STRATEGIES FOR AGRICULTURAL DEVELOPMENT AND THEIR RELATIONSHIP TO HUMAN SETTLEMENT PATTERNS, AN ASPECT OF RURAL DEVELOPMENT IN MAUN DISTRICT, BOTSWANA

BY

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D E C L A R A T I O N

"This Thesis is my original work and has not been presented for a degree in any other University"

Signed: .....
(candidate)

"This Thesis has been submitted for examination with my approval as University Supervisor".

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(Supervisor)

ABSTRACT

This study was prompted by the low agricultural production in Botswana and the Maun District in particular. Progress has been particularly slow in the crop production sector due to ecological factors and the policy approach which has over-emphasised livestock development.

The existing human settlements and land use pattern in Botswana is not conducive to agricultural and rural development. Rural settlements take the form of villages and scattered homesteads, designated as cattleposts or lands (fields). There exists a unique rural settlement pattern whereby some families have three separate homes, one in the central villages and two other homes in the lands (cultivated areas) and in the cattle posts(grazing areas). The farming households move for several kilometres (in some cases over a hundred kilometres) between the villages and areas of agricultural production. Thus time and other resources are wasted in travelling, resulting in low productivity. In general three zones of land use around the villages can be recognised in Botswana's rural areas, viz the cultivated zone nearest the village, the mixed farming zone and cattle posts zone.

Problems identified in this study for Botswana also exist in the Maun District. These include a weak development infrastructure, scarcity of water, too much time spent in travelling between the villages and areas of agricultural production, poor marketing facilities, prevalence of traditional methods of agricultural production and inadequate extension services. A resolution of these problems would lead to rapid rural development.

This study recommends improvement of the existing infrastructure and creation of more services and infrastructure. The introduction of better infrastructure and services is seen as the best way of promoting rural development in Maun District and elsewhere in Botswana. Growth and market centres should be created and infrastructure and services concentrated here. Reorganisation of the land use in the long run is also seen as necessary by this study.

Crop and livestock programmes are recommended in order to increase production in the district. To absorb agricultural produce, creation of an efficient marketing system is considered necessary. An Okavango Delta Authority should be set up to plan and co-ordinate all economic activities in the region. Future research on underground water and soil deficiences would be necessary for agricultural and rural development planning.

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CHAPTER I

INTRODUCTION

1.1. General Background to Botswana.

1.1.1 Position, Climate, Physical Features.

Botswana is a landlocked country lying in the centre of Southern Africa. It is bounded by South Africa, Namibia, Zimbabwe and Zambia (Map 1.1). Because of its position in the centre of countries which are still under minority racist regimes, Botswana faces numerous problems such as national security, and the precarious external trade routes which pass through these hostile neighbours. Also due to its colonial history, the newly independent Republic of Botswana found itself dependent on South Africa and Rhodesia economically and to a certain extent politically. Most of its manufactured goods and imported foodstuffs come from these two countries; moreover, the South African mines and farms employ thousands of Botswana men.

It became clear after independence that due to its position the country had to diversify its economy and seek alternative external routes and trade partners. Thus mining and small-scale industries have since been started and a highway has been built to link Botswana and Zambia so as to facilitate easy movement of goods and people between these two independent African countries. Other trade partners have been found such as the EEC, China and the East European countries. Increased agricultural production especially in basic foodstuffs and cash crops would also offer a means of reducing the high dependence on the neighbouring countries. Expansion and improvement of the agricultural sector

BOTSWANA AND ITS NEIGHBOURS

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could in the long run lead to self-sufficiency in the production of basic food and even exports of cash crops such as fruit, cotton and tobacco. This sector could also eventually absorb the labour force presently migrating to South Africa.

Botswana's climate is continental and semi-arid. The average rainfall is 475 mm with the highest rains in the north reaching over 650 mm and the lowest in the south-west measuring less than 225 mm per annum (map 1.2). The east receives "medium" rainfall between these two extremes. Rainfall is erratic, falling between October and April; droughts are frequent, occurring roughly every 5 years. The scarce rainfall and its distribution have serious implications to human settlement patterns, crop production and livestock management (see next section . Crop failures have often been blamed on little and unreliable rainfall, although it is known that other factors play their part. The mean maximum and minimum temperatures range between 38°C and 5°C with the hottest areas lying in the north and the west.

The mean height above sea level is 1000 metres[1] with the highest parts of the country reaching 1200 metres and the lowest 500 metres (map 1.3). Two-thirds of Botswana lies over the sandy Kgalagadi Basin occupying the centre and western part of the country. These sandy Kgalagadi (Kalahari) soils support a savanna type of vegetation. Millet, sorghum, beans and maize do fairly well on these soils especially where rains are heavier and manure and fertiliser are added. The eastern part of Botswana is hilly and has relatively more fertile ferruginous tropical soils

which support maize, groundnuts and cotton (under irrgation). Some parts of the north have sandy loams which are suitable for maize, millet, sorghum, rice, sugarcane, tobacco, vegetables, fruit and other crops.

Most rivers of Botswana are ephemeral and moreover their sand beds allow high proportions of water to percolate underground even during the rainy season. There is very little surface water in Botswana as a whole. The largest surface water is found in the Okavango Delta. This delta covers an area of about 16,000 km^2 - about 3% of the country's total area. The mean annual inflow of the Okavango water is about 11900 million cubic metres (This excludes direct rainfall). Hence the delta is a great potential water resource for Botswana. At present this vast amount of water is not used for any large scale economic scheme although it supports a rural population of about 65,000. Ways for utilising this resource for economic production such as small-scale irrigation should be worked out. The Maun District is situated in this region of potential resources such as water, relatively fertile soils and wildlife.

1.1.2 SITE, POPULATION AND HUMAN SETTLEMENTS

Botswana is a vast country covering some 570,000 km^2 approximately the size of Kenya or France. However this vast land area is inhabited by a very small population of about 800 000 thus resulting in an overall population density of about 1.3 persons per km^2 which is among the lowest in Africa. The first impression this gives is that Botswana is wholly an underpopulated country. However, a more detailed analysis of the population reveals that the population distribution and

densities vary so much that there are even areas suffering from land pressure and landlessness. For example Naledi Township in Gaborone has a population density of about 3,125 persons per km^2. whilst some villages have population densities of over 900 persons per km^2 (for example Remotswa has 937.5 persons km^2).[2] The districts in the east and south have relatively high densities. (Map 1.4). The South East District has 17.6 persons per km^2 whilst the North East District has 23.4 persons per km^2. Maun District as a whole has a very low population density of 1.4 persons per km^2. This is because the district is very large and over 16% is delta and swamp land. There are villages however, in the Maun District with population densities of over 20 persons per km^2. These include Maun and Shakawe. The smaller villages of the district have between 10 and 20 persons per km^2. Map 1.4. shows that most of the human settlements are located in the eastern and northern parts of the country, leaving a virtually empty centre, the south-west and the west. The east and north have relatively higher rainfall and better soils and the pastures are of a higher quality. Thus more people live here since they can grow crops such as sorghum and maize more successfully and keep larger herds. Most of the settlements are along rivers or around some other sources of water.

The rural population in Botswana lives in three major types of settlement - the villages, cattlepost and lands (see section on definitions). It is common to find Batswana families with two or three homes - one in the village, one in the cattlepost and another in the lands. Moreover distances between the villages can be very great, reaching up to 400 km in some areas.[3] This

population highly mobile - people moving between these settlements to perform agricultural functions. This practice is uneconomic as time and other resources are wasted during these movements. What is more, the persants tend to be away from places of agricultural production for long periods and thus creating a further problem of absentee management. There is therefore an urgent need for population stabilisation through a sound land policy such as land registration and adjudication. There are, however, indications that in some parts of the country the rural population is beginning to settle permanently in the lands and cattleposts.

1.1.3 THE ECONOMY

1.1.3.1 AGRICULTURE

The majority of the people in rural Botswana are pastoralists rearing cattle, goats, sheep and donkeys along traditional lines. Up to 1975 beef was the major earner of foreign exchange for the country. There are about three million cattle mostly of African stock, 1.4 million goats and 0.4 million sheep. Efforts are being made to introduce better breeds of cattle and modern methods of animal husbandry. However the livestock industry suffers many problems such as outbreaks of epidemics, short supply of water, poor transport facilities and poor management techniques. The present land tenure system which in most areas is communal does not allow modern ranching techniques such as controlled grazing; moreover the spatial separation of the village home from the cattleposts and lands is not conducive to efficient farm productivity.

The main food crops are sorghum, maize, millet, beans and

pumpkins. Little data is available on production, yields and acreage of these crops, but it is well known that this sector of the agricultural economy is not given as much emphasis as the livestock sector which is more attractive to farmers. As a result the rural as well as the urban population eat mostly imported food from neighbouring South Africa[5]. This makes the country virtually at South Africa's ransom. For example when in 1977 South Africa announced restrictions on maize exports, fears were immediately raised in Botswana on the implications of this action as regards food supplies in the country. With this kind of situation prevailing, it seems a matter of urgency that measures to increase crop production in the country must be taken. Although aridity is a major constraint to crop production its effects could be reduced by introducing a comprehensive agricultural development and rural settlements policy which could also deal with such vital issues as resource (especially water and rangeland) conservation.

1.1.3.2 Mining

Large-scale mining began in earnest in the country in 1970 when diamond production was started at Orapa. Copper and nickel production soon followed in 1971. For the first time in the history of Botswana revenue from minerals outstripped that from agriculture (beef) in 1975. More diamonds have been discovered at Letlakane near Orapa and mining has already started. Jwaneng in the south of the country is being built at present as a new diamond mining town which may transform Botswana's economic life. Another important mining area is Morupule Colliery whose products may enable the country to open

a huge petrochemical industry. Deposits of soda ash exists in the Makgadikgadi Pans and it is hoped their extraction may begin before the end of the current national development plan.

Mining is continuing to play a predominant role in the country's economy; thus a degree of economic diversification is being achieved, although it is clear that more attention has recently been given to beef production and mining than to arable farming. Capital gained from mining and the livestock industry should be ploughed into arable farming especially for the improvement of the subsistence sector so as to uplift the living standards of the majority of the Batswana.

1.1.3.3 MANUFACTURING AND PROCESSING INDUSTRIES

There is little manufacturing and processing industry in Botswana although opportunities for starting chemical industries using coal and soda ash deposits exist. But minerals get depleted sooner or later and the problem is aggravated by unstable prices and the trend towards synthetics to replace mineral products. This strengthens the need for setting up agricultural-based industries in Botswana in the future.

Gaborone, Francistown and Lobatse are the major urban centres of manufacturing and processing industries. These industries include tanning and leatherwork, textiles, wood and wood products, metal products, beverages and food, meat and meat products, chemical and rubber industries. Handi-crafts are made in villages throughout the country. The Botswana Enterprise Development Unit (BEDU) is helping with the promotion of small-scale industries in large population centres (both urban and rural) and encourages use of local materials and intermediate technology.

1.2 STATEMENT OF THE PROBLEM

Over 80% of Botswana's population live in rural areas and are largely dependent on agriculture. The level of agricultural production is low, not only in terms of quantity and quality but also in the farming methods used. In particular, progress in the farming sector has been slow. The farming population are capable of producing enough in some years for the country's consumption needs with a little surplus[6]. For example, in the 1974/75 season Maun District farmers produced 1,300 metric tonnes of sorghum (the principal grain) and consumed 1,100 metric tonnes, thus having a surplus of only 200 tonnes for the population that does not produce its own food in the district and beyond. However, production of crops is variable, declining in some years despite increases in hectarage. For instance, in the 1968/69 season Botswana produced 29,000 tonnes of sorghum from 103,000 hectares whilst in the 1970/71 season only 7,800 tonnes were produced from 120,000 tonnes. Figures for the Maun District in these periods are not available but production declined from 1,300 tonnes in 1973/74 to 500 tonnes in 1974/75 and increased to 2,500 tonnes the following season. These variations[5] could be attributed to low rainfall in some years but there are also instances of decreased production in years of average or above average rainfall. A comparison of sorghum and maize illustrate this. (Table 1.1). In 1971/72 both grains decreased in production from the previous years yet rainfall was higher.

TABLE 1.1

ANNUAL VARIATION IN HECTARAGE AND PRODUCTION OF SORGHUM AND MAIZE 1967/68-1975/76-BOTSWANA

	Hectarage Planted (000 Hectares)		Production (000 Tonnes)		Average Rainfall (mm)
	Sorghum	Maize	Sorghum	Maize	
1967/68	57	30	10,4	7,4	437
1968/69	103	42	29,8	12,8	428
1969/70	120	26	7,8	2,1	360
1970/71	161	38	73,3	16,6	467
1971/72	180	26	68,3	10,3	617
1972/73*	90	19	10;3	22,3	291
1973/74	181	113	72,3	33,9	722
1974/75	100	100	33,8	28,7	695
1975/76	178	223	55,5	62,6	662

*Estimated

Source: Ministry of Agriculture, Botswana

Agricultural Statistics 1977.

The decline in hectarage in some years may be explained by two factors. First after a year of poor rains farmers hesitate to plough their fields early. Secondly, a large proportion of farmers rely on borrowed or hired draught power and ploughs and owners may be unwilling or unable to give them out if they themselves have started ploughing out late.

As a result of low and variable grain production there is a shortfall between national production and consumption levels, thus necessitating imports of these basic foodstuffs from neighbouring countries. In 1976 12,000 tonnes of sorghum were imported from South Africa.

The situation is made worse by the fact that about 65% of the rural population either own no cattle at all or have less than ten head of cattle[7]. In Botswana fifty head of cattle is estimated as the minimum herd size capable of providing the average family with its subsistence requirements. In order to raise the standard of living in the rural areas, the subsistence sector should be transformed by introducing innovations that will increase production of both staple and cash crops. The farmers could then market the surplus staple crops and cash crops to obtain incomes for building better houses, educating children, buying clothes and so forth.

Agricultural development programmes and policies in Botswana have previously given more emphasis to livestock production than to crop production. This approach has resulted in a highly eskewed agricultural development with the livestock sector realising much more progress. In the Maun District progress in the livestock sector is demonstrated by the rising sales of cattle and willingness of farmers to have their cattle

vaccinated (nearly 100%); and yet hardly any local farmer uses modern methods of arable farming at present. It would be a reasonable statement to say that extension officers have tended to assist farmers more on animal husbandry.

Seventy percent (70%) of all national agricultural expenditure is on the livestock sector which in turn accounts for 80% of all agricultural exports[8]. The bias towards livestock and especially cattle development is further illustrated by the 1975 Tribal Grazing Land Policy which was an attempt by the government to formulate a viable land policy for a national agricultural development. However as its name suggests this policy hardly considered arable farming and was therefore bound to serve only a small section of the rural population. Since about 45% of the farming households own no cattle at all and 20% own fewer than ten cattle, this strategy which emphasises on cattle production is not effective for equitable distribution of development to Botswana's rural population. For development to reach the poorest sections of the rural inhabitants rapidly, more emphasis should now be given to crop farming, but seen as an integral part of the total agricultural and rural development process.

Botswana has a unique rural settlement pattern whereby some families have three separate homes, one in the central village and two other crude homes in the lands (cultivated areas) and in the cattleposts (grazing areas). This system came about when a tribe settled in a place to form a village from where the chief ruled. The fields and grazing areas were originally around these settlements, but as population increased demand for the land around also increased. Thus individual

families began to look for cultivating and grazing land farther away from the village[9]. This process continued until the areas of agricultural activity were so far away that it became necessary to build homes at the cattlepost and lands from which to operate. But during the dry season the farmers would return to the village due to lack of water . In the Maun District this process began in 1906 when chief Matiba came to power and did not restrict his subjects to staying in Maun which was infested with tsetsefly[10]. Dangers of attacks by other tribes like Amandebele had also passed. Some of the cattleposts or lands settlements became permanent and grew into villages - for example Toteng and Makalamabedi. Movements from these villages to new lands and cattleposts started again once there was pressure on land, creating new settlements and dispersing the population further.

Thus today rural Botswana live in major villages, medium villages, small villages and scattered homesteads in the lands and cattleposts. The areas next to the villages are used mainly for cultivation although a few animals may be kept. This zone usually extends to 10 km or so and is heavily overused (and over-grazed). As one moves farther from the village one enters a zone of mixed crops and animal husbandry. This area extends up to some 50 km and there are signs of environmental degradation. In the Maun District this area corresponds to the zone between Chanoga and Makalamabedi. Farthest from the major villages lie the cattleposts with the best pastures. Usually the richer cattle owners are found here and most of them have sunk boreholes for watering their animals.

Some farming households living in the villages hold agricultural land very far away, up to 400 km in some cases. There is thus a great movement of people between these areas in accordance with the seasons. This system of separate areas of different agricultural activities and the village is not compatible with the principles of efficient farming. Time is wasted in travelling between various areas and absenteeism from lands and cattleposts results in poor management. In the Maun District 64% of the farming households live in villages "commuting" to their lands according to the Ministry of Agriculture[11]. This study found that 62% of those interviewed did not stay at the cattleposts or land but migrate now and then between the village and areas. There is however, a certain degree of permanent residence (38%) in the lands and cattleposts due to the availability of water from boreholes. In other districts also, farmers are now building permanent homes in the agricultural areas. It is hoped this trend will continue and be encouraged by government.

In terms of physical planning the unstable population distribution and densities which vary according to seasons make it difficult to plan with specific numbers in mind. Moreover the implementation of agricultural developments strategies is hampered by this highly mobile rural population. Expansion work also becomes extremely difficult under this system. Under the arid and semi-arid conditions of Botswana it is still possible to create a land use system conducive to good husbandry and rapid agricultural development without resorting to the present uneconomic system - especially in the wetter areas like Maun District. The Maun District is also advantaged in having vast

quantities of surface water which should be considered in drawing up a land use plan for the area. On a national level, agricultural development strategies have been proposed for implementation without the necessary structural changes in the land use system. Changes in spatial organisation of the agricultural land use patterns should be seen as complementary to any successful implementation of the agricultural development strategies.

1.3 SIGNIFICANCE OF THE PROBLEM

Although agriculture is the predominant occupation of the rural population in Botswana as in other African countries, production is still low. In fact in other parts of the country arable farming is still at its earliest stages. The most important role of agriculture is to provide adequate and balanced food for the nation, create incomes for the rural population and provide employment. One could deduce from this the deficiency of calories and protein taken by the rural population especially those whose incomes are low. Incomes are low in the rural areas and wage employment is concentrated in urban areas. In order to raise incomes, create employment and thus uplift the standard of living in rural Botswana efforts should be made to developagriculture, especially crop farming in Botswana.

Increased investment in agriculture and expansion of this sector forms the quickest and most direct way of transforming the rural areas. If subsistence arable farming can be helped to produce more, the rural population will have more than enough food in the first place; in the long run surpluses will be produced and these will be marketed to create incomes for the

rural population. Increased incomes will lead to more and varied consumption and positive changes in the standard of living. In the end increased production may lead to the creation of agro-based industries.

To facilitate rapid agricultural development, the present land use and human settlement system in Botswana must be reorganised. The separation of cattleposts/lands and village retards effective implementation of programmes. It is therefore significant that a system which will consolidate the agricultural lands and stabilise the rural population be worked out as a necessary prerequisite to more efficient agricultural development programmes.

1.4 OBJECTIVES OF THE STUDY

(i) To examine and identify problems of agricultural development in Botswana.

(ii) To examine the pattern of agricultural development and their effects on the pattern of land use and human settlements in Maun District.

(iii) To suggest alternative strategies for agricultural land use and human settlements patterns in Maun District .

1.5 ASSUMPTIONS

(i) There is lacking an integrated agricultural policy leading to over-emphasis on livestock development and negligence of crop farming.

(ii) The existing land use and human settlement pattern is not conducive to efficient agricultural development.

(iii) A more efficient land use and human settlement pattern is necessary to establish a more integrated approach to agricultural development.

1.6 THE SCOPE AND LIMITATIONS

This study attempts to examine the general agricultural development problems, strategies and programmes in Botswana with particular reference to Maun District. The difficulties experienced in attempting to implement agricultural strategies due to the existing land use and human settlement patterns are also studied. Since agriculture is such a wide field attention will be given mostly to cattle production which has played a leading role in the country's economy and arable farming which has a potential of growth but has been given less attention previously. Strategies for an integrated approach to agricultural development in the district will be suggested. Land reform and spatial reorganisation to facilitate easy implementation of agricultural strategies will form the major proposals of this study.

Because of the limited time available for the field work the whole region could not be covered. Therefore the area immediately around Maun, bounded by Shorobe, Makalamabedi and Sehitwa was taken as the effective study area. However, the policy proposals suggested in this study are expected to be relevant and applicable to the policy requirements of the whole district and other parts of Botswana.

This study is organised into seven chapters. The first chapter gives the general background of Botswana. It also describes the problem and its significance, sets out the objectives, assumptions, scope and methodology of the study. Chapter II examines the general problems of agricultural development in Botswana. Livestock and arable farming in Maun District are discussed in chapter III. The fourth chapter

looks at some specific agricultural programmes and projects in the district. Human settlements in Maun District are taken up in chapter V. Chapter VI offers alternative strategies for agricultural development as an instrument for rural development in the district. The conclusion recapitulates the main points discussed in the thesis and draws conclusion from the findings.

1.7 THE STUDY AREA

Maun District is that area under the jurisdiction of the Maun District Commissioner. It is situated in the Okavango Delta region and covers the whole of Ngamiland. It has a population of 65,000 people living mainly on the fringes of the Okavango Delta. This area has relatively greater agricultural potential than most parts of Botswana[12]. It possesses the largest water resource in the country - the Okavango Delta. The quality of this water is fairly good since it can safely be used for domestic, irrigation, livestock and industrial purposes. However, at present this water resource is not used for any large-scale economic activity - except the Mopipi dam which supplies Orapa with water.

Some parts of the area have relatively fertile and irrigable sandy loams. These soils exist around Shorobe, Nokaneng Flats Gomare and Maun. SWECO and FAO/UNDP investigations have found that crops that can be grown here include sugar cane, rice, tobacco, cotton, fruit and vegetables.

The district possesses the most extensive rangeland in the country and abounds with wildlife; Good grazing areas exist around Lake Ngami, in the Haina Veld and the areas bordering Namibia.

Within the swamps are found a great variety of birds and animals which could be utilised for tourism and game trophies.

However, despite these agricultural and wildlife resources the district has very little agricultural development. What then are the major constraints to agricultural development and in what ways does the spatial distribution of settlements and land use system influence the success of agricultural programmes in this area? This study attempts to throw light on this basic question regarding the development of the region.

1.8. DEFINITION OF IMPORTANT TERMS

"Villages

These are traditional towns originally created when tribes in Botswana lived together in one settlement in order to defend themselves against other hostile tribes. Hilly areas were preferred especially in the south and east where such traditional villages as Kanye, Ramotswa and Molepolole grew. Later, smaller villages developed as population in the first villages grew and there was pressure on land. Most of the villages are unplanned and lack social and economic services. The large villages however possess many urban characteristics although they remain rural in economy and outlook.

"Major traditional villages"are the largest rural centres with population ranging from 6000 to 40,000. These villages include Maun, Serowe, Mochudi, Molepolole, Kanye, Ramotswa Mahalapye and Palapye.

"Large villages" refers both to the major villages and those villages with population of between 1000and 5000.

"Medium villages" have between 500 and 1000 people whilst "Small villages" are those with population of less than 500[13].

In the context used in this study medium and small villages are grouped together to form "smaller villages." It should be noted that the centres termed villages are administered by chiefs or their headmen.

"Urban Areas" are those towns which have developed recently. They are planned, they are provided with services such as sewerage, tarmaced roads, water reticulation, industries and modern recreational facilities. The rate of growth is generally higher than that of villages. There are five towns (urban centres) in Botswana, viz: Gaborone, Francistown, Lobatse, Selebi-Pikwe and Orapa. Towns are administered by town councils.

"Cattlepost" is a word refering to grazing areas situated far from the village. There is often a homestead in the cattle-posts from which animal management is done. Today there is often a communal source of water in the cattlepost in the form of dams and rivers. Private boreholes and wells are also owned. Different herds range and mix freely in the cattleposts.

"Lands" is a term used for the cultivated areas in Botswana.

"Kgotla" is a Se Tswana word used to refer to a meeting place in the village. Public consultation on important matters takes place here; it is also used as a traditional court area.

"Rural development" in the context of this thesis is seen as a process of concerted efforts directed to uplift the social, economic, political and physical well-being of the rural population and the upgrading of their physical environment. It takes both qualitative and quantitative dimensions.

1.9 RELATED LITERATURE

Von Thunen in his "Isolated State" (1826) conveived a

system of land use surrounding an isolated city[14]. He assumed soil of uniform fertility and a single centrally located city and other settlements being rural, a level plain and poor communications. Thunen calculated economic rent accruing to each land use at various distances from the central city and obtained an ideal distribution of production as a series of concentric circles around the city. Horticulture and dairying were practiced in the area adjacent to the city, then followed the zones of sylviculture, intensive arable rotation, arable with long ley, three-field arable and finally ranching. Although Von Thunen wrote about this land use system during the last century there are several cases in the world where agricultural land uses are arranged in accordance with this principle of rings, for instance in Sicily and Sardinia (quoted by Michael Chisholm). In Africa examples of concentric zones have been identified mostly in West Africa[15]. Four zones were identified by Prothero's study of Soba village (1957) in Nigeria ranging from the zone within the village walls to the farthest (up to 1½ miles) where shifting cultivation was practised. In Ghana, Manshard distinguished land use zones around a single zone in 1961. The first zone around the compound was not manured whilst the second was partly manured but larger. The third zone was manured and merged into another zone of wooded savana with scattered "bush farms". In Botswana these concentric rings tend to occur around almost all villages although the system is more complex due to the number of dispersed settlements of varying sizes and the large radii involved.

Michael Chisholm in "Rural settlement and Land Use"[16] points out the importance and effects of distance between village and

fields. "Time spent in travelling could be put to other uses whether production or more social activities and it is these other uses which may provide the measures of costs involved in overcoming distance." He thinks that fragmentation is the most widespread cause of distances. In Botswana the cause is mainly ecological. As distance increases from the village returns per hectare decline. This has to be proved in Botswana since some farmers live in the lands during the crop growing season. Also Chisholm as well as Found in " A Theoretical Approach to Rural Land Use Patterns"[17] assert that in general, intensity, gross income and net income decrease with distance from the home. These postulates are largely true of Botswana's situation since those farmers with fields in the farthest lands and cattleposts are often away from the agricultural areas leaving labourers to attend to farming affairs.

The role played by central places and growth centres in national development has been discussed by several authors such as Christaller, Perroux, Myrdal, Hirschman, Herma nsen and John Friedmann. Oneof the most recent works is that by John Friedmann "Urbanisation Planning and National Development". Friedmann postulates that development in a spatial system tends to concentrate in a small number of areas or centres called core regions which determine the development of the peripheral regions.[18] The possible spatial systems are the world, the multinational region, the sub-national region and the province. Core regions generally perform a wide variety of functions for their dependent areas. As centres of production and consumption core regions organise their peripheries into sets of supply areas for furnishing them raw materials, foodstuffs and semiprocessed commodities they need.

Thus the relationship between the core and the periphery may be to the disadvantage of the periphery which is subjected to exploitation by the core. In Botswana, Gaborone and the other urban centres forming a belt of relatively higher development may be regarded as the core whilst the rest of the country form the periphery. The growth centre strategy could be used for developing the backward rural areas of Botswana.

The general definition of a growth centre is that it is "an urban base with a rural hinterland capable of growth. Its functions include provision of marketing facilities for agricultural commodities, development of small commercial and industrial activities (agro-industries) for diversified employment. It also promotes the development of infrastructure such as roads, water supply, sewerage, power supply and social services (education, health etc). Growth centres also initiate an information and communication system for innovations. Thus exponents of the growth centre concept generally agree that it could be used as a strategy for developing backward regions by injecting industrial and infrastructural investments in selected centres. Existing central places may be selected on the criteria for their potential for development. In Botswana the existing major villages could be designated as growth centres in which agricultural-based industries such as milling and tanning could be developed. Social services like health, education and recreation are being concentrated here at present but there is a lack of industrial activities and good roads linking these villages and the smaller villages.

In Africa, the growth centre strategy has been tried in Ghana and Kenya.

In Kenya a hierarchy of rural services centres has been identified ranging from urban centres, rural centres, market centres, and local centres. The highest order centres have been designated as growth centres and development is now being concentrated on these. The higher the centre is categorised in the hierarchy the more and better facilities it is supposed to provide. For the policy to succeed, it has to be given time and the correct investments made.

S. Makings' work "Agricultural Problems of Developing African Countries"[19] gives an insight to almost all the general agricultural problems in the continent. Although the problems are general and refer to no particular agricultural area, they form a guide to a detailed study of problems in small localities. "Getting Agriculture Moving" by Mosher is another work relevent to this study,[20]. It discusses essentials for moderminzing agriculture in the developing world. These include improvement of farmers' capabilities to produce more efficiently (through extension services), adequate farm inputs, marketing facilities, credit and transportation. These essentials amongst others are of importance to the development of agriculture in Botswana.

The report of the Kericho (Kenya) Conference in 1966 - "Education, Employment and Rural Development"[21] covers many subjects on rural development. Some of the recommendations on East African agricultural development may be useful for Botswana. The Conference saw agriculture as a sector which could play an important role in national development because in the first place a well-planned agricultural programme would mean involvment of the largest possible number of citizens and the

accruing of benefits to them. It was also realised that the development of drier areas which constitued 75% of the total area of Kenya's agricultural land was desirable. Botswana has a similar problem of vast areas which are arid (only 7% is suitable for arable farming) but could be developed into extensive livestock ranches. This conference formed the foundations of the Special Rural Development Programme in Kenya. The overall objective of the SRDP was "to raise productivity, incomes and the level of welfare of the rural population" and this was based on the principle of experimentation, mobilisation and utilisation of local resources and replicability. Six areas of different human and ecological characteristics were chosen for agricultural projects with a view that these could be repeated in other parts of the Kenya with similar environmental characteristics. Botswana could experiment on this approach by, for instance, setting sugar cane growing schemes in the Okavango Swamps, cotton projects in the eastern Limpopo catchment and ranches in the Kalakgadi Basin.

Kalifa's thesis "Strategies for the Resolution of the Problems of Rural Overpopulation and Internal Migration in Uganda"[22] will be very useful in this study. Although he deals with a situation different from Botswana, viz: overpopulation, the strategies he suggests such as the establishment of district development plans, land use reform and formulation of a strong marketing policy will be applicable to the Maun District Study. Kalifa identified some problems which are crucial to most African rural areas such as traditional land tenure and agricultural practices, low standards of both physical and social infrastructure development, ineffective extension services and low

standard of formal education. These problems exist in the Maun District although in a different fashion.

The "Study of the Use, Extraction and Transfer of the Okavango Water for Development of the Okavango Corridor"[12] by SWECO (a Swedish Technical Consultation Organisation) provides a lot of relevant information on the resources of the Maun District and agro-technical questions. It classified soils and identified those which are irrigable. Groups which can do well under irrigation in the area were also identified. Later work on the district by the FAO/UNDP project abounds with socio-economic-physical information. Areas of possible development using the Okavango water are singled out. The report also recommends that since transfer of the water to other areas in Botswana would be costly, small irrigation schemes within the district could be encouraged.

The 1973-78 and 1976-81 Botswana National Development Plans discuss programmes for agricultural development in two chapters viz: "Rural Development" and "Agriculture". The national policy objectives are outlined as (1) rapid economic growth, (2) social justice, (3) economic independence and (4) sustained production. These will be achieved through various strategies such as increased agricultural output, creation of employment opportunities and rural development.

Production figures for both sectors are few, revealing the dearth of agricultural statistics in the country. National crop production is given only for sorghum and maize from 1967/68 to 1974/75. Hectarage, yield, consumption, imports and exports are not given in the 1976-81 Development Plan. It is therefore difficult to deduce from these figures whether

there was an adequate production for national food. However, the Agricultural Statistics 1977 supplements these figures by giving hectarage and yield for these years but no figures for exports and imports. The 1977 Annual Report of the National Development Bank gives import figures for sorghum for 1976 only. It is also evident from these two National Development Plans that the livestock sector is given far greater emphasis than arable farming. First there is a wider coverage of the livestock programmes and projects and secondly it is pointed out that 80% of all agricultural expenditure is on this sector. Although crop production is the predominant activity of the rural population it contributed only 13% of the total rural production in 1968/69. The Plan realises that crop production is risky because of aridity and unreliable rains. To resolve this research on dryland farming is suggested together with "minimum tillage techniques" so as to reduce loss of moisture and draught requirements. Diversification of crops is also suggested. However, there is no definite arable land policy statment. The Development Plan expresses the hope that the Tribal Grazing Land Policy of July 1975 will help in the creation of a suitable national development policy on arable farming. In this study it is intended to bring out suggestions on a land policy that will promote integrated agricultural development. To achieve this under the semi-arid conditions would require concentration on regions such as the Maun District which can support both livestock and crops. Surface water and underground water resources could be exploited for supporting both animal and plant life. The poor soils could be improved through utilisation of manure.

Arable farming will therefore be given as much attention as livestock development if not more. The NDP lacks a strong policy regarding agricultural production as an incentive for the rural population to take up crop production as a means of both raising food and incomes. The other shortcoming of the NDP is lack of enough encouragement of arable farming projects such as irrigation schemes in appropriate areas (Maun District is a case in point). In this study suggestions of such projects, crop trials and introduction of "new" cash crops in the swamps will be made.

The "Ngamiland District Development Plan 1977-82"[23] is an attempt at comprehensive district planning. The plan discusses the existing situation in the district and the development potential of each sector. Then sectoral development plans are given followed by an attempt to treat all the sectors together. The agricultural sector treats livestock and crop farming as separate and therefore the integration concept is lost completely. It is also full of lists of intentions without strategies for achieving these planned objectives.

Various organisations and departments made an input into the plan but unfortunately not much had been done to co-ordinate the various sections. For instance the Ministry of Agriculture could have combined with the Tawana Land Board and Department of Wildlife to write a chapter on Land Use Planning. The impression one got from the Plan is that the physical aspects havenot been given attention hence most of the proposals are general and do not refer to a particular area in space. Also the plan restricts itself too much to nationally proposed projects and programmes.

The Plan - only seems to be interested in seeing how these programmes can be done in the district and thus produces very little that is original and particularly suitable to the area. For instance, of the 10 projects quoted for arable farming nine are national and only one is at district level and for that matter it has not been started yet. (This project, Nokaneng Irrigation was originally suggested by the UNDP/FAO Project).

This study hopes to contribute to the understanding of land use and settlement patterns in rural Botswana by looking at the distibution of lands and cattleposts in the Maun District. Distances travelled between the villages and the agricultural lands and the time taken will be examined. The separation of agricultural lands and homes will be examined as a major force that prohibits rapid agricultural development. It is hoped that a system of land use that will bridge distances travelled and time consumed will be drawn out. Extension work will benefit greatly by having the scattered field and cattleposts brought near each other under proper management which takes account of the prevailing ecological conditions.

1.10 METHODOLOGY

Background studies on agricultural development were made in Nairobi and Gaborone before going to the field. These covered the agricultural development problems of developing countries in Africa and elsewhere and Botswana in particular. Strategies to resolve these problems were studied. Official documents on agricultural and rural development policies were studied and government officers interviewed both in Gaborone and in the district. Questions asked included the size of area the officers covered in their work, and the number of farmers

served, education, experience, number of times officers were transferred and what they considered the major constraints of agricultural development.

Two sets of questionnaires were prepared for obtaining information, one from the farmers and the other from the field officers. The sampling framework was composed of all the farming households in the effective study area. Interviews were carried out in three of the five large and medium villages (Maun, Shorobe, Toteng) and their surrounding cattleposts. Maun is in the centre and Toteng lies 67 km to the west of it. Shorobe is 50 km to the north-east of Maun. The population of Maun is about 15,000, that of Toteng 600 and Shorobe's is 300. The total area of the effective study area is around 3,000 sq.km.

Since there was no list of all farming households (estimated at 2,500) to facilitate arandom systematic and stratified sampling, it was assumed for practical purposes that all the householdsliving in the traditional sector of the villages were farming households. Although randomness of the sample could not be established, it was systematic since in the villages every third house was interviewed and in the lands and cattleposts every other homestead was interviewed. Moreover, efforts were made to include all wards in the village (wards are generally based on clan groupings) to make the sample as representative as possible and minimise bias. However, due to transport problems the data was collected in easily accessible settlements in the cattleposts and lands. One of the problems was the absence of the heads of households during the time of interview which slowed down the process and thus resulting in a small sample.

However the next homestead was interviewed whenever possible in such a case. A total of 84 farmers were interviewed 15 from Shorobe (13%), 15 from Toteng (12%) and 54 from Maun (3%). These farmers were divided into sub-sets according to the number of cattle owned as follows: (1) 0 cattle (2) 1 - 50 cattle (3) 51 - 100 cattle (4) 101 -200 cattle (5) over 200 cattle. Data was analysed using these groups of farmers.

The officer questionnaire was administered to 17 out of 30 extension officers. Those interviewed came from different stations in the Maun District since whenever they visited the Regional Agricultural Headquarters the researcher was informed.

Some agricultural projects in the district were visited in addition to visits made to the cattleposts and lands. The Ngamiland Rural Training Centre, the Tsetseku Ranch, Makalamabedi Holding Ground and Artificial Insemination Centre, Maun Secondary School were all visited and photographs taken. Although the two research stations at Motopi and Moshu were not visited discussions were carried on with the project manager and two members of the staff.

Discussions related to rural development problems were also held with the District Commissioner, the Chief, the Land Board Secretary, members of the District Council, the Village Development Committee, Chairman and Officers in other Departments such as Roads, Wildlife and Co-operatives.

A major limitations during field work was the time at which it was carried out, that is in August and September, when there was very little arable farming taking place. Thus observations were made only in irrigation schemes such as Maun Secondary School.

A further limitation was the scarcity of agricultural data for the District. However, this was overcome through intensive interviews with the Regional Agricultural Officer and other government officials.

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CHAPTER II

PROBLEMS OF AGRICULTURAL DEVELOPMENT IN BOTSWANA

In developing countries the improvement of agriculture plays an important role in rural development as the majority of the rural population subsist mainly on agriculture. Rural Development is seen as a process of conscious and concerted efforts geared to transform the social and economic wellbeing of the relatively underdeveloped rural masses and improve their physical environment. To improve the quality of life of these people the most important thing is to enable them to obtain adequate and balanced food and this can be done by assisting them to develop their traditional agricultural systems. It is expected that raised agricultural production in the subsistence sector will first provide adequate food locally and eventually there will be surpluses for marketing to less productive areas or to the new agro - industrial sector. From this point of view agriculture may be regarded as an important instrument for raising rural incomes and standards of living. However there are many formidable problems that affect agricultural development thathave tended to retard the rate of economic growth in many developing countries.

In efforts to resolve the problems of rural low food production and productivity, low incomes, unemployment and underemployment, disease and illiteracy, the Government of Botswana has to work against a number of physical, social and economic forces. Some of these are examined below.

2.1 ENVIRONMENTAL FACTORS

2.1.1 ARIDITY AND WATER

Development in Botswana is often associated with

availability of water supply - hence the national motto "Pula'" (may it rain!) The country is generally dry with an average rainfall of 450 mm. This low rainfall is unreliable. The single rainy season is from October to April but may begin as later as December. Its distribution is uneven with a few small areas with over 400 mm of rainfall (map1.2). Evaporation is high and the little rainwater is quickly lost. There is therefore very little in most parts of the country and this phenomenon impels the nation to give priority to water conservation. The only perennial river, the Okavango, lies in the north-western corner of the country. The waters of its delta have not yet been used for national development due to its geographical distance from the rest of the country. Thus the country is largely dependent on groundwater which is utilised by 75% of Botswana's human and animal population.

The areas in the south-east and north-east of the country receive just enough rainfall to support crops and animal life. Here it is possible to construct dams for livestock and domestic water supplies. In addition boreholes have also been sunk. The central, western and southern areas of the country are the driest parts of the country receiving between 225 mm and 350 mm of rain (map 1.2). The major source of water here is groundwater which is obtained by sinking boreholes.

Thus three water resource zones may be distinguished in Botswana: (1) The Northern zone roughly bounded by Nata, Kasane, Shakawe and Sehitwa. This zone has an annual rainfall of over 500 mm and has large quantities of surface water in the Okavango Delta and the Chobe river system.

(2) The eastern zone covering much of the Limpopo catchment area and the south-eastern corner of the country. Rainfall here ranges between 550 and 250 mm. Surface water is available in man-made dams. (3) The area covered by the Kalahari basin including central, western and southern parts of the country is the driest. With less than 250 mm of rain per annum.

The country has a great shortage of readily available surface water. The government has shown concern over this scarcity of water and is embarking on programmes to provide water in the villages and farming areas. The government policy is to subsidise the costs of providing domestic and livestock water supply. Hence all boreholes drilled by the government are being provided on a "repayment basis and all drilling equipment and maintenance services are paid for at an economic rate"[1], Drilling of private boreholes is subsidised through the pricing mechanism of equipment and costs of drilling. This policy is meant to encourage stockholders to treat livestock as commercial activity. Over 5 000[2] boreholes have been drilled throughout the country and it is the government's intention to supply all major population centres with water through the water supply programme under which 2,5 boreholes per week were being completed up to 1978. Priority is given to providing villages with water under the Village Water Supplies Programme. The water is supplied in communal stand pipes to within 400 metres walking distance from any residential unit. This programme has been successful in some ways since several villages are now supplied with piped water although only villages of over 500 people have been given priority. The main setback of this water programme is that although consideration has been

given to water for livestock, the policy does not state the position as regards arable farming. Map 2.1. shows that the boreholes are concentrated in the eastern part of the country which is more developed.

Besides a programme of boreholes drilling and building of dams to avert water shortage, the government is planning a programme of collecting rainwater using roof catchments in rural areas. It is also planned to have research on irrigability of the Kalahari sand soils and the useability of saline water occuring in some aquifers in the Kalahari Depression. These planned programmes will help in formulating a more realistic policy on water utilisation and conservation for agricultural development in Botswana. Up to now complete crop failures were almost entirely due to a lack of adequate rains in some years. This overdependence on natural features such as rain will continue to make agriculture an uncertain and risky economic activity in Botswana unless man learns how to control and utilise rain and groundwater.

2.1.2 SOILS

Soils form the foundation of farming. Where soils are fertile agricultural production under good husbandry is expected to be high; where they are not fertile crop production should be poor without the addition of fertilisers. Climate has a direct influence on soil development and vegetation growth. In Botswana the soils are relatively poor largely due to the semi-desert conditions. Over two-thirds of the country is covered by the Karoo basement or Kgalagadi (Kalahari) sand soils. These poor soils occur in an area of low and unreliable rainfall and can only support scrub vegetation and need heavy manure or

artificial fertilisers for any large crop production. This scrub vegetation could be used for grazing especially hardy animals like the goat. At present this area is hardly occupied except for the nomadic Basarwa who rely on gathering and hunting.

The eastern part of the country has tropical red ferrugenous soils which are relatively more fertile and support both arable and livestock farming, (map 2.2). However addition of fertilisers is also needed here. In northern Botswana soils other than Kalahari sands which are more suitable for irrigated agriculture exist at Dukwe, Nokaneng Flats, parts of Chobe district, Shorobe area and along Lake and Boteti Rivers[3]. However the usefulness of these sandy loams is destroyed by poor husbandry practices. Fertilisers are used only to a limited extent because they are expen sive and often in short supply. Any irrigation projects on these soils would require both capital and agro-technical expertise. The major problem in all the three soil zones is that at present it is not yet known what the main soil deficiencies are. A research on this is bound to make a useful contribution towards a gainful utilisation of the soils.

2.1.3 VEGETATION

Given the scarce rainfall and poor soils, the resultant vegetation would be expected to be extremely poor. Fortunately because the Kalahari sands retain water up to 6 metres below the surface the vegetation is not so poor as one might expect[4]. In this zone the major vegetation type is scrub and short grass. Occasional accacia bushes are found here and there. This scrub vegetation deteriorates to near desert vegetation in the south western corner of the country.

Tree and grassland savana occur in the eastern zone and parts of north-western Botswana in Ngamiland. These grasslands are far inferior to grasses in other African countries although extensive and reasonably palatable. The national averages carrying capacity of 12 hectares per livestock unit (L.S.U)[5] compares badly with Kenya's 4 hectares per L.S.U. in better range land. Botswana's driest areas have an average carrying capacity of 27 hectares per L S.U. whilst in Kenya the ratio is 12 hectares to 1 L.S.U.[6] The vast expanses of land in Botswana make it possible to keep large herds of cattle on its relatively poor grazing land. However careful husbandry has to be practised in order to avoid environmental damage. It is therefore necessary to create a land use system whereby products from arable farming such as maize stalk will be used as stock feed during the dry season so that grasses are not irrepairably damaged. Farmer education on range management will also help in sustaining such a system.

Savana woodland is found in the Okavango swamps and the north-eastern district. Mopane woodland predominates and the grass is taller than that in the savanna grasslands. This vegetation is useful for browsing and grazing. Tropical forests occur in a small area in the Chobe district. The Teak and Mukwa trees will form an important forest resource for a timber industry once they are mature.

Conservation of natural vegetation in Botswana is difficult at present since grazing and cutting of trees for firewood are not controlled. This is aggravated by the frequent veld fires especially during the dry season. The government has passed a law under which deterrent sentences and fines will be imposed on those who destroy vegetation in this way.

A programme of reafforestation near villages is also under way. However, individual or co-operative farmers should be expected to utilise and conserve the vegetation resources with more responsibility if they are working in a clearly bounded area of their own.

2.1.4 ECOLOGICAL ZONES

On the basis of climate, soils and vegetation, four broad ecological zones can be identified in Botswana. These are the Kgalagadi Depression, the eastern zone, the Okavango Delta and its fringes and the Chobe District (map 2.3)

The Kgalagadi Depression zone covers most of the Kgalagadi basin in the centre, west and south of the country. The soils are of mainly desert and sub-desert type dominated by loose sands (map 2.2) whose formation was mainly influenced by climate. The rainfall varies between 225 mm and 400 mm and its reliability is 20%. Its vegetation regimes are largely shrubs consisting of accacia in the centre and south and Terminalia towards the north. This zone is sparsely populated and is mainly used by the nomadic tribes who subsist on gathering and hunting. This area could be used for extensive grazing at 21 to 27 ha/LSU in the future and possibly cultivation of crops like water melons (growing wild at present). Goats could be the most suitable type of livestock for the area as they like feeding on accacia leaves. Development of wildlife areas within this zone would need provision of water from underground resources. (Map 2.4)

THE EASTERN ZONE

Covering the Limpopo catchment this zone stretches northwards to the Makgadikgadi pans. It has both the tropical ferruginous soils in the east and the Kalahari sands to the west.

The ferrugin ous soils may be of a loamy or sandy loam type. The rainfall varies between 400 mm and 550 mm. The percentage probability of rainfall exceeding 500 mm in any one year lies between 30% and 50%. The predominant vegetation is mainly tree savana with pockets of grasslands. The grazing capacity varies between 12 ha/LSU and 1 6 ha/LSU. At present cattle, goats and sheep are kept in this zone whilst the common crops are maize, sorghum, millet and cowpeas. But this zone has a potential for growing groundnuts, cotton, sunflower and fruit especially under irrigation. A small amount of cotton and groundnuts are grown at present but this could be increased especially by developing the Limpopo catchment area for irrigation. These cash crops could be grown around dams such as Shashe or even by using the groundwater supplies.

THE OKAVANGO DELTA AND FRINGES

Kalahari sands, loamy sands and hydromorphic soils exist in different areas of this region. The rainfall is relatively higher and more reliable with an average quantity of 650 mm per annum and a reliability of 60%. Vegetation varies between tree savana, grass savana, aquatic grasslands and woodland savana. The grazing capacity of the range lies between 12 ha/LSU and 16 ha/LSU. Like most parts of Botswana there is overgrazing near villages and around water points. The major crops at present are sorghum, millet, maize and beans. Crops that have been identified as suitable for growing in the region include sugar cane, rice, tropical fruit, tobacco, cotton and vegetables. The loamy sands could produce large quantities of these under irrigation using the standard surface water of the Okavango Delta.

The Okavango region is rich in wildlife with a large variety ranging from aquatic to terrestial animals. With over eighty species of fish, unknown numbers of bird and mammal species this zone could benefit through the development of a tourist industry based on the wildlife attractions.

THE CHOBE ZONE

This small area lies in the north-eastern corner of the country. The predominant soils are the relatively fertile tropical ferruginous soils. It has the highest rainfall in the country and has substantial amounts of surface water. Rainfall is over 650 mm per year and has a reliability of 80%. This is the only place in Botswana with natural forests of Teak and Mukwa which are, however, still immature for exploitation. It has the highest grazing capacity in the country of 3 ha/LSU, but has the smallest number of cattle. The grazing intensity is very low at 89.3 ha/LSU. Crops grown at present include all the traditional crops in Botswana - viz: maize, sorghum and millet. But it has a high potential for intensive maize production. Tobacco and fruit have been identified as other crops that could be grown on a commercial basis in the area. Thus for future development this zone must be marked for more intensive animal production, maize and tobacco cultivation and afforestation.

2.2 AGRICULTURAL LAND USE SYSTEM

2.2.1 LAND TENURE

Land in Botswana is divided into three categories: Tribal or communal land (71%), State Land (23%) and freehold or commercial land (6%). For each category the terms of tenure and

type of development permitted are different. Tribal land is held communally although a certificate of any customary right to use land may be issued by the land board[7]. Most of the tribal land is cattlepost country and arable lands. Individuals have the right to use the lands; the fields may be fenced, but grazing land is used communally. The disadvantages of this system include lack of controlled grazing practices which leads to rangeland deterioration. There is no incentive for individual farmers to practise sound husbandry and thus protect the range from the vagaries of overstocking, overgrazing and soil erosion. Livestock management groupings are permitted to fence their grazing thus facilitating good range management[8]. However not many such groups exist due to several reasons such as organisational problems. Individuals are allowed to sink private boreholes for domestic water supply and irrigation and watering a limited number of stock. Thus while some groups may fence grazing areas others may not, and the richer have boreholes and control the land around these, but the poorer cannot afford this. Fencing of cattleposts on a co-operative model should be promoted to facilitate short duration grazing paddocks in the Tribal Land.

The commercial areas are held under lease of 50 years and renewable after that period. The creation of new leasehold land is expected to relieve the presently overstocked and overgrazed communal areas. The strategy will benefit the richer people first and sooner or later the commercial areas themselves may be overstocked as there is at present no control on the number of livestock owned or held by each individual household. For both communal and commercial areas there must be established regulations to limit the herd size so that the grazing intensity

compares favourably with the carrying capacity. Priority should be given to the communal areas in this exercise since environmental deterioration is very fast here.

The Statelands are used as national parks and game reserves, forests or as reserves for future agricultural use. There is need to work out an integrated livestock and wildlife ranching policy in Botswana particularly in those areas abounding with wildlife such as the northern parts.

2.2.2 LAND USE PATTERNS

Arable and pastoral farming are the major agricultural land uses in rural Botswana. Ecological conditions, particularly water scarcity, have helped to shape the agricultural land use pattern in Botswana. The fields or lands are normally only a few kilometres from the village; in larger villages lands stretch to 50 km in any direction[9]. The poorer households use the land mostly around villages, growing crops and keeping a few animals. This zone is overstocked and overgrazed especially around water sources; grazing management is poor being under communal control which does not induce farmers to practise conservation methods. Although the fields are often fenced crop damage by livestock is extensive as in most cases there are no drift fences (for separating fields from pastures).

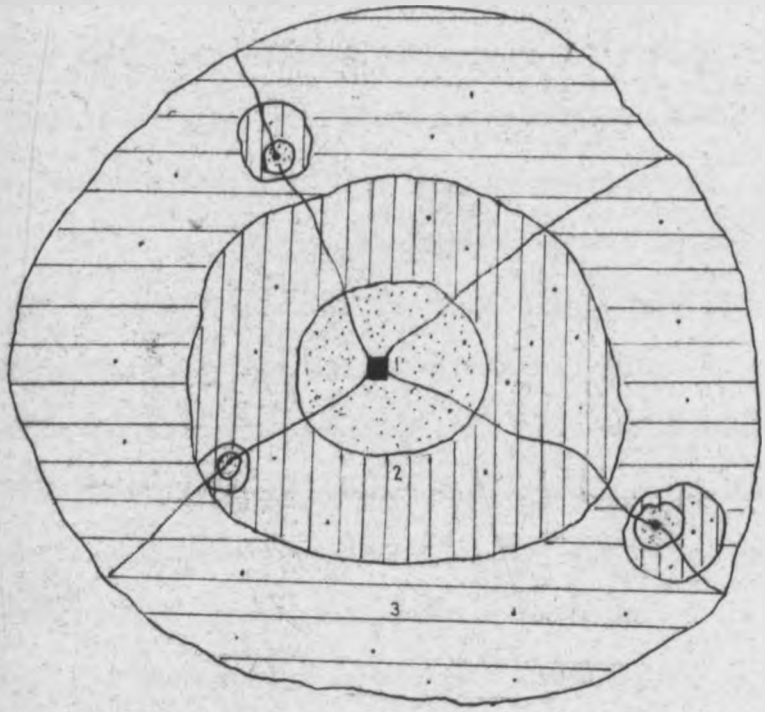
Beyond the cultivated areas are cattleposts whose quality increase outward and these may stretch as far as 400 km depending on availability of water and pastures. These outer grazing lands are occupied by richer farmers with larger herds and often own private boreholes. So the farther one moves from the village, the better the pastures become and the larger the herd per farmer.

In between the large village and the farthest cattle post may be situated smaller villages around some water source. These smaller villages have their own zones of (1) cultivated and overgrazed lands (2) distant lands and cattleposts but on a smaller scale. The better pastures of smaller villages seem to stretch in the direction away from the major village (see diagram 2.1). This pattern is exemplified by almost all areas influenced by major villages, for instance; (a) Serowe has cattleposts stretching up to beyond Orapa. Small villages around Serowe with their own cattleposts and lands include Paaje, Mogorosi, Mmashoro, and Mosolatshane. (b) In Kweneng District Molepolole residents have their fields in the nearby relatively fertile hill valleys and plains. Their cattleposts stretch for long distances beyond the small villages of Thamaga, Motsemotlhaba and Kopong. (c) The Maun farmers grow their crops mainly around the village. Their cattleposts are as far as Sehitwa (160 km) in the west, and in between is Toteng with its lands and cattle posts. In the east are other villages like Matlapanang and Shorobe.

The major problem of this rural land use pattern is that the population is not permanently resident in these settlements throughout the year. People move out from the villages to distant lands during the ploughing season, leaving only school going children and caretaker adults in the homes. However in cases where the lands are nearer this migration is on a daily basis . Cattleposts are operated largely by hired family labour (especially Basarwa or Bushmen) who see mainly to the watering of animals[10]. This system of separating areas of

Diagram 2·1

Typical rural land use pattern in Botswana



Key

Major Village

Minor Village; Scattered homestead

Zone 1 Surrounding the Village, mainly cultivated, overgrazed

Zone 2 Both crop and pastoral farming poor pastures

Zone 3 Farthest from Village mainly cattle posts

Road

agricultural activities and the permanent homes has led to absentee management with consequences such as low productivity and lack of adequate conservation of the natural resources. The owners of "remote" cattleposts only visit thier property when their wage employment and other duties or social commitment allow them to exercise effective management[11]. Time is wasted in travelling between village and lands or cattleposts. The whole system gives the impression that agriculture is not regarded as a full time occupation. Moreover separating fields from pastures by such long distances as 50 km means that imputs from the livestock sector (e.g. manure) into the arable farming sector and vice versa (e.g. cattle feed) are not readily available. It is gratifying to note that although this system of land use pattern is a direct dictate of the country's ecology, rural people are now learning the uneconomic nature of living away from areas of economic activity. Permanent homes are slowly being built at the cattleposts. However, direct government intervention in the form of land reform, provision of adequate water for domestic and agricultural uses and educating farmers in modern methods of farming would appear the quickest way of changing this anomalous land use system. It is one of the major aims of this study to suggest a few alternative models of a reorganised spatial arrangement of rural Botswana.

2.2.3 TRADITIONAL METHODS OF FARMING

Subsistence farmers in Botswana still practise the poor traditional methods of production. The fields are usually small and tilling is done by the plough or hoe. For sowing seed the broadcasting method is still prevelant. This method wastes seeds and makes weeding difficult.

Under the traditional system, little manure or none at all is used, resulting in poor yields since the soils of Botswana are relatively infertile. Crop rotation is hardly practised and this further accelerates the impoverishment of the soils. The subsistence arable farmers hardly use insecticides for controlling disease. It is therefore common to have crop failures during years of heavy rain because of pests and diseases.

Grain storage is also a major problem in a Botswana farm. Baskets plastered with mud, empty oil drums and some other simple structures are largely used for storing grain. This is not efficient storage as loss of the little harvest is incurred through rotting and attacks by pests.

Changes in the traditional practices are necessary. This could be done through education and extension work to convince the peasant farmers that their methods are not the best. Addition of manure, planting in rows, weeding and spraying the plants should be encouraged. Improved use of local materials to build better and more secure storage structures should help in the preservation of crops. The development of grain storage systems based on the existing traditional storage will be cheaper and will have better chances of acceptability in the rural areas than metal and concrete storages.

Improvement of the cattle industry is blocked by the communal system of land tenure. Peasants graze their livestock on common areas where different herds mix freely. Under this system, individual owners have no control of their cattle. Breeding is haphazard, protection from pests and diseases is not possible without collaboration.

Natural grazings deteriorate unchecked and no one is responsible for their conservation. Extension work is also very difficult under this system. The government has introduced commercial areas for ranching purposes - this will improve the management of pastures and animals. However as the majority of the people will remain in the communal zones it is necessary to introduce a system that will encourage better husbandry. Two options seem possible here. First, the grazing land could be managed on a co-operative basis with a qualified stockman responsible for managing the cattle on behalf of the community. Secondly individual enclosures of grazing land could be made in which each farmer will manage his own livestock separately.

2.2.4 EDUCATION AND EXTENSION SERVICES

The peasant farmers in Botswana have a low education or none at all. Thus it is difficult for them to understand simple instructions on farming methods such as fertiliser application. Keeping of farm records is very difficult for the illiterate peasants.

The ministry of Agriculture provides extension services to the farmers throughout the country. There are about 220 Agricultural Demonstrators in the country and each Agricultural Demonstrator is responsible for advising 300 farming households. Considering the large distances between various villages, cattle posts and lands and the lack of adequate transport this extension officer:farmer ratio is too large. A reorganisation of the rural settlements pattern could facilitate better and more effective extension services. At present extension work takes four major forms: advising individuals, teaching short courses

to groups, radio programmes and agricultural shows. This could be extended further to include group tours to progressive farms, movies, farmers newspaper and adult literacy classes. The literacy classes could be organised to have a bias towards agriculture and rural development by having more examples on those topics.

Training of agricultural staff is at three levels: certificate for the junior technical cadres of agricultural demonstrators, supervisors and veterinary assistants; diploma at middle and senior level and the degree. At all these levels there is at present a shortage of manpower. The government is planning to expand facilities at the Botswana Agricultural Collge (BAC) so that diploma cadres may also be trained locally - at present the course is taken in Swaziland.

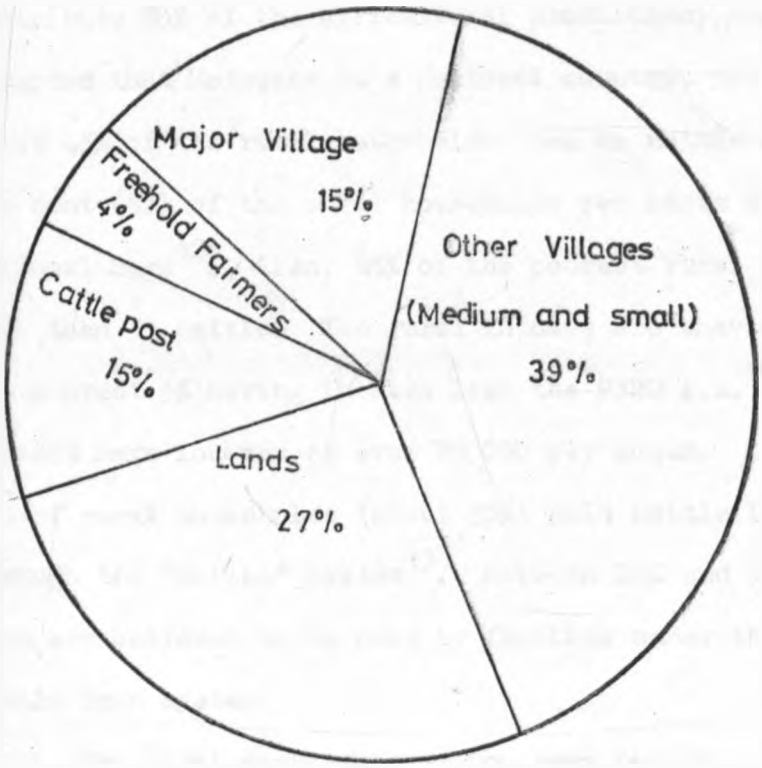
2.3 HUMAN SETTLEMENTS DISTRIBUTION

The task of developing rural areas in Botswana is made more difficult by large extensive land areas occupied by a very small population. The population of about 800,000 people lives in an area of about 600,000 sq.km. The resultant population density of around 1.3 persons per sq.km. is one of the smallest in Africa. This sparce population in relation to land area makes the per capita cost of development projects very high and implementation difficult because of great distances involved. Inter-connectivity of the scattered population is inevitably poor due to high costs of transportation. Furthermore, provision of the very basic essentials for the whole rural population is a similarly difficult task due to the scattered and discontinuous nature of rural settlements in Botswana. However, the existence of traditional villages has made the problem of

providing social infrastructure to the rural population somewhat easier since they provide threshold population for supporting these services. The problem here is that these village populations are not stable and implementation of programmes become difficult as spatial distribution of the rural population varies with seasons. Moreover the scattered homestead in the cattle posts and lands are haphazardly distributed, making execution of agricultural programmes difficult. Rural settlements in Botswana fall under three broad catergories: Major villages, medium and small villages (refered to as "other villages" elsewhere in this thesis) and scattered individual homesteads in the cattle posts. Fifteen per cent (15%) of the rural population live in major villages which have several thousands of people each. For instance Serowe has about 30,000 and Maun 15,000 people. Thirty-nine per cent (39%) live in other villages whilst the rest (46%) live in cattle posts, lands and freehold farms. (diagram 2.2). The government 's policy approach to rural settlements is to work within the existing framework, although villagisation has been proposed for the North East District. Lack of a well planned rural settlement pattern (for example, a linear pattern of homesteads along major roads and conjoint fields and grazing land) makes implementation of agricultural strategies such as cattle vaccination difficult to carry out. Distances between individual homesteads are great and linkages are poor so that extension officers cannot easily move from one "farmstead" to another. Moreover some of these "farmsteads" are not even mapped.

Diagram 2.2

Percentage of rural population by type of settlement



Source Population Census 1971

2.4 ECONOMIC FACTORS

2.4.1 DISTRIBUTION OF WEALTH

One of the most serious problems of rural Botswana is the uneven distribution of wealth. Although livestock products contribute 80% of the agricultural production, and it is generally accepted that Botswana is a pastoral country, the irony is that about 45% of the rural households own no cattle at all. Five per cent (5%) of the rural households own about 50% of the national herd[12]. Also, 65% of the poorest rural households hold less than 10 cattle. The rural incomes are unevenly distributed, the poorest 5% having incomes less tha P180 p.a.* whilst the richest have incomes of over P3 000 per annum. A large proportion of rural households (about 30%) hold cattle loaned from others through the "mafisa" system[13]. Between 20% and 30% of the national herd are believed to be held by families under the mafisa or cattle loan system.

The rural population of Botswana can thus be divided into four categories according to the economic status.[14]

(1) at the lowest subsistence level about 10% of the population (Basarwa) depend on gathering and hunting. To improve the economic status of this group they should be integrated into the other tribes and taught arable farming and animal husbandry.

(2) at another low level about 50% of the rural sedentary population depend on arable agriculture. Crop production is low and in years of drought they depend on gifts from the richer households or on Relief supplies. The standard of living of this group can also be bettered by improved arable farming.

* 1 US$ = P0.6

(3) Both arable and livestock farming are important at the middle level (35%) and incomes are relatively higher.

(4) at the highest levels (5%) stock incomes predominate.

This categorisation of the rural population in Botswana brings the importance of arable farming in the lives of the rural majority and the role agriculture should play in rural development into perspective. Thus efforts to uplift the living standards of the rural masses must focus on this rural economic activity (arable farming) first and foremost. Such a policy will reduce the inequalities of wealth distribution and change the present trend whereby agricultural programmes tend to favour the already richer and more powerful citizens (cattle owners). This sector badly needs education, health facilities and new techniques of production. Thus a comprehensive programme would be called for to take care of all these aspects of development.

2.4.2. LABOUR

The most important economic input into agriculture (especially arable) is labour in Botswana. Little supplies and equipment are used. Sixty seven per cent(67%) of the labour force in the country are engaged in family agriculture. About 60% of the labour force depend on family agriculture alone, whilst 7% are paid labourers engaged in family agriculture.

The agricultural labour is largely unskilled and its level of productivity is low. This perhaps due to the sex-ages structure of the labour force. Women outnumber men in the rural areas with about 40% of the households headed by women. Thus work in these families is mostly done by females although some of these jobs are normally done by men in an African society. Ploughing with oxen is a typical farming job traditionally

done by men. The majority of men in the rural areas are usually old, since the young and middle-aged have moved to towns. For example this study revealed that 57% of the farmers in the sample (48 out 84) were between 50 and 78 years of age. With emigration to towns this phenomenon should be true in other parts of the country. Herding and livestock management is mostly done by youngsters (herd boys) who may not have the right skills or experiences for dehorning, castrating, artificial insemination and so forth.

The rural labour force is grossly under-employed. On a daily basis a maximum of 4 hours a day during the ploughing season is common. Whilst the crops are growing little weeding is done but at harvest time more work becomes available. Most arable farmers have no work to do for five or even six months during the dry season although some may find alternative cash employment in the towns. The wages offered for those who work for farmers are very low especially when compared with the wages within the modern sector. Herdboys are offered an average of P12 per month in most areas whilst the lowest paid government employee in the modern sector gets about 5 times that amount. This differential between agricultural wages and the other sectors has resulted in the drift of young people to towns.

To improve on the productivity and stability of the rural labour force, agricultural production has to be organised in such a way that different crops are grown at different times of the year, using both rain-water and irrigation. Education of both young and adult rural people must be relevant to agriculture. As agriculture modernises, it will be able to

release labour into other sectors, thus agro-based industries in rural areas would help to absorb this surplus labour.

2.4.3 FARM SUPPLIES AND EQUIPMENT

The majority of the small arable farmers in Botswana do not use any farm inputs such as fertilizers, manure and improved seeds. This is a drawback in increased crop production in a country with soils of modest fertility and little rain. Efforts have been made to supply subsidised fertilizers but this scheme was abandoned in 1976[15]. It should be realised that kraal manure has several advantages especially to an incipient agricultural economy. Its application is simple, it is readily available in a cattle country like Botswana and does not have the negative ecological effects of artificial fertilizers. In some parts of the country, increased yields can only be realised with the improvement of soil through the application of manure or chemical fertilizers. The extension services of the Ministry of Agriculture should initiate and continue to encourage improvement of soil fertility for high crop production.

Seed used by subsistence farmers is often of poor quality traditional stock with low germinating rates. The Botswana Agricultural Marketing Board (BAMB) sells improved seeds to farmers, but this is not yet effective as only a small proportion of the poorest farmers is reached. The seed multiplication unit (SMU) selects progressive farmers to multiply tested seed varieties[16] and this programme has been fairly successful in some areas such as the Barolong farms in the south. However the largest number of arable farmers still depend on traditionally produced seed.

The progress of traditional arable farming is also hampered by a shortage of farming implements and the use of less advanced techniques such as seed broadcasting. The most common equipment in the subsistence sector is the single ox-drawn plough although at present it is only owned by a small proportion of farmers. In the last agricultural survey (1975), 90% of the farmers ploughed with oxen and only 38% of them were able to use exclusively their oxen and ploughs[17]. C.A Bond's survey of 1973/74 revealed that 46% of the households hired or borrowed the plough. This shortage of equipment affects the good timing in ploughing and planting for a very large proportion of farmers resulting in poor production.

Perhaps it would form a long term solution for the Ministry of Agriculture to provide a few hundred ploughs in each district and loan these out to farmers free of interest. However conditions for loaning the ploughs should be set up whereby the farmer who borrows the plough would, for example, be expected to use manure, stump his fields properly and repay through the crop sales. Any farmer given such a loan could then be closely supervised by the local Agricultural Demonstrator (AD) in order to ensure high production. Assuming a population of 70 000 farming families (1977 figures) and 35,000 without ploughs (remaining more or less constant in the near future) and a supply of 5 000 ploughs, in 7 to 8 years time all the farming household would be equipped with a plough each.

The more sophisticated farming equipment like harrows, planters and double ploughs are rare amongst the poorest arable farmers. Gradual introduction of these should be encouraged through demonstration of their efficiency at the Rural

Training Centres.

Injection of inputs into the livestock sector has been more successful than arable farming. Better breeds of cattle are being introduced successfully through the Bull Subsidy Scheme and the Artificial Insemination programme although again it appears the poor farmers are not reached effectively. This is either because of the farmers ignorance of the programmes, a fact which may be attributed to the extension services bias in client selection or because of lack of finance for these services. Supplementary feeds are widely used but also it is the richer and more enlightened farmers who benefit most from this facility. Other government services such as the Livestock Advisory Centres (L.A.Cs) and compulsory animal vaccinations are widely and effectively used. Agricultural Co-operatives should be set up throughout the country to help in solving most of the problems mentioned above.

2.4.4 TRANSPORT

Physical and social infrastructure is poorly developed in Botswana although the situation has greatly improved since the launching of the accelerated Rural Development Programme of 1973. This programme aimed at providing roads, water, schools, health centres and other social infrastructure to rural areas. There was no active participation of the local population in the execution of these programmes. As such, the people expect the government to maintain these facilities and even initiate new ones. They feel it is government duty to provide these services.

Roads form the major channels of transport in the country. They play a significant role in agricultural and rural development.

Development of an efficient road network facilitates the movement of goods from farms to markets, makes social interaction easier and may change the land use and settlement pattern of an area by attracting settlements and economic activity to develop along major roads. Building of new roads could lead to the growing of cash crops hitherto unknown in a particular area thus increasing the volume of agricultural trade.

In Botswana the road network is inadequate. In rural areas there are not enough feeder and access roads. Villages and cattle posts are often linked by mere tracks which are only motorable during part of the year. The existing roads are rutted, sandy and filled with potholes. This is due to irregular maintenance which is caused by shortage of staff and equipment.

Transport costs are high in Botswana because of the long distances between activity and production centres, which make construction and maintenance costs enormous. In the western parts of the country the rural roads are often very sandy and unmotorable. To accelerate rural development it should be considered necessary to ensure the development of an efficient road network linking the various rural centres and cattle posts or lands. The potential agricultural areas will benefit from such a network since diffusion of agricultural innovation will be made easier and transportation of produce to markets made possible. Construction of more roads in rural areas may also help to bring the scattered homesteads nearer these channels and thus change the present pattern of land use and settlements in Botswana.

2.4.5 MARKETING

High production of agricultural goods alone is not enough. There must be marketing facilities for selling the produce if the farmers are to have an incentive for commercial agriculture. In Botswana marketing has several problems, the most important of which is lack of marketing infrastructure and transport.

There is only one large abattoir to which the many thousands of cattle (21 000 slaughtered per year) throughout the Republic are sold. This abattoir managed by the Botswana Meat Commission (BMC) is situated in the south-eastern corner of the country, making it as far from some cattle-producing areas as over a thousand kilometres by road and rail. This means the small-scale cattle owners cannot sell directly to BMC which offers higher prices (up to over P200 per beast) since the transportation costs are prohibitive. So they have to sell to local traders who offer prices as low as P30-40 per animal. Cattle have to be trekked for long distances to Botswana Livestock Development Cooperation sales yards. The trek routes often do not have adequate grazing and water facilities hence the livestock lose weight and condition before they are sold. An improved transportation system could help in the rapid conveyance of beef cattle to markets. Regional abattoirs built for slaughtering local livestock could create a ready market for the Botswana farmers. Surplus meat could be frozen and sent to BMC for export.

Crops have a stiff competition from South African farm products. Urban and even rural areas import the cheap food supplies from the Republic of South Africa and this situation will

continue as long as there is free trade between the two countries in the immediate future. A gradual import ban of certain food items which can be produced locally could be a realistic and workable policy.

Up to quite recently crop farmers have been selling their produce solely to local shopkeepers and the local population. But this produce has been under heavy competition from the already processed South African products. There are even instances when grain has been exported to South Africa and reimported as flour. The assumption that if grain mills were introduced in rural Botswana there would be more consumption of local food and therefore higher production seems to be valid. The South African mealie-meal would be replaced, thus creating markets for local produce. Prices of grain offered by the BAMB are not attractive to producers at P5 for 70 kg of grain. The price fetched when the grain is sold to private individuals is sometimes P15 (about U.S.$20).

To improve marketing of agricultural products more and better roads should be built between farms and villages or towns. Agriculturally-related industries set up in rural areas will encourage increased production of both crops and animals. The raw material for these industries could be collected by mobile agents of Marketing Boards or other organisations from the farms. This would ease the farmers' transportation problems and thus encourage further production.

2.4.6 CREDIT

The farming population in Botswana obtains credit from the National Development Bank and the commercial banks. The

major constraint in the even distribution of loans to the farmers is the securities demanded by banks especially the commercial ones. Since almost all the farmers in the communal areas are not Title Deed holders, they also do not have enough immovable property which is pledgeable. The National Development Bank accepts cattle as securities. However this means that the 45% households with no cattle at all have difficulties in obtaining loans. This crucial population group should be given priority in small loan allocation. Ways must be worked out to produce a system which will enable the poorest among the rural population to obtain loans for farming.

2.5 SOCIAL FACTORS

2.5.1 DEMOGRAPHIC FACTORS

The population of Botswana is growing rapidly at a rate of 3.08% per annum. At this rate of growth it is estimated that by 1991 there will be over 1¼ million people of which 874,000 (74% of total population) will live in rural areas. Thus in 12 years time the rural areas will have to support an additional 249,000 people. This means more food has to be produced, more social facilities such as housing, schools and hospitals created for this additional population.

One important characteristic of Botswana's population is that it is young with 44% of the people being under 15 years. This large proportion of dependants has several disadvantages to the nation as a whole such as the need to establish educational and training facilities and the creation of employment opportunities for this large potential labour force. As the largest proportion of the population lives in rural areas, it means that most of these facilities must be located in rural areas.

to prevent a massive drift to the urban centres. This characteristic of youthful rural population could imply there exists at present in the country a relatively small adult labour force or that many agricultural jobs are done by children. The latter is particularly true with the pastoral sector in which young boys mostly carry out the function of herding. Primary school-leavers are badly equipped educationally to take up any wage employment. The education they receive is too academic and does not give enough attention to technical subjects.

The other feature of the rural population is the predominance of female over male adults. This is due largely to the migration of young men to South Africa and Botswana's new urban centres. It is estimated that between 35,000 and 50,000 men are outside the country temporarily at any time. This drift of able-bodied men from the rural population is a serious hindrance to rural development. At present, according to the Rural Income Distribution Survey of 1975, 40% of the rural households are headed by women. Since livestock husbandry is traditionally a man's job, those households without male adults suffer disadvantages in the agricultural sector. Even in the arable farming sector where oxen or tractor draught power is used, the female-headed households have to hire labour or draught power for ploughing and may thus be forced to plough late with the resultant poor harvests. Men will be encouraged to stay in the rural areas if income from the agricultural sector compares favourably with the wage employment income. An improved agricultural system with efficient marketing services could help reduce the exodus to towns.

The 50,000 to 60,000 Basarwa who mainly live by gathering and hunting should be seen as a potential peasant farming community. Thus any rural development policy should consider this section of Botswana's population as a target for introducing arable and pastoral farming. The Basarwa are slowly being absorbed into the economy through employment as herdmen in some areas. These herdmen could perform the role of "demonstrators" in the introduction of pastoral farming to their nomadic communities.

2.5.2. EDUCATION

The 1971 Population Census revealed the low standard of education and high illiteracy rate in Botswana. Many adults had not had any formal education at all. Only a small proportion had any secondary or post-secondary education. Indeed in some rural areas the illiteracy rate was nearly 100%.

The role played by education in national development cannot be over-emphasised. In Botswana, providing formal education to the people is hindered by various problems. In the first place the costs of providing this social service are too high for a developing nation like Botswana. There is a shortage of classrooms especially in the rural areas so that pupils sometimes attend classes in the open space or under trees in some areas. This inadequacy of physical facilities especially for primary schools was alleviated by the accelerated Rural Development Progremme of the previous Plan. Shortage of trained teachers is also a big problem in rural areas as trained teachers tend to be posted in urban areas. In 1975 the proportion of untrained teachers in primary schools was 36%. In secondary schools this proportion varied between 10% and 20% with urban schools having

more trained teachers.

As far as distribution of schools is concerned the eastern part of the country along the line-of-rail is more favoured. For instance in 1977 13 of the 15 secondary schools (87%) were located within this zone. This implies that education in remote rural areas like Maun District remains relatively lower.

One of the most serious problems of education in Botswana is the degree of its relevance to agricultural development in particular and rural development as a whole. Emphasis is given to academic subjects such as English, Mathematics and Science with little attention to technical subjects such as agriculture, carpentry, brickwork, leather work and needlework. As a result large numbers of primary and secondary school leavers find themselves jobless and equipped with an education unsuitable for rural jobs such as farming. Since only 20% of primary school leavers (15 000 in 1978) go for secondary education and only about 13% of the Cambridge School Certificate candidates qualify to enter University annually, the government has a task of finding alternative education or employment for these "school leavers" This problem is being partially solved by providing vocational technical education to these school leavers at the brigades centres, the National Centre for Vocational Training and other centres. However, a lot of resources could be saved by providing sufficient and relevant education at the primary and secondary school levels.

2 .5.3 HEALTH SERVICES

There are seven general hospitals in Botswana and six of them (86%) are located on the line-of-rail. The total number of beds in general hopitals is1 871 beds giving a ratio of approximately 2,8 beds per thousand people. This ratio is greater in remote rural areas. The next in the hierarchy of medical facilities are the health centres. There are at present 10 health centres which are more or less evenly distributed in the country. These health centres play an important role in remote areas where there are no hospitals as they act as referral places for cases too complicated for clinics. Ideally the medical staff in a health centre should consist of one public health nurse, one charge nurse, two to three staff nurses, two to five enrolled nurses, one or two health assistants and a family welfare educator. However, there are often shortages of man-power in these centres. Lack of adequate equipment and medical supplies is also a serious problem faced by the health centres.

The 68 clinics are located in villages (and towns) throughout the country and act as referrals for the health posts. There are 177 health posts and only 40% of these have good buildings and adequate equipment. Clinics do not normally admit patients although they should ideally have trained staff such as a staff nurse. Health posts only give basic treatment.

The most formidable diseases in Botswana are Tuberculosis, Malaria, Sleeping Sickness and Bilharzia. Diarrhoeal and skin diseases are also common. Most of these diseases could be controlled through health education and improvement of the environment. For instance basic sanitation and safe water

supplies in rural areas could improve people's health and their working capacity. Agricultural and industrial workers will have less absenteeism if they enjoy good health.

2.5.4. HOUSING

In urban centres housing is provided by councils, companies, the Botswana Housing Corporation or they are self-built. Due to the increasing rate of urbanization towns like Francistown and Gaborone are now experiencing housing shortages. In rural areas shortages of accommodation have not been noticed in the farming sector. However, it is clear that there is an inadequacy in the housing facilities such as the lack of sanitation and safe water supply.

There is a shortage of housing for government officials in rural areas. For instance, in the Maun District there were only 7 out of 22 agricultural demonstrators who were housed by the Government. This applies to other sectors such as education and health. It is difficult for civil servants without adequate accommodation to carry out their duties.

2.6 SUMMARY

Problems of agricultural development in Botswana have been identified as environmental, traditional land use system, human settlements distribution, social and economic factors. The scarce rainfall and poor soils make agricultural production a difficult task in Botswana. There are, however, surface and groundwater resources which may be used for agricultural development especially in the eastern and Okavango Delta ecological zones where soils are relatively more fertile and rainfall higher.

The existing traditional land use of separate cattle post

and/or lands from the dwelling place is inefficient. The communal land tenure does not encourage sound husbandry. Lack of a well planned rural settlements pattern makes implementation of agricultural programmes difficult.

Wealth in rural Botswana is unevenly distributed with 5% of the population owning more than 50% of the cattle. Moreover agricultural development programmes seem to favour the already rich few. Agricultural Co-operatives and an emphasis on arable farming could help to lessen the inequitable distribution of wealth. The population of Botswana is very young, there is a predominance of women over men in rural areas thus making these areas deficient of a much needed male labour force.

Transport, marketing and credit facilities are problems whose resolution could lead to rapid agricultural growth. However, social facilities such as education, health and housing are also needed to facilitate the process of rural and agricultural development.

CHAPTER 11

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CHAPTER III

AGRICULTURAL DEVELOPMENT IN THE MAUN DISTRICT

Subsistence farming is the major occupation of the people in the Maun District. They both cultivate crops and keep animals. The principal crops in the region are maize, sorghum and millet. Maize does best in flood plain areas while millet is grown mainly in the north where it is easily substituted for either maize or sorghum as a staple. Groundnuts are also grown widely in the north. Minor crops such as pumpkins, melons and beans are grown in ranging qualities throughout the region but mainly around Maun.

3.1 AGRICULTURAL LAND USE SYSTEM

The system of village - cattle post - lands which exists in other parts of Botswana is also prevalent in Ngamiland, but with its own variation due to the special ecological conditions of the area. In the first place the Okavango Swamps, infested with tsetsefly, hinder the human habitation of this vast delta area. As a result rural settlement development has taken a linear pattern along the western fringe of the delta and along delta's outlets such as the Thaoge, Thamalakane, Nghabe and Boteti rivers. It is along these ecologically favourable areas that the land use zones surrounding villages have developed although there exists some remoter settlements such as in the Haina Veld, and the western area bordering Namibia. The population in the district "commute" to their cattle posts and lands from the villages. (Table 3.1 (a)) This movement is done on a daily, weekly, monthly, seasonal or even yearly basis.

PLATE 3.1 (a)

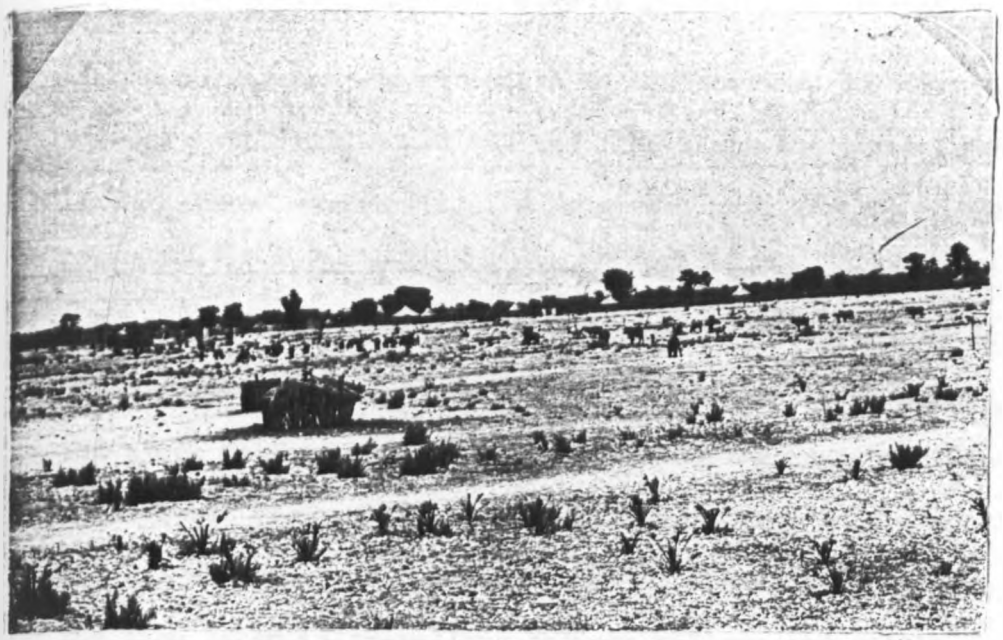
TREE BRANCHES ARE USED FOR FENCING

PLATE 3.1 (b)

FENCING BY USE OF BARBED WIRE, POLES AND

ACACIA BRANCHES

PLATE 3.2 (a)



EFFECTS OF OVERGRAZING NEAR MATLAPANENG

PLATE 3.2 (b)

EFFECTS OF OVERGRAZING NEAR MAUN

Of the 53 farmers who responded to the question on movements between cattle posts and village, 47% visit the cattle posts at least 4 times a month (i.e. once a week particularly at weekends). There are some, however, who visit their cattle posts only once a year and these depend on family labour (especially ba Sarwa) or some reliable relatives who give them occasional reports on the stock welfare. In this study 18% of the household heads interviewed visited the cattle posts less than once a month and 24% once a month. Only 4% visited the cattle posts daily. The time taken in travelling between village and cattle post varied between a few minutes and seven (7) hours, with an average of 2 hours 22 minutes. (Table 3.1 (b))

TABLE 3.1 (a)

RESIDENCE OF FARMER

Group of farmer Owning	% Staying at cattle post	% not Staying at cattle post
1-50 cattle	40	60
51-100 cattle	53	47
101-200 cattle	20	80
201+ cattle	27	73
Overall average	38	62

SOURCE:- Study field survey

TABLE 3.1 (b)

TIME TAKEN BETWEEN VILLAGE AND CATTLE POST

Group of farmer	less than or equal to 30 mins	greater than 30 mins. to 1 hr.	1 hr. to 2 hrs.	2 hrs. to 4 hrs.	over 4 hrs.
	%	%	%	%	%
1- 50	30	10	10	33	17
51-100	33	11	6	33	17
101-200	33	12	22	33	0
200+	7	36	43	14	0
Overall	25	10	16	35	14

SOURCE: Study field survey

Sixty-two (62%) percent of cattle holders did not stay permanently at the cattle posts. These facts show how difficult it is for modern cattle husbandry to be practised and more important the implementation of agricultural strategies.

Some of the cattle posts and lands in the district have developed into villages. Matlapaneng and Shorobe are lands villages with most of the farmers practising arable farming as a major occupation and keeping only a few cattle. Toteng is a cattle post village. These minor villages regard Maun as their headquarters from which they obtain agricultural inputs such as seed and animal drugs. Also Maun residents own fields and cattle posts around these outlying villages.

Distances travelled between villages and lands or cattle posts vary between a couple of hundred metres and over 160 km. (Table 3.2) Farmers in Maun have cattle posts located beyond Toteng and Sehitwa more than 100 km. away. Those farmers....

engaged in arable farming only have their fields near the village not exceeding 5 km. Around Maun the area with the radius of about 5 km. is heavily utilised being both under grazing and cultivation. However, this overgrazed (plates 3.2 (a) (b)) zone stretches for over 25 km. covering the Makaneng, Samedupe and Chanoga areas along the Maun - Francistown road. This concentration of cattle is due to the attraction of the Boteti river water for livestock. The Nghabe river banks to the north-west of Maun are also heavily overgrazed. To the north of Maun arable farming is p ractised in the Boro Valley and its extent northward is limited by the tsetsefly. Near Makalamabedi ranch pastures are still reasonably good as concentration decreases due to distances from Maun.

Along the Maun - Sehitwa route the pastures become better as one moves towards Sehitwa with the best around Lake Ngami. Some degree of fragmentation of fields and cattle posts has been found in the study area. Those farmers engaged in crop production only tended to have one field only, whereas those who practised mixed farming had 23% working more than one field and 41% of these had them in different areas. Amongst the farmers who practise mixed farming 62% claimed to have their cattle posts and lands in the same areas whilst the rest had them in separate areas sometimes in opposite directions of the village. In the areas where cattle posts and lands (fields) are found together there is no clear land use plan as the fields are haphazardly sited wherever the farmer felt suitable. This has led to continuous crop damage by cattle since the fences are often not effective (Plate 3.1 (a) (b)). This haphazard arrangement was seen particularly inthe Daoga area to the south of Maun.

N.B. 65% of all the farmers take more that 1 hour to travel to their cattle posts and most of these use vehicles (lifts).

SOURCE:- Study field survey

TABLE 3.2

RELATIONSHIP BETWEEN CATTLE POST AND VILLAGE IN DISTANCE

Distance	% of Farmers
Upto 20 km.	41
21 - 49 km.	20
50 - 160 km.	39

SOURCE:- Study field survey

The distances between village and cattle posts or lands, the time taken in travelling between these areas, the haphazard manner in which the lands and cattle posts are arranged make effective running of the agricultural activities almost impossible. Extension work is rendered even more difficult because of problems of finding the "right" person on the site of agriculture activity and the distances involved in travelling from one isolated settlement to another.

3.2 ARABLE FARMING

Arable farming is the most predominent activity in the area being practised by 70 to 90% of the population mostly at subsistence level. For commercial purposes however, cattle rearing takes the lead. There are two main systems of arable farming in the region namely dryland farming which relies on rainfall and wetland or Molapo (flood plain) farming which is practised in a few places like Shorobe and Nxaraghe. The hectarages are

generally small with an average of 5 hectares per farming family.[1] The average obtained in this study was 5 hectares (12,4 acres) and a mode and median of 4 hectares (10 acres). The plot size of the second highest frequency was 1,5 hectares (3,7 acres). However, some of the large fields are not fully utilised with only parts being ploughed in a year.

3.2.1 RESOURCES FOR ARABLE FARMING

CLIMATE AND WATER

Ngamiland has a climate dominated by the dry season - wet season cycle. The average annual rainfall is 460mm and this is sometimes erratic and unreliable. The temperatures range between $10^{\circ}C$ in winter and $42^{\circ}C$ in summer.

However, despite this low rainfall, the region has vast quantities of water. This is found within the Okavango Delta Swamps and its outlets. There are two major sources of the Okavango Swamp water. The principle source is the Okavango River flowing into Botswana from Angola and its average annual inflow is estimated at $11,000m^3$. Ninety-five percent (95%) of the inflow is lost through evaporation and percolation. The FAO/UNDP project estimated the active storage volume in the swamp at a minimum of $1 \times 10^9 m^3$ (1955)[2]. The water in the delta occurs in swamps, rivers, pools (madiba), and groundwater (shallow reservoirs).

Groundwater exists within and outside the delta but there is not adequate data on the quantities of this resource. It is known that there is an outflow of groundwater to the adjacent areas which may be extracted through drilling. However, some areas such as the Haina Veld have groundwaters independent of to the Okavango water system.

The most important outlets of the Okavango are the Thamalakane, Tsoge, Kunyere, Kwei, Boteti rivers and Selinda Spillway. The quality of the Okavango water and its outlets is suitable for domestic, irrigation, livestock and industrial uses[3]. However there are some areas with unsuitable water such as saline pools within the delta, the Mopipi reservoir and Lake Ngami groundwater. The Haina Veld groundwater is suitable for livestock and could be used for irrigation where the total dissolved solids (TDS) is less than 2000ppm[4]. The only commercial consumer of the Okavango water at present on any large scale is the Orapa diamond mine. In 1975 this industry used 1.5 million m^3 of water (see table 3.3). The other major use of this vast water resource is the traditional sector consuming 1.3 million m^3. Out of a possible maximum storage volume of 8,000 milliom m^3 only about 3 million m^3 were used in 1975. More figures reveal how underutilised this resource is and therefore it is recommended here that the government should establish an Okavango Delta Authority to advise on the utilisation and management of the Okavango water. Irrigated agriculture could be started especially in those areas of loamy sands such as Shorobe, Nokaneng and Moshu. Reliance on flood water as at present is risky because during years of low floods the "Molapo" fields cannot be worked and during high floods are very high these fields remain covered throughout the year. (plates 3.2 (a) (b)). Small-scale simple and relatively cheap irrigation projects could be opted for. Boreholes and wells have been dug in drier areas for domestic and livestock use. (Map 3.3)

TABLE 3.3

MAXIMUM WATER DEMANDS AT DIFFERENT LOCATIONS
IN MILLION m^3 PER ANNUM

Consumer	1975	1985	1995	2005
BOTETI - ORAPA AXIS				
Orapa D. Mine	1.3	2.5	2.5	2.5
Letlakane Mine	-	2.5	2.5	2.5
Unspecified mining requirements	-	-	-	10.0
Livestock	0.2	0.5	0.5	0.5
Small scale irrigation	-	0.5	0.5	1.0
LAKE NGAMI AREA				
Ngami copper mine	-	8.0	8.0	8.0
Livestock	1.0	1.0	1.3	1.3
Irrigation projects	-	8.5	18.8	32.2
SHOROBE AREA	-	-	-	18.0
MAUN AND TLADILAKANE				
Agro - Industries	-	-	0.2	0.2
Livestock	0.1	0.1	0.1	0.1
Totals	2.6	23.6	34.4	76.3

SOURCES:- FAO/UNDP Project Bot/71/506
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Land and Soils

The land resources in the district fall under three major categories: open water, areas of periodic innundation and dryland. These three are found inside the delta whilst the dryland exists both within and outside the delta.

Inside the delta arryland resources include the Sandveld Tongue, Chiefs Island and Moremi or Mopane Tongue.

The land tenure is divided into three categories viz communal, commercial and Stateland. The communal zone lies to the east, south - east and south of Maun, the western part of the district including the area used by ba Sarwa and the northern areas around Shakawe. Land use within this zone is mainly livestock rearing and cultivation. The Sandveld Tongue (south of Habu road) has been earmarked as a communal reserve by the U.N. Okavango projects. The commercial zone is mainly for ranching and at present this is in the Haina Veld. Stateland is mainly occupied by wildlife management areas in the swamps, the Moremi game reserve and the Nxai National Park.

The soils are predominantly Kalahari sands (map 3.3) overlying bedrock at depths of up to 300 metres. These range from Sandveld to old dune patterns and sands with clay plains and pans. Most of these sandy soils are poor in organic matter content. The Kalahari sands are mostly outside the Okavango Delta proper. The delta itself has young fluvial soils which are either permanently, seasonally or occassionally flooded[5].

The Okavango Delta and Makalambedi contain soils which cannot be considered for irrigation[6]. Sandy loams, loamy sands and loam exist in Chor[illegible] Xharamalakane, Boteti, Nghabe river, Nokaneng, Gomare, Lake Ngami and Shakawe. Thses soils are suitable for irrigation and can be used for the production of crops such as cotton, tobacco, sugar cane, maize sorghum and others[7]. At present there is very little irrigation carried out in the district. The Maun Secondary School, the Agricultural Experimental Station at Moshu and Mopipi and a few ..

individual gardeners are successfully irrigating a variety of crops. However, fertilisation of the soils is often needed. In this study no farmer engaged in dryland or molapo (flood plain) farming was registered as applying any manure to his farm, except institutions such as schools and experimental stations. The future of improved arable farming depends largely on proper utilisation of the soils and enrichment through the application of manure and/or fertilisers.

LABOUR

Only six percent (6%) of the labour force in the district is engaged in wage employment, mostly in Maun. The rest is either involved in the livestock and crop production sectors or are employed elsewhere such as the South African mines. In 1975 2,056 males were recruited for migrant labour under various terms[8]. Thus a substantial number of able-bodied men are migrating outside the district every year. The population has therefore a dominance of woman adults over males. Also the dependancy ratio is very high e.g 0-14 years form 47%. But perhaps the most important handicap of the available labour is lack of education and skills for agricultural development. Most of the farmers are illiterate or semi-illiterate making it difficult for them to read simple agricultural instructions.

3.2.2. FARMING METHODS

The most common food crops are sorghum, maize and millet and these are grown on very small holdings. The implements used are the hoe, the ox-plough and the tractor. Few farmers own ploughs and thus hire these from the richer farmers. Only 2% of the farmers have tractors in Ngamiland. This shortage of

implements means that farmers cannot plough as early as they prefer and this results in low production. The average production per farmer in the study area is 12.9 bags of 90kg each). The mode has 5 bags whilst the median has 9 bags. The average is higher because of a few farmers who had relatively higher or above average sorghum or maize production, such as 55 bags from a whole field of 60 acres. One farmer who produces 172 bags during the 1977/78 season was excluded when calculating the average since this figure would inflate it. It is estimated that grain consumption needs per family of 7 is 945 kg (at 135 kg each). in Botswana[9]. Using the three measures of central tendency, for calculating average family production we note that there is a deficiency in food availability when we use the median (810 kg) and the mode (450). In fact most people in the district buy imported foodstuffs from South Africa that are stocked in the local shops.

Large areas have been cleared by intending farmers but only a few acres are actually ploughed. The reasons for this may stem from lack of draught power. Moreover in some cases the destumping has not been properly done with bush or trees cut a few feet above ground so that regrowth occurs during the rainy season. Most of the fields are fenced with scrub branches which are often not totally effective barries against game and livestock. The seed broadcasting method is still common in the area for planting crops. The majority of the farmers obtain their seeds from their own crop although sometimes the Ministry of Agriculture and local traders provide improved seed. In this study, for example, 70% of those households practising arable farming used traditional seed.

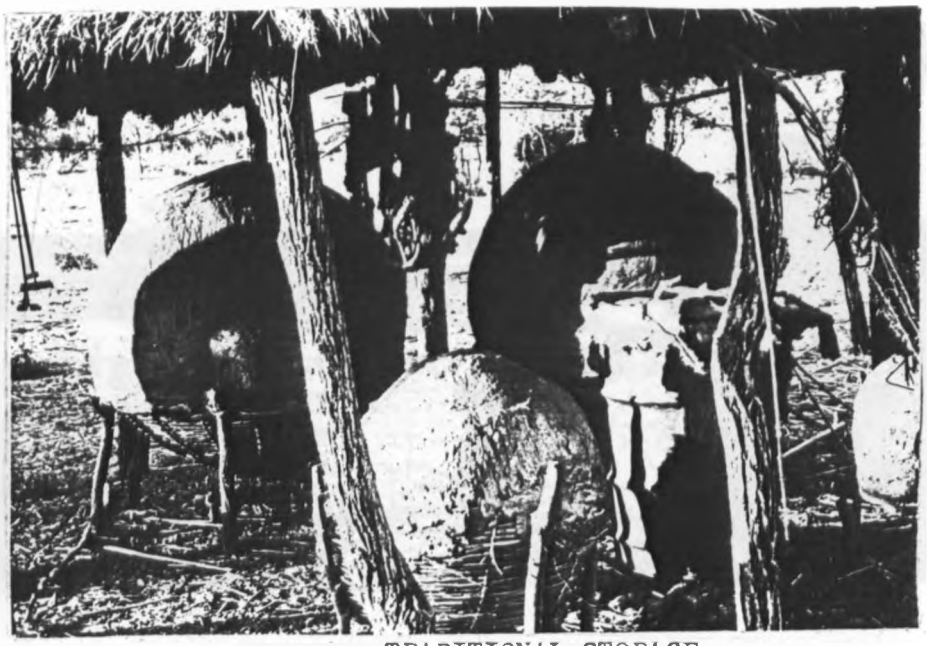
This kind of seed is not reliable as germination rates are low and yields are also low. However the Ministry of Agriculture is introducing and encouraging use of hybrid varieties. To preserve ground moisture, winter ploughing is encouraged in Botswana but in this district this is hardly practised. Only 1/10 of the farmers interviewed winter ploughed. Those farmers depending on flood plain arable farming were struck by disaster in the 1977/78 season as their fields were flooded throughout the year. Thus they did not plough and had to rely on Relief supplies for survival.

Crop diseases and pests are other sources of menace to the farmers. Insects destroy the grain both in the field and in the storages. Application of insecticides has been encouraged but there is very little response. Birds have destroyed whole fields of sorghum in the district. At least 2 farmers registered that they had reaped nothing during the last season whilst several claimed that they had harvested less than ½ a bag. The quela bird is the most common crop pest in the district. Crop destruction also takes place in the grain storages (matuka) which are made of twigs plastered with mud and/ or cow dung (see plate 3.3). Increased cereal production in the area should be accompanied by changes in the storage system.

3.2.3 EDUCATION AND EXTENSION SERVICES

In an area where agriculture is in its earliest stages as in the Maun district the role of informal education of the farmer and extension services becomes significant. In Maun District, agricultural courses for farmers are carried out at the Ngamiland Rural Training Centre which had a capacity of

PLATE 3.3 (a)



TRADITIONAL STORAGE

LARGE BASKETS SMEARED WITH MUD USED FOR GRAIN STORAGE AT SAMEDUPE

PLATE 3.3 (b)

TRADITIONAL STORAGE

USE OF REEDS AND POLES FOR STORAGE AT SAMEDUPE

PLATE 3.4 (a)

FLOOD PLAIN OR MOLAPO FIELD

PLATE 3.4 (b)

MOLAPO FIELD AT THE EDGE OF SWAMPS

33 farmers at a time. The courses are supposed to be run every week, and are free of charge. Extension officers also meet here for refresher courses. The problems encountered in running these courses included poor attendances, probably due to long distances. Although government provides transport there does not seem to be much enthusiasm from farmers and their Agricultural Demonstrators. For instance, during the period of this study a government truck brought only one farmer from one area some 200 km away (Etshaa) much to the indigation of the Regional Agricultural Officer. The Agricultural Demonstrator certainly should have realised how expensive the trip was to the government. The secondary schools and the primary schools also give agricultural courses to students. The major snag here is that this vital education seems to end in the school gardens and does not therefore achieve the goal of improving agricultural methods and general interest to the population at large.

Of the farmers interviewed 34% had attended the courses at Nxaragha Rural Training Centre whilst the remaining 66% never attended at anytime. Some of those who attended had even been at the centre for 3 times. There was no indication of those farmers who had given lessons passing the knowledge on to others let alone practising the new skills themselves. Perhaps the most importance shortcomings of these courses is the poor timing. Courses on ploughing and planting are done during the dry seasons and no demonstrations are done. Strangely, the instructiors themselves were convinced that such arrangements cannot be effective since the farmers are mainly taught theoretically.

The Regional Agricultural Officer is in charge of the whole Maun Agricultural region. He is assisted by one Agricultural Supervisor, a Livestock Officer, an Assistant Sandveld Survey Officer, two District Agricultural Officers, 4 - B Officer (young farmers club), a Poultry Officer, a Dairy Products Officer and twenty-two Agricultural Demonstrators. Through these extension officers the Agricultural Department in Maun offers extension work to both arable and pastoral agriculture. The extension officer: farmer ratio is about 1:400 although some individual officers such as the poultry officer are responsible for the whole district alone. The Agricultural Demonstrator: farmer ratio is too large especially given the scattered human settlements pattern, long distances and inadequate transport facilities. Fifty-one (51%) of all the farmers interviewed had never been visited by the extension officers before; 23% had been visited more than twice a year and the remaining 26% had been visited less than twice a year. Of those farmers owning more than 50 herd ofcattle 47% had never been visited by the extension officers. Amongst those with more than 200 cattle 96% had never been visited before. This is because of the long distances since there is a tendency of farmers owning large herds to acquire cattle-posts away from the village.

3.2.4 MARKETING

Marketing is one of the major problems of the district. Although there is increasing demand for maize meal in the district there are no mills to which the producers can sell their grain. Thus the cereal crop has to be exported to other

districts whilst maize meal is being imported from South Africa. Farmers sell their products to Botswana Agricultural Marketing Board which was established in 1977 but was closed for the best part of 1978. Local traders also buy grain from local producers and resell it to the local population. The establishment of a grain processing industry especially milling would provide a ready market and thus encourage production. Vegetables could also find a local market although these would have to be dehydrated for long-distance markets. The transportation system makes marketing even more difficult. Maun is 500 km away from the nearest rail station and major town (Francistown). Hence transporting products there is expensive and difficult.

3.2.5. TRANSPORTATION

Roads play an important role in the development of agriculture since they give access to markets and facilitate movement of extension personnal who contribute much to the improvement of subsistence agriculture. Farm supplies like fertilisers, pesticides and equipment reach the farms easily if the roads are in good condition and vehicle transport available. In the Maun region the transportation system is extremely inefficient.

The road network is inadequate both in terms of density and quality. The major road linking the district with Francistown is badly maintained and thus its surface is often rutted and filled with pot holes. The Maun - Sehitwa - Toteng road serving a relatively density populated area is a mere track in some places. Access roads linking villages and cattle posts and/or lands are inadequate. They are largely tracks which are

not motorable. The Maun-Shoga track is an example of these unconstructed winding roads. Moreover there is a shortage of vehicles in the district since only the rich own landrovers and land cruisers which they use for visiting farms. The stock of vehicles could be increased by encouraging cooperatives which could then organise transportation of the members' produce..

A potential transportation mode is the Okavango Delta and its outlets. At present dug-out canoes are used for carrying goods such as reeds (for house construction) and people. This waterway could be developed for carrying agricultural produce by introducing bigger vessels. Improvement of transport may also encourage farmers to grow new cash crops.

The Livestock industry is also faced by this transportation problem. Cattle have to be trekked for long distances up to 370 km to Makalamabedi sales yard.. This discourages the farmers who then either do not sell at all, or sell to local traders. Improvement of roads and introduction of huge trucks could increase annual offtake in the cattle industry.

3.2.6. CREDIT

The National Development Bank provides farmers with loans through the Regional Agricultural Officer who has to verify the ability of the farmer to utilise the loan gainfully. However the farmers are not well informed about this facility and the poorer farmers believe loans are for the rich. Many farmers interviewed complained that there was no financial assistance for enabling them to buy implements.

3.3. PASTORAL FARMING

Cattle rearing is the mainstay of the district economy. It is estimated that there are between 250,000 and 300,000 herd of cattle in the district. Sheep, goats, horses and donkeys are also important livestock in the area. Chicken are mainly raised for domestic meat consumption whilst pigs are rare in the district.

The district cattle herd is distributed amongst 20%[10] of the population. The number of cattle owned varies greatly from farmer to farmer. In this study the smallest has 6 whilst the largest has 399 cattle. Special distribution of cattle tends depend on water availability, tsetse incidence and availability of good grazing area (map 3.4.). Smaller herds are kept nearer the villages whilst the largest herds are farther away on better pastures such as Lake Ngami area and the Haina Veld.

3.3.1 RESOURCES

WATER

As mentioned above a large proportion of the human and animal population depends on the Okavango Delta for water supplies. Fifty-three (53%) percent of the district herd depend upon the delta for water while the remaining 47% relies on groundwater sources. Boreholes have been drilled in several parts of the district (map 3.5) for domestic and livestock water. The depth and yield of these boreholes varies from area to area. The deepest borehole is at Mpakgose (130m) and the shallowest at Makakung (30m)[11]. The highest yielding borehole is situated at Tolankane and yields 4,500 l/hr whilst

the lowest known yielder producers 1000 l/hr. At several water points boreholes are not equipped with power or a reservoir. The Haina Veld is the only zone in which the boreholes are well equipped. The quality of the borehole water is quite high with 60%[12] of the boreholes yielding fresh or good quality water and the remainder (deeper) yielding brackish or saline water. The future importance of groundwater is underlined by the fact that the Okavango region is liable to run very low or even dry up. Therefore exploitation of groundwater for livestock utilisation should be increased and knowledge of the groundwater reserves improved.

RANGELAND AND VEGETATION

The district has extensive rangeland stretching for some hundreds of kilometres away from the villages. The main grazing areas at present are the Panhandle, Tshodilo, Etshaa and its surroundings, the Delta, the north west, Nokaneng Flats. Lake Ngami and Haina Veld. In most of these pastures cattle are grazing freely in unfenced grassland and bush. The only major limitations of the range are the Delta which covers 15,000km^2 and is infested by tsetsefly and the lack of fresh water supply.

The vegetation of the district ranges over acquatic, grassland, scrubland, woodland savana, woodland and forest. In the Delta there are floating and submerged acquatics which are not used for cattle grazing. Short and tall grass is common in the Swamps although not accessible to livestock.

The most popular grassland for grazing consists of grasses in the species Digitaria, Cenchurus Ciliaries, Urochloa or Aristida (in the Nokaneng Flats) and especially Dactylon Cynodon or Panicum repens around Lake Ngami, "Pan Handle"

and Lower Thaoge. The Kalahari scrubland occurs throughout the drier parts and forms extensive browsing and grazing resources in areas like Haina Veld, Samedupe and Toteng. Short grass and acacia species such as Acacia erioloba, A. Fleckii and Combretum Hereroense predominate. Woodland and forest are predominantly in the swamps and form a potential browsing resource.

Natural vegetation has been changed drastically in some areas such as Chanoga by agricultural activities. The area around Chanoga, Mawanang and Samedupe is heavily grazed and soil erosion is already a serious problem in various parts. Unless urgent corrective action is taken the damage will be irreversible. Veld fires are also a serious menace in Ngamiland especially in the dry season. During the field visit, teams of people were being sent out almost daily by the conservation committee to extinguish fires. Conservation of vegetables and other resources has to be taught to both school children and adults. A reafforestation programme in the district should improve the environment tremendously in the long run.

3.3.2 LIVESTOCK AND RANGE MANAGEMENT

The cattle in Ngamiland are predominantly of Tswana stock and are reared along traditional lines. Cattle roam freely in the cattle post areas and herdmen only collect them to drive them to water points or for vaccination. Thus large numbers are lost through predators and theft. Uncontrolled grazing has also resulted in overgrazing and destruction of plants especially around villages and areas of water sources. The areas along river

courses such as Nghahe river and Boteti are heavily grazed, in fact the stocking rates exceed the carrying capacity (see Table 3.4.) The grazing intensity is as high as 1ha per livestock unit (LSU). Environmental degradation is already visible in these areas. One solution would be to move cattle from these overused areas to places of low grazing intensity such as the Shorobe area where the stocking rate is at present 25 ha/LSU as compared to its carrying capacity of 12 ha/LSU.

TABLE 3.4.

GRAZING CAPACITY AND STOCKING RATES IN MAUN DISTRICT

Area	Grazing Capacity (ha/LSU)	Present Stocking Rate (ha/LSU)	Water Source
Lake Ngami	12 - 16	27 - 4	Lake, wells
South L. Ngami	16	23	Wells, boreholes
Thamalakane Shorobe	12	25	River, wells boreholes
Boteti R. Right Bank	16	6	River
Boteti R. Left Bank	16	4	River
Nghabe R. Right Bank	16	1	River
Nghabe R. Left Bank	16	1	River
Maina Veld	-	11	Borehole

* LSU Livestock Unit = A mature male stock over 3 years e.g. bull, horse, or a cow and calf

SOURCES: 1. [illegible] Maun Region (Grazing capacity.)

2. [illegible]/UNDP Project report 1977 (stocking rate).

The government is making efforts to introduce breeds which gain weight quickly and this has meet success. This study revealed that the richer farmers have gained more from this cattle improvement campaign. Some farmers owning more than a hundred cattle have the whole herd composed of non-Tswana breed. These include Brahman, Tuli, Afrikander, Simental, and crosses of these with Tswana. Table 3.5 shows the composition (by breed) of cattle in the households studied.

The livestock sector has several problems including diseases, predators, water, marketing and poor management. The absence of the farmers from the cattle posts means that the attention given to animals is minimal. However most farmers seemed to be able to consult the Livestock Advisory Centres (LACs) and buy drugs. 99% of the interviewed livestock owners visited the LACs or bought drugs from local traders. Supplementary feed is given only by those who are richer and even then, particularly those with cattle posts near the villages.

Utilisation of the livestock sector is only limited to meat, milk, draught power and cash (from selling live animals). Animal products such as horns, skins,hides, bones and hoofs are hardly used for economical purposes. Almost all the respondents in the study stated that they threw away skins, hides and other animal parts from livestock locally slaughtered. The economic potential of these animals products is not yet exploited in the district. Establishment of a skin and hide centre and buying of other animal products could create more income for the local population.

TABLE 3.5

COMPOSITION OF CATTLE (by breed)
IN HOUSEHOLDS OF
MAUN DISTRICT

Farmer Category by no. of Cattle owned	No. of farmers	Total no. of cattle	No. of non-Tswana	No. of non-Tswana per farmer	% of non-Tswana
1 - 50	30	788	49	1.63	6.2
51 - 100	19	1364	28	1.49	2.1
101 - 200	10	1379	542	54.2	39.3
201+	15	5159	2975	198.3	57.7
TOTAL	74	8690	3594	48.6	41.4

N.B. Non - Tswana breeds include Brahman, Tuli, Afrikander, Simental, Bosmara, and crosses.

3.3.3 MARKETING

Ngamiland sells about 16,000 herd of cattle (or 7% of district herd) per year at an average price of P80 (U.S. $110) per animal. This offtake is small and could easily be increased if marketing facilities were available. The Botswana Livestock Development Co-operation (BLDC) is the major market of the Maun District farmers but it is eccentrically located, being on the border with the central district in the east and very far from cattle areas like Shakawe. The trek routes do not have facilities like adequate supplies of water at short intervals and holding ground for fattening. Thus is necessary to establish other Botswana Livestock Development Co-operation (BLDC) ranches in areas like Gomare. Although most of the farmers would prefer to sell to the Botswana Livestock Development Co-operation they are forced to deal with the local traders....

who offer lower prices P40 - P50 (U.S. $50 - 65: beast). The other market channel is the cooperative movement which sells cattle to the Botswana Meat Commission on behalf of the farmers. However there are delays in obtaining money for cattle sold through the cooperatives.

A local abattoir would provide a ready market for cattle and also for sheep and goats which at present are only used for the local markets. Farmers have also complained that although they would like to sell hides and skins, bones, horns and hoofs there is no local market for these. This problem of market facilities is aggravated by the remoteness of Maun from the urban centres like Francistown.

3.3.4 CREDIT

Again the National Development Bank offers credit to farmers to purchase and develop their livestock. However in the Maun District very few articulate farmers have utilised these credit services. The extension services of the Ministry of Agriculture could be useful here in educating the farmers about the availability of loans.

Nevertheless farmers are able to obtain credit indirectly from government through subsidized schemes. The Bull Subsidy Scheme, for example, enable farmers to buy high quality bulls at Tsetseku ranch at prices as low as P45 per bull. Only 10% of the farmers owning less than 50 cattle recorded that they bought bulls through the Bull Subsidy Scheme, while 75% of those owning between 100 and 200 cattle utilised the scheme. The other heavily subsidised scheme is the Artificial Insemination Programme. Farmers pay only P4 for each cow inseminated while it

costs the government P38 per cow to calve. The difficulties in fully implementing these subsidised schemes lies in the settlement patterns and long distances between the government ranches and the farmers.

3.4. SUMMARY

The traditional land use system of spatially separated villages, cattle posts, lands exists in the Maun District as in any other rural area in Botswana. The areas around villages are mainly used for cultivation although they have been overgrazed due to overstocking previously and presently. Beyond the cultivated areas lie zones of mixed farming and grazing land. A large proportion of farmers (62%) in the villages are far away from their areas of agricultural production. Thus a lot of time is spent on travelling between villages and lands or cattle posts. Implementation of agricultural programmes is made difficult by this special arrangement.

Arable farming is the predominent activity in the area with maize, millet and sorghum as the principal crops. Dryland and floodplain farming (plates 3.4 a,b) are both practised. Although the distict has resources for crop production such as relatively high rainfall (mean annual of 460 mm), suitable temperatures for a large variety of crops, abundant surface water and relatively fertile soils production is still at a low level. This is because of the traditional methods and techniques still used. Broadcasting of seed is commonly used for planting, manure and fertilisers are not applied. There is also a shortage of farming implements in the district. Extension services are not efficient since only a small proportion of farmers are visited by the agricultural demonstrators.

Lack of marketing facilities is one of the major problems. There are no processing industries such as mills to form an outlet for agricultural produce. The transportation system is poor in terms of both accessibility and availability of motor

vehicles. Roads are poorly constructed and maintained. Thus transportation of crop and animal products in the district is very difficult. Although the National Development Bank offers loans to farmers, many are not aware of this facility.

Resources for the livestock industry include abundant surface water and extensive pastures. But this sector faces serious problems due to use of traditional methods of husbandry outbreak of diseases, predators and poor marketing facilities.

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CHAPTER IV

SPECIAL AGRICULTURAL PROGRAMMES AND PROJECTS IN MAUN DISTRICT

For more than a hundred years the people of Ngamiland have depended on subsistence arable farming and cattle rearing. Before independence little was done to improve agriculture although the Pupil Farmer Scheme which was a National programme was introduced in 1962 in the area. Under this scheme, 30 farmers were chosen in different areas for supervision by Agricultural Demostrators and it was hoped these would serve as leaders of the local farmers. Besides the general extension work, some special agriculture programmes have been going on in the district since independence.

4.1. ARABLE FARMING

41.1. THE NXARAGHA SETTLEMENT SCHEME

This scheme began in 1962 when some 30 farmers were moved into the Nxaragha Valley from parts of Ngamiland especially around Maun.[1] This area was chosen because of the relatively rich soils and the seasonal flooding of the plain. In 1966 a further advantage was added by the establishment of the Moshu experimental station[2] in the middle of these farmers although it appears to have had very little impact. Most of the farmers did not transfer their cattle from the "old" cattle posts to the "new" plots at Nxaragha due to fear of the tsetsefly, for in 1942 a large population of about 20,000 cattle were evacuated from the Nxaragha Valley because of the tsetsefly invasion.[3]

The Nxaragha pupil farmers were provided with free improved seed, insecticides, chemical fertilizers and tractor services.

Initially the tractor loan service was for three years but this was extended to five years so as to get the farmers firmly settled[4]. In addition to the provision of inputs, the farmers were given two Agricultural Demonstrators who offered close supervision. The objectives of this programme were to establish a core of pupil farmers who would later become progressive farmers and finally master farmers; eventually this group of elite farmers would spread the agricultural innovations in the district through contact with other farmers. It was expected that other groups would be established in the long run and that there would be increased and improved agricultural (arable) production in the district.

The Agricultural Demonstrators helped the farmers to destump their plots properly and good methods of cultivation were insisted upon on both wetland and dryland plots. The major crops were maize and sorghum and production was higher than in other areas. Cotton was also tried but suffered because of the cotton worms and because the cotton did not pay much since there was no local market.

By 1976 there were less than 10 farmers left in the area,[5] the rest having gone back to Maun to concentrate on the other cattle posts. The Agricultural Demonstrator who was in charge of this scheme identified the major problems of the project as lack of markets, inaccessibility of the area from Maun, division of labour due to ownership of another cattle post elsewhere and lack of social facilities such as schools and health facilities in the area. In other words, these two problems may be seen to have stemmed from the spatial organisation of

human settlement in the district. The Nxaragha Valley is cut off from Maun, being linked only by a track which is motorable for only part of the year. If communications were good with areas of dense population or concentrated like Maun the scheme might, prospered as produce could easily be taken to those areas for sale. One farmer who was involved in the scheme complained that after Independence the previous close supervision relapsed and that the free inputs like fertilizer were stopped. However it is felt in this thesis that the farmers might have expected the subsidies to continue indefinitely as the farmer interviewed insisted the government has a duty to give him inputs to start again. Any revival of the scheme or the establishment of a new one must take into consideration the social and physical infrastructural base and facilitate accessibility between the project area and the village which will provide the necessary market.

4.1.2 THE MOSHU EXPERIMENTAL STATION

The Agricultural Experimental Station at Moshu was established some 12 years ago (1966) in the Nxaragha Valley. Its main objectives are to carry out experiments on the suitability of Okavango sand soils for production of crops such as maize, sorghum, millet, sunflower and others. Both irrigation and dryland farming are practised with application of kraal manure.

Results of the experiments show that a variety of crops can be grown successfully in the area. Maize and millet have been produced at a yield of over 3 000 kg. per hectare with heavy kraal manure inputs of 10 tons per hectare. It is expected that an ordinary farmer who applies manure and weeds his fields

could reach 1 500 kg. per hectare. Sunflower does well at yields of 1 000 to 1 500 kg. per hectare. Experiments on legumes have also been carried out with success. One of the most productive crops on the soils was cited as tobacco and that there is one private farmer already producing it commercially.

The problems of this project were cited as including delays in seed delivery, poor cooperation and coordination with headquarters in Gaborone, transport and communication of the results to farmers. There is very poor coordination and cooperation between this station and the Ministry of Agriculture's Department in the district. The Ngamiland Rural Training Centre (NRTC) is also situated in the same valley about 10 km. away but these two institutions do not seem to share their experiences in terms of exchange of experimental results and other information. Asked how they worked with the local farmers the officers were frank to give a negative answer of "no contact" and that they were willing to receive both farmers and extension officers in the station.

The dilemma of this station lies in the fact that although it is situated in an area of high agricultural potential it is far removed from the people and has poor connectivity with the local villages. Thus the translation of the results into use by the subsistence farmer has not been possible so far. The location of the station within an existing arable farming area like Shorobe or Matlapaneng could be more beneficial to the farmers.

4.1.3 NGAMILAND RURAL TRAINING CENTRE

This is one of the three Rural Training Centres in the

country. It is located some 27 km. to the west of Maun and serves a very large region including the Ghanzi and Chobe Districts. The purpose of this Centre is to offer short agricultural courses to farmers and field extension staff. Other government departments and organisations use the facilities. This Centre also has production of cereals and vegetables and raising of poultry as demonstrations of modern agricultural techniques.

The weekly or fortnightly courses are supposed to run throughout the year but in reality this is not the case. Organisational problems arise from the fact that a large area is served and gathering of the farmers from the scattered cattle posts and lands becomes difficult. Although each Agricultural Demonstrator is expected to make arrangements as to whom amongst "his" farmers will attend the courses problems are also encountered within the localities. Some of these include the mobile nature of the population which makes it difficult to have continuous contact between farmer and Agricultural Demonstrator. A case has already been quoted in Chapter III where one Agricultural Demonstrator brought only one farmer to the Centre from Etshaa. Thus the eccentric location of the Training Centre makes the transport costs for farmers from distant areas very high. Added to this is the fact that the governments bears all costs such as accommodation and food during the courses.

The attendances to these courses seem to reflect some bias in that certain farmers have been to courses more than once, whilst their neighbours have not been invited at anytime. This suggests that the Agricultural Demonstrators have special

clients and these happen to be the better farmers. A system which ensures fairness in selection of farmers for attendance to Ngamiland Rural Training Centre courses should be worked out. So far it does not appear that many farmers have ever attended these courses. In this study 66% of the respondents had not attended the courses before.

One serious problem of the centre is organisation of the time-table. Courses on ploughing and planting so far have been carried out during the dry season, thus giving illiterate and semi-illiterate farmers only theoretical lessons. It is hoped this mistake will be corrected soon. Transport and communications are very significant problems also. There is no telephone link with Maun and the radio is often out of order. One truck has been allocated to the Centre for use within the site and for transporting officers and produce to Maun.

On the production side the centre has been successful as yields in maize, sorghum and millet have been above national average. Figures for the 1976/77 season were sorghum 2250 kg per hectare; maize 540 kg per half hectare and millet 1080 kg per hectare. The averages over some years have been recorded as 386 kg per hectare; 412 kg per hectare and 374 kg per hectare respectively. These compare very favourably with the national average of all crops of 300 kg per hectare.

The centre could be more useful if the Agricultural Demonstrators and even the instructors were encouraged to carry out follow-up projects of the lessons imparted to farmers by visiting them in their farms. Also it could be a more effective strategy to organise lessons in different localities as in this case there could be more attendances. At present it

seems what is taught to farmers is not translated into practice.

4.1.4 THE MAUN SETTLERS

The Maun Settlers Project was started in 1971 by the Chinese(Taiwan). Its location was within the village on the banks of the Thamalakane River. The main objective of the Project was to teach a few local young people simple techniques of irrigation with a view to popularising this type of farming along the river and the Delta in the future.

The project started off very well with rice,maize and at least 16 fifferent types of vegetables(leaf,root,legume) as major irrigated crops. All the machinery and tools came from Taiwan and these included a pump engine,cultivators,a threshing machine,wheel barrows as well as fertilizers and insecticides.[6] There were 4 young men from Maun village engaged in this project. In 1974 the Chinese mission returned home and left these young people running the garden which was divided into two pieces of 300 x 300 metres each. Each young "settler" had his own plots of rice,maize and vegetables and hired extra labour to assist them. Two of the settlers worked cooperatively i.e.producing and marketing together. The tools and machinery were used communally and all contributed to full expenses.

In 1975 and 1976,the "Chinese Garden" (as it was commonly known then)was very popular,being only second to Maun Secondary School in production. It had the advantage of being located in the village,so that the market was readily available. Those who were involved in the project claim that demand was greater than supply. They also claim to have realised returns of about P1700 per year. Their small rice "paddies" produceda total of

four 90-kg. bags which they sold at P75 each;all sorts of vegetables grew very fast and were popular with the villagers. Unfortunately this successful project collapsed in 1977.

It is claimed that the major cause of the project's failure was the breaking down of machinery and lack of spares for repairs. Whilst this may be true it may be argued that in the first place the operators of these machines were negligent and did not maintain them properly. With such large returns they could easily have replaced the machinery by employing more people. Alternatively, they could have bought another water pump engine either through their savings (assuming they did save) or by acquiring a National Development Bank Loan through the local Regional Agricultural Officer. The Government has been approached to rescue these young farmers. They claim help has been promised on condition that they start the garden again using their own labour and to plant at least 2 acres. Nothing had been done by the end of September 1978.

This project at least achieved one thing. It demonstrated that small-scale irrigation can be profitable in the Swamps, and perhaps more importantly that rice can be grown successfully as a commercial crop.

4.1.5 SCHOOL GARDENS

The most successful irrigation scheme in the whole district is the Maun Secondary School Garden. The garden covers 10 hectares and is located on sandy soils on the banks of the River Thamalakane.The sprinkler method of irrigation is used in the huge garden as it is believed to have a number of advantages over furrow and flooding irrigation(plate 4.1 Firstly,it allows frequent application with small quantities corresponding

PLATE 4.1 (a)

USE OF IRRIGATION AT MAUN SECONDARY FOR
VEGETABLE GROWING SCHOOL

PLATE 4.1 (b)

CABBAGE GROWN BY IRRIGATION
SECONDARY SCHOOL

to the very low water holding capacity of sandy loams and loamy sands[7]. Secondly, it is simple and does not require highly skilled and experienced labour to operate it.

The crops include fruit such as pawpaws, guavas, bananas and citrus fruit. There is a large variety of vegetables including cabbages which weigh as much as 3 to 4 kg. each. The produce feeds about 500 students and 26 teachers; also people from the village get their vegetables mostly from this garden since prices are relatively cheaper and there is a fairly wide variety of vegetables available throughout the year. The school also supplies other institutions with vegetables and these include Safari South (a Safari company), Island Safari Lodge, Riley's Hotel and the Hospital. Fodder crops, especially lucerne, are also grown for feeding the school's dairy cattle. Leaf cabbage is also used as stock feed. The soils are fertilised by application of kraal manure bought from local kraals (Plate 4.1(b)).

The garden is divided into two parts, one area which is purely commercial and the other which is for teaching students practical agriculture. The students' portion is very productive and the students occasionally carry vegetables home. Unfortunately this useful education tends to end inside the school garden. Most students do not grow vegetables at their homes although they have the know-how. This problem has to be taken up by the Education Officers in order to see how students could be encouraged to establish small gardens at home.

The primary schools have all started small gardens for teaching children elementary agriculture. Some of these gardens

are growing both vegetables and fruit successfully and sell these to raise funds for the school. Occasionally pupils carry vegetables from their plots home. However, they should be encouraged to start gardens at home so as to improve the diet.

4.2 PASTORAL FARMING

4.2.1 THE ARTIFICIAL INSEMINATION SERVICE

The objective of the Artificial Insemination Service is to up-grade the national herd through improvement of individual farmer's cattle by providing subsidised semen to farmers. The Government has a Bull Station at Ramatlabana from which semen is collected and sent to 10 Artificial Insemination Centres throughout the country[8]. Farmers may take their cows to these centres for insemination or they may buy semen, liquid nitrogen and other equipment for insemination on the : farms. The Government trains inseminators for private farmers free of charge. The breeds kept at the Bull Station are Brahman, Tuli, Simental, Bosmara and Afrkaander. Although Hereford and South Devon bulls are kept, they are not recommended for Botswana's climate.

In Maun district the Artificial Insemination Centre is at Makalamabedi to which farmers take their cows for insemination in September. The price is P4 and includes feeding and veterinary care for a period of 4 months[9]. Each farmer is allowed a maximum of 10 cows for insemination in one year. In the 1977/78 insemination period only 32 farmers in Western Ngamiland sent their cows for insemination. This was a very low number, perhaps attributed to the great distances farmers have to trek their cows to Makalamabedi. Trekking distances vary between 5

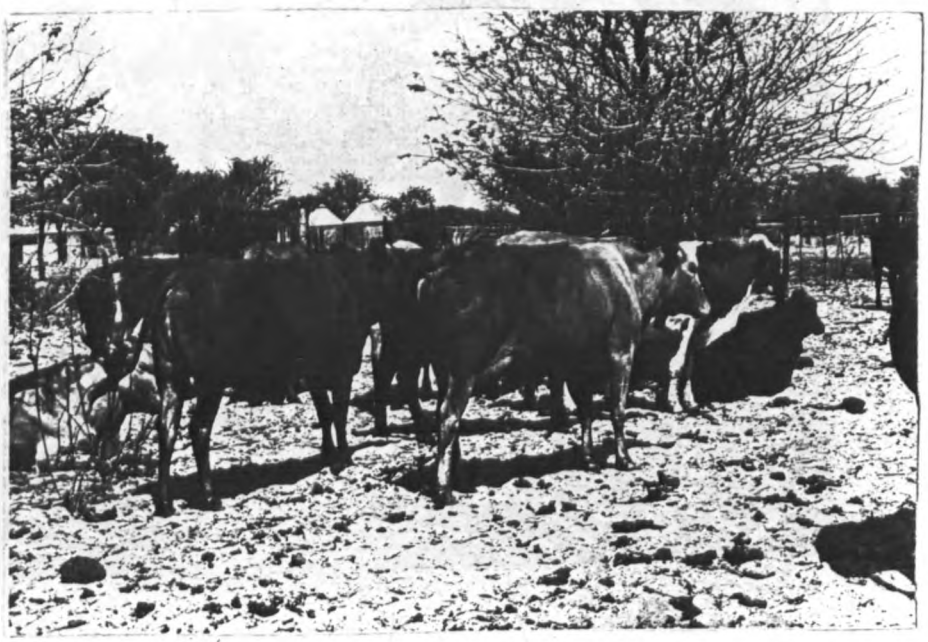
and 370 km.. In this study 35% of the farmers had used the Artificial Insemination Service before. However use of the Artificial Insemination Service tended to be related to the size of the herd owned, with the largest owners utilising the Artificial Insemination Service more. Only 13% of those farmers owning less than 50 cattle sent their cows for artificial insemination and 27% of those with between 51 and 100 cattle did. The percentages for those with between 101 and 200 cattle and for those with over 200 cattle were 70% and 73% respectively. The explanation may be that the rich farmers are more aware of this service or that they are more willing to pay the P4 than the poorer farmers.

4.2.2 THE BULL SUBSIDY SCHEME

This scheme is complementary to the Artificial Insemination programme and was started much earlier. Its aim is to provide farmers with high grade bulls at subsidised cost. This scheme is financed by the Export Levy Fund accumulated by 20 thebe(P0.20) deductions from each beast slaughtered at the Botswana Meat Commission's abattoir. The subsidy works according to the farmers'incomes with the minimum price of P45 a bull and a maximum of P150.

In Maun district the bulls are kept at Tsetseku Ranch near the Ngamiland Rural Training Centre (Plate 4.2b). This ranch was started in 1968 and mainly serves two purposes; firstly as a demonstration ranch working in conjunction with Ngamiland Rural Training Centre and secondly as the Bull Subsidy's distribution camp. Breeding cows are also kept (Plate 4.2a). It covers 4 000 hectares and is divided into

PLATE 4.2 (a)

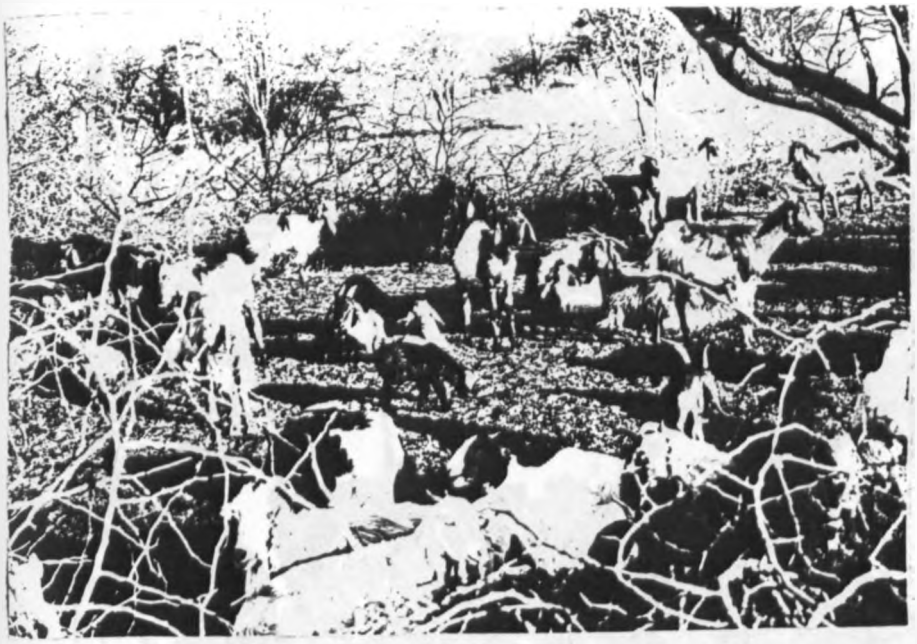


BREEDERS AT TSETSEKW RANCH

PLATE 4.2 (b)

BULL READY FOR SALE UNDER THE BULL SUBSIDRY SCHEME AT TSETSEKW

PLATE 4.3 (a)



MANY SMALL FARMERS KEEP GOATS BUT THERE
IS NO FORMAL MARKETING FACILITY

PLATE 4.3 (b)

TRADITIONAL COWS HAVE A LOW YIELD OF MILK
THEY COULD BE UP GRADED THROUGH CROSS BREEDING

PLATE 4.4 (a)

SUPPLEMENTARY FEEDING OF GOATS
AT SAMEDUPE

PLATE 4.4 (b)

SUPPLEMENTARY FEEDING OF CATTLE
NEAR MAUN

6 paddocks. It has a total of 250 cattle, of which 40 are grade bulls for distribution to farmers. These bulls come from the Bull Station at Ramatlabane and are sold at the age of 2½ years. In 1977 22 bulls were sold and all went to the area around Maun. Although this programme is aimed at all farmers and to subsidise mainly the poorest, it seems the richer have benefited most. For instance, in this study only 10% of those farmers owning less than 50 cattle had bought bulls from the ranch whilst 75% of those owning between 101 and 200 cattle had done so. However, the fact that in 1977 all the bulls were bought by farmers around Maun i.e. near the ranch , is a pointer to the importance of distance in effecting the programme.

4.2.3. MAKALAMABEDI (BLDC) RANCH

Makalamabedi was the first ranch set up by the Botswana Livestock Development Cooperation, a subsidiary of the Botswana Meat Commision in 1975. Its objectives are to provide a ready market to the farmers of the remoter parts of Botswana such as Ngamiland and to stop exploitation of the farmers by speculators. The ranch has an area of 80 000 hectares and it can carry more than 70 000 cattle at a time.

The ranch purchases cattle from farmers and sells them to the B.M.C. in Lobatse. No cattle are rejected whatever their condition. After the cattle have been purchased the ranch is used as a holding ground whilst the cattle await movement in batches to B.M.C or other ranches for fattening. In 1977 the numbers maintained on the ranch were about 6 000 head.

The major setback of this ranch is its location far from important cattle areas such as Shakawe (over 300 km. away). Farmers have to trek their livestock over large distances so

the cattle lose weight on the journey. Since the ranch does not have a fattening scheme like the other BLDC centres, farmers from the more remote areas are only able to obtain lower prices for their cattle since their condition has deteriorated on the long journey. The Botswana Livestock Development Cooperation (BLDC) should therefore open up sub-branches in other parts of the district such as Gomare and Sehitwa or help to provide water facilities along the trekking routes. The Botswana Livestock Development Cooperation should also provide marketing facilities for small stock such as goats and sheep (Plate 4.3a). This would increase the incomes of the poorer farmers who own goats and sheep but no cattle. At present these farmers have to rely on local markets. Ngamiland has not so far participated in the Botswana Meat Commission's Grazier Schemes. Perhaps it could start these schemes by utilising the cattle bought by the Botswana Livestock Development Cooperation at Makalamabedi.

4.2.4 THE DAIRY FARMING PROGRAMME

The main objective of this programme is to encourage production of fresh milk in the district. To achieve this the Thamalakane Dairy Farmers Association was started in 1978. It is composed of 13 farmers who have subscribed P10 each. The area for the project is about 11 km. from Maun and close to the river so that pastures may be irrigated.

Each member has contributed a predetermined number of poles and droppers for the construction of the perimeter and paddock fencing. Also each member is required to contribute a beast for sale so as to boost the Association's funds. On top of this a cow will be contributed by each farmer. This cow will be sent to the Artificial Insemination Centre to be inseminated with

semen from dual purpose breeds (milk and beef) such as Simental, so as to upgrade the herd(Plate 4.3b). The farmers also obtained a group loan of P1 700.

The project is still in its incipient stage. A dairying demonstrator has been assigned to the area and he is actively assisting the Association. He has also been assigned to start a second dairy project in Sehitwa. The problems cited by the Agricultural Demonstrator concerned were lack of a tradition in milk production in the area and transport problems between Maun and Sehitwa.

4.2.5 THE POULTRY PROGRAMME

A Poultry Agricultural Demonstrator has been charged with the duties of introducing commercial poultry farming in the district. He helps farmers to construct "proper" housing for chickens and to acquire the necessary equipment. When housing, equipment and supplies of feed are ready the Agricultural Demonstrator makes an order of one-day-old chicks on behalf of the farmer. These chicks are kept at Ngamiland Rural Training Centre for 8 weeks and then sold to the farmer.

At present (late 1978) there are 10 farmers keeping a total of 200 layers and broilers. Most of them are in Maun, but the Poultry Agricultural Demonstrator is carrying out campaigns in other parts of the district to popularise the poultry industry. The main problems encountered so far include the vast area covered by the Agricultural Demonstrator and the lack of transport, poor management despite poultry keeping lessons given to farmers and delays in receiving chicks from South Africa. Distribution of feed to outlying areas is also a

serious problem. Egg production is still very low and so the district still relies on egg supplies from outside the country (South Africa and Rhodesia).

4.2.6 THE P50 SCHEME

The outbreak of the Foot and Mouth Disease at the end of 1977 resulted in the stoppage of cattle purchases by the Botswana Livestock Development Cooperation in the infected areas. Ngamiland was one of those areas heavily infected. As the spread of the disease was fast and prospects of controlling it quickly were fairly remote, the Government worked on a short-term strategy for helping the affected farmers who depended on cattle for their cash incomes. In May 1978 the rescue operation called the P50 Scheme was launched.

Under this scheme the Botswana Livestock Development Cooperation paid P50 for each beast the farmer intended to sell to it at the end of the outbreak. All such cattle were marked with a special Botswana Livestock Development Cooperation tag. Only those cattle worth more than P50 were accepted. The farmer kept the cattle marked for the Botswana Livestock Development Cooperation and sold them at the end. The balance out of P50 would go to the farmer. Each farmer could pledge up to 10 cattle at a time. The Botswana Livestock Development Cooperation had loaned a sum of P350 000 by the end of September.

In the Maun district the scheme was successful although extra expenses were incurred by the Botswana Livestock Development Cooperation due to poor communications and roads. The Botswana Livestock Development Cooperation team used four-wheel drive vehicles to visit the scattered cattleposts, using

the villages as bases.

4.2.7 THE TRIBAL GRAZING LAND POLICY

After realising the problem of range deterioration as a consequence of the traditional system of grazing in Botswana, the Government formulated a policy on grazing land development. The policy proposals advocate a change in land tenure and land use for rural areas. The major proposal is the zoning of the tribal grazing land into communal, commercial and reserved areas. From August 1975 the Government started consultations with people to obtain their views on the new policy. This exercise lasted up to August 1976.

In the Maun district the response of the farmers was not very favourable. It is believed that the people in this district saw marketing problems as most crucial, and did not see these being solved by any of the Tribal Grazing Land Policy provisions. Some people also think it was misinterpretated as farmers thought they would be deprived of their rights to use communal grazing areas. Others thought the commercial zones were meant for the rich only. During consultations there was a high "none" response to the question on overgrazing in Ngamiland although on a national scale the highest response was that there was a lot of overgrazing. This is difficult to interpret since there is significant overgrazing around centres of population such as Maun, Shakawe and Sehitwa.

Twenty-five per cent (25%) of the Radio Learning Groups (RLGs) in Ngamiland were against granting of exclusive grazing rights in communal areas as compared to the 10,2% national response[10]. On the question of zoning, people at

Kgotla meetings expressed the view that this would have a detrimental effect on the traditional way of life and deny people access to land in times of drought. People also rejected the proposal to limit cattle numbers. It is therefore clear that an educational campaign should be a prerequisite to any change of land tenure and land use in the district.

However action has already started in the district to implement the policy proposals. The Haina Veld has been demarcated as a commercial zone. The ground demarcation started in October, 1978 and all tha ranches are of the same size, that is 7 x 7 km.. The ranches will be run by individuals and groups, including those who already have livestock in the area as well as newcomers. The area is 16 km. south of the tribal zone and covers an area of 354 000 hectares with 18 600 cattle. At present there are 34 boreholes in the area and fencing will be guided by these boreholes. It is estimated that fencing will cost P250 per km. and cost of firebreaks at P40 per km..

The communal cell development is part of the Tribal Grazing Land Policy. Ranches will be developed by the Animal Production and Research Unit within communal areas to teach low level techniques in modern livestock development. Two areas have been identified in the Maun district, namely north of Samedupe and north-west of Sehitwa. These areas are already overgrazed and are near centres of population concentration. These areas will be fenced and the pastures rejuvenated. Local farmers will put weaners in the fenced area for two years; after five years the fenced areas will be surrendered to the local councils.

The Tribal Grazing Land Policy in Ngamiland has seen little success since only a few people are involved in the present commercial zones. The policy excludes the majority who own no cattle and who depend on arable farming. It is therefore essential that a comprehensive agricultural policy be developed to embrace both livestock and arable farming.

4.3 PROBLEMS OF THE AGRICULTURAL PROGRAMMES AND PROJECTS

A number of common problems were and are experienced by the various programmes and projects in the district. Perhaps the most common problem is that of inaccessibility. Projects such as the Bull Subsidy Scheme, the Artificial Insemination Service, the Moshu Experimental Station are not easily reached by a large proportion of farmers due to large distances and particularly lack of transportation facilities. Marketing of farm produce is difficult because of the poor transport network, shortage of vehicles and lack of adequate marketing facilities. The weak physical and social infrastructure in some settlements such as Nxaragha farms has led to the failure of programmes since farmers were forced back to Maun to look for health and educational facilities.

The agricultural schemes seem to benefit Maun farmers mostly. This is because these farmers are concentrated in a major village and hence more accessible than the farmers in the more dispersed human settlements which lack branches or agencies of these schemes. Even in the Maun area the richer farmers tend to gain more since they have greater access to extension services. Poor contact between the agricultural demonstrators and farmers and lack of close supervision hinders rapid modernization in

the district.

Outbreak of diseases ,especially Foot and Mouth,can disrupt the district's economy. The easy contact between domestic animals and wildlife makes easy the spread of disease. This could be controlled by fencing of both the wildlife and grazing areas. The free mingling of different herds in communal grazing land also facilitates the spread of disease. Under the communal grazing system poor rangeland "management" has been practised. As a result of overgrazing the environment has been degraded severely in some areas. Thus the need for the Tribal Grazing Land Policy has been realised in Botswana.

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CHAPTER V

HUMAN SETTLEMENTS IN MAUN DISTRICT

5.1 Population Distribution and Density

The Maun District has a population of about 65 000 people living mainly in the Tribal Trustland area of 68 847 km.^{2}. There is an additional 18 847 km.^{2} of Stateland and 16 000 km.^{2} of inland waterways in which only a few human settlements are located[1] (2 000 people are estimated as living in the Swamps). The population density is very low at 0,49 people per km.^{2}. This makes "the per capita cost of any development programme prohibitive"[2].

The settlement pattern in the district is determined by the tsetse fly incidence and the water availability. Thus the eastern part of the Okavango Delta which is tsetse-infested has a low population (most parts being virtually inhabitable), whilst the tsetse-free south-west and north, into which most of the Delta's outlets flow, are relatively highly populated. Over 40 000 (about 80%) of the population live in the southern and western fringes of the Delta (Table 5.1). The population lives in large and small villages between which are scattered communities designated as cattle posts and lands. In the western fringe the more highly inhabited area forms a narrow belt which is between 10 and 80 km. wide and 270 km. long, lying between Sehitwa and Mohembo. To the west of this belt population is sparse with a density of less than 0,1 persons per km.^{2}. The major population centres in the north, west, south and south-east have population densities varying between 0,1 persons per km.^{2} and over 20 people per km.^{2} (Map 5.1). Maun, Sehitwa, Gomare, Sepopa and Shakawe all have population densities

of over 20 people per km.^{2} whilst areas to the north of Gomare including Etshaa, the area north of Shakawe and Matlapaneng area have densities of between 10 and 20 people per km.^{2} Around Shorobe and Nokaneng (areas with irrigable soils) densities are between 5 and 10 people per km.^{2} . The large remaining areas have large cattle herds and it is here that extension work and the implementation of livestock programmes become very difficult because of the large distances and the dispersed nature of the cattle posts.

The areas around the more densely populated villages are overused due to overstocking and hence the current efforts to seek grazing land elsewhere so as to remedy the situation. Agricultural development is greatly influenced by the scattered nature of the population centres and the unstable population characterised by great movements between villages and areas of agricultural activity.

There are four major ethnic groups in the district. The Tawana form the majority and practise both livestock production and cultivation. They are distributed fairly evenly throughout the District with a concentration in Maun. The Ba Yei are cultivators, fishermen and hunters and a large proportion of them live within and adjacent to the swamps. An ethnic group with similar cultural practises as the Ba Yei are the Mbukushu who migrated from Angola and are engaged in successful crop production in Etshaa which used to be a refugee camp. The Herero, originally from Namibia, are traditionally cattle herders. Perhaps these traditional economic activities should be exploited by developing these ethnic groups on lines based on their existing economic activities. For instance, the integrated ....

agricultural approach could start with ba Tawana whilst some ba Yei are trained as specialists in modern fishing and so forth. The other smaller ethnic groups are Ba,Sarwa, ba Kglagadi, ba Kereku and ba Subia. BaSarwa are perhaps the most interesting of the minority groups as they [illegible] subsist largely on hunting and gathering and therefore any agricultural programme to include them should bear in mind that this activity would be entirely new to most of them.

TABLE 5.1

POPULATION DISTRIBUTION IN NGAMILAND. (1971 CENSUS)

AREA	VILLAGE	POPULATION
Western Fringe	Maun	13,000
Western Fringe	Shakawe	1,967
Western Fringe	Sehitwa	1,217
Western Fringe	Etsha	3,800
Western Fringe	Gomare	6689
Western Fringe	Tsau	427
Western Fringe	Nokaneng	335
Western Fringe	Sepopa	298
Western Fringe	Toteng	505
Eastern Fringe	Seronga	302
Eastern Fringe	Shorobe	266
Delta Catchment	Small Scattered Settlements	17,194
Sandveld Areas	Small Scattered Settlements	11,323
Total		51,323

Source:Ngamiland District Development Plan 1977

5.2 EXISTING HUMAN SETTLEMENT HIERARCHY

During the 1971 census 70% of Ngamiland 's population were living in villages whilst 30% were in cattle posts and lands. These villages have populations ranging between less than a hundred to 15,000 people. In general five levels of human settlements may be recognised in the district using population size and service availability as criteria for categorisation.

First there is Maun which is the major village, dominating all other settlements and has a population of around 15,000. It lies on the southern edge of the Okavango Delta and is a focal point for communication routes from Francistown, the Chobe District and Ghantsi District. Its immediate hinterland goes a 100 km. westward to Sehitwa and another 100 km. eastward to Zankuyo. Southwards this zone of influence stretches some 50 km. to Makalamabedi. This area depends on Maun for services such as primary and secondary education; hospital facilities, security (police), commercial services, postal services and agricultural supplies such as animal drugs and cattle feed. Some farmers in areas as far as Sehitwa have homes in Maun from which they occasionally visit their cattle posts. It is the major marketing centre of this area. However, Maun's influence covers the whole district and even Ghantsi and Chobe Districts. Ghantsi, for example, uses Maun's post office for receiving and sending mail. The entire Maun district depends on Maun for their agricultural supplies, administration, government services, wholesale trade and many other services. However, this village offers very little in terms of employment opportunities and processing industries which would form an outlet for agricultural produce for its sphere of influence. Moreover for such a regional centre its

services and infrastructure are inadequate.

Maun has both urban and rural functions. It houses government departments which are engaged in rural development projects and it has about 6% of its adult population in wage employment. It has commercial, educational and health facilities. Maun has 18 trading stores, 3 butcheries, 4 petrol stations, 2 Safari companies, a large hotel and a small curio industry. Just outside Maun are located 3 Safari Lodges which cater for tourists and occasionally for the local population. There are 7 primary schools in the village and 6 of them offer education up to Primary School Leaving Certificate (Standard 7). However there is a shortage of classrooms as enrolment is high since children from neighbouring villages such as Matlapaneng attend school in Maun. There is only one Secondary school which serves not only the village but the district as well. A Youth Brigade Centre provides a small number of school leavers with vocational training. Maun has an old hospital with 140 beds and it serves a population of about 70 000 people as a general referral hospital. It is frequently manned by only one doctor or perhaps two although it is supposed to have three doctors. The District Council runs a clinic in the village.

Maun is the administrative headquarters of the district, being the seat of the District Commissioner and the North West District Council. It has the Regional Police Station and a prison.

Within Maun itself the main roads are tarred. The Central Transport Organisation (C.T.O.), a parastatal body which manages government vehicles has its District Headquarters here. There is a telephone system in Maun (192 connections) and a post office

(with 9 private bags and 500 boxes). Botswana Power Corporation supplies part of the village with electricity from its diesel-generator power station. Water is supplied in communal stand-pipes in the traditional section of the village. The modern section (mostly government and council houses) have piped water in the houses. The modern section also has sanitation facilities provided whereas the traditional sector only has privately-dug pit latrines. These houses are constructed from a variety of local materials, including reeds.(plate 5.1b).

In the second level of the hierarchy of human settlements in the district are large villages with populations of over 1 000 people. These villages include Shakawe, Sehitwa, Gomare and Makalamabedi. Each of these villages has its own sphere of influence, with occasional overlaps. The distances between these villages are very large(for example, Sehitwa to Shakawe is 250km.) and in between are small villages, scattered, discontinuous cattle posts and lands.

Shakawe, located 370 km. to the north of Maun, is the largest village in that area and has a population of about 2 000. Its zone of influence covers an area with a radius of approximately 100 km.. The pastoral farmers to the west of the village (up to 100 km.) have homes in Shakawe. Its surrounding area depends on it for health, educational and postal services. Shakawe has a primary school, a clinic, a police station and an airstrip. It now enjoys a piped water system. However as its hinterland consists of about 11 000 people, the existing services are not sufficient. For example, the clinic(which can only handle minor cases) cannot cope with the high number of patients.

PLATE 5.1 (a)

TYPICAL HOUSING IN MAUN VILLAGE

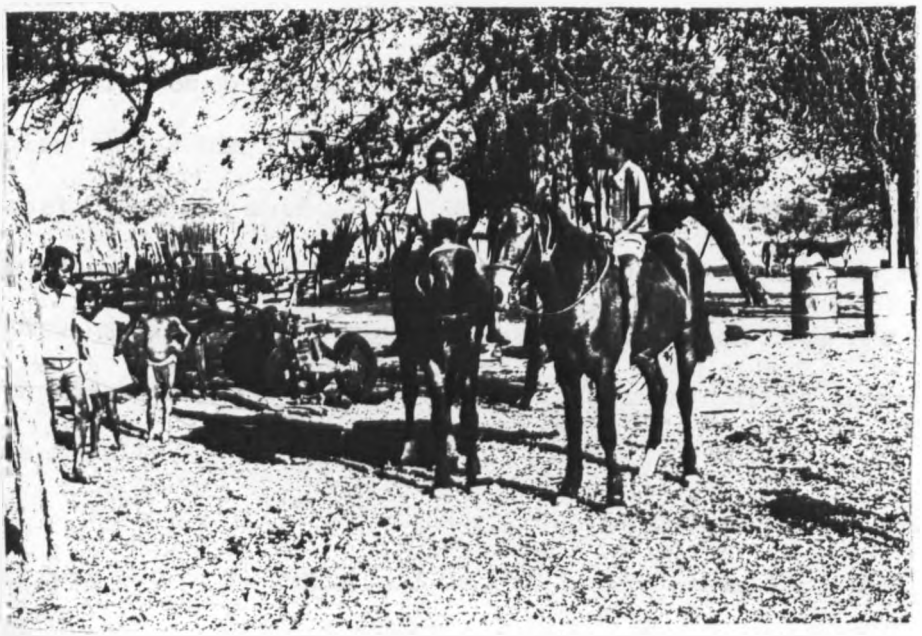
PLATE 5.1. (b)

USE OF LOCAL MATERIALS FOR HOUSING IN
MAUN - POLES, REEDS, MUD, GRASS

PLATE 5.2 (a)

TYPICAL CATTLEPOST / LANDS HOME

PLATE 5.2 (b)



HORSES AND DONKEYS ARE AN

IMPORTANT MODE OF TRANSPORT. NOTE THE MULTI-BLADE

PLOUGH RECENTLY BOUGHT BY THIS PROGRESSIVE FARMER

Although schools exist at Sepopa and Seronga(nearby villages) the physical facilities in these are not sufficient. For instance, the classroom:pupil ratio in Shakawe is 1:53 compared to 1:92 in Seronga. Also there are no marketing facilities for farm produce in the village.

Sehitwa also has a population of about 2 000. Its zone of influence stretches westwards and northwards for about 100 km.. To the east its influence only reaches for about 50 km. because of the stronger influence of Maun in that direction. Sehitwa is located near Lake Ngami and has a large cattle population, resulting in its immediate surroundings being heavily overgrazed. This village has a few trading stores, 1 primary school, a clinic and a post office agency. It also has a resident Agricultural Demonstrator. Its resource base includes cattle, fish and arable land.

Like Shakawe, Sehitwa lacks essential services. Transportation to its hinterland is inadequate since the roads are badly constructed and maintained. There is no marketing infrastructure in the village so farmers send their cattle 150 km. to the Botswana Livestock Development Cooperation near Maun for sale. Crops are only sold to the local population. There is no electricity in the village.

The other village in this group is Gomare which lies halfway between Shakawe and Sehitwa. It is smaller than the other two, having a population of 1 120 people. Gomare lies in a relatively more fertile area in which maize production and cattle keeping are important activities. This area is also well-known for its basketwork. To the north of Gomare lies the

relatively new settlements that make up Etshaa,an important crop growing area. Gomare has a primary school,a health centre and a post office agency. However infrastructure for agricultural development is lacking.

The third category comprises villages with populations of between 500 and 1 000. This group includes villages such as Toteng,Matlapaneng,Thale and Komana. These villages have small spheres of influence,averaging to a radius of about 50 km.. Social services and infrastructure are lacking. For instance, Matlapaneng and Toteng had no schools until the beginning of 1978 so children had to go to larger villages for their education. Toteng,Komana and Makakung have health posts which offer minimal health care since they are manned by largely untrained personnel. So the sick have to seek medical care in other villages. Marketing facilities are almost non-existent except for local traders who buy cattle at very low prices, about P30 - P40 ($ 50-65). Agricultural inputs have to be obtained from the large villages.

The fourth category is that of villages with less than 500 people,such as Shorobe,Tsau,Nokaneng,Kwai,Qobega and Sepopa. Most of these villages have little social services,although it is interesting to note that some of them,e.g. Shorobe, had schools before some of the larger villages ,e.g. Toteng. Health services are in the form of health posts so many patients travel to clinics at the larger villages whenever they can. Safe water and sanitation are largely unavailable at these small settlements. The marketing situation is even poorer than in the third category.

Isolated and dispersed homesteads in the cattle posts

and lands form the last group of human settlements in the district. There is a tendency for some of these homesteads to become permanent and to form small clusters. Such settlements include Kgantsheng, Lediba and Sedia. Social services are almost nil in these settlements and a lot of time has to be spent in travelling for shopping, education and medical treatment.

5.3 Infrastructure and Services for Human Settlements

It has been shown above that although the services and infrastructure available in the settlements of Maun District differ according to the functional level of the settlement in the hierarchy they tend to be inadequate in all the villages. All the roads in the district, except those inside Maun, are dirt roads. Accessibility is poor due to the absence of an adequate road network. Villages are merely linked by tracks which are sometimes unmotorable. Thus services are difficult to transmit from a centre of a higher category to that of a lower one. For instance, the Maun-Shorobe road is often corrugated in the dry season and flooded during other times of the year, especially near Matlapaneng, thus cutting off Shorobe from Maun's services. Others which are often in bad condition include the Maun-Sehitwa-Shakawe road, Maun-Samedupe-Haina Veld road and the feeder roads linking the cattleposts and lands to the villages. Inaccessibility is a common problem throughout the district. The transport business has not been developed in the area so that the only available motor vehicles are those belonging to the government and a few private individuals. Transportation of goods and passengers between villages is thus

difficult in the area.

There is abundant surface water in the swamps and rivers. Yet safe, piped water is not available in many areas. Only some of the larger settlements have communal water stands. Sewerage facilities have not been provided anywhere other than a small section of Maun. It would be very beneficial to harness this water supply for domestic and irrigation purposes.

The most common infrastructural problem identified by farmers in the district was lack of marketing facilities. This problem is largely associated with the poor transport facilities. The district is 500 km. by road from Francistown, the nearest urban centre and railway station. Transporting of cattle to the railway station is expensive (P17 a beast). The cost of transporting crop produce to the urban centres would be prohibitive at P30 per ton of goods. Therefore the farmers are mostly restricted to the poor local markets only. The establishment of food processing industries in selected villages should help in overcoming these transport costs. This would not only open up brighter prospects in the future but would also stimulate increased agricultural production.

Lack of marketing infrastructure was alleviated for a while in Maun when the Botswana Agricultural Marketing Board was established in Maun in 1977. However administrative problems forced it to close in 1978. It was of great help to farmers in and around Maun though it had little impact on farther villages. Despite the high demand for processed maize meal in the district there is no industrial infrastructure for processing this or any other cereal. So mealie-meal has to be imported from South Africa.

There is no industrial infrastructure in the District for processing this produce. The livestock sector also suffers from lack of processing industries at the local level. This lack of cattle marketing infrastructure forces farmers not to sell their cattle often enough. Skins, hides, horns, hoofs and bones have no market in the district. This results in the waste of these resources which are thrown away as useless by the farmers.

Other development infrastructure lacking in the district include electricity, postal services, stores for agricultural supplies, health facilities and schools. Provision of these in the villages could encourage economic growth and social improvements. The higher a settlement is in the hierarchy of centres the more it should have of these facilities. Complete absence of schools and clinics (for example) in villages of over 500 people should be eliminated if possible through use of the self-help concept and cooperation.

5.4. AGRICULTURAL LAND USE PATTERN

Alongside the human settlement system that has evolved in the district a land use pattern has developed. The Botswana traditional land use system of cattle posts and lands prevails in the district. In the 1971 census 21 of the 35 settlements of over 200 people were designated as "cattleposts villages" whilst 3 were termed "lands or farms". Arable farming is also carried on in the so-called cattleposts. Each settlement has its own cattleposts and lands although distances vary according to the hierarchy of the settlements. In Maun, for instance, farmers have their farthest cattleposts 160km away with the nearest at 5km. away whilst Shorobe's farthest cattleposts are only 25km. away. Thus farmers in larger villages have cattleposts and

lands beyond the smaller villages.

The location of the cattleposts and lands in relation to the village differs from one individual farmer to another. For instance this study identified four different cases.

The first case is one in which the lands and cattleposts are in the same direction away from the village of residence. (Diagram 5.1,a). An example in this case was a farmer living in Maun with fields near Shorobe and the cattlepost 25 km to the east of Shorobe.

A second type of arrangement is exemplified by a case in which the lands and cattle post are in different directions from the village. (Diagram 5.1,b).

The third case is one in which the respondents were working in Maun, had cattleposts nearby and had lands in their original village. (Diagram 5.1,c).

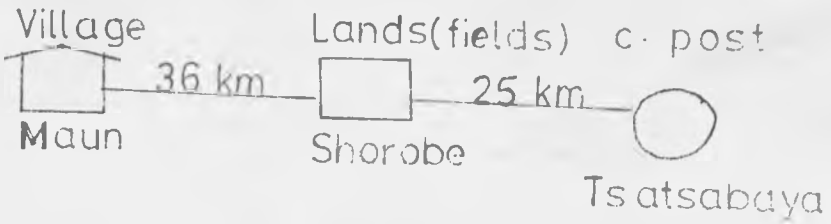
The fourth arrangement is perhaps the most practical in terms of integrated farming activity. Although the fields and cattle post are away from the village, they are in the same place. (Diagram 5.1,d).

Thus farmers move between village and agricultural land on a daily, weekly, monthly and even yearly basis, sometimes covering over a hundred kilometres. They have cattle posts and lands beyond other villages. In this study 59% of the farmers had their agricultural lands more than 20 km. away from the villages. The majority (62%) of the farmers had their lands and cattle posts in one place although it was clear that cattle rearing was given more attention by those who practised both farming systems. Table 5.2 shows the relationship between cattleposts and lands in the district as revealed by the study.

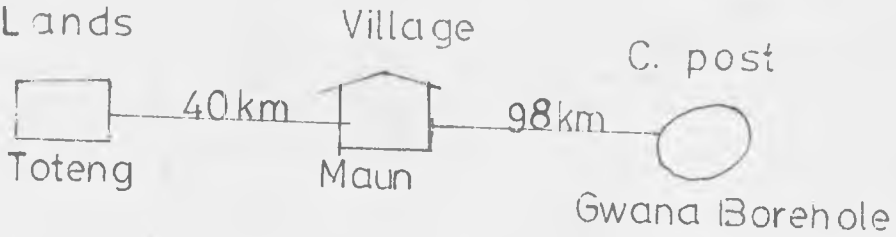
Diagram 5·1

Relationship between village, lands and cattle posts (four typical cases)

(a) Farmer 1



(b) Farmer 2



(c) Farmer 3

(d) Farmer 4

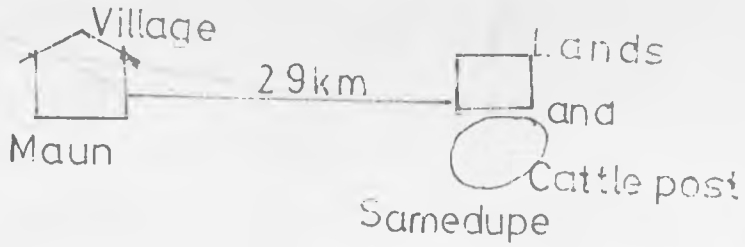


TABLE 5.2

RELATIONSHIP BETWEEN CATTLEPOST AND LANDS

BASED ON FARMER'S CATEGORY BY OWNERSHIP OF CATTLE

Category of farmer	Conjoined cattlepost and lands		Separated cattlepost and lands		Cattle only	
	Farmers	%	Farmers	%	Farmers	%
1 - 50 cattle	21	70	7	23	2	7
51 -100 "	12	63	6	32	1	5
101 -200 "	6	60	4	40	-	-
201+ "	3	20	8	53	4	27
Total	42	62	25	38		

Source: Study Field Survey.

The difficulties which arise in trying to implement agricultural strategies on separate fields and cattle posts can be seen in the light of distances and time taken travelling between these agricultural areas and villages. This is both a hindrance to the farmer himself and the extension officer. On the farmer's side it leads to absent management, divided attention, inability to integrate the complementary aspects of mixed farming such as manual inputs and utilisation of crops as stock feed. In the case of the extension officer the major snag in the first place is to know where his client (the farmer) is at the time he wants to visit him. The Agricultural Demonstrator is also only able to deal with crop and livestock problems on separate visits since these are located at different places.

The land around Maun, Sehitwa and other villages is mainly used for cultivation although some farmers keep goats and small herds of cattle. In smaller villages like Shorobe and Toteng

the fields may belong to farmers living in Maun and perhaps having a second home in the small village. The area around the villages is almost always overgrazed and the natural vegetation has been degraded. For instance the stocking rate around Maun is 9-12ha per livestock unit which tallies with the grazing capacity of 12 ha per livestock unit. This is because the District Council has prohibited herds being kept in and too close to the village. But some eighteen kilometres from the village at Samedupe the stocking rate becomes too intensive at 1-4 ha per livestock unit. Moreover homesteads are becoming permanent and local farmers are beginning to look for grazing land elsewhere - for instance at Haina Veld. Controlled grazing through limited herd numbers and rotational use of pastures could avert this problem. The fact that overgrazing has been transferred from the village areas to the cattle post areas like Samedupe, Nghabe, Makgalo, Mogugelo and Damara makes the need to search for a more workable system urgent. Areas around the existing human settlements could be restricted for use by the inhabitants of those villages only in an organised pattern rather than having farmers from other villages holding lands and cattle posts here. As mentioned before there is a tendency at present of having farmers in large villages like Maun holding agricultural land around small villages like Toteng. This strategy would reduce the distances travelled between the village and agricultural land. Establishment of services and infrastructure in these settlements could also help to speed up rural development.

5.5 SUMMARY

The population in the Maun District is concentrated in the southern and western fringes of the Okavango Delta. The population density is low with an average of 0,48 persons per sq.km.

There are five recognisable categories of human settlements in the District. Maun village with a population of 15 000 is the dominant regional centre whose area of influence stretches beyond the boundaries of the District. Although it has more and higher sevices and infrastructure than other settlements, its rank makes the establishment of more social and physical infrastructure necessary.

The next group of villages in the hierarchy of settlements includes Sehitwa, Gomare and Makalamabedi whose population ranges between 1 000 and 2 000. Infrastructure and services in these villages are fewer and lower than those in Maun. Their population is thus dependent on Maun for higher services such as postal services, farm supplies, transport and medical care. Their distance between them and Maun makes provision of these services very difficult. Moreover the difference in size and services between them and Maun is too great to have them placed in the second position. (Appendix D.)

Toteng, Thale, Matlapaneng and other villages with between 500 and 1 000 people are in the third category. Social services and development infrastructure are lacking in these settlements rendering them more dependent on Maun for services than the villages in the second group.

Villages of less than 500 people are the largest group in

the district and have 56% of the population.[4]. Yet they are inadequately served with social facilities such as schools, hospitals, roads, marketing facilities and so forth. The last category is that of isolated and dispersed homesteads (30%) which experience the worst difficulties in obtaining services due to their remoteness.

The village - cattlepost - lands system exists in the district. Each village has its zones of cultivated land and grazing land. Farmers in larger villages tend to have agricultural land in smaller villages. There is a great movement of people between the villages and cattle posts on a daily, weekly, monthly and seasonal basis. These movements are made on foot, donkeys and motor vehicles. However transportation is one of the worst problems in the district. Time spent on travelling could be put into other uses. The separation of agricultural land from the place of residence makes implementation of agricultural strategies a difficult task.

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CHAPTER VI

STRATEGIES FOR RURAL DEVELOPMENT IN THE MAUN DISTRICT

6.1 Introduction

The previous three chapters have outlined the agricultural development and human settlement trends, problems and prospects in the district. It was noted that agricultural production is still low in the area due to constraints such as poor spatial system, low capabilities of the farming population, poor services and weakly developed infrastructure. The physical and social developments that will stimulate, enhance and aid agricultural growth includes roads, marketing facilities, growth centres, safe and potable water, educational and health services, extension services and small-scale agricultural industries.

This chapter discusses the problems identified in the district, sets out policy implications and strategies for their resolution.

The role of agriculture in rural development as well as national economic growth cannot be overemphasised. It provides food for both the agricultural and industrial population and thus the country spends less on food purchases. The agricultural sector will also supply labour to the other sectors once efficient farming, which uses less labour, is achieved. This sector will form capital for other development purposes and provide raw materials for the industrial sector. Agriculture may also provide foreign exchange if it is export-orientated. The Maun District could also have its development stimulated by improvements of the agricultural sector. It is hoped that the

suggestions for resolving problems hampering agricultural progress in Botswana will trigger off rapid agricultural progress at the national level and particularly in the Maun District, if implemented.

6.2 THE PROBLEMS IDENTIFIED

The problems identified in this study are not unique to Maun District, they are prevalent in other parts of Botswana and indeed in several countries of the Third World, especially Africa. The national problems identified in Chapter II exist in the Maun District and some may be more acute due to the remoteness of the district from the zone of higher development (i.e. the line-of-rail). Only those problems regarded as forming critical obstacles to rural development and in particular agricultural improvement in the district are discussed below.

THE EXISTING LAND USE SYSTEM

The present traditional land use system has come about due to ecological and cultural reasons. Lack of adequate water has led the population to search for pastures far from their villages to areas with water for their animals. The animals live at the cattle post while the people live in the village. Fields are also separated from the village and cattleposts by tens and even hundreds of kilometres. This present pattern of land use does not make easy the implementation of comprehensive and integrated development programmes. Crop and livestock farming cannot complement each other under these circumstances. Time, money and other resources are wasted during movements between the village and agricultural lands. Moreover it is difficult to plan physical infrastructure

and services for such an unstable population. Extension work is difficult to carry out due to the scattered nature of lands (fields) and pastures. This problem is aggravated by the inadequate transport network and means of travelling in the whole country. If this problem of separated agricultural production areas is solved the country is bound to realise increased production. More time will be devoted to agricultural production; the complementary agricultural sectors will assist and uplift each other and extension work would be easier to carry out on consolidated agricultural land.

THE EXISTING SETTLEMENT PATTERN

The existing settlement pattern characterised by dispersed and discontinuous isolated homesteads and villages is not conducive to rapid agricultural and rural development. Moreover most of the villages are only central places offering little services and depending for their existence largely on their hinterland. There are no villages in the region which can be recognised as growth centres with a propulsive industrial sector as described by Hermansen[1]. Neither can the largest villages in the district be said to have a high capability of emanating "spread effects" [2] or "trickle down effects" [3]. They mostly serve as residential areas for the surrounding farming areas. A modification of the present system of human settlements should enable the easier diffusion of innovations from growth centres to the outlying areas, and create a settlement pattern that is more manageable and conducive to rapid agricultural development.

Lack of services and developmental infrastructure in the existing villages hampers the rapid spread of impulses

of development in the district. Social services, transport, health and educational facilities and farm supplies are not adequately available at present in most settlements. This means that the progress in agricultural and rural development is slowed down. Provision of services and infrastructure according to the functional level of the settlement in the existing hierarchy could improve on and expand the functions of these settlements.

SUB-SECTORAL IMBALANCE

There is too much emphasis on the livestock development in the district at the expense of arable farming. Although some piecemeal attempts have been made on arable farming programmes and projects, no land use policy on this sub-sector has been formulated. In fact a comprehensive agricultural land use policy is needed for the development of the total agricultural sector. Since the majority of the peasant farmers depend on crop production for subsistence in the district equal or greater emphasis on this sector is necessary for rapid and equitable development for the rural population.

THE LOW STANDARD OF PHYSICAL AND SOCIAL INFRASTRUCTURE

Physical and social infrastructure is weak in the district and this inhibits rural development. Accessibility is poor since the road network in particular is inadequate. The existing roads are in poor condition due to bad construction and lack of continuous maintenance. Moreover there is a shortage of motor vehicles in the district. This implies that transportation of farm produce to markets is difficult, transmission of innovations to the farming population is slow and services cannot be

offered easily to the areas that are inaccessible from those human settlements with relatively better services. Better roads and more services could help in the resolution of the problem of low agricultural production and the underdevelopment of rural areas.

INADEQUATE MARKETING FACILITIES

For both crop and livestock products there is a lack of marketing facilities. The Botswana Agricultural Marketing Board is in Maun itself and moreover it only worked for a short time because of administrative problems. Other centres in the district do not have ready outlets for their produce. The only official cattle sales facilities are at Makalamabedi although Sehitwa now has a marketing cooperative. Farmers have to trek their cattle for long distances(up to 370 km.)for marketing. This means that the farmers do not sell as many cattle as they could if marketing facilities such as the Botswana Livestock Development Cooperation's sales yard at Makalamabedi were available in other and nearer parts of the district. Small livestock such as goats have no formal market at all thus making it more difficult for farmers to obtain income from them. If marketing facilities were createdin all villages greater production would be encouraged.

TRADITIONAL METHODS OF PRODUCTION

Traditional methods of production are still prevalent in the district. There is too much reliance on nature(rainfall and unfertilised soils),traditional crops and traditional husbandry. Modern inputs such as fertilisers,insecticides and improved seeds are hardly applied and thus production,especially in crop farming, remains extremely low. Modernisation of

agriculture is badly needed in the district, indeed in the whole of the country. Education of farmers in better methods is highly necessary and the extension services can and must play a major role in this task.

THE LOW EDUCATIONAL STANDARD

In the district the standard of education is low and in some areas the adult illiteracy rate is nearly 100%. In the past school enrolment was low due to an insufficiency of schools. However since the early 1970's school enrolment has greatly increased due to a rapid increase of new schools. There are now 30 primary schools in the district. However as there is still only one secondary school the majority of the primary school leavers cannot obtain secondary school places. The vocational training offered at the Ngamiland Youth Training Centre only caters for a small number of students each year. For more rapid social and economic development the population needs more education. The farmers, for instance, would find it easier to learn about modern methods of farming if they were literate. Programmes for improving the educational standards in the district are essential provided that it is not education per se but education designed for the needs of the people.

INADEQUACY OF THE EXTENSION SERVICES

The extension service in the district is inefficient and largely ineffective. Personnel at the lowest ranks do not seem to deliver the services to the farmers. The inaccessibility of the agricultural areas seems to be the major obstacle. There is, however, the problem of attitudes towards the job. The wealthier and more progressive farmers are given more help than the

smaller farmers. A modified land use system and more rigorous supervision of the agricultural demonstrators could improve the system. At present some agricultural demonstrators do not even have a list of the farmers to which they are assigned, let alone records of production. The farmer records which the agricultural demonstrators are supposed to keep should be constantly checked and varified wherever possible.

OUTBREAKS OF ANIMAL DISEASES

Ngamiland is frequently attacked by animal disease outbreaks. The most common disease in the area is the foot and mouth disease which is transmitted to the domestic animals by the buffalo. During outbreaks of this disease livestock sales in the district are suspended and thus the area suffers economically. Moreover control of animal movements during the outbreaks means that oxen may not be transferred from the cattleposts to the lands thus severely hitting the crop production sector as well. Since disease outbreaks like this affect both livestock and crop production it is necessary to adopt methods that would minimize the probability of the epidemics occurring. The occurrence of Tsetsefly in the district is also a hindrance to livestock farming. Potential grazing areas cannot be used beneficially at present.

PEOPLE'S ATTITUDE

People's attitudes towards arable farming are negative, giving a high regard to cattle ownership. This is a result of the economic benefits from the livestock industry without the strenous work needed in arable farming. Moreover the cattle industry has a better marketing infrastructure than crop farming. To modernise arable farming in this district it must be demonstrated that this type of farming is beneficial.

Farmers must be assured of a ready market and good prices. It is therefore necessary to find various ways of popularising crop production in the district . The small farmers do not as yet regard livestock keeping as a business. Both arable and pastoral farming should be portrayed to the farmers as full-time commercial activities.

6.3 POLICY IMPLICATIONS

A resolution of the problems discussed above is expected to lead to rapid rural development in the district. A policy that aims at the creation of a human settlements system that is capable of making the diffusion of innovations possible is necessary. Infrastructure and social services should be created in selected villages to assist in the development of the rural areas. Under this policy it is necessary to modify the land use pattern in order to make the implementation of programmes easy. This policy aims at the establishment of a comprehensive spatial system that will facilitate integrated agricultural development and reduce the sub-sectoral imbalances noted through the popularisation of arable farming in the district.

The provision of an adequate road network in the district will reduce inaccessibility and assist in the movement of goods and people. To complement the improved transportation system priority should also be given to the creation of an efficient marketing mechanism. This will enable farmers to sell their produce easily and thus produce more and even begin to grow new cash crops. It is considered necessary to promote the rapid growth of commercial agriculture in the district by introducing agro-industries that will absorb the farm produce,

create employment opportunities and thus raise incomes. This way it is expected that for increased production the farmers will be induced to adopt better methods and higher technology of farming and thus modernise agriculture.

The policy aims at resolving the problems of low standards of education in the district especially the elimination of illiteracy amongst the adult population. Raised educational standards will enable farmers to understand the process of farming, improve their management capabilities and awareness of the forces that hinder progress. Extension services should be improved in the district as a desirable strategy for increasing farmers' capabilities to produce more through the adoption of better methods. Priority should also be given to minimisation of disease outbreaks in the district. The easy contact between domestic animals and wildlife should be reduced to avoid these epidemics, also the free mingling of different herds needs control in order to prevent quick spread of diseases. Loss of animals through predators could also be controlled through fencing programmes.

6.4 STRATEGIES

The policy implications outlined above can be translated into action through the adoption of the strategies suggested below. It is realised that numerous obstacles will hinder the implementation of these strategies but these bottlenecks are not insurmountable.

6.4.1 THE LAND USE REFORM STRATEGY

Due to the prevailing ecological conditions and deep-rooted traditional practices it is considered difficult to make drastic changes of the land use pattern.

However a gradual approach to the problem may be fruitful. For immediate action it would appear that the land tenure and land use system be retained and changes in agicultural production be made within it. The communal, commercial and state lands should be left as they are at present. However it is considered that the provision of infrastructure and social facilities should be given priority as agents that speed up economic development. Throughout Botswana growth and market centres should be identified for the initial concentration of infrastructure and services. Then these could be provided to the agricultural lands themselves.

Improvement of roads in the market centres and access roads leading these to the productive hinterlands could help promote agricultural and rural development. Farm produce, services and people will be moved easily if an efficient transport system is established. In the market and growth centres marketing facilities such as marketing boards and processing industries should be set up to absorb the local farm produce. Market centres should also have an efficient linkage system with each other at the district and national level. This will facilitate the interchange of goods between various parts of the country.

In the Maun District there should be a programme for supplying water in the villages and the isolated cattleposts and lands. Wells and boreholes could be dug for tapping underground water in drier areas like Qangwa and Haina veld. In other places with rivers such as the Samedupe and Chanoga area dams could be constructed for irrgation and watering livestock. In the communal areas the government should encourage cooperatives which will be assisted in the provision of water and building

of roads. The commercial zones like Haima veld could specialise in ranching and dairying and loans made available for borehole drilling.

The provision of services and infrastructure in the market centres serving small farming areas may encourage the population to be stable and more concentrated. (The types of social services are suggested in the next section). Thus a more idealist form of land use system may be intoduced wherever possible especially in those areas well-endowed with resources to support both arable and livestock farming. Such a system would be aimed at replacing the village-cattlepost-lands system. Several obstacles will still be expected such as cultural resistance, lack of motivation for improvement and inadequate land capable of carrying both livestock and crop farming side by side especially around villages. Areas near villages are already too overused for intensive mixed agriclture. However through some husbandry these areas could be rejuvenated in the long run through techniques such as deferred grazing and grass planting.

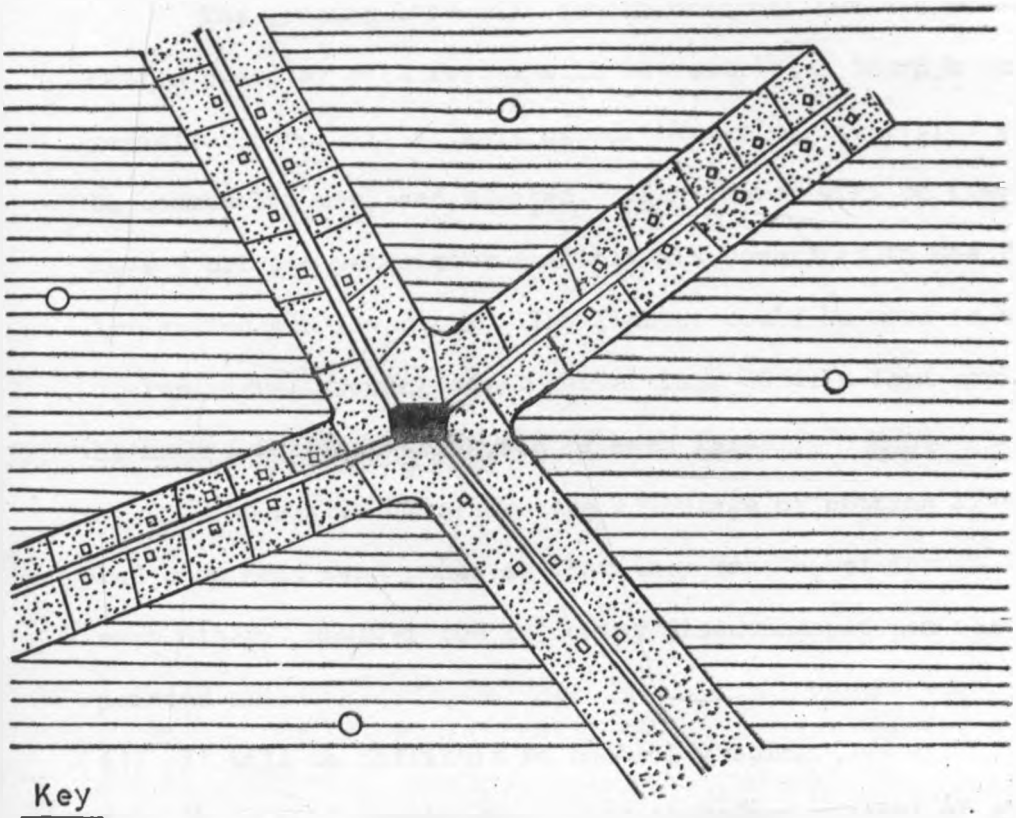
This thesis offers three alternatives for re-organisation of agricultural land use in the long term especially in areas of high agricultural potential. Give enough incentives the farmers will be able to adjust to the new system. Perhaps the most important single factor is to raise the farmers' capabilities through education in modern techniques of farming and range management appropriate for the prevailing conditions.

Alternative I

In this spatial arrangement, individual farmers will have exclusive rights to use their arable land which will be set in a

Diagram 6.1 Alternative 1.

Individual fields and communal grazing.



Key

- Growth or market centre
- Farm homestead
- Cultivated land
- Rotational grazing land
- Water point
- Road

linear pattern with other fields. The fields should be fenced and the farmers' homesteads built within this area. There will be an access road linking the homestead to a main road.

The grazing land will remain communal but the number of cattle owned by each farmer will be restricted through the registration of all animals owned. Watering facilities will be communally used and managed. Each farmer will be free to have a private water source within his homestead to use for irrigation and livestock. The fields, could be used as common or individual grazing after harvesting. Cattle feed could also be made from stalk and grain by each farmer.

The system does have the advantage of putting livestock and crop near each other so that they can inject inputs into each other. However the following disadvantages can also be pointed out.

(1) It will be difficult to control grazing.

(2) Herds will mingle freely and therefore control of spread of diseases made difficult.

(3) Environmental management and conservation would need cooperation and good-will of all the users.

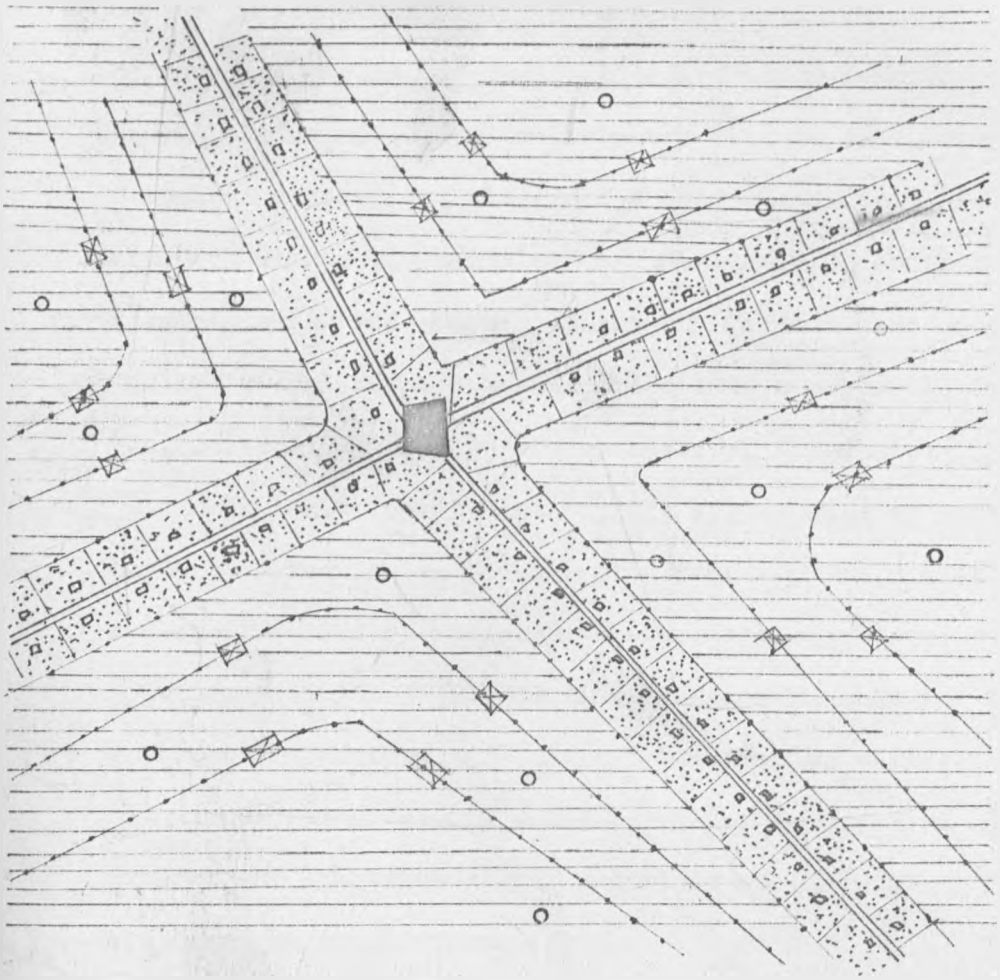
(4) Some people could resent restriction of animals kept and therefore avoid their registration.

Alternative II

The second alternative is based on the idea of individual fields and cooperative management of the rangeland. The farmers will have individual rights of use of arable land but share the grazing land which will be managed by a qualified government livestock officer. Under this system the rangeland will be divided into a number of grazing lands (like big paddocks)

Diagram 6-2 Alternative II

A possible spatial arrangement for cooperative rotational grazing and individual fields



Key

- Growth or market centre
- Farm homestead
- Cultivated land
- Rotational grazing land
- Fence with gate
- Water point with dipping facilities
- Road

which are fenced so as to facilitate rational grazing. The fencing will be done by the farmers themselves through contribution of labour or material. At first it will be easier to use bushes (thorny acacia) for both drift fencing (fencing to separate fields and pastures) and grazing land (paddock) fencing. The number of cattle owned will be restricted and the rangeland manager and his staff should ensure that sick animals are kept within the homestead of the owners to avoid rapid spread of disease. Dipping of cattle will be done cooperatively and individual farmers should contribute money and labour towards the construction of dips and purchase of chemicals.

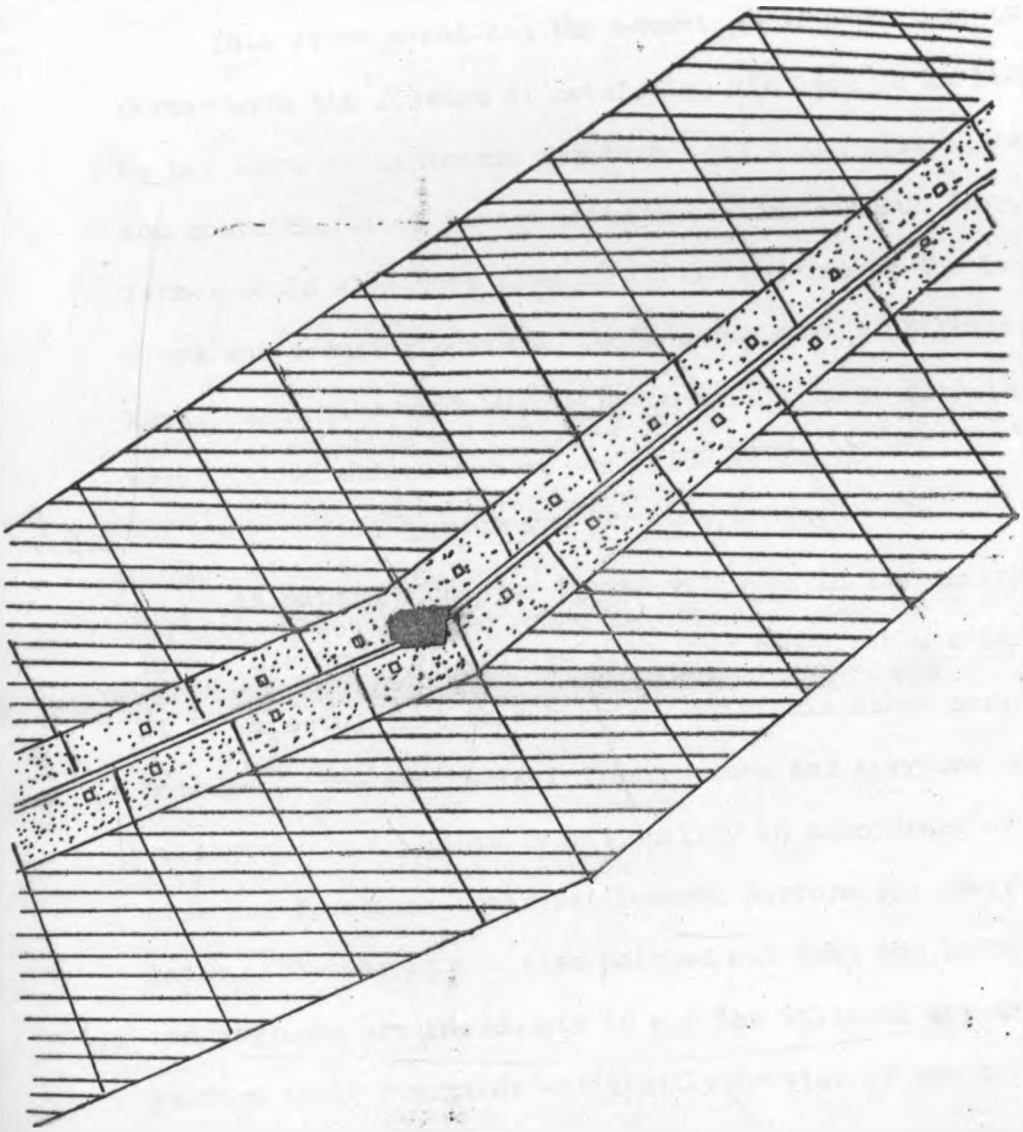
The major constraint of this system lies in the expenses to be incurred in the fencing programme and the organisation and mobilisation of farmers. However the advantages of pooling together resources and good range management make the system a worthwhile venture to attempt. Cooperative marketing of both crops and livestock would be easier to organise under this arrangement since the very foundations of the spatial organisation are based on cooperation.

Alternative III

Under the third alternative it is proposed to have each farmer with right of use title to both arable and grazing land which will be on a single piece of land. Fencing of the fields and pasture land will be by the farmer himself who may pledge the land and development thereof as securities for obtaining loans. Each farmer will be encouraged to paddock his land so as to practise rotational grazing. Developments within the "farm" will be according to the wishes of the farmer but at least part of the land must be given to cultivation purposes.

Diagram 6.3 Alternative III

Illustration of individual fields and grazing



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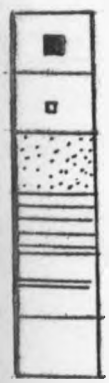

Growth or market centre

Farm homestead

Cultivated land

Grazing land

Road

This arrangement has the advantage of providing the farmer with the freedom of developing his land as he likes. He has security of tenure for both arable and grazing land and could therefore invest in both sectors without fear. The farmer could also have flexibility of increasing the land under crops and reducing pasture land and the number of livestock kept. Extension work will also be much simpler with the two agricultural subsectors on one piece of land.

6.4.2 THE GROWTH CENTRE STRATEGY

As noted in Chapter V, the villages in the district form a hierarchy of centres with four reognisable categories. It is expected that this hierachy exists in other parts of Botswana. The available infrastructure and services in these villages vary in quantity and quality in accordance with the size and functions their settlements perform for their hinterlands. However it was also pointed out that the infrastructure and services are inadequate in all the villages for them to perform their functions efficiently in view of the hinterland populations they serve. Accordingly, this study suggests the creation of growth centres in the district by upgrading selected villages. In these growth centres there should be more development infrastructure, services and new growth industies. The processing industries will provide markets for the agricultural hinterland and create employment, generate incomes to facilitate rural development and raise living standards.

Development agencies such as the Ministries of Agriculture, Commerce and Industry and parastatal bodies like the Botswana Agricultural Marketing Board (BAMB) and Botswana Livestock

Development Cooperation (BLDC) should also have branches in the selected growth centres. In the short term there should be 3 levels of growth centres and one level of market centres based on the existing villages. There will be one major growth centre (Maun), one secondary centre (Shakawe) two minor growth centres. These have been selected because of their hinterland development potentialities and population concentrations. Since the difference between villages in the third and fourth levels in terms of functions and size is not too large, all these will be designated as market centres to serve the farming localities. These will include, among others, Toteng, Shorobe, Thale, Nokaneng, Seronga and Matlapaneng. The services and infrastructure provided should, however, depend on the category of the villages as outlined in the previous chapter. An outline of the proposals for each growth centre follows.

MAUN

As pointed out above Maun is a regional centre whose influence goes beyond the district boundaries. However its infrastructure and services are too low for a centre of its importance. There are also no industries in the village which would stimulate growth of its environs and the district as a whole.

It is thus suggested that due to the population under its influence, its nodal positions and the commercial, social and administrative functions, Maun should be designated as a town. First this implies that the land on which the village is sited at present should be detribalised. Second an appropriate town management authority should be set up to administer the new

town. Many problems will be encountered in this process such as resistance to land detribalisation by the local tribe, shortage of capital and manpower to administer the new town.

Growth inducing industries should be established in Maun so as to stimulate its growth and that of the surrounding areas. It is proposed here that a small regional abattoir be established in the town to serve the whole district. This could either be a government, town council or private enterprise but the standard of hygiene should be controlled by the government and compare well with that at the Botswana Meat Commission. This slaughter-house will buy cattle, sheep and goats from the Botswana Livestock Development Cooperation or direct from farmers and should supply meat to the town, the minor growth centres, market centres and surrounding cattleposts and lands areas.

Complementary industries to the abattoir should include a tannery to process hides and skins and curio industry to make artefacts from horns, bones and hoofs. These industries will create outlets for the livestock produce and expand local employment opportunities. Arable farming in the district will be promoted by the creation of a grain milling industry which will absorb locally produced(viz maize, millet, sorghum and rice) grains. At present, the whole district does not have this vital industry. The population depends on mealie-meal from South Africa. It is proposed here that the grain milling factory be established in the town's industrial estate. Its supplies will come either from the BAMB or directly from the farmers and producer prices should be attractive.. All types of local grain should be ground in this factory. The smaller villages could have small grinding mills like the "mophe" mills of

Kenya for local purposes. It is also recommended that a vegetable dehydration plant be set up in the village to absorb the present and expected produce from institutions such as the Maun Secondary School and local farms.

We recommend that the upgrading of Maun into a town be given consideration from now on and that the establishment of industries be undertaken as a long-term programme. The government could create incentives for investment by constructing factory shells and pursuing a taxation policy favourable to the investors such as tax holidays and free import duty on machinery.

There should be developed an efficient transport system within the village and its surrounding areas. The dirt roads within Maun should be gravelled initially, later bituminized. The roads converging on Maun such as Maun-Shorobe, Maun-Francistown and Maun-Sehitwa roads need to be upgraded to all-weather condition. Feeder roads joining these roads have to be improved by using labour intensive techniques and new ones created to open up new agricultural production areas. Water reticulation has already been achieved in Maun in the form of communal stand pipes. The new town council should engage in land use planning which will include provision of utilities such as house-to-house piped water, and sanitation facilities. Electrification is still restricted to a small area in the village. It is suggested that the power station be expanded so as to provide power to the industrial state, the schools and residential areas of the village.

The Maun farmers market should be provided with more stalls. Other markets could also be encouraged in other parts of the town. The sales yards for cattle in the village should

be removed to an area on the periphery of the village so as to get rid of flies caused by the kraals inside the village.

The Maun referal General Hospital is inadequate for a regional population of over 70,000 covering a large area (over 80,000 km^2) Although the patient bed ratio of over 500 to 1 and the doctor patient ratio of between 1:35,000 and 1:70,000 may be regarded as high when compared to other African rural areas the distances covered make this facility inadequate. This hospital should be expanded to double size for serving its huge hinterland, and another built at Shakawe to serve the farthest population. An increase of staff particularly those of intermediate level such as registered nurses is desirable. Also in demand is a dentistry section in the hospital with a full-time trained dental assistant. At present dental problems which could be cured by such methods as filling are left to a medical assistant who merely pulls out the teeth. Medical facilities could also be improved by building a health centre in the village. Provision of medical facilities alone is however, not enough, improvement of the environment is also important. There should be a latrine building programme in Maun, an efficient garbage collection and disposal system, and spraying of the Thamalakane river to get rid of the snails that harbour the bilharzia germs.

As stated in Chapter V Maun has only one secondary school which caters for the whole region. Its intake is only 400 students at a time. Another secondary school in Maun would be considered necessary in view of the population in its immediate hinterland and the district as a whole. The number of primary school leavers is rising every year as more schools are built. To supplement the secondary schools the government and the local authority

could build a rural polytechinic in the town witnin the next two planning periods (short-term). Students would be trained in jobs related to the newly set up industries and agricultural work. Village polytechnics could also be introduced in other rural areas in the country.

To promote tourism the present hotel in Maun could be expanded, the road to the Moremi and Game Reserve improved and new wildlife areas developed within the swamps.

SHAKAWE

Shakawe lies some 370 km. to the north-east of Maun near the Namibian border. As stated above its area of influence at present covers a population of over 11,000 living in small and medium villages. But services offered in Sehitwa at present are very low as indicated in Chapter V. Besides since Maun is far from this area and transportation and communication between the two villages are poor, the influence of Maun is rather weak here. Maun cannot serve Shakawe and other areas efficiently because of long distances and poor transport. Also the gap between this regional centre and the villages in the next level of function is too large. Therefore Shakawe, because of its location and potential should be upgraded to a secondary growth centre. Its population should be increased to say 6,000 to 8,000 through the creation of employment opportunities andsocial services.

To grow into a sub-regional centre small industries should be created in Shakawe. These will include fishing on the Okavango River, vegetable drying, a small abattoir and small grain mills. Shakawe should be upgraded into a subregional administrative and commercial centre.

The District Council should set up its sub-regional headquarters here to be responsible for an area stretching up to Gomare. More trading shops, bank branches and a hotel should be built to increase the commercial status of Shakawe. The government ministries would be able to work more efficiently if they opened branches in this village. Introduction of these facilities is expected to generate employment in Shakawe.

The Botswana Livestock Development Co-operation should set up a ranch near Shakawe for buying cattle and an Artificial Insemination centre. A bull centre could also be part of the ranch. This will bring the services which are at present only in Maun near the population of Shakawe and its hinterland. The Botswana Agricultural Marketing Board could also build a branch here.

Shakawe should be provided with a secondary school and a hospital to serve the sub-region. This would alleviate the present problems whereby these facilities at present exist only in Maun and therefore the population in the Shakawe area are deprived of them. At least three more primary schools should be built in the town.

To promote Shakawe into the second major tourist centre in the district a hotel should be built, recreational facilities such as boating, water skiing in the Okavango river and Safari lodges should be introduced in the village.

SEHITWA

Sehitwa should be upgraded into a minor growth centre since it has a large resource base (cattle, fish and some population concentration). The previous Chapter outlined the

hinterland of this centre and the services presently available. A fisheries centre is proposed for Sehitwa to promote commercial fishing in Lake Ngami. This Centre should have refrigeration equipment, storage and processing facilities. Such a fishing complex will generate employment for the local population and provide a basic activity which will bring income to Sehitwa and its hinterland. The fish will be sent to other villages in the district and other parts of the country for sale. The government could become partner with local enterpreneurs in this project. In the long term in order to sustain the fishing industry it would be necessary to deepen the Lake.(since it is known to dry up approximately every 8 years) and introduce new breeds. Most of the fish should be processed using simple methods such as sun-drying and smoking; some could be frozen for export.

Being in a prosperous cattle area Sehitwa should be provided with a hides and skin collecting centre which will buy these items from farmers on behalf of the Maun tannery. This centre could also be used for collecting horns, bones and hoofs for the curio industry in Maun. A small grinding mill is also recommended for Sehitwa. There should also be created a Botswana Agricultural Marketing Board, Botswana Livestock Development Cooperation and Livestock Adivisory Centre in Sehitwa to facilitate marketing of crops and livestock and provision of medical supplies.

Improvement of roads linking the centre with its hinter land is necessary. This should be done by the district council which should also provide and run a health centre. It is also suggested that another primary school be built in Sehitwa to relieve congestion in the present overcrowed school whose

pupil / classroom ratio is 1:60.

GOMARE

This study proposes that Gomare as a growth centre should specialise in the production of animal feed using local grain, other crops, swamp reeds and dried animal carcasses. Due to its central position between Shakawe and Sehitwa the product could be used by livestock in these areas and even Maun. Thus a good road system should be developed in the area for transportation of the raw materials and the finished product. Trucks carrying maize meal, meat, dried vegetables and fish from Maun and Sehitwa could return loaded with hides, skins, animal feed and grain.

Gomare has a thriving basket cottage industry. It is realised how important this industry is in generating income for a wide section in and around Gomare. This cottage industry should therefore be encouraged by establishing a permanent basket buying centre in Gomare. This will provide a reliable market for Botswana basket work which is increasingly becoming popular overseas.

A branch of the Botswana Agricultural Marketing Board should be built in the village to buy grain from local farmers. There should also be a branch of the Botswana Livestock Development Cooperation for buying animals in the area. In the short term Artificial Insemination and Bull Subsidy Ranches could be located in Gomare to serve Shakawe and Sehitwa; later the other two centres could have their own ranches. A livestock Advisory Centre and an Agricultural Office are also desireble in Gomare.

A second primary school in Gomare should be considered for

building within the next 5 years. It is felt that the existing health facilities in the village (a health centre) are adequate at the present moment. There should be improvements in sanitation facilities by building public and private latrines.

MARKET CENTRES

The villages in the third and fourth categories should be developed into viable market centres. These market centres will be equipped with marketing stalls. The centres will perform collecting and distributing fuctions for local farmers and should therefore have trading and storage facilities where farmers can buy farm implements and inputs such as ploughs, seed and fertilisers. Social services such as clinics, health posts, primary schools and churches should be built here. Transport facilities in form of improved roads and adequate vehicles should be made available so that farmers can be able to travel to the market centre and back within one day. Thus the homesteads that are too scattered will be reorganised so that there is some degree of concentration around the market centres.

6.4.3 THE ARABLE FARMING PROGRAMME

It is proposed here that all farmers in the communal areas be expected by government regulations to use part of the land allocated to them for crop production. Incentives to attract farmers to this sector will include high and stable producer prices, preferential treament in providing credit for the development of this sector and subsidised prices of implements and imputs such as fertilizers and seed.

The markets provided in the newly created growth centres are expected to stimulate crop production. Farmers will also be encouraged to diversify their produce by introducing new crops

such as tobacco , sugar cane rice, fruit and vegetables. Farm planning will be introduced through the help of extension workers to enable farmers to keep records and plan ahead for the development of their land.

Every farmer rearing cattle will be advised to raise a few grade cows for milk production. This will be done through improvements of the present programmes of Artificial Insemination and Bull Subsidis Schemes.

NEW CROPS

The new crops to be introduced will mostly be cash crops to increase the farmers incomes. A few of the possible cash crops are briefly discussed below.

Tobacco

This crop does very well in the area although at present only one farmer is known to grow it for commercial purposes. Farmers cultivating areas to the north of Maun (Boro Valley) will be encouraged to specialise in this crop. Since it is a new crop in the area extension workers should work closely with the farmers in both growing and processing the crop. Simple curing methods such as sun-curing will be employed and initially the farmers will sell their produce to South Africa. As the crop production increases, it is suggested that the farmers cure their tobacco co-operatively and supply it to the cigarette factories in Gaborone and Francistown.

Sugar cane

Sugar cane does well in the swamp areas as is shown by small private growers (mostly for chewing). An increase of acreage of this crop under irrigation could lead to its

commercial utilisation. However the major problem with the estabishment of a sugar industry in the area is inadequecy of of energy supply. At the beginning this crop could be grown for cattle feed and eventually sugar factories could be established when the coal deposits to the north of Francistown are exploited for fuel. The woodlands inside the swamps could also be used for fuel in the white sugar factories. In the long term it is hoped that the Maun district would supply a substantial amount of the national sugar demand.

Rice

As mentioned before rice has proved to be suitable for commercial growing in the area. Small irrigation fields could be established along the rivers Thamalakane, Boteti and Nghabe for the growing of rice. In that project, use should be made of the four young farmers who gained experience in rice growing and processing with the Chinese project discussed in Chapter IV. The stalk of the rice could also be used for stock feeding. Market for rice is already available in the area, although the growers should be highly competitive in their market promotion of their produce in order to beat the South African product which is now commanding the market. Government policy on rice imports should be geared to protect the locally produced crops.

Fruit and Vegetables

The Maun Secondary School garden is a living example of the suitability of the soil and climatic conditions of the district for the growing of fruit and vegetables. Small irrigation schemes should be set up along the rivers near Maun, Shorobe, Toteng, Gomare and other villages for production of these

crops. For marketing purposes the vegetables could be sold in various forms such as fresh, dried, frozen and even canned in the long run. Fresh fruit could be sold on a regional and national level. At present the market is flooded with South African fruit and vegetables, but this could be replaced within a period of ten years given a well planned programme. The Secondary School garden is capable of supplying the whole of Maun with its vegetable needs although products from outside are still allowed to flow into the district. Government policy would encourage further production if fruit and vegetable imports were restricted, permitting only those products which cannot be grown locally.

MODERNISING AGRICULTURE

It has been shown earlier that the majority of the crop farmers still use traditional methods of production and management. The single plough, although commonly used by farmers is owned by a few. Many farmers rely on borrowing or hiring the plough and /or draught power. This leads to delays in ploughing. The hoe is still prevelant in some parts of the district, especially within the Okavango swamps. This method of cultivation is slow and inefficient since the depth dug is too shallow for effective growth of crops. The single plough seems to offer the best opportunity in the transformation of traditional methods of village. The availability of this tool and draught power could trigger off higher crop production due to early ploughing, and larger acreages. We suggest here that government provide single ploughs to all farmers in form of loans. As stated in Chapter II this could be a national programme under which the farmers are required to destump a piece of land, plough and repay the loan

through the sales of the harvest.' The multipurpose plough (makonatsothle) could be introduced to those farmers who are already more advanced.

Traditional seed as present commonly used has to be replaced by carefully selected seed. Therefore the government is asked to establish a seed farm in the country to provide farmers with quick growing, drought-resistant strains of local grain and vegetables. Planting should also follow the accepted modern ways of setting rows which make easy the application of fertilisers and weeding during the growing period. This needs extensive educative campaigns of farmers by the extension department. Manuring and fertilising are badly practised at present and encouragement of this could lead to increased production. The placing of crops and cattle near each other as suggested before would enable manure to be used for soil fertilisation whilst the stalk and grain are fed to livestock.

Grain storage in the district is poor with farmers using small containers made of twigs and plastered with mud. Insects often attack the grain causing great losses. The programme of introducing metal containers should be intensified and the traditional methods improved upon by introducing brick and concrete containers.

The traditional ways of rearing cattle should be transformed by using controlled grazing as suggested above in 6.4.2. To recapitulate, it has been suggested that pastures should be fenced to provide paddocks for rotational grazing, and that the numbers of livestock owned be limited. Control of livestock disease will be effected by providing fences, building dips

and spraying. Farmers should also be encouraged to sell their livestock strategically i.e. at certain periods such as in March when they are in good condition.

Provision of modern equipment and supply of fertilisers and other inputs are not enough to transform traditional agriculture. Raised farmers' capabilities in modern farming methods should be accompained by incentives which will ensure that efforts made are rewarded generously. It is hoped that the suggested market system will provide part of this incentive.

6.4.4 THE LIVESTOCK DEVELOPMENT PROGRAMME

Livestock farming in the district should continue to be practised in the communal zone as well as commercial ranches. In view of the high grazing potential of the swamp area it would be considered necessary to extend the communal zone into this area by tsetsefly eradication. The area east of Tsau and Nokaneng is specially recommended for this due to the availability of the Sandveld Tongue, a dryland resource within the delta area. Eradication of the tsetse could be done in stages by construction of controls fences. This area would be most suitable for the cooperative grazing suggested above because of the good quality grazing land.

The overgrazed area near the villages and water points can be rejuvenated by allowing them to lie fallow for some years and possibly reseeding. Cattle would have to be moved to areas of better pastures like Shorobe and Haina Veld. These overgrazed areas including Sehitwa, Nghabe, Samedupe, Tsau are shown on map 3.3. The livestock sector will benefit from the even distribution of services. For instance the Bull Subsidy

Scheme ranch (Tsetseku) the AI centre (Makalamabedi) and the Livestock Advisory Centre now concentrated in and around Maun could be set up in other centres as suggested earlier.

The Haina Veld is now planned for 42 ranches. To this the area in the south-western corner of the District (see map 6.1) could be added since it has a high grazing potential and adjoins the Ghantsi Commercial farms (map 2.3) and the Haina Veld. These ranches should specialise in beed production although a few grade dairy cows could be encouraged. The roads linking the ranching areas should be improved to facilitate the easy movement of cattle by trucks to the Maun abattoir. These ranches could either be individual or cooperative - it would be easier for a group of farmers to pool their resources for fencing, providing water supplies and supplementary feed, breed improvement and marketing.

DAIRYING

The areas along rivers have been suggested for small-scale irrigation to allow for all years round production. Some of this irrigation could be devoted to producing fodder crops for dairy farming in particular. Thus dairy farming could be started in or near these irrigation schemes to ensure a continuous production of milk. This is because fresh grass is generally only available during the rainy season in Botswana. Therefore if supplementary feed is not provided milk production would be minimal.

Local cows could be greatly improved by cross breeding through the AI or the Bull Subsidy Scheme. Since there is no tradition of dairying in the district the farmers will have to be intensively educated on the industry.

GOATS AND SHEEP

Goats and sheep do well in the district. To encourage their commercial production markets should made available for them through the suggested sub-regional and regional abattoirs. The local goats and sheep could also be improved by cross breeding. The Karakul rams (from South Africa) be used to upgrade local sheep which would produce wool.

POULTRY

A poultry project has been started in the district with little success. The major problem cited by the Poultry Officer is that the farmers who have started to raise chickens do not follow the correct methods of poultry husbandry. However, it is also true that there is lack of chicken feed in the district. Therefore the Department of Agriculture could stock a large amount of poultry feed in the district. (brought from Francistown). The government could also establish demonstration chicken runs in the villages to show farmers how to raise both broilers and layers.

DISEASE CONTROL PROGRAMME

Fencing

The area north and east of Maun abounds with wildlife, and there is frequent contact of game and domestic animals. A double fence should be built about 50 km north of Maun between Nokaneng and the Moremi Game Reserve to prevent wild animals from invading the present and potential grazing and arable lands. This restriction of wildlife movement will reduce the transmission of diseases from game (especially buffalo which carries the foot and mouth disease virus) to domestic livestock. The fencing system suggested in sub-section 6.4.1 above will

also help reduce the rapid spread of disease between different herds. Under the same system predators will also be controlled by keeping them out of the grazing areas.

DIPPING AND SPRAYING

External parasites could be controlled by the dipping programme already suggested above. Farmers would be encouraged to construct dips cooperatively for use by the local community. Dipping of cattle should be compulsory and an authority will be set up to administer this programme. Individual farmers could if they so wished supplement the dipping arrangement by spraying their herds privately.

6.4.5 IMPROVEMENTS TO THE TRANSPORTATION NETWORK

Roads

In view of their economic importance it is necessary to upgrade the Maun - Toteng - Sehitwa road, the Sehitwa -Shakawe road and the Maun-Gweta road to all-weather conditions within the next National Development Plan. The problem of lack of qualified personnel and equipment at the moment would be the major hinderance in implementing this project. However, it is hoped that a well programmed project using the available resources (abundant labour, the small qualified Roads Department Staff, Roads Department and Wildlife Department equipment) could help solve the problem. The roads between Maun and Sehitwa should be given priority as it carries the heaviest traffic in the district. Most of the available personnel and equipment could initially be concentrated on the reconstruction of this road, withdrawing them to other roads towards the finishing stages of construction. The next phase could concentrate on the

Sehitwa - Shakawe road and the Maun - Gweta roads. This staging is suggested because of the state of the roads and their importance in view of the recommended growth centre strategy. The road between Maun and Shorobe will have to be rebuilt by the District Council, also to all-weather conditions. The problems of inadequate personnel and equipment will also be the most preponderant one for this project. Although the council may have meagre funds for this project, the importance of the road should be realised as it is the only gate-way to Moremi Game Reserve from Maun catering mostly for large numbers of tourists. The North Western District Council is thus urged to channel some of the funds raised through gate-takings at the Game Reserve to this project. The Wildlife and Tourism Department which own graders and other road building machinery should also be involved in the upgrading of this road.

This paper suggests that access roads in the district be built by the local farming population on a cooperative basis with assistance from the District Council. The existing access roads for improvement will include Maun - Moshu, Tsau - Qangwa, Maun -Haina Veld and Shakawe - Xeidum amongst many other roads linking villages and fields or cattleposts. Farmers will be expected to contribute labour, materials and money. New access roads will be created where necessary in the long run depending on the implementation of the suggested land use reform, and farmers should be involved both in the selection of routes and the actual construction of the roads.

6.4.6. MARKETING

The proposed growth and market centres are expected to form outlets for agricultural products.

The Botswana Agricultural Marketing Board and Botswana Livestock Development Cooperation will establish collecting and distributing branches in all growth centres and agencies in the market centres. Farmers will thus be able to sell their crops to Botswana Agicultural Marketing Board and livestock to Botswana Livestock Development Cooperation which will deliver them to the milling factories and abattoirs in Maun and elsewhere in the country. Farmers should also be able to grind their grain for domestic consumption in small mills in the villages. The agents of Botswana Agricultural Marketing Board in the market centres will buy the produce and a mobile unit will collect it. The mobile unit will also be expected to collect produce from the farms farther from the market and growth centres. Throughout the district marketing cooperatives should be promoted.

The tannery and curio factories in Maun will create a market for hides, skins, horns, bones and hoofs, oollected at the various centres. The cattle bought by Botswana Livestock Development Cooperation at the centres will be trucked or trekked to the main ranch at Makalamabedi. From there some will be sent to the Maun abattoir whilst the bulk continues to the main abattoir at Lobatse. The trek routes should be provided with adequate water points and fenced ranches for feeding the trekking cattle. In connection with cattle marketing, it should be noted that at present there are no fattening ranches in Ngamiland. These should be set up at Makalamabedi, Sehitwa, Gomare and Shakawe (which are important cattle areas) to enable the farmers to improve the quality of their stock before sales.

The absence of an organised market for small stock (sheep, goats, pigs and poultry) at present, hampers the development

of this sector. It is suggested that the abattoir and tannery in Maun should buy and process small livestock and their products. Development of this sub-sector will insure continued meat production during outbreaks of cattle disease. Maun should also have a small dairy produce marketing cooperative to collect and deliver fresh milK in the area. This would change the situation whereby virtually all local fresh milk is consumed at the cattleposts, whilst the large villages depend for drinking milk on ultra-heated milk from South Africa.

6.4.7 EDUCATION AND EXTENSION SERVICE PROGRAMME

The basic education standard of farmers is very low in the area. In some parts the adult illiteracy is 100%. It is therefore imperative that an Adult Education Programme be started in the district. Under this programme, classrooms could be used in the evenings and on Saturdays for teaching the indigenous population to read and write. School teachers and other government officers could be asked to offer voluntary services in this programme. The ability to read and write will help the farmers to keep simple farm records and to read simple instruction on crop and livestock husbandry.

The present courses at Nxaragha are not very effective as only a few farmers attend them. Also some courses are organised at the wrong time of the year, for instance as mentioned above courses on ploughing and planting are run during the dry season and thus little practical work is done by the farmers. The time-table has to be changed to suit the seasons so that the attendants can be given instructions under realistic conditions.

Both group and individual farmer education is important

in spreading new agricultural ideas. The group meetings could be held at the Kgotla and Agricultural Demonstrators and specialists give lessons in simple terms. Some farmers could be used in educating others by telling success stories. Tours by groups to successful farmers and experimental stations should also be helpful in introducing and promoting new methods.

The Pupil Farmer Programme started in 1962 was abandoned in 1974 as it was realised that only a few farmers were reached under this scheme. Under the scheme, 30 farmers were trained (supervised) to serve as an elite group who were expected to perform the functions of leaders and innovators. In time these farmers would be upgraded to progressive farmers and later to master farmers. The major weakness was that the elite group of farmers did not effectively spread their newly gained skills. In the Maun district the Nxaragha settlers (farmers) were far removed from the rest of the community and it was not easy to spread the new farming methods they had gained. At present the 22 Agricultural Demonstrators in the district work from the villages and have to travel long distances to the lands and cattle-posts. The problem of transportation makes contact between farmers and Agricultural Demonstrators even more difficult. This thesis suggests that under the proposed land use system, whilst the core of Agricultural Demonstrators remain in the villages, new recruits should be located in the country-side inside the farming community. They could also be given prieces of land on which they could produce using modern methods. In this way the extension officers could advice and council with farmers more effectively.

At present, agriculture, especially crop production is not

regarded highly in the district. The spatial system suggested above is expected to act as one of the major factors useful in creating awareness of agricultural importance in development. People, given a piece of land to work on, a ready market, modern skills and education will be stimulated to utilise the available opportunities in order to raise incomes and standards of living. The price policy of arable products has to be favourable to the farmers. High and stable prices of grain and other crops will induce the farmers to produce more and even attract other members of the community to join the activity. The Ministry of Agriculture's Information Division should provide the farmers with price information and encourage use of uniform units of measurements. At present grain is sold in a variety of units ranging from tins, baskets, buckets and bags.

Campaigns on the importance of farm produce as the major supplier of local food and the cheapest way of raising incomes should be carried out far and wide. Lessons on the role played by grain, fruit, vegetables and meat in human nutrition and therefore good health could help in stimulating farmers to produce for their own food needs and later for the market. The means of campaigning could include radio listening groups, group meetings, posters, movies and competitions. It should be stressed to farmers that proper methods of crop production can bring quicker returns than from livestock production but the two activities should be seen as complementary to each other.

6.4.8 PRIORITIES

In light of the recommendations made in this thesis it is considered that a few specific ones should be treated as policy priorities. These should be effected as short-term and long-term priorities.

In the short-term the following are considered necessary.

(1) The provision of adequate infrastructure such as roads and water in the villages and their immediate hinterland should be given first priority in order to facilitate the efficient movement of goods and people and encourage population stabilisation and increase agricultural production.

(ii) Social services such as school, clinics and good housing should be provided to increase the population's knowledge for economic development and ensure the much needed good health.

(ii) Growth centres and market centres that will offer these services to the hinterland and spread innovations should be created in the short-term.

(iv) The establishment of marketing facilities such as Botswana Agricultural Marketing Board branches and processing industries will induce rapid agricultural production.

(v) Improvement of extension services in the district will facilitate the education of farmers and popularisation of agriculture.

(vi) Simple equipment such as the single ploughs will enable farmers to plough more efficiently.

The following are considered necessary in the long-term.

(i) An Okavango Delta Authority should be set up to co-ordinate planning and implementation of projects and programmes in the district. This will help in achieving integrated development.

(ii) A well organised land use system based on individual fields

and cooperative ranching will facilitate a more efficient production system.

(iii) The proposed agricultural industries will in the long-term absorb local produce, create employment opportunities and generate incomes to raise the standards of living.

(iv) New crops and better breeds of cattle should be introduced as a long-term programme to promote higher productivity and commercial agriculture.

(v) Dips and fences should be constructed to facilitate the control of foot and mouth disease, nagana (carried by tsetefly) and tick-born diseases.

6.5 IMPLEMENTATION REQUIREMENTS

The strategies for agricultural development suggested in this thesis will meet various obstacles during implementation. Perhaps the most important problems include inadequate human, material and capital resources to help in the exploitation of natural agricultural resources. Each strategy will need financial inputs and skilled personnel. For instance the growth centre strategy will need industries and trained administrative and professional staff. These are expensive to acquire. Government could induce investment in the district by offering factory sites, pre-constructed factories, having some tax-holidays and going into partnership with firms. For small projects, local finance should be raised through self-help project and cooperative contributions.

Government is already making efforts to train adminstrators technicians and professionals both at home and abroad. It is hoped that an intensification of this programme can alleviate this shortage of skilled personnel in all parts of the country. It

is suggested that priority be given to the training of medium - level personnel and later highly qualified man-power can be trained in agriculture and other sectors.

Some materials such as building and fencing materials have to come from outside the district. However, improvements could be made on the local materials for construction purposes. For instance, mud bricks could be burned or the clay mixed with sand and cement to harden them; poles could be tarred to prevent attack by ants. For fencing purposes in the immediate future, the thorny acacia bush which is abundant in some areas could be used.

Resistance to modern ideas and innovations is one of the most serious problems likely to be faced by moves towards change. The extension, education and agricultural popularisation programmes could help in reducing this resistance. When farmers see the rewards of adopting modern methods by their neighbours they are likely to adopt them as well. Subsidiary agricultural shows should be held in the smaller villages to help in popularising agriculture. This will enable the farmers that are far away from Maun to participate in agriculture shows.

In view of the physical, social and economic problems of implementing development programmes in the district, it would be highly beneficial for the region as a whole if an Okavango Delta Authority were set up. The functions of this authority will include planning for the development and initiation of projects and programmes, assessment and utilisation of resources such as water, soils, forests and wildlife. It should be engaged in the construction of any works necessary for the protection and utilisation of water and soils in the area.

The proposed Okavango Delta Authority should work as a strong machinery to coordinate all planning and development activities in the region and thus it will have to maintain a liaison between the Government, the District Council the private sector other agencies in matters concerned with the development of the area with the view to limiting the duplication of effort and ensuring the best use of technical resources. The Authority should be the main offering organisation advice in human settlement and land use matters in the district. Thus through this authority integrated rural development may be achieved. To perform its functions efficiently the authority should be given wide powers such as recruitment of personnel, borrowing of funds, purchase and sale of materials and machinery for construction works and agricultural production. The government should also make available to the authority financial and material resources to enable it to perform its functions efficiently.

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CHAPTER VII

CONCLUSIONS

Over 80% of Botswana's population live in rural areas and depend for their living on agriculture. However, agricultural development is still low particularly crop production. The farming population are capable of producing enough food in some years for the country's needs with a little surplus. Production of crops is variable with shortfalls occurring in some years. Thus the country is sometimes forced to import food from neighbouring South Africa and Rhodesia. The low production has been attributed largely to poor ecological conditions although other factors have a great influence as well. For instance there has been an overemphasis on livestock development in agricultural development programmes; development infrastructure in rural areas is weak and traditional methods of farming are still dominant.

This study assumed from the onset that there lacks an intergrated approach to agricultural development in the country and that the existing human settlements and land use pattern is not conducive to efficient agricultural production and therefore hampers rural development. It set out to investigate the national and district problems of agriculture and how they are related to the existing pattern of land use and human settlements. On the national level it was pointed out that the vast land occupied by few people has resulted in low densities and scattered human settlements. The population in rural Botswana lives in villages and scattered homesteads designated as cattleposts and lands. There exists a unique land use pattern under which some farming households live in the villages and

hold agricultural land far away, up to hundreds of kilometres. There is thus a movement between the villages and areas of agricultural production on a daily, weekly, monthly or even yearly basis. This system has come about due to ecological factors as people had to look for more water and better pastures once the areas near the villages they lived in became dry and overused. Transportation services to facilitate this movement are however poor and thus a lot of time is wasted in travelling rather than production. The road network is insufficient and thus accessibility to cattleposts and lands is a great problem. Moreover there is a shortage of vehicles in the country. Thus implementation of agricultural and rural development becomes difficult since the population is unstable and densities vary with seasons. Also extension work is made difficult due to long distances separating areas of agricultural production and the villages.

A problem closely linked with the poor transportation system in Botswana and the Maun District in particular is poor marketing facilities. First, it is difficult to transport goods to markets because of the lack of transportation facilities. Secondly, the marketing mechanism is poorly organised. There are few farmers' markets in the rural areas and in some districts there are none. Where parastatel organisations like the Botswana Agricultural Marketing Board and Botswana Livestock Development Co-operation operate, they are often very far from the farmers - up to 370 km in the Maun District. Processing industries for agricultural produce are virtually non -existent in the region and very low in the country as a whole. The establishment of these would be considered necessary as an

outlet for agricultural produce.

It was noted that four broad ecological zones can be established in Botswana and that each has its own potentials and disadvantages for development. The Maun District is in a zone identified as one that is endowed with resources which could support both arable and livestock farming. However the district is faced with numerous problems which hamper rapid rural development. National problems such as poor infrastructure and services, separated agricultural and residential functions, scattered homesteads, poor marketing, inefficient extension services and adherence to traditional methods are present in the district and aggravated by its remoteness from the more developed region in the east. There has been overemphasis on livestock production in the district,shown by the number of projects and programmes attempted. However this sector faces several problems such as frequent outbreaks of disease and lack of adequate marketing facilities. Richer farmers have benefited more than the poor farmers in the livestock sector. Since over 70% of the District's population depend on subsistence arable farming it would be logical to put more emphasis on this sub-sector than is presently done. The crop farming programmes that have been attempted in the district have lacked co-ordination, and have suffered from inaccessibility, marketing and organisational problems.

In the Maun District five categories of human settlements were recognised based on their functional levels. These are Maun, the regional centre; villages with population above 1,000; villages of between 500 and 1,000 people, small villages under 500 and the scattered homesteads in the cattle posts and lands.

It was noted that the gap between Maun (15,000) and the villages of the second level below 2,000 is too great and that for effective equitable distribution of regional development this is not a favourable situation. Thus it was suggested that Sehitwa be upgraded into a sub-regional centre of 6,000 people. Infrastructure and services are concentrated in Maun but they are not enough for the village and its hinterland. The smaller villages have services of a lower order, but these are inadequate for these settlements. Rural industries, power, water supply, good roads and social services are virtually absent from most villages.

For more rapid rural development in the Maun District and other parts of Botswana some strategies have been suggested. Due to the ecological conditions and deep - rooted traditions of the village - cattleposts - lands system it is considered that this system should be changed slowly. Perhaps the most suitable approach would be to improve the existing infrastructure and social services and introduce new ones. Water supply is seen as one of the major factors of stabilising the population especially in areas far away from the delta such as Nxaunxau and Haina Veld. Boreholes and wells could be dug and dams constructed where possible. Extraction of the Okavango water for use in the adjacent areas could also be considered. Provision of water would tend to stabilise the population and in the long-run a well organised spatial pattern in the form of a hierarchical order of growth centres. Roads should be improved and new ones constructed in the villages and their surrounding areas. To complement this a growth centre and market centre policy is suggested for the District and Botswana as a whole.

The present major village of Maun could be transformed

into a town and its services improved greatly. Agro-industries have been suggested for Maun. It is hoped these will increase the new town's ability to serve its hinterland by absorbing agricultural produce and creating employment opportunities, generating income and raising the standard of living. Shakawe is suggested as a secondary growth centre. Two other growth centres could be developed in Sehitwa and Gomare. Infrastructure and social services will be upgraded to enable these centres to serve their hinterlands more efficiently. The smaller villages will act as market centres for their hinterlands.

Crop farming and livestock programmes in the district could benefit from a well-organised human settlements and land use pattern. In the short-term, agricultural development could be promoted by the provision of infrastructure and services whilst the existing land use pattern is maintained since sudden changes could not be possible. In the long-term, agricultural land use should be reorganised to facilitate individual fields and cooperative ranching in the same area rather than separated lands and cattleposts. Mixed farming should be encouraged in the communal areas whilst ranching is done in the commercial area.

New crops are to be introduced in the area to encourage commercial agriculture and higher production. Methods of farming should be changed through introduction of better equipment such as the single plough, use of fertilisers, improved seed and insecticides. Extensive education campaigns will be necessary to popularise crop farming. The livestock sector will benefit from the reclamation of good pastureland now occupied by tsetsefly. This will be done through a fencing programme.

The Bull Subsidy Scheme and the Artificial Insemination Programme should be expanded by establishing new centres in otherparts of the district. Dairying, commercial goat and sheep rearing and poultry should be introduced throughout the region so as to diversify the livestock sub-sector. Control of diseases will be effected by the fencing and dipping programmes.

Priority should be given to the provision of infrastructure and services, creation of growth centres with agro-industries, establishment of markets and popularisation of agriculture through education campaigns and an efficient extension services system. In the Maun District it should be seen as desirable for the Government to create an Okavango Delta Authority. This Authority would be responsible for planning and coordinating development in the region.

For the future, some of the strategies offered here could be applied to Botswana as a whole. In particular the growth and market centre strategy should be used as a framework for a national policy on human settlements. Further work is desirable on the historical development and planning problems of Botswana's villages. For every major village in the country there should be developed a physical plan.

Research is desirable to investigate the nutrient deficiencies of Botswana's soils and their irrigability. Investigations of the existence and quality of underground water and its suitability for domestic, livestock, irrigation and industrial use is also necessary.

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APPENDIX A

UNIVERSITY OF NAIROBI

DEPT. OF URBAN AND REGIONAL PLANNING AUGUST/SEPTEMBER 1978

Strategies for Agricultural Development in the Maun District,

Botswana Farmer Questionnaire

Name of village . . . . . .

Name of cattle post or lands. . . . . .

Date of Interview. . . . . Name of Interviewer. . . . . .

Type of Land Tenure. . . . . .

1) State farmer's main agricultural activity. . . . . .

2) Sex of household head. . . . . 3) Age. . . . . .

4) Education. . . . . .

HOUSEHOLD CHARACTERISTICS

5) Sex	Age	Place of birth	Period of stay in Maun D.	Education	Occup.	Income
a)						
b)						
c)						
d)						
e)						
f)						
g)						
h)						
i)						
j)						

LIVESTOCK FARMER

6) Number of cattle posts. . . . . .

7) Distance of cattle post from village. . . . . .

8) Time taken to travel between cattle post and village. . . .

9) Does farmer stay in cattle post. . . . . .

10) If not, who stay in cattle post. . . . . .

11) How often does farmer visit cattle post. . . . . .

12) Does farmer have wage employment. . . . . .

13) Number of employees on cattle post. . . . . .

14) Predominant breed of cattle kept. . . . . .

15) Size of farm if commercial holding. . . . . .

16) INVENTORY OF THE HERD.

Breed	Heifers	Bulls	Oxen	Calves	Total
Tswana					
Tuli					
Brahman					
Semintal					
Grade Dairy					
Cross					

17) Ages of bulls. . . . . .

18) Where were bulls obtained from . . . . . when. . . . . .

19) Were any bulls purchased through the Bulls Subsidy Scheme . . . . . .

20) Does farmer utilize the artificial insemination services for breeding purposes . . . . . .

21) Average number of calves per year. . . . . .

22) Does farmer wean calves . . . . . .

Age at weaning. . . . . .

23) In supplementary feed used . . . . . .

State type. . . . . .

24) Source of water supply. . . . . .

25) Distance between water supply and cattle stalls. . . . . .

26) How many times are cattle driven to water supply per week . . . . . .

27) If farmer own boreholes, state source of funds . . . . .

is borehole owned jointly . . . . . ; . . . . .

28) Does farmer poll herd . . . . . .

29) Have any of your cattle died during the last twelve . . months . . . . . .

30) State causes of loss herd . . . . . .

Other causes . . . . . .

31) How many cattle lost per year (average) . . . . . .

32) State main causeloss of herd . . . . . .

Other causes . . . . . .

33) In the event of a sick animal, what action does farmer. take . . . . . .

34) Where does farmer obtain drugs . . . . . .

35) Does farmer isolate sick animals . . . . . .

36) Does farmer dip or spray cattle . . . . . .

37) How many times is farmer visited by extension Officer . a year . . . . . .

38) Has farmer attended any courses on animal health/. . . . production etc . . . . . .

Where . . . . . .

39) Has farmer obtained any credit for livestock development . . . . . .

State origination . . . . . .

40) What securities are usually asked for . . . . . .

41) Where does farmer sell his cattle . . . . . .

To whom . . . . . .

42) Average prices: Heifer . . . . . Old cows . . . . .

Bulls . . . . . Oxen . . . . . .

43) How many cattle sold per year . . . . . .

44) Does farmer send cattle to holding grounds for . . . . .

fattening . . . . . .

45) How are cattle taken to sales yards . . . . . .

46) What does farmer do with hides and horns etc., of . . .

cattle slaughtered at home . . . . . .

47) State other smaller stock kept . . . . . .

48) So far, has farmer been involved in the Tribal Grazing

land policy . . . . . State in which way . . .

49) Is farmer a member of a cooperative . . . . . .

Name of cooperative . . . . . .

50) State problems considered as most crucial by farmer . .

. . . . . .

. . . . . .

CROP FARMER

51) State number of fields/lands owned . . . . . .

52) Are the field in different areas . . . . . .

State areas . . . . . .

53) How far is main field/lands from village . . . . . .

54) How far is main field/lands from cattle post . . . . . .

55) Time taken travelling between lands and village . . . .

56) Time spent on lands . . . . . .

57) Does farmer stay on lands . . . . . .

58) If not, who stays on lands . . . . . .

59) Mode of transport used for travelling to lands . . . . .

60) State number of employees on lands . . . . . .

61) What is the size of main field/lands . . . . . .

62) Total size of all lands/fields . . . . . .

63) Main crop grown . . . . . .Others . . . . . .

State whether cash on subsistance . . . . . .

64) Area covered by main crop . . . . . .

PRODUCTION

Crop	Acreage
Maize	
Sorghum	
Millet	
Beans	
Others (state)	
. . . . .	
. . . . .	
. . . . .	

65) Technology for ploughing (hoe, ox-drawn plough, tractor)

. . . . . .

66) Does farmer practise winter ploughing . . . . . .

67) Is manure/fertilizer applied . . . . . .

68) What kind of seed is used . . . . . if improved of high breed, state where obtained . . . . . .

69) Does farmer practise crop rotation , ...

70) Are crops sprayed against insects . . . . . .

71) State type of material used for building crop storage

. . . . . .

72) Where does farmer sell produce . . . . . .

73) What proportion is sold . . . . . .

74) Mode of transporting produce to market . . . . . .

75) Has farmer received any loan for improving crop production State organization . . . . . .

76) Has farmer attended any courses at N.R.T.C. on crop . . production . . . . . .

77) How many times does extension officer visit farmers. . . a year . . . . . .

78) Is farmer producing under any special programme . . . . . .

79) State main probles of farmer . . . . . .

. . . . . .

. . . . . .

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

AUGUST/SEPTEMBER, 1978

STRATEGIES FOR AGRICULTURAL DEVELOPMENT IN

MAUN DISTRICT, BOTSWANA

OFFICER QUESTIONNAIRE

Name of Area: _____

Name of Interviwer: _____ Date of Interview _____

1. Post held by officer: _____
2. Number of years in service: _____
3. Number of years in this particular area: _____
4. Qualifications: _____
5. State main duties of this post: _____
6. If extension officer state size of area covered: _____

   _____
7. Number of farmers visited per year: _____
8. Means of transport used for carrying out duty: _____
9. State projects or programmes officer is involved in implementing: _____
10. What are the main problems encountered in implementing these projects? _____
11. What suggestions would the officer make to make implementation of projects easier? _____

    _____

    _____

APPENDIX B

Some crops suitable for growing in the Okavango Area.

(a) Indicated by Project BOT 72/019 1978

Vegetables		Fruit
cucumber	melon	avocado
pumpkin	squash	banana
tomato	sweet pepper	cape gooseberry
vegetable marrow	water melon	lemon
brocoli	cauliflower	grape fruit
beans	cow pea	tangarine
pea	peanut	bergamot
soyabean	savoy cabbage	florida
head cabbage	sweet potato	fig
spinach	lettuce	guava
parsley	water cress	mulberry
carrot	beetroot	papaya
turnip	radish	
koherabi	onions	

APPENDIX B (continued)

(b) Indicated by SWECCO (1975)

Fruit	Flowers	Other
avocado	roses	tea
lemon	carnation	coffee
prunes		garlic
cherries		ginger
grapes		brussel sprouts
olives		asparagus
strawberries		litchis
almonds		sunflower
pears		sugar cane
pineapples		rice
dates		potatoes
		oil seeds
		cotton
		tobacco
		luceme

APPENDIX C

LIVESTOCK UNIT

Definition:

A livestock unit (L.S.U.) is defined as a mature animal with a liveweight of 500 kg. (D. Field 1978)

Class of Stock	Proportion of a livestock Unit
Mature Male Stock over 3 yrs. Cows and calves bulls Horses	1,0
Immature Stock 2-3 yrs. Tollies, heifers, donkeys	0,75
Immature Stock 1-2 yrs.	0,5
Sheep, goats over 1 yr.	0,2

APPENDIX D

Selected Human Settlements in Maun District

Name of settlement	Estimated Population	Schools *	Health Facility **	Communal Piped Water** *
Maun	15 000	lss, 7ps	lc	+
Etshaa (settlements)	4 690	lps	lc	+
Shakawe	2 310	lps	lc	+
Sehitwa	1 590	lps	lc	+
Makalamabedi	1 450	lps	-	+
Xada	950	-	-	-
Gauxa	860	-	-	-
Gomare	1 200	lps	lhc	+
Matlapaneng	830	lps	-	-
Toteng	660	lps	lhp	-
Tsau	560	lps	lhp	-
Nokaneng	440	lps	lhp	-
Sepopa	390	-	lhp	-
Seronga	350	lps	lc	+
Shorobe	350	lps	lhp	+
Betsaa	790	-	-	-
Makakung	400	lps	lhp	-
Kwai	71	-	-	-
Kwebe	400	-	-	-
Zankuyo	190	-	-	-
East Mohembo	390	-	-	+
Komana	800	-	lhp	-
Chanoga	350	lps	lhp	-
Qobega	300	-	lhp	-

(Key overleaf)

Key: * ps = primary school, ss = secondary school

** c = clinic, hc = health centre, hp = health post

H = hospital

*** + = available, - = not available