the environment, weakening veld composition, reducing its production as well as causing widespread soil erosion. But fire is a useful instrument in veld management. Many farmers and grazing experts, consider controlled burning essential to manage invader species. Fire is also important to remove moribund or unpalatable grasses, providing palatable and nutritious grazing. In the interview, 53% of the leaders of the community indicated that they did not experience veld fires in the area, while 47% stated that they did. Most suspected that the cause of such fires was careless people throwing down cigarette stubs.

The community leaders were asked whether, in their view, they consider veld burning to be of value. The majority (93%), stated that veld fires had no beneficial effect on the veld condition since grass was destroyed. From these response it is clear that they do not have any experience of fire as a management tool.

5.3.4.2.5 The problem of bush encroachment

Bush encroachment has become a serious problem in South Africa, effecting 2.5 million hectares of the Northern Cape alone (Moore, van Niekerk, Knight and Wessels 1985). The seriousness of this situation has long been realized (Donaldson 1967; Donaldson & Kelk 1970, cited by Moore et al., 1985). Moore et al. (1985), further stated that in some parts of the Molopo area, bush encroachment is thought to have already depressed grass production by 80 percent or more. This effect on grass production has resulted in many farms becoming uneconomical units. The community leaders were asked to indicate whether they were experiencing problems with bush encroachment in the area. The majority (67%) indicated that they do experience bush encroachment. The perceived causes are tabulated in Table 5.6.

Table 5.6: Distribution of the community leaders according to their perceptions of the causes of bush encroachment, 1996, (n=30).

Category	No.	%
No cutting of trees	18	60
Overgrazing	5	17
Drought	7	23
	30	100

Table 5.6 indicates that the majority (60%) perceive the cause of bush encroachment to be the fact that trees are not cut and, therefore, tend to develop dense stands. It was observed that 23% of the leaders felt that bush encroachment was caused by drought, while 17% indicated that it was caused by overgrazing. It could also be seen that some of the members associate bush encroachment with poor veld since they stated that it is caused by overgrazing.

The community leaders were asked specifically to explain the effect of bush encroachment on the veld condition. The responses are tabulated in Table 5.7.

Table 5.7: Distribution of the community leaders according to the effect of bush encroachment on veld condition, 1996, (n=30).

Category	No.	%
Suppress grass	24	80
No effect	2	7
No comment	4	13
	30	100

The majority realize that bush encroachment suppresses grasses and, therefore, results in veld deterioration. The community leaders were further asked to indicate how bush encroachment could be controlled. Their feelings in this respect are tabulated in Table 5.8

Table 5.8: Distribution of community leaders according to suggested bush control methods, 1996, (n=30).

Category	No.	%
Cutting of trees by Government	15	50
Cutting of trees by Tribal Authority	7	23
People to be given more land by Government	6	20
Answer not known	2	7
	30	100

Table 5.8 indicates that 73% of the members of the community stated that, to control bush increasing in density, the trees should be harvested. Fifty percent felt that trees should be cut by the Government while 23% felt that trees should be cut by the Tribal Authority. It can also be seen, that some of the leaders of the community (20%) felt that, since the area was encroached by bush, the Government should give them more land.

5.3.4.2.6 Grass species which indicates that the veld is in a poor, fair or good condition

The community leaders were asked to name two grass species in the area, which indicate that the veld is in a poor, fair or good condition. The answers are reflected in Table 5.9.

Table 5.9: Distribution of the community leaders according to naming of grass species which indicates that the veld is in a poor, fair or good condition, 1996, (n=30)

Category	Grass species	NO.	%
Poor condition	A. congesta	10	33
Fair condition	-	Nil	Nil
Good condition	D. eriantha	5	17
Answer not known	-	15	50
		30	100

Fifty percent of the members did not know the grass species occurring in the area, and would not know (based on the predominant species in the area) whether the veld was in a poor, fair or good condition. Some of the farmers (33%) could only name one grass species (Aristida congesta), which indicated that the veld was in a poor condition, while a small number (17%) named only one grass species (Digitaria eriantha), which indicated that the veld was in a good condition.

5.3.4.2.7 Evidence of soil erosion in the area

The basal cover of the grass communities plays an important role in the dissipation of much of the energy of the falling raindrops - energy which would otherwise pound and pulverize the soil surface. Hence the basal cover and the canopy cover of the veld at the time of intense precipitation may exert an important influence on the infiltratrion of water into the soil, by protecting the soil surface from direct raindrop impact, which would reduce the infiltration of water (Scott 1981). The community leaders were asked to indicate whether they had observed evidence of soil erosion in the area over the past twelve months. The majority 60% stated that they had. They were then asked to indicate the seriousness of such erosion. Their responses are tabulated in Table 5.10.

Table 5.10: Distribution of community leaders who observed soil erosion and their perception of the seriousness of such erosion, 1996, (n=18)

Category	No.	%
Very serious	2	11
Serious	11	61
Not serious	4	22
Uncertain	1	6
	18	100

Seventy two percent of the community leaders who observed soil erosion felt that the impact of soil erosion in the area was serious or very serious. When asked what the cause of this soil erosion was, the majority stated that it was caused by runoff. When asked how they could solve the problem, they replied that the Government should hire people to construct gabions for silting up the dongas.

5.3.4.2.8 Discussion

The majority of the community members felt that the veld was in a fair to good condition (Table 5.5). Although they were not clear on the type of grass that was predominant, they felt that there was enough grass available. Some members could indicate that when Digitaria eriantha is predominant, the veld is in good condition (Table 5.9), but when shown the grazing camp and asked which grass species was predominant, they did not know. This indicates that they do not know how to determine the predominant species in the veld. To solve this problem, the local extension officer should make the community members aware of the grass species occurring in the area and their value in determining veld condition. This will also enable people to estimate the grazing capacity of the veld using botanical composition. The fact that the members of the community did not know the recommended stocking rate for their area (5.3.4.2.2), means that they did not know whether the present stock exceeded the grazing capacity of the veld or not. It is essential that the extension service make people aware of the extent of Ganyesa area and the number of livestock (M.L.U) which should be stocked. This information will enable the members of the community to know the extent of stocking in the area and to plan for a fodder bank, especially for the critical winter and early spring periods.

The community members preferred rotational grazing, although they could not give a strong reason for their preference, except that they felt that the veld should rest. The people need to be informed on how moderate grazing stimulates the growth of grass and that overutilization could retard the growth of grass and that it ultimately reduces the grazing capacity of the veld.

A majority felt that veld fires are detrimental because the grass is destroyed. People should be made aware of the danger of fire if it is not controlled, but that fire may be used as a management tool to control bush encroachment and/or to remove moribund grass.

The majority of the community members expressed their concern about bush encroachment. They feel that the situation is being aggravated by the fact that the trees are not utilized and, therefore, become more dense. The people do not relate overgrazing in the area to bush encroachment. People should be made aware of the fact that this area falls within the Savanna vegetation formation, where there is a balance between woody species and herbaceous species. Over-grazing retards the growth of grass and the trees get a chance to suppress the herbaceous component of the vegetation, because they are not utilized. Such encroachment reduces the grazing capacity of the area. The community members felt that the problem of bush encroachment could be solved by cutting of trees and that this should be done by Government. Such people should, therefore, be made aware that the veld belongs to them and that they should take the initiative to control bush. Requests to the Government to subsidize such an exercise would probably be viewed more favourably in the light of such pro-active measures.

The majority of the community members do not know the grass species occurring in the area (5.3.4.2.6). Only a few could identify Aristida congesta as an indication that the veld is in a poor condition. Still fewer members could identify Digitaria eriantha as an indication that the veld is in a good condition. It is necessary that these people be able to identify indicator grass species occurring in the area. This knowledge would enable the people to monitor the veld and would give some indication of the stocking rate to be applied.

The majority of the members confirmed that soil erosion is serious in this area but they did not relate the erosion to the poor veld condition. Instead, they feel that soil erosion in the area is caused by rainfall, and that Government should hire people to construct gabions to facilitate the silting up of dongas. The extension service should make people aware that overgrazing reduces the basal cover of the vegetation which retards the speed of the runoff water over the soil surface and hence the erosive power of the runoff water. The people should also be made aware that it is their responsibility to reclaim the eroded areas and that they could only request the Government for assistance.

Ganyesa like most of the communal grazing areas, is overstocked and this has resulted in veld deterioration. Ganyesa falls under the Western Region of the North West Province which Meyer (1998) indicated that the animal numbers in the Province exceed the carrying capacity of the land by approximately 70% and that overgrazing occurs generally as a result of too high animal numbers and lack of infrastructure.

Although Meyer (1998) from the discussions with the extension staff indicated that one of the reasons of the farmers not selling their livestock is the low prices at the livestock auctions, it has been realized from practical experience that farmers sell their livestock very late in winter and hence the poor condition of livestock and low prices (chapter 5.3.4.1.2). Meyer (1998) indicated also that the policy changes at financial institutions will in future make loans for purchasing stock accessible to more people thereby increasing pressure on the land. This situation already exists in the Western Region of the North West Province. The Landbank is giving loans to people to purchase livestock and this situation increasesthe pressure on the land. Meyer (1998) also reported that another reason for high stocking rates is that the majority of farmers institutions eg. farmers associations, work towards maximising the income of their members and thereby promoting overstocking.

Ainslie, Palmer, Hurt and Swart (1998) indicated that the central issue that the "new paradigm" introduces to the ecological debate is that livestock owners operating in the communal sector must have access to sufficiently extensive areas of rangeland in order to make optimal use of environmental variability and, quoting Scoones (1994:23) stated that the one way to ensure sufficient rangeland is through flexible resource access arrangements, so that livestock are able to track resource availability across the landscape. Ainslie et al. (1998), further reported that an argument put forward in defence of the dis-equilibrium concept, is that high temporal and spatial variability of resources in semi-arid rangelands encourage herbivores to move across the landscape in order to maximise the use of production in the

variable environment. Quoting Ellis & Swift (1988) stated that this argument has been well developed and researched in arid and semi-arid environments but extremely poorly developed in the less arid environments of the eastern seaboard of South Africa, and that clearly high spatial and temporal heterogencity of resources will buffer temporal variation in fodder production resulting from shortages following grazing events and/or climatic fluctuations. This is an important issue in the communal systems, but grazing areas need to be sufficiently extensive to allow for such buffering. Although Ainslie et al. (1998) stated that some parts of South Africa, such as former Transkei, Kwazulu/Natal and parts of the former Ciskei would appear to be sufficiently large to allow for extensive livestock movements (except for areas which have been planned), Ganyesa area does not have a large area for this system to be practised.

In explaining the stability concept, Tapson (1993) indicated that McKenzie (1982:22) elaborates the stability concept to include resistant stability and recuperative stability which is close to Walker's (1980:79) resilience concept. McKenzie (1982:22) defines resilience as the ability of a system to absorb changes in state variables, and still persist intact through time. Tapson (1993) further stated that the particular effect of these concepts in Transkei, is that the desirable climax Themeda veld, being lower on the resilience scale than the less desirable Aristida, has been largely replaced by it. The Aristida on the other hand is showing both high resilience and resistance and recuperative ability, and appears unlikely to be replaced by any other system either higher or lower in the succession and citing McKenzie (1982:21) added that it is a degraded but highly sustainable condition supporting in

addition a stocking rate twice as heavy as its accepted carrying capacity. Although Tapson (1993) indicates that Aristida is a degraded but highly sustainable condition, it has a low feeding value and comparatively this stage would support a smaller number of livestock.

5.3.5 Communication situation

5.3.5.1 Introduction

This section of chapter 5, covers the following aspects: sources of information on livestock farming; useful information learnt on the management of livestock; the extension officer in Ganyesa village; three best farmers in the Ganyesa area; newsletters; farmers information days; organisations to which members of the community belong; the strongest organisation in Ganyesa area; demonstration on livestock management; skills learnt from demonstration lessons.

5.3.5.2 Sources of information on livestock farming

The sources of information play an important role. Leagans (1961) stated that the world has never seen a time when the role of the communication was so important. This is so because the world has never seen a time when there was so much to know, so many people who need to know, and so many who want to know so much so quickly. Certainly in newly developing countries nothing is more important than the transfer of useful ideas from one person to another. Leagans (1961) further indicated that in the process of good communication lies the potential for millions of people in those countries to overcome ignorance, poverty and disease, and to attain their goal of economic and social well being.

Communication research has shown that certain sources of information tend to be more influencial in acquainting farmers with new practices (Wilkening 1951, cited by Bembridge 1975). Data on the sources of information on livestock farming, used by leaders, is provided in Table 5.11.

Table 5.11: Data on the sources of information on livestock farming, 1996, (n=30).

Category	No.	%
Extension officer only	16	53
Farmer colleagues	3	10
Own experience	3	10
Extension officer and farmer colleagues	2	7
Extension officer and own experience	6	20
	30	100

It is clear that the majority of Ganyesa community obtain information on livestock farming from the extension officer. From this information, the farmers should not experience problems on livestock farming since they can get information from the extension officer.

The members of the community were asked to indicate useful practices learnt in the management of livestock. The majority (70%) stated that they have learnt the skills of dosing against internal parasites and inoculation of livestock from the extension officer. These skills play an important role in the subsistence farmers because most of them own only a few head of livestock and, therefore, do not look after them as the commercial farmers do.

5.3.5.3 The Extension Officer in Ganyesa village

The extension officer, especially in the rural area, plays a very important role in disseminating technical information. Adams (1982) states that development workers and aid agencies in many countries are becoming increasingly concerned that the benefits rarely seems to reach the resource-poor farmers. Adams (1982) further indicated that it is well known that extension workers find it easier to work with the more affluent farmers who are usually more educated, hospitable and appreciative than poor farmers. The poor majority tend to be neglected and fall further behind. This need not be so. Agricultural extension agencies, with their network of field staff in close contact with the grass roots, are well situated to reach the poor. With only minor changes in organisation and policy, it should be possible to focus attention upon the poor majority, diagnose the needs of various subgroups (including women) and shape services, recommendations and information to fit those needs, all within the frame work of an uncomplicated and inexpensive programme. Although Adams (1982) indicated that the extension officers tend to concentrate on better-off farmers, it has been observed from practical experience in the developing areas that the extension officers actually avoid commercial farmers because most of them feel that these farmers are often more knowledgeable than they are. This situation, therefore, indicates that extension officers need to keep up to date with the latest information so that they can be confident when discussing farming practices with the commercial farmers.

The community members were asked whether they have an extension officer in Ganyesa village. Seventy three percent indicated that they do have an extension officer and 50% of those, stated that they consult the E.O. on livestock management.

5.3.5.4 Frequency of consultation with regard to the management of livestock

The frequency of consultation on the management of livestock is reflected in Table 5.12

Table 5.12: Distribution of community leaders who consulted with the extension officer according to frequency of consultation on the management of livestock, 1996, (n=11).

Frequency of consultation No. times in past twelve months	No.	%
Nil	1	9
1	2	18
2	6	55
3 or more	2	18
	11	100

This table shows that 55% of the community leaders who consulted the E.O. did so only twice in twelve months. Eighteen percent indicated that they consulted thrice or more and another 18% only once. It can be deduced that on average the community members do not consult the E.O. regularly on livestock management.

5.3.5.5 The three best farmers in Ganyesa area

The aim was to ascertain whether the community could identify the three best farmers in the area and their perceptions of the best farmer. The members were asked to name the three best farmers in the area but

each person gave different names. This indicates that the members do not have criteria for a good farmer and, therefore, could not specify the best farmer. The members were then asked to indicate why they regard the nominated people as good farmers. Their responses have been reflected in Table 5.13.

Table 5.13: Distribution of community leaders according to their perceptions on the three best farmers in Ganyesa area, 1996, (n=30).

Category	NO.	%
They farm on their own farms	9	30
They have more cattle than other people	12	40
They have good quality livestock	5	17
No comments	4	13
	30	100

Table 5.13 shows that the majority of the members (40%) regarded the farmers with large numbers of livestock as the best farmers in the area, while 30% felt that the best farmers were those who have their own farms and only 17% felt that the three best farmers were those who own good quality livestock.

5.3.5.6 Newsletters or magazines on livestock farming

A newsletter is a channel of communication. A channel of communication is a means by which a message gets from one individual to another. The nature of the information exchange relationship between individuals determines the conditions under which a source will or will not transmit the innovation to the receiver, and the effect of the transfer (Rogers 1983). The community leaders were asked to indicate whether they received newsletters or magazines on livestock farming. The majority (80%) stated that they do not receive any newsletters or magazines and only 20% receive "Farmers Weekly" magazines. This shows that

the community does not get enough information on livestock farming, except that from the E.O., which is also inadequate as shown in Chapter 4.3.5.4.

5.3.5.7 Farmers information days

A farmers information day, or field day, is an extension diffusion exercise in which the group approach is used to influence the attitudes of agriculturists and those interested in agriculture by discussion and demonstration in the field. It is an integral part of an extension programme (Graham 1962). The community leaders were asked whether they had attended farmers information or field days. Fifty three percent of them confirmed that they attended such days in the area, while 47% indicated that they had never attended such days. The community leaders were asked to indicate the number of information days they attended during the past twelve months and their responses are reflected in Table 5.14.

Table 5.14: Distribution of community leaders who attended information days in twelve months, 1996, (n=16).

Farmers information days No.	No. Respondents	%
None	2	12.5
1	6	37.5
2	3	19
3	4	25
4 or more	1	6
	16	100

Thirty seven percent of the community attended only one such day, 19% attended two information days and 31% attended three or more. When asked to indicate some skills which they learnt from the farmers information days attended, they mentioned the control of bush encroachment and livestock management.

5.3.5.8 Demonstrations of livestock management

Demonstrations consists of two aspects: result demonstration and method demonstration.

5.3.5.8.1 Result demonstration

"Seeing is believing". An important teaching method is to demonstrate what actually happens when a particular practice is followed (Mosher 1978). Result demonstration is a method used to evaluate a particular practice by comparison.

5.3.5.8.2 Method demonstration

"Learning requires doing". Method demonstration of a single operation should actually be carried out by the farmer if he is to implement an improved technique. Method demonstration practices are very important in an extension service because the aim of the extension worker is to teach the farmers new farming practices so that they can apply them with little or no guidance. This is what development in rural areas actually implies (Tshenkeng 1985). The community leaders were asked whether they know of any demonstration on livestock farming conducted in Ganyesa area. The majority (83%) of the members stated that they did not know while 17% did recall some demonstrations where these had been held. The members were then asked to indicate who conducted the demonstrations. Forty seven percent stated that they were conducted by people from outside the area, while 33% stated that demonstrations were conducted by the local E.O. and 20% stated that they were conducted by farmers. From the statement above, it is clear that the E.O. was involved in conducting demonstrations because even if he himself did not conduct demonstrations, he is responsible for the arrangements for people from outside the area.

The community leaders who indicated demonstrations conducted in the area, stated that the skills they learned from such demonstrations were: castration of calves; dehorning of cattle; how to use a hypodermic syringe and inoculation of cattle against diseases.

5.3.5.9 Organisations in Ganyesa area

Organisations such as farmers' associations play an important role in agriculture because of benefits such as credit and marketing facilities. In this way hardworking farmers stand a chance of improving their productivity (Tshenkeng 1985). Bembridge (1983), cited by Tshenkeng (1985), stated that an important advantage of farmers associations is that they have an intimate knowledge of each farmer's circumstances and are able to link credit with the purchase of inputs, marketing and the extension service.

5.3.5.9.1 Organisations to which community leaders belonged

The community leaders were asked to name the organisations to which they belonged. A list of such organisations is reflected in Table 5.15.

Table 5.15: Distribution of community leaders according to the organisations to which they belonged, 1996, (n=30).

Category	No.	%
National African Farmers Union	10	33
South African Agricultural Union	6	20
United Christian Democratic Party	2	7
None	12	40
	30	100

Forty percent of the members did not belong to any organisation while 33% belonged to National African Farmers Union (NAFU), 20% belonged to South African Agricultural Union (SAAU) and 7% belonged to United

Christian Democratic Party (political party). It is clear that a large percentage of the members of the community did not belong to any organisation. The reason might be that the E.O. did not motivate the people to join the farmers unions or members did not realize the advantage of belonging to such farmers unions.

5.3.5.9.2 The strongest and the most influencial organisation in Ganyesa area

The community leaders identified the two farmers' unions (NAFU and SAAU) as the strongest and most influencial organisations. When asked to state the reason for such evaluations, they indicated that at meetings the possibilities of inviting more buyers to the livestock auctions to improve the prices were discussed.

5.3.5.10 Discussion

The majority of the community leaders indicated that their source of information on livestock production is the local E.O. although they still experienced problems with the death of calves at birth (5.3.4.1.1). This indicates that the community did not receive enough information on fodder flow planning. It was observed that the cows in Ganyesa area do not have a calving season and may even calve in winter when the quality of grazing is exceedingly poor. In order to solve this problem, the E.O. should motivate the community members to obtain crop residues from neighbouring farmers to feed their cattle during winter. The E.O. should also emphasize the importance of planning the communal grazing areas into grazing camps. In this way bulls could be kept in a separate camp so that mating could be controlled.

The community members indicated that they do consult the E.O. about livestock management but low prices at the livestock auctions (5.3.4.1.2) are discouraging. Such low prices occur during winter when livestock are in a poor condition. The E.O. should, therefore, motivate farmers to sell their livestock before the onset of winter, when livestock are still in a good condition and prices are still high.

It has been found that the contact between the E.O. and farmers is irregular (5.3.5.4). This problem could be solved by individual visits of the extension agent to the farmers. Such visits although costly are the most effective extension methods, because they facilitate concentration on particular problems of the farmer and because they demonstrate the interest of the E.O. in the problems of the individual farmer (Mosher 1978). Regular visits by the E.O. to the individual farmers, result in greater trust and interaction but because of the high costs involved in individual contact, the extension agent should mostly apply group methods and only when necessary resort to individual contacts.

While it is the perception of many community members that people who have more cattle are the best farmers, it is the duty of the E.O. to motivate members to run their farming as a business in which the optimum number of livestock are maintained in good condition (even in winter) and a reasonable living is made without degradation of the resources.

As members attend very few farmers information days (5.3.5.7), it is important that the E.O. makes greater use of this channel of communication to transfer information on livestock farming.

The majority of the community members do not belong to any organisation. The E.O. should, therefore, motivate the members to register as members of the farmers' unions even if they do not own large numbers of livestock. The benefits they would derive by joining the farmers' unions should be emphasized. This will also help the E.O. because the members of the community will obtain information on livestock farming from their farmer colleagues in the farmers' unions.

CHAPTER 6

CO-OPERATION

6.1 Co-operative societies

Co-operation, whether for the sake of farming, hunting, looking after livestock and even for self defence, has characterized the history of human development everywhere in the world. However, the transitional, legal and institutional aspects of co-operative schemes came into being relatively recently, in various parts of the world (Kaya & Rapoo 1992). Kaya & Rapoo (1992) indicated that, in the area previously known as Bophuthatswana, traditional co-operation took a number of different forms. There was co-operation both in the field of crop and animal production. As in other parts of Africa members of a village community participated in some agricultural activities, such as land clearing, weeding and harvesting for a member of the community, who requested them to do so. There were also co-operation with respect to livestock care. For this kind of co-operation, there were invitations for drinks and feasting together, as a token of goodwill for the participants.

Traditional forms of co-operation were basically for subsistence, with limited independent exchange outside the family and clan membership. In these old forms of co-operation, the integration of diverse production, distribution and consumption systems rested on family and clan structures. Like in most pre-industrial and pre-capitalist societies, the division of labour among the co-operators was mostly based on sex and age (Kaya & Rapoo 1992), citing Campbell (1983). With the introduction of modern forms of co-operation,

traditional ways of co-operation are currently playing a less significant role. The introduction of a cash economy has brought about a differentation between the socio-economic contexts of production, distribution and consumption. Money has gained the command in the circulation of goods and services. It has also undervalued familial and clan sanctions and the solidarity that governed the traditional forms of co-operation. However, traditional, or even modern, forms of co-operation have often been confused with co-operative societies. For instance political and charitable organisations have been confused with co-operative societies. This implies that in order for co-operative societies to be successfully launched, there is a need to define the boundaries of their activities and principles. The co-operators, the public and those entrusted to manage co-operatives should note that a co-operative society is a specific type of socio-economic organisation. In a co-operative society, the promotion of pooling financial resources, for profit making per-se is not a specific characteristic of the co-operative as is often emphasized. The economic interests of members should be qualified in accordance with co-operative principles (Kaya & Rapoo 1992), citing Duma (1989).

In considering the domains of co-operative activities, one fundamental issue always needs to be recognized i.e. the traditional socio-economic links which existed prior to the formation of the co-operative society. Studies in various developing countries have shown that one of the fundamental failures of co-operative societies in these countries has been that they are often organized and managed by people whose traditional links with that specific socio-economic activity is minimal. For example, cattle rearing co-operatives would do well in an area, and amongst people, where cattle keeping has been a vital

economic and cultural factor. The above implies that it is proper to encourage co-operatives in the socio-economic activities known to the people and where their interests are strong.

6.2 Procedure prior to obtaining registration as a co-operative

Kaya & Rapoo (1992) indicated that according to the Bophuthatswana Co-operative Act of 1977, (No. 20 of 1997) no Co-operative shall be registered by the Registrar unless there has been present at least the minimum number of persons competent to form such a co-operative. The following documents should also have been presented at this meeting i.e. a written statement showing: the objectives of the co-operative; its business prospects, and facts and statistics calculated to show that, when registered, it will be able to carry out its objectives successfully; a copy of the regulations it is proposed to tender for registration.

After considering the statement and regulations, each of the qualified persons competent to form a co-operative, signs an application for membership in the proposed cooperative. They will then proceed to elect the first management committee of the co-operative, in accordance with the provision of the Bophuthatswana Co-operative Act. Within two months after the meeting of the Co-operative founders, the application for registration of the Co-operative society is sent to the Registrar of Co-operatives. The application should be accompanied by the following documents:

(a) a solemn declaration, or affidavit, by persons who acted as chairperson and secretary respectively at the founding meeting, to the effect that all the requirements of the Act in respect to registration of a co-operative have been complied with;

(b) a copy of a written statement showing the objectives of the co-operative, its business prospects and statistics calculated to show that, when registered it will be able to carry out its objectives successfully.

(c) two copies of the proposed regulations signed by not less than ten applicants for membership of a primary agricultural co-operative. Each of those signatures should be confirmed by at least one witness;

(d) a list containing:

(i) in the case of a primary co-operative society the full names, address, identity number, sex and occupation of the members of such co-operatives;

(ii) in the case of a secondary agricultural co-operative, the names and registered addresses of the primary agricultural co-operatives concerned;

(iii) in the case of a federal agricultural co-operative, the names and registered address of the secondary agricultural co-operative concerned;

(e) The permanent address of the registered office of the co-operative and the permanent address where the co-operative is to conduct its business.

6.3 **Model Regulations**

Any co-operative society which proposes to apply for registration in terms of the provision of the Bophuthatswana Co-operative Act may adopt as its regulations any or all of the model regulations, some of which are as follows:

(a) the proposed name of the co-operative, with the words "agricultural co-operative" as part of its name and the word "limited" as last word of its name;

(b) where the office and place of business are to be situated;

(c) the objectives of the co-operative;

(d) the manner in which the capital of the co-operative is to be raised or procured;

(e) the manner in which the profits which may result from the transactions of the co-operative shall be applied etc. (Kaya & Rapoo 1992).

6.4 **Problems of co-operative development in the area previously known as Bophuthatswana**

Co-operative businesses, like any other business, succeed to the extent that they are well managed. The limiting factor in nearly every case has been the lack of quality and vigour on the part of the manager, including management committees (Kaya & Rapoo 1992). Kaya & Rapoo (1992) indicated the following as some of the constraints limiting growth and development of co-operative societies, not only in the area previously known as Bophuthatswana, but in most African countries.

6.4.1 Lack of co-operative education

Due to illiteracy, or lack of co-operative education, members of the co-operatives are manipulated and misled by selfish leaders. This happens when leaders pass resolutions, which are contrary to members' interests and aspirations.

6.4.2 Ineffective supervision and control

The management of co-operative societies is the responsibility of management committees. But there are also staff employed by the co-operatives to carry out their businesses on a day to day basis. The employees are usually led by a manager or secretary. There is, however, an indirect management of co-operatives by the Government, usually by way of supervision, control and guidance. The Government role should be considered only as one of active helpfulness aimed at assisting them to develop to a more self sustaining level, especially in a situation where the co-operative movement is still in the infancy.

It has also been noted in the study by Kaya & Rapoo (1992) that the growth and development of co-operatives in the area have been hindered by lack of effective supervision. The laxity of both co-operative officials and Government, has been a limiting factor.

6.4.3 Lack of guidance in co-operative investments

There are two issues to be observed with regard to investments of co-operative societies. Firstly, it is normal practice, in co-operative business, to invest the surplus funds. When this is done, members should be issued with share certificates, equal to the amount which a member is supposed to receive in the form of dividends or bonuses. This means that the member

would also benefit from the profits earned from the investments. In the event of a member ceasing to be a member of a co-operative, the share certificate would be passed to his nominee or a member can be paid the amount shown in the share certificate.

If, however, a society wishes to invest with the aim to generate income for the society, members generally resolve to increase shares for such a project. Nevertheless, they may also decide to apply for a loan. But there must be a careful study of the project, so that a detailed feasibility report is presented to the members for consideration. There are cases noted, where management committees have used undue influence on members, such that resolutions by members are mere rubber stamps. In such cases, one is likely to find that the cost of projects have been inflated, so that the committee members get a share.

When a co-operative society plans to invest, the most important aspect to consider are the members. Is the project in line with the society's objectives? Will members' interests not be compromised by undertaking this investment? What benefits will members derive from it, in the short -term and/or in the long - term? What are the short-term or long term financial implications?

Are members' funds going to be tied up for long periods? These are some of the issues which committed co-operative leaders, must be satisfied with, before they decide to ask the members to approve the investments.

CHAPTER 7

DESCRIPTION OF THE ATAMELANG BARUI POLAR CO-OPERATIVE BEEF RANCH

7.1 Historical background and geographical situation

The members of Atamelang Barui Polar Co-operative Beef Ranch (ABPCBR) come from Ganyesa village. Besides the Co-operative Ranch, the members of the Ranch also have livestock in the Ganyesa communal grazing area and on leased farms in the vicinity of the Co-operative Ranch. The (ABPCBR) is surrounded by leased farms with a State Beef Production Project (Radobil) also adjacent. The Beef Ranch is +-60 kilometers from the Ganyesa village and +-130 kilometers from Vryburg, which is the nearest town from which supplies could be obtained. The Ranch is, therefore, far from town and it is expensive to bring inputs to the Ranch. This statement is further corroborated by Sebotja (1991), that the geographical situation of a farming unit is an important factor, in as far as it determines the cost of variable inputs and the price of the products, and thereby further affects the gross margin of an enterprise.

7.2 Climate

ABPCBR is in the Ganyesa district. Ganyesa is situated at 24° 10'E, 26°35'S. The area is very hot in summer, the hottest month being January (32.2° c) and very cold in winter, the coldest month being July (0.2° c). The area experiences strong dusty winds during August.

The average rainfall is low i.e. 469.3mm per annum and is concentrated in a short summer growing season.

There is no weather station in the Ganyesa district. The rainfall data obtained from the Weather Bureau Station on Armoedsvlakte Research Station, near Vryburg, has been used to depict the rainfall situation at ABPCBR.

Table 8.1: Average monthly rainfall on Armoedsvlakte Research Station.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
mm	86.5	81.4	74.8	43.9	14.7	8.2	2.6	6.0	11.3	31.7	45.5	62.2	469.3

The average monthly maximum (M) and minimum (m) temperatures for the Armoedsvlakte Research Station are presented in Table 8.2.

Table 8.2: Average monthly maximum (M) and minimum (m) temperatures for Armoedsvlakte Research Station.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
M°C	32.2	30.5	29.0	25.9	22.7	19.5	20.0	22.8	27.1	29.1	30.5	31.9
m°C	16.9	16.2	14.3	9.7	4.4	0.7	0.2	2.7	7.6	11.5	14.0	15.7

8.3 Soils

A survey of the soils on the ABPCBR was conducted (Van Heerden 1995). Apart from an old cultivated land, 23 representative sites were identified. These sites were all classified as belonging to the Clovelly form, Setlagole family. These sandy soils would be suitable for the establishment of A pubescens. This grass requires a sandy soil with a minimum annual rainfall of 250mm.

On the old cultivated land, two soil forms have been identified. The Molopo soil form, the soil family being Pomfret, and the Clovelly soil form, the soil family being Setlagole.

7.4 Vegetation

The main vegetation in this area is the Savanna formation. The veld type is the Kalahari thorn veld (Acocks 1988).

Due to the fact that the soil form on the whole farm is very uniform, the vegetation is also homogenous. It is only in the depressions where there is an increase in certain tree species but the botanical composition of the grass layer remains essentially the same.

The tree species of general occurrence are; T. camphoratus, G. flava, T. sericea, D. cinerea, A. mellifera, A. haematoxylon, and Z. mucronata. In some areas (deep sandy soils), T. sericea is the predominant tree species but in the depressions, A. mellifera tends to be predominant.

The data in Table 3.1 regarding the survey on tree species on the farm of the sites (4,5,6,7,8,9,10 and 11), there was a high percentage of trees of less than one metre high. In this situation, by the year 2000, should all these small trees survive and grow, these densities will pose a serious problem. This increase is, therefore, a problem which should receive priority attention.

The grass species of general occurence are: A. pubescens, B. nigropedata, D. eriantha, S. pappophoroides, S. Uniplumis, E. lehmanniana, E. rigidior, A. meridionalis, A. stipitata, S. kalaharensis, P. squarrosa, E. pallens, M. repens, A. congesta and T. berteronianus.

The grazing capacities as determined (chapter 3.2.2) are as follows: 28 ha/M.L.U; 27 ha/M.L.U; 22 ha/M.L.U; 20 ha/M.L.U; 11 ha/M.L.U and 10 ha/M.L.U.

Due to lack of drinking water in certain grazing camps, the grazing capacity, as determined, differs from one area to another. The areas which have no water, have not been heavily utilized in the past and the grazing capacities are relatively high (11 ha/M.L.U and 10 ha/M.L.U) whereas in areas which have access to water, utilization has been heavier, and the current grazing capacities are poor (27 ha/M.L.U and 28 ha/M.L.U).

7.5 Infrastructure

7.5.1 Fences

The ABPCBR has been planned and divided into nine blocks of four grazing camps each (36 grazing camps). The condition of the fences on some of the internal grazing camps is, however, poor. Some of the gates are broken and need to be replaced.

7.5.2 Watering points

Water is the major problem on the farm. Most of the grazing camps have no water because the windmills are broken, some boreholes are not in good working condition, others are not equipped with windmills and the reservoirs in some of the grazing camps are in poor condition. This situation has led to uneven utilization of the rangeland (some grazing camps are underutilized and others are overutilized).

7.5.3 Roads and firebelts

There is a road running through the middle of the farm from North to South (appendix E). The firebelts along the fences are poorly maintained. Apparently these were made some years ago but have not been maintained. Trees have developed along the fence which make it difficult to travel along the fence in a vehicle during the inspection trips.

7.5.4 Livestock handling facilities

There is a crushpen for the immunization of livestock and the dosing of cattle against internal parasites. The crushpen is still in good condition. The treatment of cattle against external parasites is irregular or ineffective, as has been observed by the presence of ticks on the cattle. Although there is a dipping tank on the farm, the cattle are not trench dipped because the herdsmen claim that the cattle are aggressive and do not want to get into the trench and, therefore, whenever cattle are treated for external parasites, a tick grease or a spray is used which is evidently not effective as it should be.

CHAPTER 8

THE SYSTEM AS CURRENTLY PRACTISED IN THE STUDY AREA

8.1 Introduction

ABPCBR was started in 1977. It is a farm of 9776 ha in extent. The members of the Co-operative were given Polar farm by the State on condition that they keep it in such a manner, that it remains a model farm for good livestock and veld management for the individual farmers on leased farms and particularly to farmers in the communal grazing area. The farmers, therefore, did not pay any fee towards using the farm. From information from the Assistant Secretary (Rakgwale 1995), the members were informed that, once allowed to use the farm, they would have to maintain it.

From information from the members, the Co-operative apparently started well, the farmers visiting the Ranch regularly, but later on, the activities of the farmers at the Co-operative deteriorated. The main problem appears to be poor management. It, therefore, became necessary to review the management system.

The farmers who started the ABPCBR are from Ganyesa communal grazing area (GCGA). It was also necessary to investigate the management of livestock in G C G A and to ascertain whether the attitude of these farmers from GCGA had not contributed to the retrogression in the management.

8.2 Social aspects of the farmers

8.2.1 Introduction

In this section the social aspects of the farmers of the ABPCBR are discussed. The aim is to ascertain whether certain characteristics of the members have contributed to the constraints on their farming activities.

8.2.2 Personal factors

Personal factors include sex, marital status, occupational status, age and level of education.

8.2.2.1 Sex and marital status

Gender plays a very important role in agriculture. In general, men are physically capable of coping with all the farming practices that may be recommended by the extension agents. On the other hand, women, even if they are better educated, often need mens' help to carry out certain activities in farming (Tshenkeng 1985).

Marital status also plays a major role in agriculture, especially in rural areas, where certain duties, such as the management of livestock and cultivation practices, except weeding, are assigned to men. On the other hand women are assigned duties such as cooking, fetching water, collecting firewood and weeding while the crops are growing. This means that an unmarried farmer is confronted with all the duties mentioned above and is, therefore, unlikely to be successful in all of them (Tshenkeng 1985). This statement is supported by Mtsotso (1982) who stated that married men are likely to progress faster in agriculture than unmarried men because they are being helped by their family members. Table .1, illustrates the distribution of the members of ABPCBR according to sex and occupational status.

Table 8.1: Distribution of the members of ABPCBR according to sex and marital status, 1995, (n=14).

Category	No.	%
Married men	13	93
Single men	Nil	Nil
Widowers	Nil	Nil
Widows	1	7
	14	100

As can be seen the majority of the farmers (93%) are married men and should, therefore, have a better chance of success in farming.

8.2.2.2 Occupational status of the farmers

Occupational status plays a very important role in agriculture. If a higher percentage of the physically able men supplement their income by working in urban areas permanently, or as monthly commuters, the progress in farming is often detrimentally affected as women, old men and inexperienced young men tend to be less successful in farming (Tshenkeng 1985). Theisen (1976) indicated that the absence of the male head of the family, over long periods of time, had a serious effect on the ability of the family to adjust. Theisen (1976) further stated that the stress and the loss of cohesion of the family unit caused by the absence of the head gave rise to a degree of functional disorganization within the family. For example, the wife may suddenly find herself unable to cope with the added responsibilities such as making kraal compost and dealing with livestock, which are traditionally men's work. This may result in a reduction in crop yields and livestock production which, in turn, would have a significant influence on the nutrition and health of the family. Table 8.2 shows the members of the Atamelang Barui Polar Co-operative Beef Ranch according to their occupational status.

Table 8.2: Distribution of the members of ABPCBR according to their occupational status, 1995, (n=14)

Category	No.	%
Permanently at home	12	86
Daily commuter	2	14
	14	100

Eighty six percent of the members of ABPCBR are permanent residents. The opportunity for the farmers (members) to visit the Co-operative frequently and improve the management practices and livestock production should, therefore, be good (especially as most of them have vehicles).

8.2.2.3 Age

Age plays an important part in agriculture. Smith and Zopt (1970), as cited by Bembridge (1975), in their study of the sociological effects of age, stated that an individual's age is one of the most important personal characteristrics, since the way a person thinks and behaves and their needs are closely related to age. Figure 8.1 shows the distribution of the members of ABPCBR according to age.

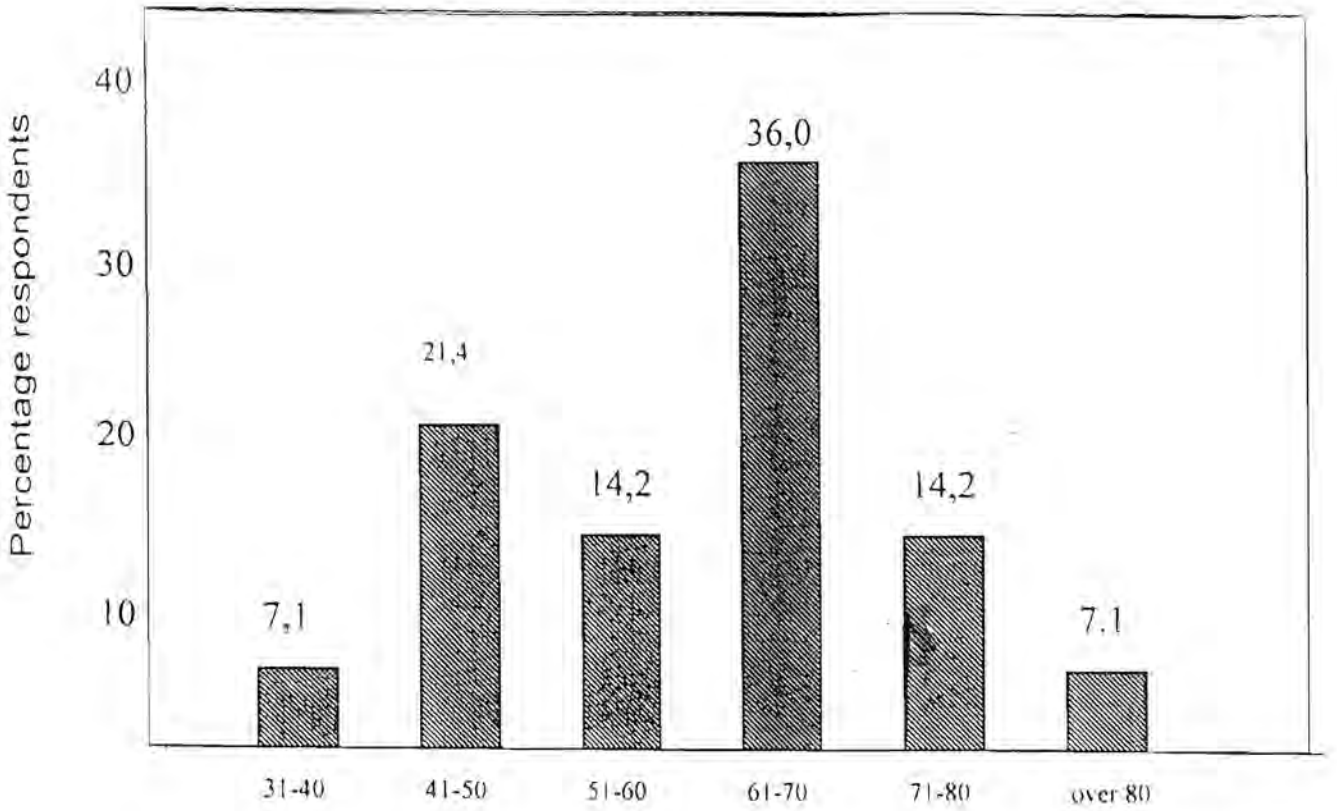

Figure 8.1: Distribution of the members of ABPCBR, according to age 1995 (n = 14)

Figure 8.1 shows that the majority of the farmers (57,3%) were older than 60 years of age. This group of the Co-operative members would be less likely to visit the Co-operative regularly to check on whether the veld and livestock were being managed correctly. Hence the management of both veld and livestock would tend to be poor on the Ranch.

8.2.2.4 Level of education

Education plays a very important part in agriculture. Generally, farmers with some education are able to obtain farming information from written material such as magazines and newsletters. Such farmers tend to be receptive to new ideas, especially if the new ideas are related to information which they obtained from magazines (Tshenkeng 1985).

Leseme (1983) states that the potential of humans must be realized by education and training, before they can become key factors in the development process. The distribution of the members of ABPCBR in terms of education is reflected in figure .2.

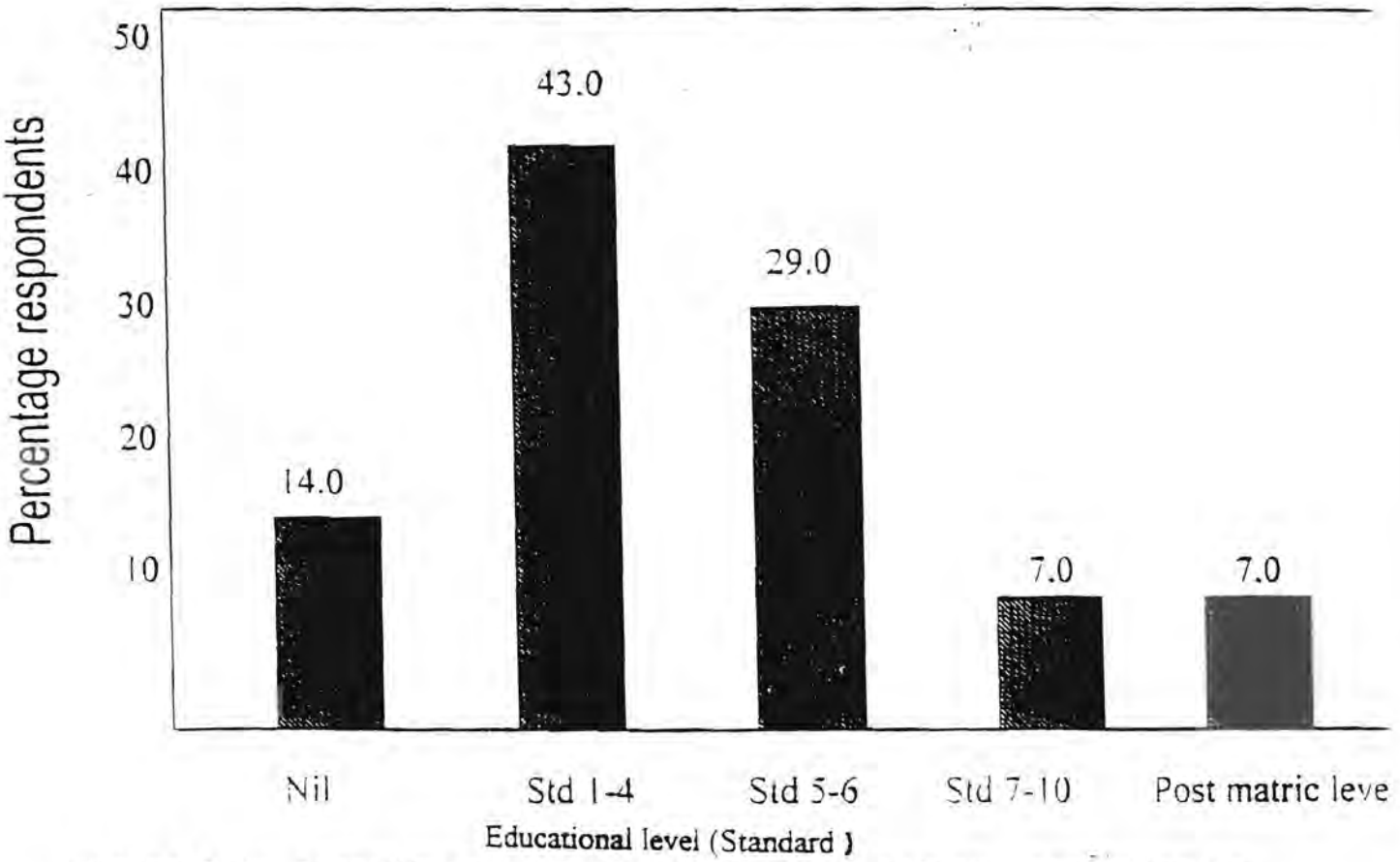

Figure 8.2: Distribution of the members of ABPCBR, according to the level of education, 1995, (n=14).

These data indicate that 14% of the members of the Co-operative Beef Ranch have never had an opportunity of schooling, while 43% had a level of education of between Std I and Std 4, 29% a level of between Std 5 and 6, 7% a level between Std 7 and 10 and 7% a post matric level. Although the majority of the members had a low standard of education (between Std I and Std 4), considerable progress in agriculture may be achieved, if the correct approach is applied. Steyn (1982), states that care should be taken not to forget that illiterate people can take initiative if approached and involved properly.

8.2.3 Discussion of the personal factors

The majority of the members of ABPCBR are permanent residents. The members should, therefore, have the opportunity to visit the ranch frequently to help in the management of veld and livestock and to inspect the infrastructure (for example, the broken windmills and broken fence lines). Unfortunately ABPCBR is characterized mainly by older members and the Ranch is about 60 kilometers from the Ganyesa village, where the majority of the members live. It is evident that these older members would be less likely to visit the Ranch regularly. This means that such members should be motivated to arrange that their family members should visit the co-operative on their behalf and help in the management of the veld and livestock.

A high percentage of the members of the Co-operative (43%) have an education of between Std I and Std 4. Since all the members of the Co-operative own livestock on the Ranch and in the GCGA, they should, therefore, have considerable experience of farming and there should be no problem in motivating them to accept new ideas on farming.

Considering the number of years spent as members of the Co-operative (most of them 18 years), the farmers should be committed to the management of the Co-operative. Observations on the poor management of the Co-operative would, however, seem to indicate that the members of the Co-operative have stronger commitments elsewhere.

All members of the Co-operative (although others mentioned other sources also) indicated that they obtain information on the management of the veld and livestock from the extension officers. The situation

regarding the management of the veld and livestock at the Co-operative does, however, indicate that the farmers were not applying this information.

8.2.4 Farming experience of the members of the Co-operative

Experience plays a very important role in farming especially where the level of education of the farmer is low. His/her experience in farming facilitates his/her receptiveness power for new ideas. Table 8.3, shows the distribution of members of ABPCBR, according to their farming experience on the Ranch.

Table 8.3: Distribution of the members of ABPCBR according to their farming experience on the Ranch, 1995, (n=14)

Category	No.	%
18 years experience	11	79
11 years experience	1	7
5 years experience	1	7
1 year experience	1	7
	14	100

The majority of the members of the Co-operative (79%) had been farming at the Co-operative since its inception. By 1995, they had already completed 18 years as members of the Co-operative. This means that they should have gained enough experience to realize good profits from the Co-operative.

8.2.5 Sources of information on the management of the veld and livestock

A source of information is an individual or institution that originates a message (Bembridge 1975, citing Rogers and Shoemaker 1970). The communicator gives expression to a message intended to reach the audience in a manner that results in correct interpretation and desirable responses. The credibility of the communicator, as perceived by the

audience, is a key factor determining the effectiveness of the communication (Smith 1971, cited by Bembridge 1975). Table 8.4 illustrates the distribution of the members of ABPCBR, according to the sources of information on the management of the veld and livestock.

Table 8.4: Distribution of the members of ABPCBR, according to the sources of information on the management of the veld and livestock, 1995, (n=14).

Category	No.	%
Extension officers only	11	79
Extension officers and own experience	1	7
Ext. off., adjacent white farmers, farmer colleagues and own experience	2	14
	14	100

Table 8.4, indicates that the majority of the members of ABPCBR get information on the management of veld and livestock from the extension officers. Considering the poor level of management of the veld and livestock observed at the Co-operative, it would appear that the farmers were not applying this advice. The E.O's might not have been utilizing the various recommended channels. The most common channels include, meetings of all kinds, radio, books, bulletins, letters, newspapers, organized tours and personal contacts (Leagan 1961, cited by Seobi 1980). Seobi (1980), citing Bembridge (1978), further stated that research has shown that for effective communication, at least five channels need to be used, each supplementing the other in a planned and orderly manner.

There was no E.O. assigned specifically to the Co-operative. The E.O. who was servicing leased farms, adjacent to the Co-operative Beef Ranch, helped the

members of the Co-operative in the management of the Ranch. The same E.O. had committed himself to helping the farmers by delivering mineral licks with his official vehicle. The basic philosophy of agricultural extension is to help people to help themselves. This can be achieved through an effort to achieve the objectives of extension viz. (i) to motivate people and to help them to develop and improve their agriculture and rural life; (2) to create incentives which will lead to optimum economic agricultural production; (3) to improve the image of farming and status of extension workers (Seobi 1980). After a meeting with the E.O. and Co-op members, there was a discussion that the farmers should appoint a manager for the Co-operative. This step was taken because it was realized that the members of the Co-operative did not have a sense of ownership and depended on the E.O. for all the management activities on the Ranch.

8.3 Livestock production

Livestock production is the major component of agricultural production in the so-called Black States of South Africa because 80 to 86 percent of these areas can potentially only be utilized for grazing (Steyn 1982) Steyn (1982) further stated that approximately 58 percent of the gross value of agricultural production can be attributed to livestock and that the gross returns on total livestock units in such areas was R1,66 per livestock unit compared to R46,90 in the commercial farming sector of the Republic of South Africa (Benso 1978).

8.3.1 Livestock management

Management plays a very important part in the livestock production, because it determines the success of the farming business when all other factors are normal

8.3.1.1 Farmers visits to the Co-operative

The management of livestock at ABPCBR is generally poor. Members visit the Ranch only occassionally. When asked on their visits to the Co-operative, eight (57%) out of the 14 members of the Co-operative Beef Ranch reported that they visit the Co-operative only once a month, and six (43%) reported that they visit the Co-operative only once in two months. The frequency of visits to the Ranch is very poor and hence the management of the veld and livestock is also poor. The problems experienced with livestock, as identified by the members during their visits, are presented in Table 8.5.

Table 8.5: Identification of problems by Co-operative members during their visits, 1995, (n=14)

Problems experienced	No. of respondents	%
Lack of water	6	43
Poor condition of livestock	3	21,4
Deaths due to diseases	2	14,3
No mineral licks	2	14,3
Rotation of camps not regular	1	7
	14	100

The largest proportion of the Co-operative members (64%) indicated that lack of water in the grazing camps, and poor condition of livestock were the major problems. The cause of lack of water was ascribed to insufficient boreholes and broken windmills. Members felt that the State should do the work. If they were committed to the Co-operative, they would have repaired the broken windmills themselves, drilled sufficient boreholes to supply all grazing camps with water, and tested the strength of the existing boreholes with the aim of gravitating water to the different watering points. Although some members felt that the problem could be solved by drilling more

boreholes, they did not feel that it was their duty to see to the broken windmills, despite the pre-condition that they undertook to maintain the farm (8.1). Some windmills had been broken for three years and nothing had been done to repair them.

8.3.1.2 Feeding of mineral supplements

Mineral nutrition plays a very important part in livestock production in this area. Minerals support a wide range of functions in the body:

- the composition of skeleton and teeth,
- maintenance of osmotic gradients and exchange of ions
- surface electrical activity and irritability of muscles and nerves.

The adequate supply of, and balance between, minerals are essential. Mineral imbalances in animals on veld are related to soil quality. Large regions in Southern Africa are phosphorus deficient (Casey & Maree 1993). It is, therefore, necessary to correct this deficiency by supplying phosphorus licks. The response with respect to supplying mineral licks is tabulated in Table 8.6

Table 8.6: The frequency per month, of feeding mineral licks on the Co-operative, 1995, (n=14)

Frequency month	No. of respondents	%
Once	6	43
Twice	4	29
Thrice	1	7
Four times or more	3	21
	14	100

The confused response on this aspect indicated that the members did not know about the desired frequency of feeding mineral licks. The feeding of such licks at the Co-operative was poor. It was observed that the troughs for mineral licks were often empty. Phosphorus deficiency was also observed in cattle, especially with the old cows. The affected animals moved with symptomatic stiff short gait, hump-backed and the abdomen tucked under the body.

8.3.1.3 Treatment of cattle against ticks

The members of the Co-operative were asked the frequency of dipping cattle against ticks and the majority (36%) reported that the treatment was applied only once a year, using the tick grease. Although tick infestations on cattle are generally not a serious problem in the area, the general opinion is that annual treatment against ticks is inadequate.

8.3.1.4 Stock theft at the Co-operative

Stock theft is a serious problem in the Ganyesa district. The members of the Co-operative stated that they were also experiencing problems with cattle theft. When asked what steps they took to solve the problem, the members of the Co-operative stated that they reported the matter to the police. The fact that most members only visited the Co-operative once per month, is an indication that their livestock control was poor and that cattle theft could develop into major problem.

8.3.1.5 Herd composition

The members of the Co-operative were requested to describe the herd composition at the Co-operative. All respondents knew that the herd was divided into groups such as cows, heifers, steers and bulls, but none of them had any idea of the number of livestock

in each group. This situation illustrated the lack of attention to their cattle on the Ranch. The herd composition at ABPCBR as determined by the E.O. was as follows:

Cows	150	
Calves	90	(0,5 x 90 = 45 M.L.U)
Heifers	45	
Steers	48	
Bulls	6	
Total	339 cattle (294 M.L.U).	

8.3.1.6 Cattle owned at the Co-operative as well as on leased farms and in the communal grazing area

All Co-operative members reported that apart from cattle on the Co-operative Ranch, they also owned cattle in the GCGA and on leased farms. This situation was purported not to affect the management of the Co-operative. Although members stated that owning livestock at the Co-operative and on communal grazing area did not affect the management of the Co-operative, there is a strong feeling that each farmer (member) is more committed to their livestock closest to home, or on leased farms, and thus has little time to pay attention to the Co-operative. The members have been advised to appoint a manager for the Co-operative in an attempt to improve the level of management at the Co-operative.

8.3.1.7 The type of breed kept

The members brought cattle on to the farm at the start of the Co-operative. The breeding herd for the Co-operative was selected from their herds. Each member selected and brought in a certain number of cows and heifers from his own herd. Livestock were then improved by upgrading i.e. putting in improved sires to improve livestock. With respect to the breed of

bulls used, there appear to be a considerable confusion. Initially two bulls (Hereford and Drakensberger) were donated by the then President of Bophuthatswana with the aim of helping the members to improve their livestock. The other bulls (Brahman, Simmentaler, Pinzgauer and Bonsmara) were brought in by the members themselves. Most of the cattle on the Co-operative are thus crosses of the abovementioned breeds.

The Co-operative is situated in a semi-arid area and cattle breeds such as the Hereford, Simmentaler, Pinzgauer and even the Brahman have been observed to lose a lot of condition during winter, which indicates that such breeds are less suited for such a system, because of their high maintenance and management requirements.

8.3.1.8 Reproduction

All the members of Co-operative indicated that they rear cattle in order to sell them for profit. This statement, therefore, shows that at least the members of the Co-operative regard farming as a business undertaking, although their management might be unsatisfactory. The reproductive and mortality rates of cattle on the Co-operative Ranch are presented in Table 8.7.

Table 8.7. Reproductive and mortality rates of cattle at ABPCBR, 1995.

Reproduction and mortality	No	%
Cows	150	-
Calves born	90	60
Calf mortality	14	16
Calves weaned	76	84

The average calving percentage was sixty percent. This might have been caused by low level of nutrition since cattle were mostly concentrated in the grazing camps which had water, which, therefore, were over-utilized and degraded. The calves are entirely dependent upon milk in their initial growth stage, prior to their being able to utilize natural grazing. High calf mortality (16%), might have been caused by insufficient milk from the cows due to low level of nutrition and poor nutrition when they started to utilize the natural grazing. This situation has led to a low weaning percentage (84%).

8.3.1.9 Marketing of livestock

Marketing plays a very important part in any business. It is, therefore, necessary that before a farmer starts any enterprise, he should first determine whether there will be a market for that commodity. Forty-three percent of the members of ABPCBR reported that culling and selection exercise is done once in two years and thirty-six percent stated that it is done once a year, whereas twenty-one percent stated that it is not done. This situation indicates that members do not visit the Co-operative regularly and do not know how these activities are applied at the Co-operative.

The current stocking rate on the Co-operative Ranch is 294 M.L.U (on 9776 ha, this is equal to 33ha/M.L.U) compared to 960 M.L.U (10,2 ha/M.L.U) in 1980. The number of cattle on the farm has thus declined considerably. Although a high percentage of the cattle have been sold, and also a certain percentage given to members as a share, a percentage died in the veld due to poor management of livestock. On two occasions, the remains of animals in the veld were identified, which the members of the Co-operative did not know

The farmers sell their livestock at the Tswana Livestock Auctioneers (local livestock auctioner). They were not, however, satisfied with the price offered for their cattle, mainly because there were too few buyers and there was not enough competition in bidding for livestock.

8.4 Range management on the Co-operative

Basically, range management deals with the use of land of low potential productivity maintained under extensive systems to produce water, red meat, fibres, hides, wildlife, timber and recreational opportunities in such a way that the basic resources (soil and vegetation) remain unimpaired (Stoddart, Smith & Box 1975). Stoddart, Smith & Box (1975) further indicate that range management is the science and art of optimizing the returns from rangelands in those combinations most desired by and suitable to society through manipulation of range ecosystems.

8.4.1 Problems experienced by members of the Co-operative regarding the veld

The problems are presented in Table 8.8

Table 8.8: Distribution of members of ABPCBR with respect to veld problems, 1995, (n=14).

Problems experienced	No. of respondents	%
Poor grazing condition	9	64
Bush encroachment and poor grazing condition	4	29
Under-utilization of some of the grazing camps	1	7
	14	100

Sixty-four percent of the members indicated that the major problem is poor grazing condition. In fact 93% of the members have mentioned poor grazing condition as the major problem. It was also found that 29% of the members reported bush encroachment as one of the problems they experience, with 7% indicating that some of the grazing camps were under-utilized. The statement that some camps are under-utilized indicates that they realize that there is a problem but lack the commitment to attend to such a problem, or seek advice to solve such a problem.

8.4.2 Causes of problems in the veld

The causes of the veld problems, as identified by the Co-operative members, are tabulated in Table 8.9

Table 8.9: The distribution of the members of ABPCBR, according to the causes of veld problems, 1995, (n=14).

Causes of the problems	No. of respondents	%
Lack of rain	7	50
Veld fires and lack of rain	2	14,3
Continuous grazing	3	21,4
Lack of help from water supply authority	2	14,3
	14	100

Table 8.9 shows that 50% of the members of the Co-operative indicated that the basic cause of the veld problems was drought. A further 14,3% indicated the cause to be veld fires and lack of rain. Altogether 64,3% of the members indicated that the basic cause of poor grazing condition was the lack of rain. Some members 21,4% stated that the cause of the problem experienced regarding the veld was continuous grazing and 14,3% reported that the cause of the problem is that they do not get help from the Water Supply Authority. Although 64,3% of the Co-operative members

reported the cause of the problems they experienced to be lack of rain, there are areas on the Ranch where the condition of grazing is good (with the grazing capacity of 10ha/M.L.U and 11 ha/M.L.U), as compared to other areas which are in poor condition (20 ha/M.L.U, 22 ha/M.L.U and 28 ha/M.L.U). This is a clear indication that poor management and not lack of rain is the primary cause of poor veld condition. The fact that the members of the Co-operative do not get help from the Water Supply Authority should not be a problem because the Co-operative is an independent body and the members could arrange for private contractors to help solve the water problem mentioned in Table 8.5, more especially as they knew that they were responsible for maintenance (chapter 8.1).

The members of the Co-operative were given Polar farm to use, by the State on condition that it is maintained, and kept it in such a manner, that it remained a model farm for the demonstration of good livestock and veld management to the individual farmers on leased farms and particularly to farmers in the communal grazing area.

The Ranch has already been divided into grazing paddocks but most of these paddocks do not have water at present. In some of the paddocks, the windmills are broken and in others the boreholes have not been equipped. This situation has resulted in livestock concentrating in paddocks which have water and as a result these are over-utilized. The decline in grazing condition could thus be ascribed to both over and under-utilization.

8.4.3 Farmers solutions to the veld problems

Members offered several solutions, which have been tabulated in Table 8.10

Table 8.10: Distribution of the members of ABPCBR according to solutions of veld problems, 1995, (n=14)

Solutions of problems	No. of respondents	%
Water Supply Authority to help solve water problem	5	36
Drill more boreholes	2	14,3
Rotational grazing	3	21,4
Provide water in the grazing paddocks	1	7
Cutting of trees and rotational grazing	2	14,3
Reduce livestock	1	7
	14	100

Table 8.10 shows that 36% of the members of ABPCBR felt that the Water Supply Authority should solve the water problem on the farm. This statement indicates that the farmers were not clear on the pre-condition by which they were allowed to use the farm (chapter 8.1), because it is clear that they are not committed to the Co-operative and, therefore, act as though the Ranch belongs to the Department of Agriculture, and all associated organisations falling under it, and that these organisations are responsible for the maintenance of infrastructure.

The members of the Co-operative were fortunate because the basic infrastructure was provided i.e. fences were erected, boreholes drilled and equipped, chrushpen for handling livestock provided and a house for herdsmen. The then President of Bophuthatswana also donated two bulls. These bulls were given to the Co-operative to improve their livestock. In return, the Co-operative was to act as a source of information and demonstration for the adjacent farmers on the correct management of livestock and veld. Apparently the members have tended to think that the Department of Agriculture will always give them everything free of

charge and, therefore, expect help from the Department on aspects, which they themselves should do. This situation should once more be clarified.

The farmers were asked to indicate whether the "Rest" paddocks had been grazed. All of them (100%) replied in the affirmative, adding that they rest those grazing paddocks which do not have water. This statement indicates that the farmers do not have a clear idea of the reason for resting. The farmers, therefore, need more education on the reason for resting the veld.

8.4.4 The value of veld burning

Fire and its use in veld management is aptly summed up by the phrase "Fire - a bad master but a good servant". This is because, now, as in the past, a great deal of damage has been and is being done to the veld through the incorrect use of fire, resulting in a serious deterioration in the condition and productivity of the vegetation and widespread soil erosion. Conversely, research and the appreciation of the ecological role fire plays in the dynamics of natural ecosystem and plant communities, in particular, indicate that it can be a very important and useful tool in the management of vegetation (especially savanna) for livestock (Trollope 1989).

The members of the Co-operative were asked whether veld burning is of any value on the farm and all of them (100%) stated that veld burning is of no value and their reasoning was that veld burning leads to veld deterioration. At the Co-operative, because of lack of water in some grazing paddocks, the veld is under-utilized and this situation has led to moribund conditions and the deterioration of the veld. Most of the highly desirable grass species such as Anthephora

pubescens and Digitaria eriantha, which had developed in those areas have died because they have not been stimulated by grazing. This area, therefore, needs to be burnt to remove the dead grass and stimulate the highly desirable species to develop. The farmers, therefore, need education on fire as a management tool.

8.4.5 Situation with respect to bush density (Bush encroachment)

Encroachment can be defined either as the invasion of undesirable plants into an area where previously it did not occur or aggregation of existing undesirable plants in the area (Trollope et al. 1989). It was indicated by Donaldson (1966) that large areas in many parts of the world of once good grazing were virtually ruined, or in the process of being ruined, by dense encroachment of worthless bush. The value of grazing land may be completely destroyed by encroaching woody plants, and their eradication may cost more than the land is worth.

Donaldson (1966), citing van der Schijff (1964), further stated that in South Africa, where approximately thirty-three percent of the area is covered by bush, scrub or Savanna, it has been estimated that at least 12,847,500 ha of bushveld is largely damaged by the abnormal coppicing of bush or is endangered by bush encroachment. Donaldson (1966) further indicated that in the Orange Free State Region, it is mainly the Molopo area (now part of North-West Province), of the Vryburg, Kuruman and Mafikeng districts, which had been invaded by undesirable scrub plants. Donaldson (1966), citing Eberson et al. (1960) states that it has been estimated that over 856500 hectare of valuable veld of this area had been dominated by

black-thorn *A. mellifera* spp. detinens), a multi-stemmed undesirable thorny woody plant. The members of the Co-operative were asked to indicate whether the bush density on the farm had increased, had not changed, or had actually declined since the inception of the Co-operative Ranch. Their responses are tabulated in Table 8.11.

Table 8.11: Distribution of the members of ABPCBR with respect to their bush density on the farm, 1995. (n=14).

Bush density situation	No. of respondents	%
Increased	12	86
Unchanged	2	14
Declined	-	-
	14	100

The majority of the members of the Co-operative felt that the bush density on the farm has increased since the inception of the Co-operative. When asked what steps should be taken in the present situation, all members who stated that the density has increased, responded that the density should be controlled by chemical methods. Although the farmers indicated that bush encroachment should be controlled chemically, the control of bush by a chemical, although much faster, may be expensive, especially considering the large area that has been affected. The method of burning the stem would appear to be more affordable for the farmers. Although it might be a slow process, it is cheap to apply because the fuel used is dry dung, sawdust or wood. Donaldson (1967) indicated that burning the lower basal areas of the stems of blackthorn plants with dung, sawdust, wood, or with any other types of available fuel, offers an effective and relatively economical method of controlling this plant, provided that, the effective period of the burn

exceeds three minutes. It was further stated by Donaldson (1967) that, although this method of eradicating blackthorn is subject to various problems such as limited supply of readily available fuel, the shortage of labour and the slowness of the method, there is a reason to believe that these obstacles can largely be overcome.

8.4.6 Encroaching tree species

When asked to identify the most invasive tree or shrub species on the Co-operative Ranch, the members' responses were as follows (Table 8.12):

Table 8.12: Distribution of the farmers of ABPCBR according to the identification of invasive tree species, (1995, n=14).

Encroaching tree or shrub species on the farm	No. of respondents	%
Acacia mellifera	8	57,2
Dichrostachys cinerea	2	14,3
Acacia tortilis	1	7,1
Grewia flava	2	14,3
Acacia erioloba	1	7,1
	14	100

Most of the members of the Co-operative (57,2%) regarded A. mellifera (blackthorn) as the most invasive tree species on the Co-operative. It is clear that the basal stem burning method, recommended by Donaldson (1967), should be evaluated by the members of the Co-operative to control bush encroachment.

8.4.7 Grass species occurring on the farm according to the members of the Co-operative

The knowledge of grass species by farmers has a very important role in the management of the veld. If the farmers do not have the knowledge of grass species

occurring on his/her farm, he/she could easily overestimate the condition and grazing capacity of the veld. This could result in veld deterioration. The members of the Co-operative were asked to name the grass species which they identified on the farm of the Co-operative and also to evaluate their feeding value. Their answers have been tabulated in Table 8.13.

Table 8.13: Distribution of the members of ABPCBR according to grass species identified and their perception of feeding value, 1995, (n=14)

Grass species	No. of members and their perception of the feeding value of grasses						Total no respon-dents	
	Poor		Fair		Good			
Aristida congesta	8	57	4	29	2	14	14	100
Eragrostis lehmannia	10	71	3	21	1	7	14	100
Cenchrus ciliaris	11	79	2	14	1	7	14	100
Cynodon dactylon	5	36	3	21	6	43	14	100
Eragrostis pallens	7	50	6	43	1	7	14	100

Fifty seven percent of the members of the Co-operative Ranch recognized Aristida congesta as one of the poor grass species occurring on the farm. Aristida congesta is the predominant grass species in overgrazed areas on the farm, hence the members tend to note it well. The majority of the members (79%) indicated that Cenchrus ciliaris was one of the poor grasses occurring. Cenchrus ciliaris is very scarce on the Co-operative, hence the farmers do not know it. The farmers must have seen a sample of Cenchrus ciliaris or have been taken elsewhere because in the Ganyesa district, this grass is found only in the depression of earthen dams and along the tarred roads where it is not disturbed by grazing.

It is essential that the members of the Co-operative Ranch should be educated on the importance of different grass species occurring on the Ranch, as well as their feeding value, to enable them to monitor veld condition using the key grass species approach.

CHAPTER 9

RECOMMENDATIONS

9.1 The conditions of using the farm as a Co-operative

There was no written contract, between the co-operative members and the Department of Agriculture, that the co-operative should be used as a model farm and that farmers should be responsible for the maintenance of the farm, hence the farmers are not committed to the Co-operative. It is recommended that the conditions set for farmers on leased farms in the Ganyesa district should also apply to the farm of the Co-operative i.e. the farmers should pay the Department of Agriculture, a rental fee per hectare per annum for the grazing land, subject to an escalation clause. The farmers should be responsible for the maintenance of the farm (including infrastructure). There should be a written contract entered into, between the farmers of the co-operative and the Department of Agriculture. In the contract it should be clearly stated that if the farmers do not use the farm correctly, the Department has the right to take it from them. This contract should be signed by both, the members of the co-operative and the representative of the Department of Agriculture. In this way it is hoped that the farmers would be more committed to the Ranch.

9.2 Extension service

Due to a shortage of staff, there can be no extension officer who is solely responsible for the Co-operative, but the E.O. who is working on leased farms adjacent to the Co-operative should be responsible for extension service to the Co-operative members. The

E.O. should compile a training programme in this respect on the management of livestock and veld on the co-operative, as there should be opportunities to use this unit for demonstration purposes, as was originally intended.

The Extension Officer should visit the Ranch regularly i.e. at least once a week to check on the management of livestock and veld as well as infrastructure and discuss the problems identified with the manager and steps to be taken for their solution based on his (manager) level of decision making. He should arrange for meetings,(at least once per month) with the members of the co-operative to discuss problems, which the manager is unable to solve without the consent of the Co-operative members, particularly if large amounts of money are required. The E.O. should arrange for information days or farmers days on the activities on the farm such as dipping for external parasites and determining weaning weights. He should discuss inoculation and dosing programmes with the members of the co-operative. He should also conduct workshops and demonstrations on the activities of the farm such as castration of male calves, dehorning of cattle, inoculation for various diseases and dosing against internal parasites. The E.O. should train the farmers on the above mentioned skills so that at the information or farmers' days the members could demonstrate these activities to the invited farmers.

9.3 **The role of the Department of Agriculture on the Co-operative**

Senior officials of the Department of Agriculture, particularly those in the management position, should visit the Co-operative regularly to check on the

management of veld and livestock on the farm. They should check as to whether the skill training programmes compiled by the Extension Officer are being carried out, information days or farmers days (to which farmers from leased farms and communal grazing area are invited) are being held and that the co-operative is actually used as a model farm. In this way it is hoped that the members of the co-operative would become more interested in, and committed to the activities carried out on the Ranch, because they would know that they would have to demonstrate the activities on the farm to the farmers outside the Ranch.

9.4 Infrastructure

9.4.1 Fences

The fences on the farm need to be repaired, loose wires tightened and broken gates repaired or replaced in order to control livestock. The E.O. should motivate the members in their monthly meetings that they are responsible for the maintenance and repair of the broken fence lines. The E.O. should particularly emphasize to the manager that whenever the fence lines are broken, he should organize the herdsmen to repair them.

9.4.2 Water points

The water situation requires drastic attention. All grazing camps which do not have water need to be provided with water so that a rotational grazing and resting system can be applied.

9.4.3 Dipping tanks

There is a crushpen which is provided with a dipping trench. The farmers do not use a dipping trench but treat cattle with a tick grease because the cattle are not used to a trench. The fact that cattle are not

handled frequently makes them wild and it is, therefore, difficult to be forced into a dipping trench. Farmers should handle cattle regularly by inoculation and dosing practices. In this way farmers would be able to use the dipping trench more effectively, and even increase the frequency of dipping. In between the dipping trench frequencies, the tick grease practice could be applied.

9.5 **Breed of bulls to be kept**

Under the current level of management, the bulls that need to be kept should be hardy breeds such as the Sanga, Drakensberger, Bonsmara and Afrikaner. Heavier breeds such as the Hereford, Simmentaler, Pinzgauer and even the Brahman (with higher maintenance requirements) could be introduced as the level of management and nutrition is improved.

9.6 **Marketing of livestock**

Cattle that have been culled during the selection exercise should be sold to reduce the pressure on the overgrazed areas, or cattle to be marketted could be withdrawn from the veld and "finished" on Cenchrus or Anthephora. It is recommended that the culling and selection exercise be done before the winter season commences and thereafter, the farmers should arrange for buyers at the livestock auction as this usually results in higher prices at the livestock sales.

9.7 **Management of livestock**

9.7.1 Treatment of calves from birth to weaning age

The weight of calves should be determined at birth. The quality of grazing at this time should be good so that calves will get sufficient milk from their mothers and sufficient grazing when they start to utilize the veld grass. At the age of 4 to 6 weeks calves should be inoculated against paratyphoid

disease. Thereafter besides veld grass they should be provided with supplementary feed and mineral licks as required, and treated according to the scheduled inoculation and dosing programmes. At weaning the weight of calves should be determined again. This exercise enables the farmer to have a knowledge of the growth rates of the different calves as well as the mothering ability of the dams. This statement is corroborated by van Zyl, Maree & Seifert (1993) that weaning weight is an important trait in beef production, since weaners are usually the first marketable product in the beef herd and the weaning weight of the calf crop is a true indication of the cow's efficiency.

9.7.2 Condition of cows at calving

The condition of cows at calving is very important since it affects subsequent reconception rates. Properly planned supplementation is the key to the condition of cows at calving (van Zyl et al. 1993). Due to the poor condition of some of the grazing camps, supplementary feed in the form of crop residues and mineral licks should be provided to cows to keep them in a good condition and to enable them to produce sufficient milk for calves. The calving season should be planned in such a way that when the cows start calving there should be enough grass for the cows to perform well. It has been recommended, by van Zyl et al. (1993), that as a rule of thumb, the calving season should commence approximately 30 days before the first summer rains and that a high percentage (60%) of the calves should be born in the first 30 days of the season.

9.7.3 Management of bulls

It is a general statement that a bull is half the herd. This actually implies that the bull should be carefully selected and well managed to give the farmer

a good calf crop. The bulls should be kept in a separate paddock and only brought to the cows during the mating season. The bulls should be kept in a good condition, by supplementary feeding before being taken to the cows for mating, but should not be overfed. The bulls which are in poor condition are lazy and tend to lose the desire for mating. The members of the Co-operative should check on the bulls regularly to see that they do not lose condition and to check on their fertility before being taken to the cows for mating. The bulls should be kept far from the cows' paddocks so that they do not break the fence and force their way to the cows. The number of bulls to cows should be in the ratio of 1:20 or 1:25. Fortunately, on the farm at present there is the correct number of bulls to cows (ratio 1:25).

9.7.4 Culling and selection

To ensure that the farmers of ABPCBR keep the desired type of cattle it is necessary that culling should be done every year. The aim of culling would be to remove all unwanted cattle from the farm and to keep only those that meet the production standards set. This exercise is also important because the members of the Co-operative will feed only animals whose production potential is within the farmers expectations. Culling is usually based on the following criteria:

(i) Females

- A cow that persistently weans lighter calves should be removed because weaning weight plays a crucial role in beef production.

- A cow that lacks mothering ability should be culled because the calves of such a cow take long to reach the target weaning weight.

- Elderly cows tend to lose reproduction potential and it is advisable to replace them with young capable animals.

- All cows that have aborted should be culled.

- Animals suffering from diseases that require expensive treatments should be removed.

(ii) Bulls

- The bulls that have undesirable defects such as an abnormality in the sheath that may prevent the penis from extruding should be removed.

- The bulls that fail to serve the cows successfully should be removed.

N.B. Due to the frequent drought periods in the area and lack of competition from the buyers at the livestock auction, it has been found profitable to sell steers at 18 months to 2 years of age or even older.

9.7.5 Dipping of livestock

Ticks, the most important external parasites of domestic animals in South Africa, are usually a problem in the summer rainfall regions. Ticks do harm both directly and indirectly. Directly, they cause loss of condition of their hosts e.g. loss of condition in cattle resulting from loss of blood, tick worry and tick toxicosis. Their bites, damaging in themselves, can result in the degrading of hides. Frequently, too, they provide a route for invasion of the animal tissue by secondary, harmful organisms. Indirectly ticks carry diseases which may cause death (Bayer 1998).

In the Western Region of the North West Province (Ganyesa area) the problem of ticks on livestock is not as severe as compared to the Eastern Region (Brits areas) of the Province. It is recommended that dipping of cattle should be done four times per year, using the trench method. The tick grease method could be used when necessary between these occassions.

9.7.6 Feeding of mineral lick

Boyazoglu (undated) reported that the most limiting individual nutrient is phosphorus which deficiency is down to 0.05% in Winter and rises to 0.17% still inadequate level in summer. These fluctuations can be mellowed substantially by the judicious supplementation of nutrients in the form of licks which are formulated according to seasons.

9.7.6.1 Lick formulation

Boyazoglu (undated) indicated three basic types of licks which are available and which require only a shovel and hard floor to mix and store under roof. Animals are fed in troughs and these are replenished when necessary.

9.7.6.1.1 Mineral lick - summer

In its simplest form, a lick is made up to supplement the phosphorus deficit of good summer grazing as follows:

Dicalcium phosphate	50 kg
Salt	50 kg
Molasses meal	20 kg
	120 kg

It is indicated that such phosphate supplementation, aided by molasses to improve acceptability, could benefit growing, pregnant and lactating cattle substantially.

9.7.6.1.2 Mineral and energy lick - Autumn

This formulation is recommended where grazing is waning in quantity and quality as in Autumn or where summer rains have been below optimum and the summer grazing is unseasonably sparse.

Maize meal	50 kg
Dicalcium phosphate	25 kg
Molasses meal	20 kg
Salt	50 kg
	145 kg

It is indicated that where animals have never had access to a salt-phosphate lick, the initial intakes for 2-3 weeks could be substantially higher until their needs are saturated for salt and phosphate.

9.7.6.1.3 Mineral-energy-protein lick - winter

The winter months necessitates supplementation of a broader spectrum of essential nutrients to maintain the previous summer gains at best, or minimize the cyclical winter losses of body mass, with their related negative effect on the following season's fertility.

Maize meal	150 kg
Dicalcium phosphate	50 kg
High protein concentrate (60%)	
(10% urea content)	100 kg
Molasses meal	80 kg
Salt	200 kg
	580 kg

This lick supplies energy and protein which assures the maintenance of the ruminant microflora for the best utilization of the poor quality winter grazing. The advantage is substantial in relation to the limited cost.

9.7.7 Feeding of crop residues

ABPCBR is in the semi-arid area of the North West Province and the rainfall is low and unreliable (10.8.4.2). Livestock tend to lose condition considerably during winter. It is necessary that the members of the co-operative should provide supplementary feed in the form of crop residues (maize stover and groundnuts hay) during winter. Crop residues could be obtained from some black farmers in the area and from neighbouring white farmers.

9.8 **Management of the veld**

9.8.1 Stocking rate

The grazing capacity of the veld in the Ganyesa district, as determined by the state in 1965, was 10ha/M.L.U. for Bench Mark condition. This grazing capacity has never been reviewed. Based on Bench mark condition, the farm could theoretically carry 976 M.L.U. The current grazing capacity, based on the variable range condition, varies over three identified portions: The first portion of the farm (indicated as A on the map - appendix C) is that which has been lightly utilized (grazing capacities 10ha/M.L.U and 11ha/M.L.U). The reason for this is that the windmill in this area had not been functioning and livestock had to walk a long distance to water and consequently concentrate near the water point. When they do come to the area without water, they only stay for a short period and go back to the area which has water, hence the good grasses are not overutilized and, therefore predominate. The second portion (B on the map-appendix C) is that which is totally underutilized. While the windmill in this area was not functioning and the area was also far from the water point, it had a higher percentage of Anthephora pubescens, which is very sensitive to underutilization and the grass has become moribund and has died out. This situation has

resulted in low current grazing capacities (20ha/M.L.U and 22 ha/M.L.U). The third portion (C on the map - appendix C) is the portion that has water and is the area where livestock concentrate and is, therefore, heavily overutilized (current grazing capacities 27 ha/M.L.U and 28ha/M.L.U). For practical purposes, as indicated on the map (appendix C), the farm can, therefore, be divided into three portions:

Portion A = 10ha/M.L.U (4234 ha)	423 M.L.U.
Portion B = 20ha/M.L.U (3184 ha)	159 M.L.U.
Portion C = 30ha/M.L.U (2342 ha)	78 M.L.U.
	660 M.L.U.

Based on the variable range condition indicated above, the average stocking rate on the farm should be in the region of 660 M.L.U (266 breeding cows, 53 breeding heifers, 11 bulls, 212 calves, 99 steers 1.5 years, 100 heifers 1,5 years and 179 steers 2.5 to 3 years = 920 head of cattle [659 M.L.U.]). The range condition should be monitored regularly and the stocking rate adjusted as the range condition improves. The potential grazing capacity (when the veld condition has improved) will be 978 M.L.U. There is thus a strong motivation to improve the veld condition and, therefore, the grazing capacity.

9.8.2 Rotational grazing

This is defined as the type of management which requires that the grazing allotted to a group or groups of animals for the entire grazing period, be subdivided into at least one more camp than the groups of animals (Barnes 1989, citing Booysen 1967). Barnes (1989) further stated that the primary objectives of the rotational grazing are:

1. To control the frequency of utilization of plants through the control of the frequency of utilization of each camp. Animal production is maintained from a fluctuating forage source, and forage production is maintained through the defoliation of plants according to their requirements for maximum production.

2. To control the intensity of utilization of plants through the control of animal numbers and periods of occupation. This objective aims at reducing the extent of species selection by manipulating stocking pressure, and attempts to prevent large differences in competitive ability between preferred plants.

Recommendations have been made with respect to the type of breed to be kept on the co-operative. As stated that there are six breeds of bulls on the farm (chapter 8.3.1.7), most of the cattle are crosses of these bulls. The co-operative is situated in a semi-arid area and the level of management at the co-operative is still poor, therefore, the types of breed that are recommended currently are the Bonsmara, the Drakenberger, the Sanga and the Afrikaner. Except the Afrikaner and the Sanga, the other two breeds of bulls (Bonsmara and Drakensberger) are already present on the farm and the crosses of these bulls can easily be identified.

It is recommended that the other breeds of bulls (Hereford, Simmentaler, Pinzgauer and Brahman) be replaced, as they grow old, by the four breeds of bulls mentioned above, taking into consideration that the ratio of bulls to cows should be 1:20 or 1:25.

The progenies of the Bonsmara and Drakensberger bulls, which can be easily identified, should be kept separate and served by the Bonsmara and Drakensberger bulls respectively.

The cattle should be grouped as follows:
- cows
- calves
- heifers
- steers and bulls

There are 36 paddocks on the farm, and because some of the paddocks are overutilized, 33% of the grazing area should be rested for the whole growing season, to recover and for the grass to form seed without being disturbed by defoliation. These rest camps (paddocks) will only be grazed during winter. Tainton and Danckwerts (1989) indicated that resting one third of the veld in the sweet grassveld area will result in the accumulation of the fodder reserve and regaining of the vigour of the desirable grasses. The rest of the area (67%) would be rotationally grazed. Out of the 36 paddocks, 12 paddocks would be rested for the whole growing season and the rest (24 paddocks) would be divided as follows:

3 herds - cows and calves (318 M.L.U) = 12 paddocks (4 paddocks per herd).
1 herd - heifers (97 M.L.U) = 4 paddocks.
2 herds - Bulls and steers (244 M.L.U) = 8 paddocks (4 paddocks per herd).

After weaning the male calves would graze with the steers and bulls and the female calves would graze with the heifers depending on the number.

Depending on the number of cattle in each paddock and the size of the paddock, livestock would be allowed a

period of occupation of a maximum of two weeks to prevent regrazing (second bite) particularly of the desirable species. This recommendation was suggested by Barnes (1989) who found that the repeated defoliation of the same plants within the grazing period exerted a high demand on the reserve carbohydrates, for regrowth.

9.8.3 Rotational resting

Rest periods are designed to allow for a period of uninterrupted plant development so that the plants are provided with an opportunity to complete those processes necessary for the survival and continued health, free from interference, or to allow forage to accumulate for animal production purposes. Irrespective of the form of grazing management which is adopted, resting is often essential if the condition of the veld is to be maintained or improved (Tainton & Danckwerts 1989).

As mentioned in 9.8.2 above, 12 paddocks will rest for the whole growing season, when 24 paddocks will be rotationally grazed. Although the maximum period of occupation allowed in the growing season will be two weeks, the farmers and the extension officer should visit the paddocks regularly for inspection and to check whether in some of the paddocks, based on the grazing pressure, it is not necessary to move livestock from one paddock to another even earlier than decided.

9.8.4 Burning to remove moribund grass material

9.8.4.1 Burning the grass material

The area that needs to be burnt had previously a higher percentage of A. pubescens. Due to the fact that there was no water in this area, the paddocks were underutilized. A. pubescens is sensitive to underutilization and, therefore, died out because of the moribund condition. This material, therefore,

needs to be burnt, in order to stimulate A. pubescens and other desirable grass species to develop.

9.8.4.2 Season of burning

The rainfall in the Western Region of the North West Province is very low and unreliable particularly during the Spring season (September, October and November), and the first Spring rains are usually of a thunderstorm nature.

This means that if burning is done during Spring, the area may remain bare for a longer period and, therefore, exposed to soil erosion. The rainfall tends to be higher and reliable from December to March. Although Trollope (1989) states that the danger of soil erosion can be minimized by burning as close as possible to the commencement of the growth at the beginning of the growing season, because of the unreliable nature of rainfall in Spring, it is recommended that burning, particularly to remove moribund material, should be delayed until it has rained. Burning should be done after a good rain so as to retain as much material on the soil surface as possible. According to Trollope (1989), burning to remove unacceptable and/or moribund grass material, should be applied when the soil is moist so as to retain as much litter on the soil surface as possible after burning.

9.8.4.3 Type and intensity of fire

The effect of burning on vegetation depends to a large extent on the type and intesity of fire (Trollope 1978). Trollope (1989), citing Brown & Davis (1972) and Luke & McArthur (1978), indicated three broad types of fire namely:

- Ground fire: The fire that burns below the surface of the ground in deep layers of organic material.
- Surface fire: The fire that burns in the herbaceous surface vegetation.
- Crown fire: The fire that burns in the canopies of trees and shrubs.

Trollope (1989), stated that besides the afore-mentioned types of fire, a further subdivision into fires burning with and against the wind could be made. Trollope (1978) referred to these fires as head and back fires. Trollope (1989) further stated that, according to Phillips (1974), the two types of fires have a significantly different effects in the open plant communities. Trollope (1989), citing Trollope (1978), stated that research results showed that head fires had a significantly greater rate of spread, flame height and overall intensity than back fires, while at ground level, back fires were more intense and had a significantly depressive effect on the recovery of the grass sward, resulting in lower yields. Trollope (1989) further stated that research results and field experience indicated that, under ranching conditions, veld fires should be applied as head fires because they cause the least damage to the grass sward and can do maximum damage to woody vegetation, if necessary.

Based on the research results of Trollope (1989), it is recommended that, to remove the moribund material in the area mentioned above, a head fire of cool intensity (100 KJ/S/m) be applied. Trollope (1989) stated that such a fire will be obtained if it is applied when the air temperature is 20°c and the relative humidity 50%. He further indicated that

these conditions generally prevail during the morning until approximately 11h00 and during the afternoon after 15h30.

9.8.4.4 Grazing management after burning

It is recommended that after burning, the area should be given a full season rest and should only be grazed lightly in winter. This statement was made by Trollope (1989), citing (Trollope (1984a); Aucamp & Danckwerts (1986) and Anon. (1988), confirming that recently documented post-burn grazing management recommendations require that the veld in semi-arid areas should be given ample opportunity to recover after fire, and that in particular, it has been recommended that the veld should not be grazed until it has recovered to a height of 100mm to 150mm.

9.8.5 Bush control

Bush encroachment causes a significant reduction in the grazing capacity of veld (Trollope, Hobson, Danckwerts & van Niekerk 1989). Trollope et. al. (1989) indicated that both Du Toit (1968; 1972) and Trollope (1977) have found that the annual production of grass material was reduced by approximately 40-50% in veld encroached by bush. Trollope et al. (1989) further quotes Aucamp, Danckwerts, Teague & Venter (1983) who found that at A. karroo densities of 1000, 1500 and 2000 tree equivalents (T.E)/ha, the grazing capacity of the veld can be expected to be 90, 67 and 32% of its potential, respectively. Trollope et. al (1989), citing Trollope (1983a), reported results obtained in the false thorn veld of the Eastern Cape which showed that, in veld with different densities of a multi-species bush component, the estimated mean grazing capacity of unencroached veld was 3.0ha/M.L.U while that of encroached veld was only 6.0ha/M.L.U.

Trollope (1977), cited by Trollope et al. (1989), indicated that there are two alternative approaches to the control of bush encroachment. The first is to adapt the vegetation to the animal factor, or secondly, to adapt the animal factor to the vegetation. Trollope et al. (1990) stated that until recently, the general approach of pasture scientists and ranchers has been to adapt the vegetation to the animal factor. Trollope et al. (1989) further indicated that cattle ranching has been the main livestock enterprise of the encroached areas and the philosophy was to retain only that fraction of the vegetation that is acceptable to cattle, namely grass, and a limited number of acceptable trees and shrubs, and to eradicate the unacceptable vegetation, i.e. bush.

On the majority of the sites surveyed on the Co-operative (67%), tree densities of more than a thousand trees per hectare were recorded. These will have a serious effect on the grazing capacity. This situation is aggravated by the fact that some sites (10 and 11) have a low density but a high percentage of young trees, less than one metre high, which will pose a serious problem in the future (chapter 7.4). This means that the problem of bush encroachment requires urgent and immediate attention.
The fact that the members of the Co-operative Ranch are not fully committed to the management of the farm means that they will not agree to the use of expensive chemical methods. The stem-burning method, which has been applied with success by some farmers on leased State farms should be adopted by the members of the Co-operative. This method is slow but very cheap to apply because it can be applied by herdsmen while busy with their routine work. All that is needed is some sawdust, dry dung or wood or even groundnuts shells.

It would not be advisable to use veld fire to burn the whole area encroached by bush because most of the grazing camps have a very sparse cover, which will not be effective to use fire to kill the thorn bush.

Trollope et al. (1989) state that recently, the second approach i.e. adapting the animal factor to the vegetation, has been receiving attention of pasture specialists and ranchers alike. This involves introducing a browsing animal such as the goat into the farming system. As stated earlier, the level of management of the Co-operative is still, however, very low and because it will be expensive for the members of the Co-operative to provide infrastructure, such as a netting wire fence to control goats, it is recommended that the introduction of goats, into the farming system, should be delayed until the level of management of the farmers has improved.

9.8.6 Demarcation of sites for determining the grazing capacity and bush density.

The extension officer and the members of the Co-operative should demarcate representative areas, of 0.1ha (30mx30m), where the veld condition and grazing capacity will be determined at regular intervals. This should be done using iron standards at the corners of each site. Another site of 0.5ha (50mx100m) should be demarcated in each area to determine the bush density.

9.8.7 Establishment of planted pasture

Dannhauser (1991) stated that traditionally, South Africa is a land of livestock production and indicated further that previously livestock was kept mainly on the veld. This is supported by the fact that 80% of the land in South Africa comprises veld for livestock. Dannhauser (1991) further reported that much had been

done on the veld and the management thereof. This work has shown that the condition of the veld had declined. Based on this, it is clearly necessary that planted pasture be established to reduce the grazing pressure on the veld and to increase livestock production.

9.8.7.1 Establishment of "borseltjiegras in strips

Anthephora pubescens requires a sandy soil with the minimum annual rainfall of 250mm. Fair (1989) indicates that the most outstanding attributes of Anthephora are its drought tolerance, palatability and nastritive value. It, therefore, results in excellent animal production. It also has a good foggage value. It is recommended that Anthephora seed be planted in strips two metres apart in more degraded areas during the rainy season (January to March) to improve the botanical composition of the veld. This has been applied with success by one of the white farmers in the North Western side of Kuruman district.

9.8.7.2 Establishment of "borsetjiegras" - A. pubescens on the old cultivated area (5ha area)

There are two soil forms on the old cultivated land where planted pasture need to be established:

(i) Molopo soil form - Pomfret soil family
(ii) Clovelly soil form - Setlagole soil family (chapter 7.3).

A pubescens, because it requires very sandy soil, will be established on the Clovelly soil form.

9.8.7.2.1 Seedbed preparation

A very fine seedbed, which is moist, free from clods and plant material, is necessary for the planting of grass. The subsoil should contain sufficient moisture to facilitate the development of seedlings after germination.

9.8.7.2.2 Planting season, method of planting, seeding rate fertilization and weed control

Since rainfall in the Western Region of the North West Province is very unreliable in Spring, it is not advisable to plant grass during this period. It is recommended that the grass be planted at the end of January to February. During this period, the rainfall is more reliable and weed problems are minimal.

There is a special planter for grass. This planter is specially manufactured to plant borseltjiegras seed. Since borseltjiegras seed is woolly, this planter has been manufactured to minimize wastage of the seed. Because of a small area, the use of a contractor is recommended.

Although Dannhauser (1991), citing Donaldson & Kelk (1974), recommended, that for optimum stand density, seed should be planted at the rate of 5kg/ha in rows 75-90 cm apart, in the Western Region of the North West Province, seeding rate generally varies between 3 to 4kg/ha in rows 1000 - 1500 cm apart.

Regarding fertilization, a representative soil sample, from the old cultivated area, was sent to the North West Agricultural Development Institute (NWADI) in Potchefstroom for analysis and recommendations. The results, from the Institute (Bloem 1998) were made available. Based on these results, Bloem (1998) recommended the fertilizer mixture 2:3:0 (21) at the rate of 380 kg/ha at planting, and a topdressing of 82 kg/ha LAN 2 to 3 months thereafter.

Grass seedlings are very sensetive to weed competition and weed control is a necessity, especially in the establishment season.

9.8.7.2.3 Utilization

Fair (1989) reported that Anthephora should not be grazed in the first summer of establishment. In the following seasons it should be grazed once or twice in the summer and then rested for winter grazing.

The Anthephora pasture will be used for finishing steers being prepared for sale and also as a seed source (chapter 7.3). Such seed may be used to overseed veld paddocks, which are in poor condition, to establish larger areas of pasture or as a source of income.

9.8.7.3 Establishment of bluebuffalograss - C.ciliaris on the old cultivated land (3ha area)

Dannhauser (1991) has stated that the best known cultivar of this grass is Molopo. Recently the cultivar Gayndah was imported from Australia, but little is known about its adaptability, although it has a finer texture and might, therefore, be more palatable.

C.ciliaris will be planted on the Molopo soil form, of the old cultivated land because it requires a heavier soil.

9.8.7.3.1 Seedbed preparation, planting season, planting method, seeding rate and fertilization

The same as those mentioned in 9.8.7.2.2 above.

9.8.7.3.2 Utilization of pasture

This pasture will be utilized by the bulls when they are not with the cows. If they do not utilize the grass efficiently, steers will be used on the same pasture.

9.8.7.3.3 Management of pasture

(i) Ripping and clean mowing

Fair (1989) stated that C. ciliaris responds very well to cultivation and aeration of the soil between the rows. Ripping to the depth of 15-20cm should be done at least once a year.

Cenchrus should be cut back to ground level each year to remove the old and dead material and to stimulate new tillers. This implies that a mowing equipment should be made available or because of a small size of the cultivated area, a contractor could be hired to do the work.

9.9 Training of farmers

The members of the Co-operative need training and motivation to manage their farm effectively as well as to improve their commitment.

9.9.1 Training on the management of veld and livestock

The farmers of the Co-operative Ranch need training in record keeping of all farm activities. The following records should be kept:

(i) Records of all the grazing camps, which should clearly be numbered must be kept. This will include notes on problems in each paddock such as deterioration of the veld, the moribund situation, bush encroachment, the presence of poisonous plants etc.

(ii) Records of the infrastructure on the farm and their condition. For an example, most of the windmills on the farm are not functioning and these need to be recorded so that a method can be identified for their repair.

(iii) Records of the number of livestock on the farm i.e. birth dates, weaning dates, birth weights, weaning weights, date of sales, prices obtained on sales, mortality etc.

(iv) The inoculation for specific diseases, such as anthrax, which is done annually in this area, should be recorded so that farmers can know timeously when to order vaccine to inoculate for such diseases.

(v) While veld burning is not encouraged on the Ranch, because of the sparse grass cover, farmers should be taught that underutilization of the veld leads to moribund condition and that to control the situation, grazing camps may be burnt to remove the dead grass and to stimulate the living grass tufts to develop. A record should be kept of this situation.

(vi) Farmers should be taught to keep records of the rotational grazing and rotational resting of the veld. Farmers should be taught to inspect their grazing camps before cattle are allowed into the camps and after they have been moved to another. It will also be necessary to inspect the camps currently in use to determine whether there is still enough grass for livestock in the particular paddock.

(vii) Besides record keeping the members of the Co-operative Ranch need to be motivated on their commitment to the Co-operative and to make them aware of the contract signed with the Department of Agriculture (chapter 9.1) i.e. to remind them that they have been allowed to farm on condition that the Co-operative is maintained as a model farm of sound management of livestock and veld for demonstration to the adjacent leased farms and the communal grazing area.

(viii) The extension officer should teach the farmers to assess veld condition and have representative sites demarcated, where the veld condition on the farm could be re-evaluated to check if it is improving or deteriorating, as well as checking whether the bush is increasing or not.

(ix) It is important that the extension officer should teach the members of the Co-operative at least elementary book keeping, i.e. the total expenditure and income, so that at the end of the year they could balance their books and see whether their business is a success or not.

BIBLIOGRAPHY

Acocks J P H 1953. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 28.

Acocks J P H 1975. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 40.

Anon. 1923. Droogte Ondersoek Kommissie. Finale Verslag. Government Printer, Pretoria.

Anon. 1984. Kritieke veldagteruitgang in die suidoos Transvaalse Hoeveld: 'n Evaluasie van die situasie en 'n strategie vir optimale veld benutting en veeproduksie. Transvaal Region, Department of Agriculture, unpublished article.

Anon. 1990. Management of communal natural resources in Botswana: A summary, In: Portillo E M, Weaver L C and Motsamai B (eds). Planning for management of communal natural resources affected by livestock. Proceedings from a workshop for SADCC Countries held in Mohale's Hoek on May 18 - June 1, 1990.

Anon. 1991. Food and Agriculture Organic of the United Nations. Volume 45, 1991, Rcme.

Anon. 1993. Abstract of agricultural statistics, 1993, Republic of South Africa.

Anon. 1965. Agricultural Economic map of Southern Africa. Government Printer, Pretoria.

Ainslie A, Palmer A R, Hurt C R and Swart D 1998. Communal rangeland management dynamics: Towards a multidisciplinary research agenda. In: de Bruyn T D and Scogings P F (eds). Communal rangelands in Southern Africa: A synthesis of knowledge. Proceedings of a symposium on policy-making for sustainable use of Southern African communal rangelands. Department of Livestock and Pasture Science, University of Fort Hare, Alice, South Africa.

Acocks J P H 1988. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 57.

Aucamp A J 1981. Animal production off veld. Proceedings of the Grassland Society of Southern Africa 16:17-18.

Aucamp A J 1990. Bos in die Bosveld: Bate of hindernis vir vleisproduksie. Agricola 8:11-17.

Aucamp A J, Danckwerts J E and Tainton N M 1992. Range monitoring in South Africa: a broad perspective. Journal of the Grassland Society of Southern Africa. 9,1:8-10.

BIBLIOGRAPHY

Acocks J P H 1953. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 28.

Acocks J P H 1975. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 40.

Anon. 1923. Droogte Ondersoek Kommissie. Finale Verslag. Government Printer, Pretoria.

Anon. 1984. Kritieke veldagteruitgang in die suidoos Transvaalse Hoeveld: 'n Evaluasie van die situasie en 'n strategie vir optimale veld benutting en veeproduksie. Transvaal Region, Department of Agriculture, unpublished article.

Anon. 1990. Management of communal natural resources in Botswana: A summary, In: Portillo E M, Weaver L C and Motsamai B (eds). Planning for management of communal natural resources affected by livestock. Proceedings from a workshop for SADCC Countries held in Mohale's Hoek on May 18 - June 1, 1990.

Anon. 1991. Food and Agriculture Organic of the United Nations. Volume 45, 1991, Rcme.

Anon. 1993. Abstract of agricultural statistics, 1993, Republic of South Africa.

Anon. 1965. Agricultural Economic map of Southern Africa. Government Printer, Pretoria.

Ainslie A, Palmer A R, Hurt C R and Swart D 1998. Communal rangeland management dynamics: Towards a multidisciplinary research agenda. In: de Bruyn T D and Scogings P F (eds). Communal rangelands in Southern Africa: A synthesis of knowledge. Proceedings of a symposium on policy-making for sustainable use of Southern African communal rangelands. Department of Livestock and Pasture Science, University of Fort Hare, Alice, South Africa.

Acocks J P H 1988. Veld types of South Africa. Memoirs of the Botanical Survey of South Africa No. 57.

Aucamp A J 1981. Animal production off veld. Proceedings of the Grassland Society of Southern Africa 16:17-18.

Aucamp A J 1990. Bos in die Bosveld: Bate of hindernis vir vleisproduksie. Agricola 8:11-17.

Aucamp A J, Danckwerts J E and Tainton N M 1992. Range monitoring in South Africa: a broad perspective. Journal of the Grassland Society of Southern Africa. 9,1:8-10.

Adams M E 1982. Agricultural extension in developing countries. Intermediate Tropical Agricultural series. Longman. Essex.

Barnes G R 1989. Grazing management principles and practices. In: Danckwerts J E and Teague W R (eds). Veld management in the Eastern Cape, 1989, Government Printer, Pretoria.

Barnes D L 1992. A critical analysis of veld management recommendations for sourveld in the south-eastern Transvaal. Journal of the Grassland Society of Southern Africa 9,3:126-133

Bayer A W 1955. The ecology of Grassland. In: Meredith D (ed). The grasses and pastures of South Africa. C.N.A. Johannesburg, pp. 539-550.

Bayer (DR) 1998. Ticks, the most important external parasites of domestic animals in South Africa, are extremely prolific and should be controlled. In: Malherbe I and Barton P (eds). Land. October 1998, volume 2 no 6. P.O. Box 1802, Cape Town, South Africa.

Bembridge T J 1975. The communication and adoption of beef cattle production practices in the Matebeleland and Midlands provinces of Rhodesia. D. Agric. (Inst. Agrar) thesis, University of Pretoria.

Bembridge T J 1983. A systems approach study of agricultural and rural development in the Republic of China and Republic of Transkei. Department of Extension and Rural Development, University of Fort Hare.

Bloem D 1998. Analysis of soil samples from the Atamelang Barui Polar Co-operative Beef Ranch. Agricultural Development Institute. Department of Agriculture,Environmental affairs and conservation, Potchefstroom.

Boonzaier E A, Hoffman M T, Archer F M and Smith A B 1990. Communal land use and the 'tragedy of the commons': some problems and development perspectives with specific reference to semi-arid regions of Southern Africa. Journal of the Grassland Society of Southern Arica 7,3:77-80.

Boyazoglu P A (Undated). Animal production in small farm system. Undated pamphlet. Department of Animal Health and Production. Faculty of Veterinary Science, Medunsa.

Casey N H and Maree C 1993. Principles of livestock production. In: Maree C and Casey N H (eds). Livestock production systems. Agri-Development Foundation, Brooklyn, pp. 69-87.

Child G, Parris R and Le Riche E 1971. Use of mineralized water by Kalahari wild life and its effect on habitats. E. Afr. Wildl. J.9:125-142.

Dannhauser C S 1991. Die bestuur van aangeplante weiding in die somerreenvaldele. Review Drukkers, Pietersburg.

De Klerk J C 1947. Pastures of the Southern Orange Free State: A century ago and today. Farming in Sth. Afr. April, 347-354.

De Klerk C H 1987. An investigation into factors inhibiting the adoption of recommended veld management practices. S. Afr. J. Agric. Ext. 16:39-43.

Donaldson C H 1966. Control of blackthorn in the Molopo area with special reference to fire. Journal of the Grassland Society of Southern Africa 1, 57-62.

Donaldson C H 1967. The immediate effects of the 1964/66 drought on the vegetation of specific study areas in the Vryburg district. Journal of the Grassland Society of Southern Africa 2, 137-141.

du Toit P F 1981. Introduction to the Bushveld problem. Unpublished manuscript presented at the bush veld study group workshop, Nylsvley, 29 September 1981.

du Toit P F, Aucamp A J and Bruwer J J 1991. The National grazing strategy of the Republic of South Africa. Objectives, achievements and future challenges. Journal of the Grassland Society of Southern Africa 8,4:126-130.

Duvel G H and Scholtz H P J 1992. The incompatibility of controlled selective grazing systems with farmer's needs. Journal of the Grassland Society of Southern Africa 9,1:24-29.

Edroma E L 1989. The response of tropical vegetation to grazing and browsing in Queen Elizabeth National Park, Uganda symp. Zool. Soc. Lond. 61:1-13.

Erasmus T 1990. Public accountability. Veld Trust Conference on the conservation status of agricultural resources in the R.S.A., 19 October 1990.

Foran D B 1976. The development and testing of methods for assessing the condition of three grassveld types in Natal MSc. (Agric.) thesis. University of Natal, Pietermaritzburg.

Foran D B 1980. Change in range condition with distance from watering point and its implications for veld survey Aust. Rangel. J. 2:59-66.

Fouche H J, De Jager J M and Opperman D J P 1985. A mathametical model for assessing the influence of stocking rate. Journal of the Grassland Society Southern Africa 2, 3:4-6.

Fourie J H, Redelinghuys G J and Opperman D P J 1984. Influence of stocking rate and grazing system on plant basal cover and botanical composition of veld in the Northern Cape. Journal of the Grassland Society of Southern Africaa 1,4:20-24.

Graham R R 1962. Field days in agricultural extension. In: Vincent V (ed). Extension methods in South Africa. Government Printers, Pretoria.

Motsamai B 1990. Management of Communal Range resources in Lesotho. In: Portillo L, Weaver L C and Motsamai B (eds). Planning for management of communal natural resources affected by livestock. Proceedings from a Workshop for SADCC Countries held in Mohale's Hoek on May 28- June 1, 1990.

Mtsotso M C 1982. Maize production and socio-economic problems in Ntsimbini extension ward. Lusikisiki district. Republic of Transkei. B. Agric. Extension Hons. dissertation, University of Fort Hare.

Novellie P 1988. The impact of large herbivores on the grassveld in the Addo Elephant National Park. Journal of the Southern African Wild Reserve 18:6-10.

Owen-Smith N 1985. The ecological potential of the Kudu for commercial production in Savanna Regions. Journal of the Grassland Society Southern Africa 2,3:7-10

Papenfus S F 1980. A critical review of co-operatives in Bophuthatswana. Report. Department of Agriculture, Mafikeng (mimeograph).

Rakgwale D 1998. Personal communication. Manthestad, Taung. North West Province.

Rogers E M and Shoemaker F F 1971. Communication of innovations. A cross cultural approach. Collier Mc Millan LTD London.

Rogers E M 1983. Diffusion of innovations. Third edition. Division of Mc Millan publishing Co., New York.

Roux P W 1966. Beginsels van veldbeheer in die karoo en droe soetveldgrasstreke. In: Hugo W J (ed). Die kleiveebedryf in Suid Afrika. Department of Agricultural Technical Services. Government Printer, Pretoria.

Roux P W and Vorster M 1983. Vegetation change in the Karroo. Journal of the Grassland Society of Southern Africa. 18:25-29.

Sebotja I 1991. A comparative evaluation of three irrigation schemes in Lebowa. M. Agric dissertation. University of Fort Hare.

Seobi N K 1980. A study of maize growing and socio-economic problems in the Naauwspoort extension ward. B. Agric. Hons. dissertation. University of Fort Hare.

Schulze B R 1994. Climate of South Africa. Part 8, general survey. First edition. Eighth impression. Weather Bureau. Department of Environmental Affairs, Republic of South Africa.

Scotney D M 1984. Opening address to the 19th annual general meeting of the Grassland Society of Southern Africa 1:10-13.

Scott J D 1981. Soil erosion, its causes and its prevention. In: Tainton N M (ed). Veld and pasture management in South Africa. Shuter and Shooter and University of Natal press, Pietermaritzburg.

Smit G N and Rethman N F G 1992. Inter-related floristic changes associated with different long-term grazing treatments in sourish mixed bushveld. Journal of the Grassland Society of the Southern Africa 9, 2:76-82.

Snyman H A and Fouche H J 1991. Production and water use efficiency of semi-arid grasslands of South Africa as affected by veld condition and rainfall water. S.A. 17:263-268.

Snyman H A and Fouche H J 1993. Estimating seasonal herbage production of a semi-arid grasslands based on veld condition, rainfall and evapo-transpiration. African Journal of Range and Forage Science 10,1:21-24.

Steyn G J 1982. Livestock production in the Amatola basin. MSc thesis, University of Fort Hare.

Stoddart L A, Smith A D and Box T W 1975. Range management. Third edition. Mc Graw-Hill Book Company. New York, Auckland, Johannesburg, Tokyo and Toronto.

Stuart-Hill G C, Aucamp A J, Le Roux C J G and Teague W R 1986. Towards a method of assessing veld condition of the valley Bushveld in the Eastern Cape. Journal of the Grassland Society of Southern Africa 3:19-24.

Tainton N M and Danckwerts J E 1989. Resting. In: Danckwerts J E and Teague W R 1989 (eds). Veld management in the Eastern Cape. Government Printer, Pretoria.

Tainton N M 1981. Natural grazing lands and their ecology. In: Tainton N M (ed). Veld and pasture management in South Africa. Shuter and Shooter and University of Natal Press, Pietermaritzburg.

Tainton N M 1988. A consideration of veld condition assessment techniques for commercial livestock production in South Africa. Journal of the Grassland Society of Southern Africa 5:76-79.

Tapson D 1993. Biological Sustainability in Pastoral Systems: The Kwazulu Case. In: Behnke R H, Scoones I and Kerven C (eds). Range ecology at Disequilibrium. New Models of Natural Variability and Pastoral Adaptation in African Savannas. Overseas Development Institute, London.

Theisen R J 1976. Development in rural communities. Research report. Zambia.

Thrash I, Theron G K and du P. Bothma J 1993. Impact of water provision on herbaceous community composition in the Kruger National Park. South Africa. African Journal of Range and Forage Science 10, 1:31-35.

Tolsma D J, Ernst W H O and Verwey R A 1987. Nutrients in soil and vegetation around two artificial water points in eastern Botswana. J. Appl. Ecol. 24: 991-1000.

Trollope W S W 1989. Veld burning as a management practice in livestock production. In: Danckwerts J E and Teague W R (eds). Veld management in the Eastern Cape. Government Printer, Pretoria.

Trollope W S W 1990 a. Development of a technique for assessing veld condition in the Kruger National Park, using key grass species. Journal of the Grassland Society of Southern Africa 7:46-51.

Trollope W S W 1990 b. Veld management with specific reference to game ranching in the grassland and Savanna areas of South Africa Koedoe. 33: 77-87.

Trollope W S W, Hobson F O, Danckwerts J E and van Niekerk J P 1989. Encroachment and control of undesirable plants. In: Danckwerts J E and Teague W R (eds). Veld management in the Eastern Cape. Government Printers, Pretoria.

Trollope W S W (undated). Determination of veld condition and grazing capacity in the Western Region of the North West Province. Glen Research Institute, Glen.

Tshenkeng T S 1985. Evaluation of the accessibility of communication for farming practices in Gakhunwana area. B. Agric. Extension Hons. dissertation. University of Fort Hare.

van der Schijff H P 1957. 'n Ekologiese studie van die flora van die Nationale Kruger Wildtuin. D. Sc. thesis, Potchefstroom University for Christian Higher Education.

van Heerden A 1995. A survey on soils at Polar Beef Ranch, Ganyesa. Soil and crop scientist, Agricor.

van der Westhuizen H C and Pansegrouw L B (undated). The determination of the veld condition and grazing capacity in the Dewetsdorp district. Director, Free State Region, Private Bag x01, Glen.

van Zyl J G E, Maree C and Seifert G W 1993. Beef production systems. In: Maree C and Casey N H (eds). Livestock production systems. Agri-Development Foundation, Brooklyn.

Walker J W 1995. View point: Grazing management and research now and in the next millenium. Journal of Range management. 48: 350-357.

Whitlow R 1987. "A National Survey of Zimbabwe". Journal of Soil and Water Conservation 42 (4): 239-242.

Young E 1970. Water as 'n faktor in die ekologie van wild in die Nationale Kruger Wildtuin. D. Sc. thesis, University of Pretoria.

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APPENDIX A.1

DETERMINING VELD CONDITION AND GRAZING CAPACITY IN THE WESTERN REGION – NORTH WEST PROVINCE (J. JONES AND J J OLIVIER – GLEN RESEARCH INSTITUTE

In the North West Province, including the areas formerly falling under Bophuthatswana, two techniques were applied to determine the veld condition and grazing capacity. In the eastern region of the former Bophuthatswana, the key grass species technique developed by the University of Natal in association with the University of Fort Hare was applied and in the Western region (Kudumane, Ganyesa and Taung), the key grass species developed by Glen Research Institute was applied.

Key grass species technique by J. Jones and J J Olivier (Glen Research Institute).

Date:
Type of veld: Sandy area (sagte veld).
Sample site

SPECIES NAME	%	W (F)	SAMPLE SITE SCORE	BENCH MARK SCORE
Anthephora argentea		10		
Anthephora pubescens		10		
Asthenatherum glaucum		10		
Brachiaria nigropedata		10		
Digitaria eriantha		10		
Panicum coloratum		10		
Schmidtia pappophoroides		10		
Stipagrostis uniplumis		10		
Subtotal highly desirable				
Eragrostis lehmanniana		7		
Eragrostis trichophora		7		
Eragrostis rigidior		7		
Subtotal desirable				

Aristida stapitata Aristida meridionalis Eragrostis pallens Pogonathria squarrosa		4 4 4 4		
Subtoal less desirable				
Aristida adscensionis Aristida berteronianus Aristida congesta Schmidtia kalahariensis		1 1 1 1		
Subtotal undesirable				
Veld condition score				855
Basal cover %				3.2

Bench mark score: Reflected in Appendix A.2
Factor = Grazing value - index of the grass species

Grazing capacity of the area = Grazing capacity of the area as was determined By Government (Agricultural economic map of South Africa 1965).

Calculation of the Grazing capacity of a sample site

Grazing capacity = $\frac{\text{Bench mark score}}{\text{Sample site score}}$ x Grazing capacity of the area ha/M.L.U

= ha/M.L.U

APPENDIX A2

Bench mark site identified by annual monitoring of a specific site of the Western Region – North West Province

Type of veld : Sandy area **by J Jones and J J Olivier**

Name of the area	Site No.	Relative % Composition			
Species name	W Factor	Growing season			
		1986/87		1988/89	
		%	Score	%	Score
Anthephora argentea	10	3.43	34.3	4.43	44.3
Anthephora pubescens	10	5.66	56.6		
Asthenatherum nigropedata	10	3.43	34.3	3.01	30.1
Brachiaria nigropedata	10	0.40	4.0	0.19	1.9
Digitaria eriantha	10				
Panicum coloratum	10				
Schimidtia Pappophoroides	10				350.3
Stipagrostis unimplumis	10	32.93	329.3	16.29	162.9
Subtotal highly Desirable		45.85	458.5	58.95	589.5
Eragrostis lehmanniana	7	16.97	118.79	33.99	237 93
Eragrostis trrichophora	7				
Subtotal desirable		16.97	118.79	33.99	237.93
Aristida stipitata	4	1.01	4.04	0.85	3.4
Aristida meridionalis	4	6.87	27.48	6.12	24.48
Eragrostis pallens	4				
Pogonathria squarrosa	4				
Subtotal less Desirable		7.88	31.52	6.97	27.88
Aristida adscensionis	1				
Aristida congesta	1				
Schmidtia Kalahariensis	1	29.09	29.09	0.09	0.09
Subtotal undesirable		29.09	29.09	0.09	0.09
Total (%)		100		100	
Veld condition score			637.9		855.4
Basal cover %					3.2

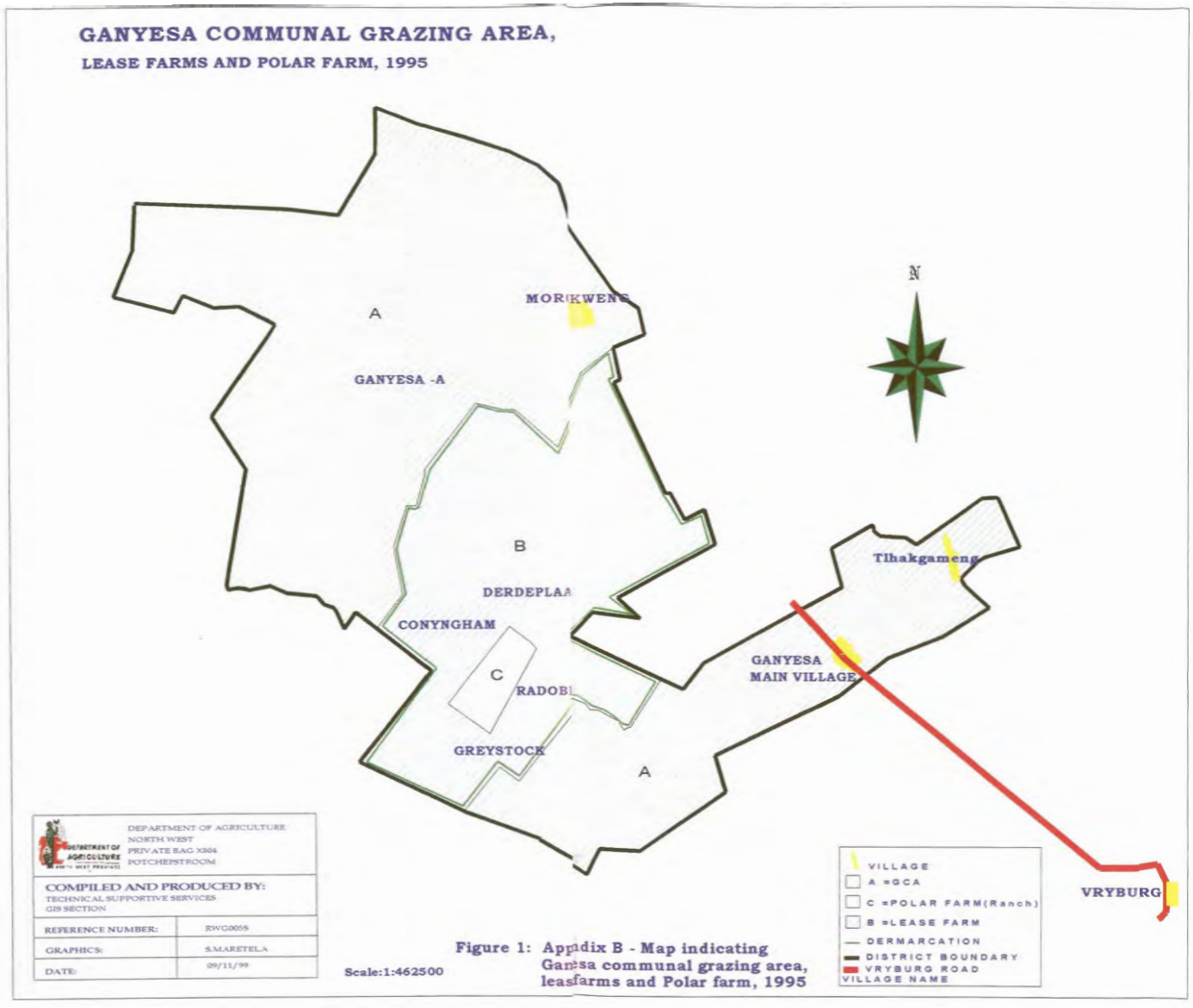

Figure 1: Appendix B - Map indicating Ganesa communal grazing area, leasfarms and Polar farm, 1995

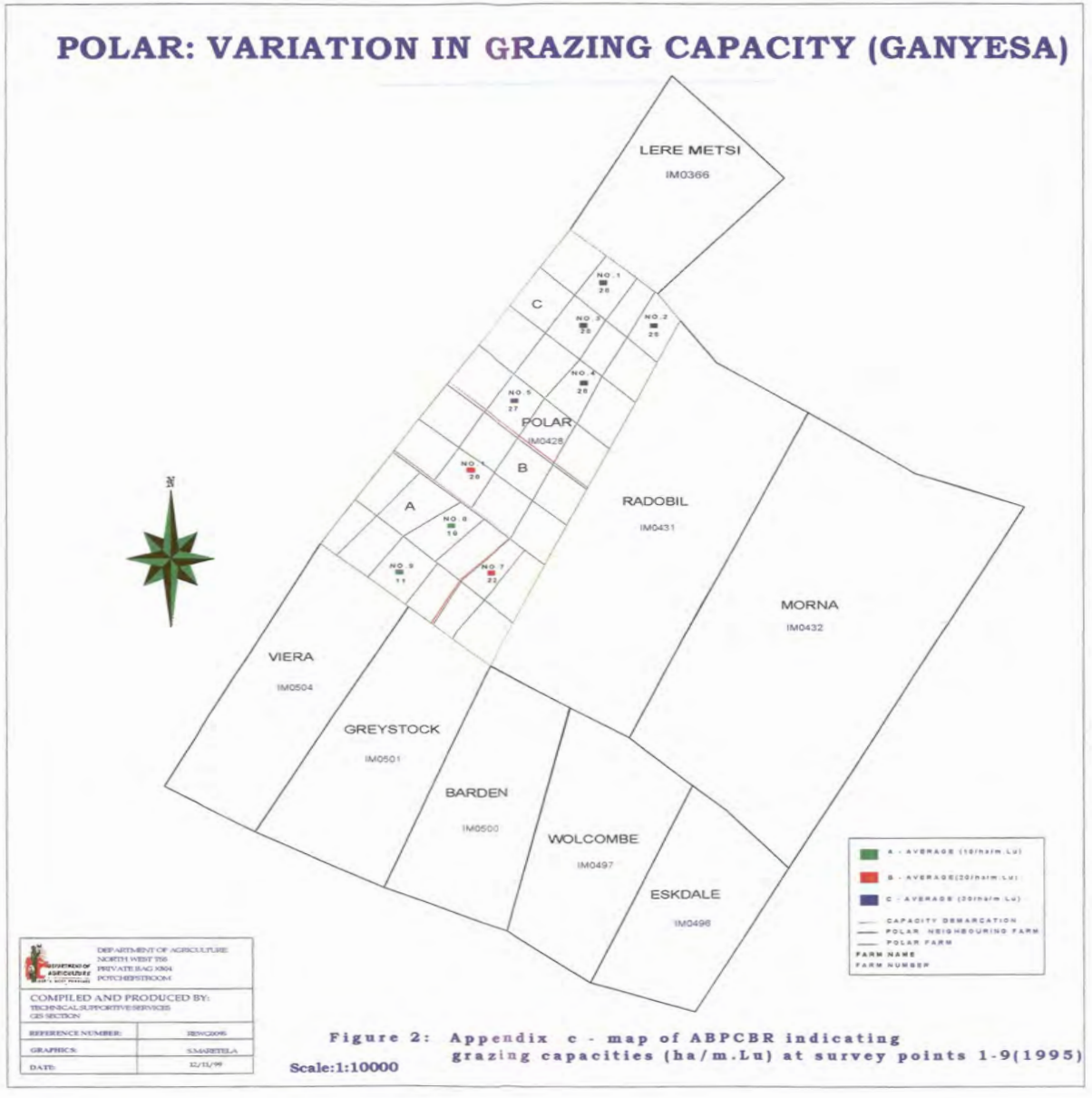

Figure 2: Appendix c - map of ABPCBR indicating grazing capacities (ha/m.Lu) at survey points 1-9(1995)

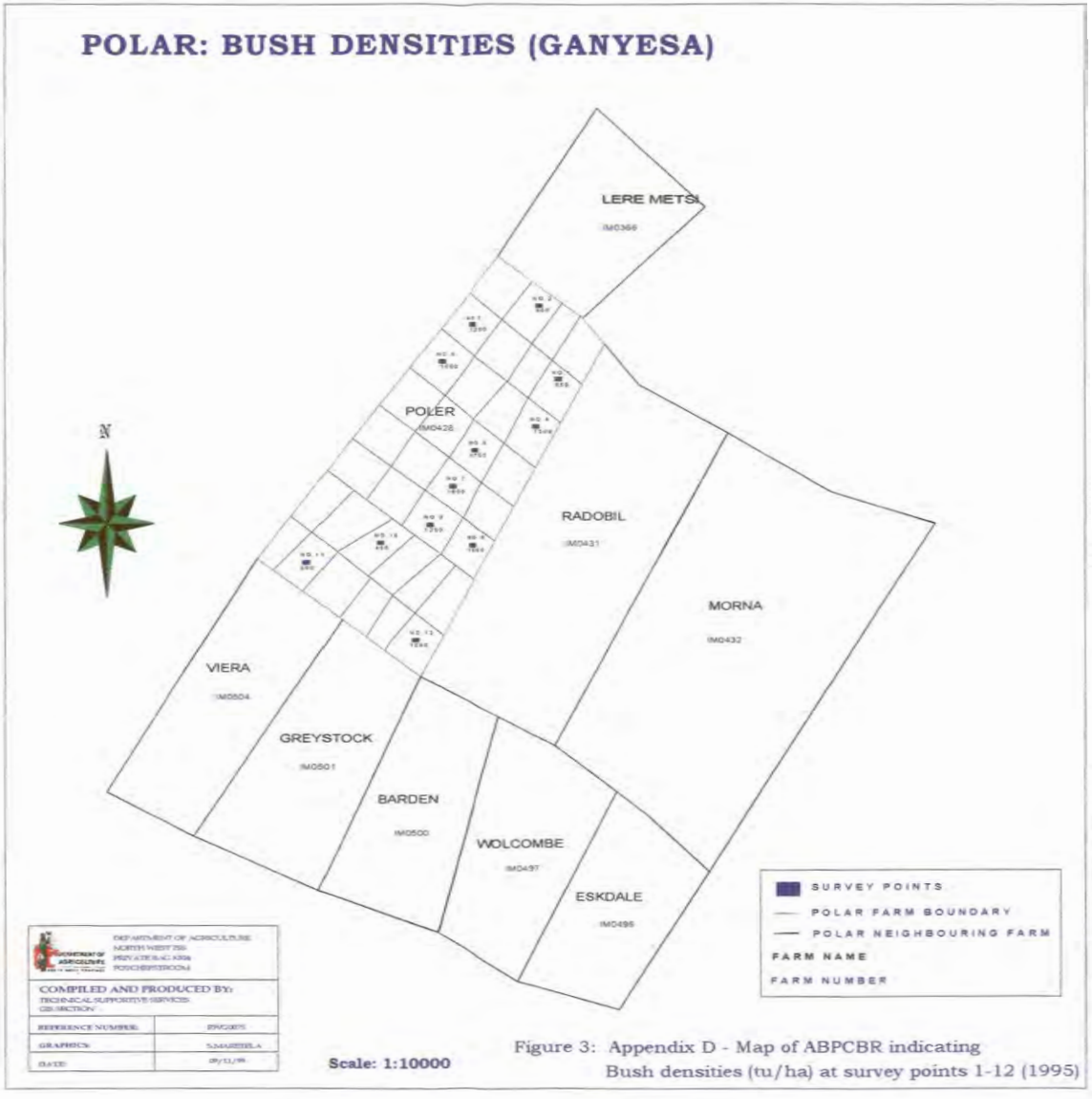

Figure 3: Appendix D - Map of ABPCBR indicating Bush densities (tu/ha) at survey points 1-12 (1995)

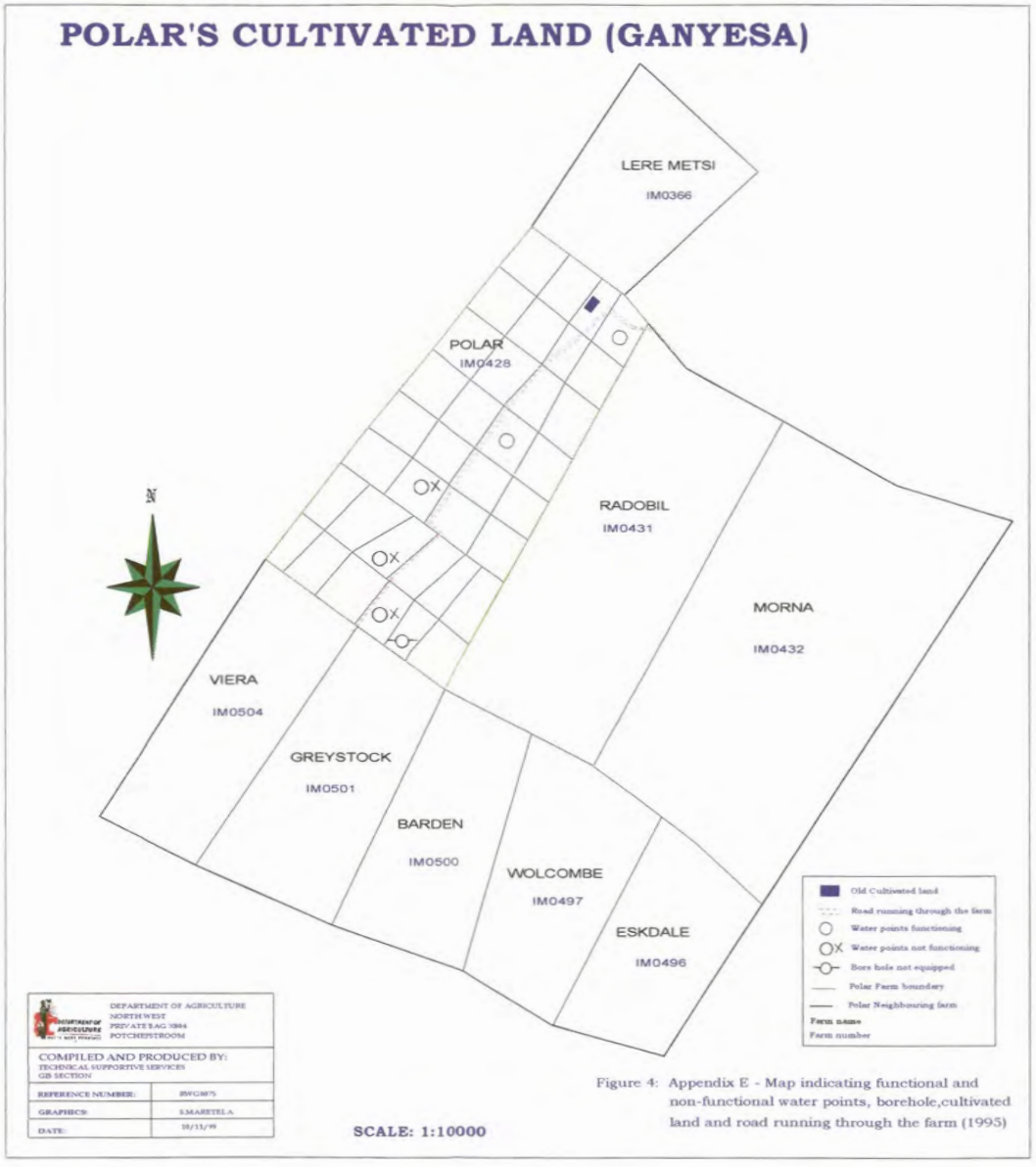

Figure 4: Appendix E - Map indicating functional and non-functional water points, borehole,cultivated land and road running through the farm (1995)