

PRICES

“ INVESTIGATIONS ON RESPONSE TO CATTLE BY
SMALL SCALE TRADITIONAL FARMERS IN BOTSWANA
: THE CASE OF THE MAHALAPYE SUB-DISTRICT. ”

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A thesis submitted in part fulfilment for the
degree of Master of Arts (Economic Geography)
in the University of Nairobi.

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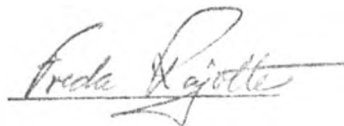
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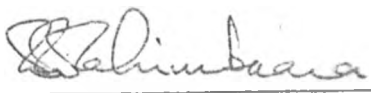
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ABSTRACT

The question of response to price by the traditional livestock farmers in Africa has been a vexed issue for a long time. Some researchers contend that response is basically a matter of perception among these farmers. Other researchers contend that the traditional cattle farmers are economically rational. Complex as it is, the response of these farmers to prices has to be understood in order for rural development planning to be meaningfully designed.

This study investigates the response to fluctuations in cattle prices by the small scale traditional farmers in Botswana. The research is carried out in the light of the implementations of the Botswana Government's policy of raising cattle sale prices as an incentive to increase cattle off-take from among these farmers. The study area for the research is the Mahalapye sub-district.

The research attempts to investigate two basic hypotheses which summarize the problem and the objectives of this study. First, whereas agricultural credit to small scale traditional farmers might be expected to increase livestock production, it is not likely to increase off-take rates because

farmers do not respond to price incentives. Second, the Government's credit scheme in its present form is likely to worsen income inequalities among small scale traditional cattle farmers and among the rural dwellers in general, since not all cattle farmers receive credit.

The main technique used to examine the two hypotheses is multiple regression analysis and partial correlation analysis. Two multiple regression functions were drawn, the Production Function and the Response Function.

The results of the analysis of the primary data show that credit has greatly increased the number of cattle among those few farmers who received it. Credit in the form of loans has also increased the financial obligations ("immediate needs") of the farmers so that these farmers have had to sell more cattle in order to repay the loans. However, credit acquisition has eventually resulted in more cattle on the already overgrazed communal tribal areas where the traditional cattle farmers operate.

Besides the above findings, this study has observed that in Botswana the traditional cattle farmers keep their animals mainly as a form of wealth and to a less extent as a means of earning an income. This is corroborated by the other finding

that the salaried young people in the formal sector are taking advantage of the agricultural credit to purchase breeding stock as a form of investment. These two findings have important implications for range conservation.

Following from these findings, the main recommendations for the development planners are firstly that ways should be found to raise the cash needs of these farmers in order to persuade them to sell more cattle. Secondly, legislative measures should be used to force cattle farmers out of the overgrazed areas around the villages in Eastern Botswana into the less densely populated areas of Western Botswana. The main recommendations for further research are firstly that there should be investigations into the possibilities of inducing the traditional farmers to invest outside the cattle industry. Secondly, researchers should focus on the economic relationship between farmers with cattle and those without cattle in the rural areas.

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CHAPTER ONE

INTRODUCTION

Statement of the Research Problem

This study investigates the response to cattle prices by small-scale traditional farmers in the light of the implementation of the Botswana Government's policy of raising cattle sale prices as an incentive to increase cattle offtake from small scale traditional farmers.

There are four reasons for the justification of this study. The first one is that agricultural production is the backbone of Botswana's rural economy. It directly involves 80% of rural households and contributes 95% of total rural incomes (National Development Plan, 1976-1981). With population in the rural areas projected to increase by 40% between 1976 and 1991 (Central Statistics Office, 1974), the continued improvement and increase of agricultural incomes is clearly a major priority. Livestock production, mainly cattle, accounts for over 80% of total agricultural productivity (Rural Income Distribution Survey, 1974). Cattle ownership is highly skewed and ways have to be found to redistribute cattle or assist

those without them to acquire some.

Secondly, Botswana's planning objectives are stated as "rapid economic growth, social justice, economic independence and, finally, sustained development" (National Development Plan, 1976-1981). Measures to promote the livestock industry are being taken on five main fronts, namely, sustained production, animal health and disease control, research, increased linkages and increased offtake (Botswana Government, 1976). To help facilitate the increased offtake of cattle for sale, the Government has devised a credit scheme that is designed to assist able farmers to produce and sell livestock at a faster rate. This study inquires to what extent the credit scheme has succeeded at the expense of social justice while being instrumental to rapid economic growth. Thirdly, the majority of the livestock farmers are of the small scale traditional type (Rural Income Distribution Survey, 1974). The question of their response to cattle prices has sparked off controversy. Haaland (1975), for instance, observed that the supply curve for cattle plotted against prices is backward sloping amongst the traditional producers in Africa and South East Asia. Wolgin (1973) showed that in Kenya, such farmers do not show economically rational behaviour or economic efficiency in accordance with profit-

maximisation models. But Sandilands (1970) considered that traditional farmers do act rationally; the only point is that they are risk averse. Being risk averse simply means that they feel insecure with too few cattle since they are always anticipating hazards such as drought, disease or theft. The experience in Botswana is that drought hits hardest those farmers in the traditional sector with small herds (Hitchcock, 1974). Despite this controversy, the Government policy on livestock development presupposes economic rationality among the traditional cattle producers. This study consequently enquires whether or not the Botswana Government is misdirecting its efforts as well as the nation's resources by persuading the traditional producers to sell more cattle using higher cattle sale prices as an inducement. The final justification is that, notwithstanding its expediency in development planning, especially rural development planning, the problem of response to prices by the traditional cattle producers has not been given due attention by either the Government or the scholars in Botswana. In Kenya, quite a number of response studies have been carried out by scholars, government agencies and international bodies such as the World Bank. The findings of this study will hopefully benefit the planners in the livestock sector of Botswana's

economy.

Research objectives

- a) To study the response to price by the small-scale traditional livestock farmers.
- b) To investigate the effect of credit on cattle production rates among the traditional producers.
- c) To investigate the effect of credit on the marketing of cattle amongst the traditional producers.
- d) To examine the consequences of credit on the rural small-scale traditional farmers with special reference to income inequalities.
- e) To assess or evaluate the implementation of the Government's strategy of trying to increase cattle sales as a dimension of rural development.

Theoretical Framework

This research was carried out within the broad framework of rural development in a centre-periphery setting. While "development" may be regarded as a broad, diverse and indeed complex pheno-

menon that defies any definition, the objective of rural development in a basically agricultural setting is considered not only to increase the overall production but also to increase participation of low income farmers in the production and distribution with a view to reducing disparities between the classes of farmers (Dams, 1980). Experience suggests that rural development strategies and programmes in Africa are more easily designed than effectively carried out. Perhaps basic and central to the problem is the fact that development strategies presuppose economic rationality, that is, profit maximisation, among the traditional Africans most of whom apparently do not exercise it, but rather cling perpetually to their own values and life styles handed down from one generation to another within the stable milieu of the customs and traditions in which they live. There are many unknowns in the method of existence of rural traditional Africans. It is not easy, therefore, to apply research methods which require a statistical control of the major factors in the attempt to fully understand the economics of traditional African life. Consequently, most development programmes designed for rural Africa tend to go contrary to the development desires of these rural poor and might even cause them increased hardship and poverty, at least in the short

run (Sarmoff, 1980). It would appear, therefore, that there is a lack of the necessary grassroots participation in the planning process for the development of rural Africa.

One of the questions in the multicentric economic activity of rural Africans in their response to changes in the market forces which affect them directly or indirectly. The majority of them engage in a peripheral market economy in which the bulk of subsistence requirements are acquired outside of the market place. Conversions of commodities also take place with very little cash flow (Bohannan, 1969). This accents the centre-periphery nature of rural Africa in contrast to the urban areas which are dominated by the cash economy and the market system. However, rural areas in Africa are fast being penetrated by the market economy (Amis, 1979).

Before presenting the working model for this study, a number of preliminary observations need to be made. They are concerned with the traditional uses of cattle in the subsistence sector of the economy. Firstly, cattle supply milk and meat. Fresh milk and sour curdled milk are the most important foods derived from cattle (McDonald, 1978). Meat is normally only eaten when cattle die or are slaughtered for ceremonial purposes. Secondly, cattle supply dung which is used

to smear and decorate the walls and floors of huts and courtyards. It is also used to fertilise the cultivable fields; and when it is dry, it is used also as fuel, especially around the large and older villages where firewood is becoming scarce. Thirdly, hides from cattle are tanned and used to make ropes, mats and clothing. Fourthly, oxen are inspanned to haul sledges and waggons when farmers collect firewood and when they transport their families' possessions to and from cattleposts. Oxen are also used to plough the fields during the cropping season. Finally, cattle are used as a medium of exchange. If a farmer's crops in a particular year are poor, then he may exchange cattle for grain. Cattle are also used for barter, that is, to exchange for other cattle or small stock. Fines handed down by the customary court are often expressed in terms of a certain number of cattle. Cattle herders who are employed by the farmers are often paid with cattle (Hertel, 1977). However, "the modern world has brought a new range of needs and obligations to the people of Botswana. These go beyond what can be satisfied from purely traditional sources. They tend to be foods and services which must be paid for with cash, and include such things as school fees, taxes, food and clothing not normally produced at home, and medical and legal

expenses" (McDonald, 1978).

Grain is also often sold in order to satisfy other cash needs since most people in Botswana live a life which puts a mixture of traditional and modern needs and obligations on them. Cattle are extremely useful in fulfilling both kinds of life. The question then arises, "why does the farmer not put aside a sufficiently large sum of money so that he can satisfy his cash needs as they arise?" Two main reasons have been advanced. The first one is that the banking services are not yet widespread in Botswana. The opportunity for some farmers to earn interest on their money is not yet available to them. Their money, therefore, does not grow. The idea of putting their money in a bank for someone else to look after is not acceptable to many people in Botswana (Henderson, 1971). They prefer to keep an eye on it themselves. The second reason for the farmer not to sell cattle and keep the money is that by keeping cattle, he gains three advantages: his ability to satisfy and fulfill his traditional needs is enhanced; he can exchange cattle for cash as and when he needs to satisfy his modern needs and obligations; and, his cattle if properly managed will reproduce so that his wealth will grow (Ibid). What all this implies is that cattle are in some respects

a bank or a store of wealth upon which a farmer can draw to satisfy both his traditional and modern needs as they arise. At its simplest, there are two kinds of cash needs, predictable and unpredictable (McDonald, 1978). Predictable cash needs are those which are expected, such as school fees, taxes and food. The unpredictable cash needs include medical expenses, accidents, deaths and the sudden recall of debts. The unpredictable demands for cash are almost always very urgent. For farmers who are poor planners, most cattle sales will be urgent while for those who are good planners, very few sales will be urgent. When cattle sales are urgent, the farmer is not so much concerned with good prices as he is with getting the amount of cash that he requires. Cattle sales which are conducted urgently have therefore generally "benefitted the buyers to the detriment of the sellers" (Henderson, 1977). It has also been observed in Botswana that when the traditional farmers sell their cattle without the urge of emergency cash needs, the rule is that the amount of money anticipated from the sale should be thoroughly accounted for before the sale (Hitchcock, 1978).

The working model, drawn from the foregoing remarks on the traditional uses of cattle, could be stated broadly as

- Y = $f(X_1, X_2, X_3, X_4) + e$, where
- Y = number of cattle marketed per given time
- X_1 = production rate of cattle on the cattlepost
- X_2 = traditional farmers' attitudes towards
cattle accretion
- X_3 = demand for traditional farmers' cattle by
buyers
- X_4 = the immediate needs which the traditional
farmer wishes to satisfy
- e = the error term.

This model merely embraces the major variables but it is not to be quantified, hence it does not show the relationship between these variables. It simply gives the broad theoretical framework within which this study was carried out. As can be noticed from its form, the model is a multiple regression function. Later on in Chapter three, this model will be elaborated into quantifiable functions, namely the Response Function and the Production Function.

Hypothesis

This research proposes two hypotheses for testing. The first hypothesis covers the first three research objectives while the second one covers the last two objectives.

- i) Whereas agricultural credit to small scale traditional farmers might be expected to increase production (that is, the number of cattle being born or acquired), it is not likely to increase offtake rates because farmers do not respond to price incentives. Previous works done outside Botswana indicate that an inverse relationship generally obtains between price rise plotted against cattle supply among the traditional farmers (Haaland, 1975).
- ii) The Government Credit Scheme in its present form, is likely to worsen income inequalities among the small-scale traditional cattle farmers and among the rural dwellers in general since not all cattle farmers receive credit. By implication, the credit system will therefore fail to achieve social justice.

Literature Review

A literature review on this topic must of necessity begin with a brief consideration of development since this study is investigating what is merely one aspect of development. Development is a phenomenon which is very difficult to define. In Africa, develop-

ment is often a political issue that follows either the capitalist or the socialist mode of production depending on the inclination of the country concerned. Consequently, this literature review will discuss it from the point of view taken by the Botswana Government as revealed in the National Development Plans. Development is aimed at bringing about rapid economic growth, social justice, economic independence and sustained growth (National Development Plan 1976-1981). These are the country's planning objectives. It is easy to anticipate conflict between rapid economic growth and social justice, or equitable distribution. The conflict is apparently brought about by bringing together social justice, a production model associated more with socialism, and rapid economic growth, a production model associated more with capitalism. Having noted what development is expected to bring, the next task is to examine the approach that has to be taken to bring about this development. Peet (1977), Dams (1980) and Cossins (1980) all stress the grassroots participation of the low income groups in both the development planning process and the implementation of the development strategies. Since grassroots participation in development programmes does not come naturally, one is forced to discuss the conditions which are conducive to mass participa-

tion in them. As a matter of fact, most rural development programmes are seen to have failed basically because of the failure of grassroots involvement. Bratton and Wiley (1980) have very strongly emphasised the fact that it is important first to understand the sociology of the people for whom any development plan is being formulated. Granting that most rural dwellers in Africa are illiterate, there is some limited justification for externally induced development in their society. All the same these rural dwellers must be seen to understand it and to desire it before it can be implemented amongst them. Even though it is evolved externally, any development strategy must accommodate the values of its target population. Box (1980) has, in support of Bratton and Wiley rigorously criticised the views expressed by the leading development economist Lipton in the latter's Why Poor People Stay Poor for ignoring the sociological aspect of development in planning for the poor. In certain aspects, rural development may be considered to be actually more complex than urban development because of the many unknowns in the life style of the peasants. Box calls for a much more cross disciplinary analysis than has Lipton exercised in his renowned work, Why Poor People Stay Poor. Egner and Klausen (1980)

have also emphasised that there can be no success with any rural development strategy that is not formulated jointly with the target group itself. And a good design of rural development will, according to Lele (1978), aim specifically though not solely, at the participation of the lower income farmer.

Quite often, development planners are themselves what one would call "the economic man" or profit maximisers. They tend to fall easily into the temptation of presupposing similar priorities among their target population groups. Consequently, they come up with complex and compact development programmes which totally ignore the socio-economic conditions of the people (Dams, 1980). Eventually, such development programmes become a hindrance to development. Another important factor in any development strategy is the conservation of the physical environment (Mutter, 1975). The problem of pollution of the atmosphere, the oceans and the rivers, and the soil cannot be over emphasised in the industrial cities of the developed world. In rural Africa, the threat posed by overgrazing to the natural environment has surfaced and there are many attempts to halt dessertification which is seen to be the direct result of overgrazing (UNEP, 1979). The last point has a bearing on livestock development strategies in

Africa, especially in Botswana which is basically a cattle ranching country.

Having considered the socio-economic and the physical environmental factors in rural development planning, an attempt is now made to survey the overall economic order, of which the area being developed is a part. Box (1980) states in no uncertain terms that rural development strategies could defeat themselves if they ignored the international economic order. This remark by Box takes the debate back to the classical development and underdevelopment theories. Those sharing the sentiments of Box include Sarmoff (1980) who sees most of rural development in the Third World as the encroachment of peripheral capitalism, and Dumor (1979) who considers that rural development programmes fail because of the institutional and structural elements of the economy, that is, how the rural economy is subjected to the requirements of external capitalism and to market forces. According to Dumor, the rural economy is continuously marginalised and perpetuated through the operations of the dominant external and domestic classes. But Hyden (1980) has sharply criticized the standpoint of Box, Sarmoff and Dumor in his research on underdevelopment in Tanzania. Hyden believes that most peasant studies have been undertaken on a wrong premise. By focusing almost

exclusively on the nature of international economic relations as the cause of underdevelopment, social scientists put the cart before the horse. The dependence that stems from unequal exchanges with the richer countries can only be rectified by strengthening the domestic base (Hyden, 1979). Hyden's point of view is simply that it is not capitalism but the peasant mode of production that keeps rural Africa poor and underdeveloped. Hyden further postulates that the problems of underdevelopment do not stem from an excessive penetration by world capitalism. Rather, they stem from the inability of capitalism to produce the same dynamic transformation of the material base as it once did in Europe and America. Capitalism fails to break down the precapitalist barriers that still exist in the Third World. To some extent Hyden is supported by Spray (1977), who, after studying livestock economics in Botswana, noted that in pre-capitalist production, large scale eliminates small scale; but this has not been the case with cattle production in Botswana (Spray, 1977). The reason why large scale cattle production fails to eliminate small scale cattle production in the Botswana livestock sector is probably that the two groups do not interact very much in production or even in marketing. Large scale cattle production occurs mostly in ranches

and in freehold farms and its marketing is done directly at the Botswana Meat Commission. On the other hand, small scale livestock production occurs on communal tribal grazing lands, and the marketing is done mostly through traders and co-operatives. Both of these buyers pay less than the Botswana Meat Commission, as will be shown in Chapter Five, later on in this thesis. This statement on the dichotomy in livestock farming is confirmed by The Rural Income Distribution Survey (1974) which reveals that the dramatic doubling of Common Market beef prices between 1971 and 1974 brought a substantial increase in income to the richest 1% of the rural households in Botswana. It would thus appear that small scale traditional livestock producers are not aware of the effect of the external factors of capitalism on their economic environment. Hyden's observation, therefore, applies to the case of rural Botswana. However, it is clear from the National Development Plan 1976-81, that Botswana development planners are very much geared towards preparing the rural dwellers to be part of capitalism on a world scale (Amin, 1975). This is revealed through the overall intention of livestock development which is to persuade the small producers to sell at a higher rate to the Botswana Meat Commission which only serves the world or foreign

market (the Botswana Meat Commission does not produce for the local market as does the Kenya Meat Commission, for example). In this respect, the Government is seen to be agreeing with neo-classicists that trade, especially foreign trade, raises economic growth at home (Spray, 1977). The extent to which the Government of Botswana has responded to these aspects of rural development in its planning can be assessed from the analysis of this current research.

Having briefly reviewed some of the literature on development the next task is to do the same for the response to fluctuations in cattle sale prices by traditional livestock farmers. It would appear that the response to fluctuations in cattle sale prices amongst farmers depends on how they view or regard their cattle.

Doran, et al (1977) suggest that there are two important purposes for rearing cattle amongst farmers. They observe that some farmers rear cattle as a means of wealth while others rear them for the purpose of earning an income from them. These scholars further state that the reactions of these two groups of farmers to cattle price fluctuations and hazards will always vary. For instance in 1972 a survey conducted by the Lilongwe Land Development Programme's livestock section indicated that 81% of traditional cattle owners considered their stock to

be primarily a form of insurance against economic hazards, and only 19% viewed cattle as an important source of income (Lele, 1978). Cattle kept as a source of income have been observed to be better kept than those held as a means of wealth or status (Doran et al, 1977), and they are generally sold before they are three years old, i.e. when they are in their prime condition as opposed to those kept for wealth. The latter are sold when they can no longer reproduce or when they are unable to chew the grass well, i.e. at over six years of age (Hertel, 1977). Consequently these cattle fetch lower prices when compared with those kept healthy for generating income.

Ryan (1958) found out that in pre-independence Botswana, Africans generally sold proportionately fewer cattle than their white counterparts who depended only on ranching for their livelihood. He further recorded that Africans sold cattle only to meet their modest cash needs so that there was no direct relationship between their wealth and their standards of living. The offtake from the African livestock keepers was 3% of the total stock while white farmers maintained an offtake of 15% of their total stock (Ryan, 1958). Thus it can be concluded from the Ryan's report that Africans before independence in

Botswana were keeping cattle for status, security and other reasons whereas whites kept cattle for income generation. This is an important statement and it will be investigated further in this thesis.

With this split in the attitudes towards cattle accretion between traditional herders and commercial ranchers in mind, an attempt will now be made to study or review some of the writings on the question of the response of farmers to changes in cattle prices.

The question of response to price by traditional cattle farmers has always been controversial. Whetham (1972) asserts that prices somehow affect cattle supply, but he stops short of saying exactly how price changes affect the supply of cattle for sale. Meyn (1970) notes that prices are instrumental in determining the direction of flow of supply where there are competitive prices through various buying agents. The essence of Mayn's remarks is that some traditional cattle farmers are positively responsive to price rise. But Schneider (1974), after studying cattle response in East Africa, asserts that there, the traditional pastoralists are indifferent to prices. This, he says, is because these farmers keep cattle not as a means of earning an income but rather as a form of wealth or insurance. Haaland (1975)

also holds the same view. He concludes that traditional cattle farmers will sell their beasts only to meet their most urgent needs but they are otherwise indifferent to price fluctuations. Yet Hill (1970) finds considerable divergence in the existing evidence on the nature of price responsiveness among cattle producers. He discovered that when cattle sale prices rise, nomadic herdsman in West Africa behave like economic men, that is, they sell more of their stock. Sandilands (1970) also contends that traditional farmers are economically rational, all they need are obvious advantages in the marketing process. Embedded in the notion of keeping cattle as a form of insurance is what Wolgin (1973) calls being risk averse. He finds that traditional farmers are cautious not to sell their cattle without due consideration for possible disasters such as drought and disease. In support of Wolgin, Vasthoff (1968) confirms that a farmer who has many cattle normally fares better in a drought than his fellow farmer who has very few animals.

Perhaps the most comprehensive analysis on response is that put forward by Sanford (1980). Sanford approaches this question historically. He concludes that if pastoral societies are examined in the historical context, they can be seen to display considerable capacity for selective change. Where

they have not been responsive to change, it has often been because it was ecologically or economically or politically unwise to do so. For example they have maintained raiding behaviour to discourage agriculturalists from pre-empting their necessary but seasonally vacated pastures; they have avoided animal sales where the terms of trade became markedly unfavourable; and they have responded slowly to children's education because schools preempt the necessary labour and leave children without the experience in herd management. But pastoral populations have in varying degrees turned to livestock sale, to the use of agricultural produce as food, to the purchase of market goods, to education, to health services, and to political activism in the recent past. In short, pastoral populations are willing and able to change when they perceive it is in their interest to do so; and since their perceptions seem as rational as those of any one else, the myth of pastoral resistance to change should be dispelled (Sanford, 1980).

Sanford further notes that the question of response is easily complicated by the multiplicity of the components of rural African life. He states that pastoral production systems have generally been approached in terms of their most conspicuous animal

species, namely, cattle. He observes that this approach ignores the complexity and diversity of such systems because farmers also keep goats and sheep and furthermore they might have arable fields. Without the vastly different population dynamics of goats and sheep to support it, it is quite unlikely that the African small scale cattle production system could function adequately to support humans under the seasonally fluctuating ecological conditions of African rangelands.

Whereas it is very easy to agree almost totally with Sanford, consideration should also be given to the findings of Low (1977) who has come to believe that a positive supply response to rising prices indicates that cattle are being held mainly as a means of generating income. If cattle are being kept for income generation, he further notes, their condition will be high, while the condition of cattle being kept as a means of wealth is generally low. This simple conclusion of Low's seems to be very applicable to the cattle industry in Botswana. Most traditional herders seem to keep cattle as a means of wealth as the Ryan report has noted (Ryan, 1958). However some farmers in Botswana also keep other livestock such as goats and sheep. They also cultivate fields or take up paid employment in addition to

cattle raising. Farmers are able to do other jobs besides herding cattle because it takes only one person to look after a maximum of 50 head of cattle (Machacha, 1976). The head of the family does not have to look after cattle himself. He can easily delegate that to his eldest son or any unemployed close relative. This allows the head of family to take up paid employment if he can find it.

Studies based particularly on Botswana also reveal a diversity of conclusions. Spray (1977) rationalised that the immediate reaction to price increase by any farmer would be to withhold cows from the market in order to build up cattle numbers. Ansell and Cole (1977) discovered that in Western Botswana farmers work towards a target amount of money. Once their cattle sales reach this amount of cash, no further sales are done. This tendency of the farmers to sell cattle in order to raise a specified amount of money results in their supply curve sloping backwards (Ansell and Cole, 1977). The findings of Ansell and Cole were immediately confirmed by Devitt (1978) whose study, based in the South West of the country, revealed that farmers had a positive supply response to prices. Devitt's work was based, however, on the freehold farmers, most of whom are Europeans. Therefore, his work will not

be taken as a counter to the conclusion of Ansell and Cole who studied traditional farmers.

Egner and Klausen (1980) revealed that after the EEC subsidies had raised the price of beef from Botswana to 60% above world market levels, there was an immediate overproduction of beef in the country. But perhaps this overproduction was accounted for by freehold farmers since it has already been noted in the Rural Income Distribution Survey, 1974, that the effect of increased beef prices was proportionately less for the owners of small herds. This last point receives support from Gulbrandsen (1979) who, after conducting research amongst the traditional cattle owners of Southern Botswana felt confident in stating that neither increases in the market prices of cattle nor improvements in the animal husbandry practices of herders, would necessarily result in an increase in the offtake rates unless and until cash needs increase amongst the farmers themselves. If the farmers' cash needs do not rise with prices, then fewer cattle will be sold. Similarly to Gulbrandsen's findings, Devitt observed that the supply curve is likely to slope backwards when cash income from cattle is approximately that required to maintain the household.

However, a study conducted by the Ministry of

Agriculture in Botswana, A Study of Constraints on Agricultural Development in the Republic of Botswana, 1974, points out a new and important development in the economic perception of rural cattle owners. The study cautions that the attitudes of the Batswana towards cattle are changing due to rising cash needs in the form of school fees as more children go to school, taxes, better quality clothing and the better quality diets.

Before finally looking at marketing of livestock in the traditional sector, it is necessary to consider credit, another controversial aspect of development.

According to the publication, Co-operative College of Kenya, Agricultural Credit and Saving, 1970, credit is defined as a means whereby a commodity or a service can be obtained immediately but paid for later on. To cover the risk involved in credit repayment, the creditor has to charge interest when selling his credit. Interest is defined as the price for credit facilities. The rate of interest, according to this publication, is based on two major factors, the demand for credit and the risk involved in lending it. If credit funds are scarce when the demand for credit is high, then interest will be high. Also, interest will be high if the collateral security

for the loan is deemed less than satisfactory by the lenders.

Credit can be either static or dynamic. Dynamic credit leaves the borrower in a better position so that he does not stand to gain or profit by the loan. Also, it is possible that credit has in some cases left the borrower worse off than before he had it (Vasthoff, 1968). This has occurred where farmers failed to make any profit from the credit either because of their inexperience with the profitable use of credit or because they were hit by misfortunes such as drought or floods. Despite any disaster that might befall the farmers, the creditors still expect to be repaid their credit, although they may not pressurise the farmers to repay in time as they would if no disaster had struck the farmers (Vasthoff, 1968).

Vasthoff gained support from Sen (1965) who observed that in the less developed Far East, credit has not been the panacea for failures in cattle production among the peasant farmers. Sen notes that credit is only one of the required inputs in peasant farming. As such it does not take the place of the farmer's technical skills and entrepreneurship. By itself, credit does not guarantee success to the borrower.

Von Pische (1974) condemned the role of credit in traditional cattle farming on the grounds that it generates increasing inequality amongst the farmers since not all of them will normally qualify for credit. He noted that in the granting of credit to livestock producers, there is a bias in favour of those more able to repay despite the policy of development which normally aims at helping the weakest of the farmers.

Hunt (1975) states that no sound basis exists for lending to farmers who operate entirely on subsistence levels. He goes further to suggest that credit be reserved only for those farmers who are emerging from the traditional marketless society and are entering the monetary economy.

Discussing the Grazier Scheme of the Kenya Meat Commission, Metson (1975) also realised that many farmers, especially the small scale farmers, may be better off without credit facilities. He analysed the operations of this Grazier Scheme and concluded that the service which the scheme was giving to farmers was an economic burden to them. The Scheme allows eligible farmers to keep a certain number of cattle belonging to the Kenya Meat Commission. The Commission charges these farmers for keeping its cattle. When the Commission feels that the cattle

are now mature and ready for slaughter, it simply recalls them from the farmer. After the cattle are graded at the abattoir and the price for them is fixed, any profit that is realised goes to the farmer who had been looking after the cattle on behalf of the Commission. However, Metson's finding is that the charge made by the Commission to the farmer for keeping the cattle is often more than the profit realised after the sale of the animals. He therefore feels that the Grazier Scheme does not help the farmers as it was designed to do. The Grazier Scheme is an example of credit not in the form of cash but in the form of goods.

However, there are many politicians and scholars who are more optimistic about the effect of credit on livestock. Most of them stress the need for caution and wise use of credit if it is to yield good results. Former United States President John Kennedy, in 1963, said that the wise use of credit was an essential ingredient in growing economies (Prindle, 1967): Heyer, et al (1969), whilst not denying the usefulness of credit in livestock development, caution that a wise selection of competent farmers must precede credit allocation because the assurance of profit is essential to the granting of credit. They further noted that credit

use must be supervised if the borrower is illiterate. Supporting these three scholars, Whitaker (1973) agrees that it is useful to study the impact of credit on herders using the factors of production namely land, capital and labour. He noted, however, that whereas profitability is a prerequisite for obtaining or granting credit, traditional African livestock farmers should not expect quick results from this credit since their own attitudes to cash economic activities change only slowly.

Notwithstanding the very objective and constructive contribution from Whitaker, it must be accepted that credit cannot, and is not meant to be, given perpetually. The project being afforded credit facilities must become financially independent within a reasonable time, otherwise it becomes difficult to justify its receiving credit. If it does not become economically independent, it may be because it is receiving the wrong or inappropriate type of credit; or the project might be applying inappropriate technology (Newlyn, 1968). Clayton (1964) summarises these views on credit. He simply maintains that the real need for credit is often overstated while the potential of the farmers to build up capital is often understated. Having noted that many Botswana pastoralists also rear goats and sheep and some even have

arable fields, it is quite probable that the view of Clayton is applicable in Botswana where farmers can always attempt to build up capital from all of these activities. Even small scale livestock farmers can often afford to finance what Baun, et al (1961) term "short term credit needs"; for example, credit for the purchase of supplementary feed or for medical bills. However, these farmers will still require financial assistance for such major tasks as fencing, drilling boreholes and obtaining major veterinary requisites (Food and Agriculture Organization : Agricultural Credit in Africa, 1973).

Giordano De'll Amore (1971) studied the Lilongwe Land Development Scheme in Malawi. The Scheme's objectives were to consolidate livestock farmers and arable producers so that they would be able to raise their own credit needs and in that way avoid the expense of loans. The scheme never succeeded due to the apathy of some of the farmers. Eventually credit had to be given to those farmers who were deemed to be credit worthy. As a result of the selection of only those who were worthy of receiving credit, the repayment rate was satisfactory. The other reason for the satisfactory repayment was cited as the well organised market facility.

The Vihiga Maize Credit Scheme in Kenya nearly failed because of the failure of the authorities to identify precisely the constraints on farmers who were considering using the Credit programme (Von Pische, 1971). Another credit programme in Malawi, the Salima Project, aimed at assisting both the middle income and the small income groups of farmers. It was realised here that generally, the repayment rate of loans was inversely related to social status, that is, the lower class farmers repaid promptly and satisfactorily (Lele, 1978). It was felt that the middle income farmers thought that because they were politically influential, they could renege on their debts with impunity. Heyer (1969) studied 14 districts in Kenya and concluded that low repayment rates generally resulted from; creditors inadequately following up on the farmers, lack of supervision of loan use, and a lack of sufficient marketing facilities for the farmers. It would appear, therefore, that since most creditors demand adequate security to cover the loans before they can make credit available [in Kenya the Agricultural Finance Corporation gave 88% of its loans to large scale farmers in 1971 while in Ethiopia, the Agriculture and Industrial Development Bank omitted 80% of the farming population when giving out loans "because they could not repay"

(Lele, 1978)]. Governments in Africa might themselves undertake to finance small scale livestock producers who do not qualify for credit under the profit oriented credit schemes which operate here. The Government of Botswana attempted to bridge the gap between the small scale and large scale livestock producers by setting up the National Development Bank that would be biased towards the smaller producers (National Development Bank Annual Report, 1976). But this credit agency has failed to reach those most in need of the credit because they cannot repay. The argument of the National Development Bank is that since credit funds are borrowed from outside the country, they should be invested only where they are most likely to reap quick benefits since the country has not yet reached the level of affording welfare programmes for the sake of social justice (National Development Plan 1976-81). It must be emphasised that notwithstanding the genuine argument advanced by the National Development Bank, the plight of the small scale livestock farmer has not been eased by the Bank, and it is therefore not meaningful as yet for the Botswana Government to speak of social justice in the livestock section of agriculture.

Finally, a short look is taken at the marketing of livestock. Sorenzen (1964) defines a marketing

system as a complex pattern of institutions and physical facilities which relate human beings and things in the transfer of goods and services. The system must be seen as a social network of elements involved with the transaction and transformation of goods and services in spatial and temporal dimensions. The elements in this definition are identified as: the cattle producers, consumers and livestock traders (Kivunja, 1976). The goods are cattle and their products such as beef, offals, hides and skins. "Transaction" refers to the economic interactions involved in the movement of cattle and their products from producers to consumers, which result in the transfer or exchange of property rights over the cattle or the products.

As already noted, beef production in Kenya is meant primarily to supply the local market whereas in Botswana, beef production is meant primarily to supply the external market. Therefore the marketing systems of the two countries will not be similar in many respects. However, there are important parallels in the marketing systems of Botswana and Kenya which make comparison of their functions possible. The livestock marketing systems of the two countries are dominated by the Botswana Meat Commission and the Kenya Meat Commission respectively. Both these

Meat Commissions are subsidiaries of the Commonwealth Development Commission in Britain. The Kenya Meat Commission and its sister Commission in Botswana are the only bodies which are legally authorised to export meat from the countries in which they are operating. In other words, the Commonwealth Development Commission has the monopoly of exporting beef from Kenya and from Botswana. This is an important finding for this thesis, in which it is maintained that beef production and marketing in Botswana tends to underdevelop the rural areas where the cattle are raised.

Although the majority of the small scale traditional cattle producers do not sell directly to the Botswana Meat Commission it has been discovered by McDonald (1978) that over 80% of all cattle bought from these farmers end up at the Meat Commission. The small scale traditional livestock producers sell their cattle mostly to traders or to the Agricultural Marketing Cooperatives. What seems to obtain in Botswana is that the livestock marketing system has a definite hierarchy as will be shown under Chapter five. Small scale livestock farmers, however, do not have a perfect knowledge of the alternative selling outlets available to them (Ansell and Cole, 1971). The middlemen have exploited this ignorance

of the farmers (Hitchcock, 1978).

While it is understandable that due to overstocking rates averaging 6.9 Hectares per livestock unit instead of the recommended 12 Hectares per livestock unit in the communal tribal areas (Botswana Government, 1975) the Government must make all possible efforts to increase offtake rates from the communal tribal areas, it is at the same time difficult to understand why it seeks to raise cattle production rates in the same areas. However, the Government has demonstrated a positive attitude towards involving cattle producers in development programmes through wide consultations with those in the Tribal Grazing Land Programme. This programme generally seeks to reduce grazing pressure on communal land by encouraging larger scale farmers to move out into previously unused pasturelands which will then become commercial and hopefully more productive since they will be ranches. Whereas this programme sounds well planned, the problem is that it is already being executed before it has been accepted by the farmers. Farmers in the Central District (where most of the national herd is to be found) have shown reluctance to accept the programme. This should be a lesson for the Government that they should not only consult the farmers during the implementation of a programme, but rather in the very

planning process itself. Also, on the basis of the available literature, the question of the response of traditional livestock farmers to fluctuations in cattle prices is still unresolved, yet its resolution is a prerequisite of any useful planning of livestock development in the rural areas.

The credit system in Botswana, has, like the others which have been discussed, apparently failed to give practical meaning to social justice since it has seemingly failed to reach those most needing it.

The marketing system is a clear indicator of underdevelopment in the Botswana livestock industry.

Small scale traditional cattle producers are not fully aware of all the alternatives of marketing their cattle. Consequently, the middlemen exploit their ignorance.

CHAPTER TWO

THE STUDY AREA

Botswana is 570000 km² in area and lies at the centre of the Southern African plateau (Fig. 2.1). Its climate is continental and semi-arid with an average rainfall of 475 mm. Rainfall ranges from less than 250 mm in the south west to more than 650 mm in the north east (Fig. 2.2). The mean maximum and minimum temperatures vary according to regions, but the former seldom rises above 38°C and the latter seldom falls below 5°C.

There are very few perennial rivers and they all lie in the north and eastern parts of the country (Fig. 2.1). Boreholes are the main source of water for both people and animals. The generally poor soils combined with the low and variable rainfall result in rangelands and vegetation types which are characteristic of semi-desert conditions, particularly in the Kalahari area (Fig. 2.3).

Botswana got its independence in 1966 after being a British Protectorate since 1885. Since independence, the country has followed a mixed economy, i.e. an economy where both the government

and the private sector play important parts. The country follows a British brand of multiparty parliamentary democracy. Until 1976 when minerals overtook it in generating revenue, beef had been the backbone of the economy of Botswana (National Development Plan 1976-81). Considering that minerals are limited in quantity, the Government still considers the beef industry to be the long-run backbone of the economy. At independence in 1966, Botswana's GDP amounted to P5789000, and, 90% of this amount was contributed by agriculture [P1.00=US\$1.20]. The main part of the contribution from agriculture came from the livestock sector since arable farming was, as it is even now, primarily subsistence due to low rainfall and poor crop husbandry among the majority (80%) of the traditional farmers (Coclough and McCarthy, 1980). Botswana has a small population of 800 000 but the population growth rate of 3.2% is considered rather high for a country with such a low level of development (National Development Plan 1976-1981). In 1979, the GNP rose up to P400 or US\$480 per capita (Central Statistics Office, 1980) from P35 or US\$42 per capita in 1966. The sharp rise in the GNP was accounted for by the minerals. Botswana exports diamonds, copper and nickel. Minerals contribute 60% of the GNP.

FIGURE 2.1 REPUBLIC OF BOTSWANA

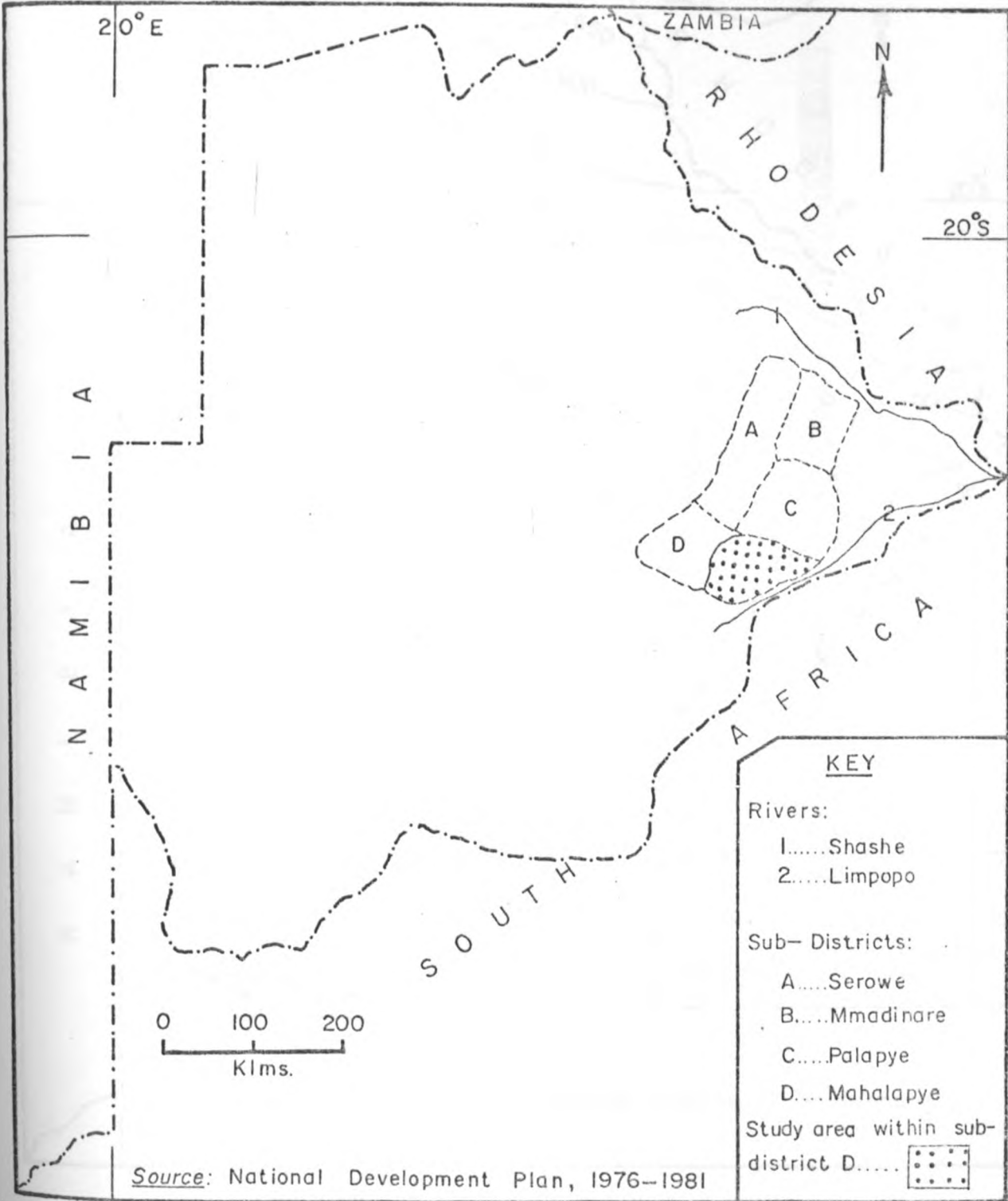


FIGURE 2.2 BOTSWANA MEAN ANNUAL RAINFALL IN (mm.)

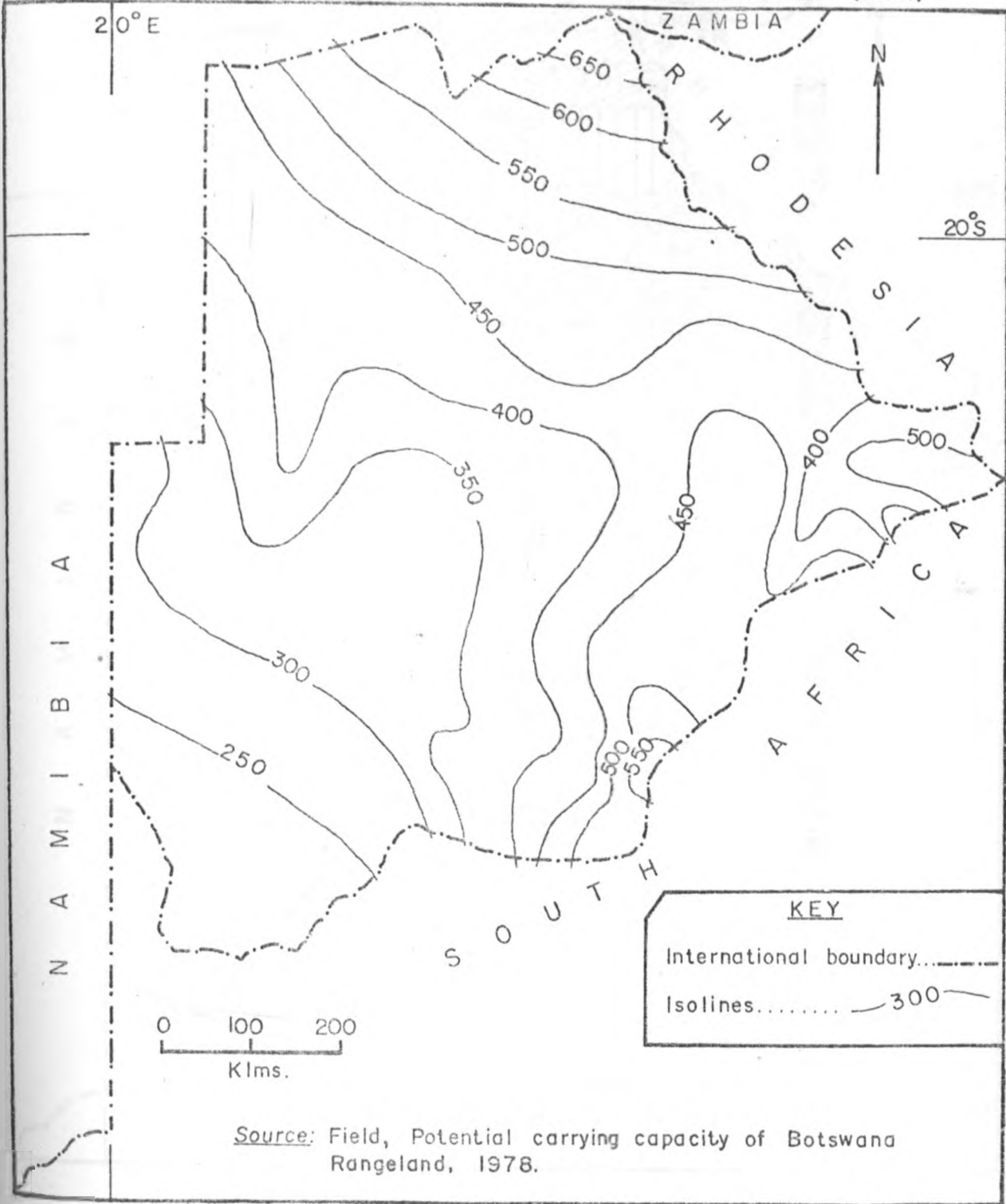
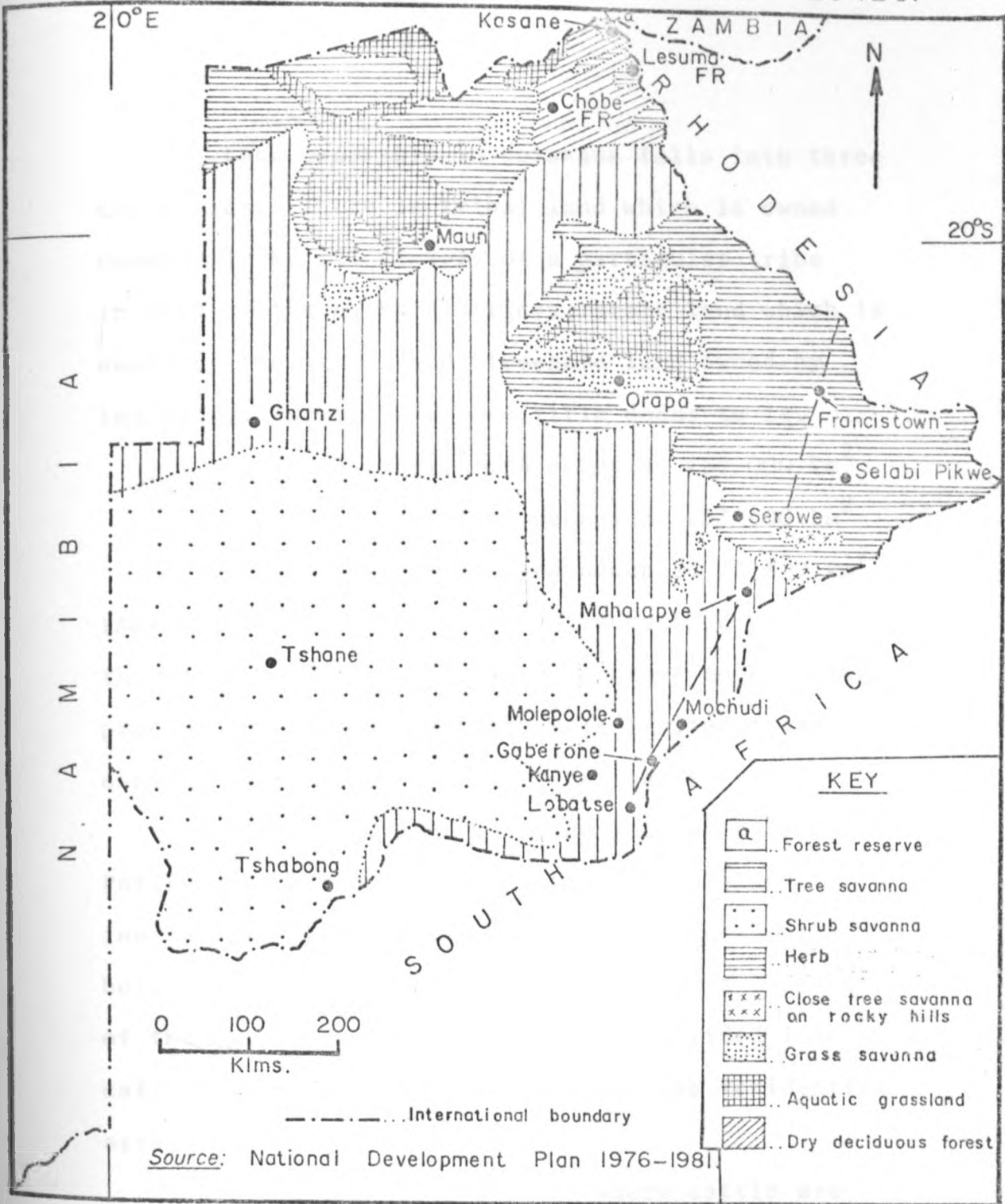


FIGURE 2.3 BOTSWANA VEGETATION ZONES.



Land ownership in Botswana falls into three categories. There is tribal land which is owned communally by all members of a particular tribe in each of the eight districts, state land which is owned by the state, and, freehold land owned by individual farmers who have title deeds to it.

In 1967, tribal land occupied 288 000 km²
state land occupied 257 600 km²
freehold land occupied 23 800 km²
(Ansell, 1971). The Government converted parts of the state land to tribal land in order to ease land pressure recently. This study is limited to an enquiry of response in the tribal lands.

Until 1968 when the Land Act was passed in Parliament, authority to allocate tribal land to individuals for arable farming, cattle grazing and building homes, had been vested solely in the chiefs of the tribes. Tribal land use was divided into cattlepost areas, arable fields and the residential areas.

A cattlepost is a place where cattle are herded. It simply constitutes a hut where the herder lives and a kraal where the cattle are kept overnight. Cattleposts are located away from arable fields since the cattle could damage the crops. The herders are either employed ~~non~~-relatives of the cattle owners,

or close relatives of the cattle owners. Sometimes the herders are the younger members of the family. From time to time cattle owners visit their cattleposts in order to pay the employees and also to bring them food while at the same time checking on the condition of cattle and pastures. Most families would like to have a cattlepost but only 45% of the country's population own any cattle. The wealthiest 5% of all cattle owners own 50% of all the national herd. Cattleposts have different locations according to the size of the herds. Nearest to the villages are found those cattleposts with smaller herds while those with bigger herds are mostly found far from the villages. Farmers with smaller herds cannot usually afford the costs of travel or the costs of keeping individual boreholes which are necessary to keep cattleposts far from villages. The pastures are much better in the distant cattleposts where farmers are few and far between. Around the villages, pastures are poor due to grazing pressure which results from the many cattleposts of the small scale farmers.

The cattlepost or communal type of land tenure requires no overhead capital and it also incurs very little running costs when compared with commercial ranching or the costs of running a free-

hold farm. It also gives cattle owners a considerable degree of flexibility in moving their cattle from one area to another in order to take advantage of better grazing. Management skills deployed here are very basic. However, this system of land tenure also has some disadvantages. It prevents any attempts at range management. It tends to be a dis-incentive to cattle owners to undertake livestock improvement programmes because they do not own the grazing areas. Any other cattle farmer can join them at any time and share the benefits already paid for by those who settled on the pasture before. Or after investing in a particular pasture development programme, the farmer might find better pastures elsewhere in the tribal land so that if he transferred his stock to the better area he would then lose the benefits of his investment. This system of land tenure also does not give cattle owners any security against which funds may be borrowed. It also makes stock theft easy and it results in low cattle husbandry standards which in turn result in higher mortality rates among the calves and lower calving rates. Finally, and perhaps most importantly, this type of land tenure has led to serious overgrazing (Ansell, 1971). Overgrazing has led to bush encroachment in the tribal communal grazing lands (Field, 1978).

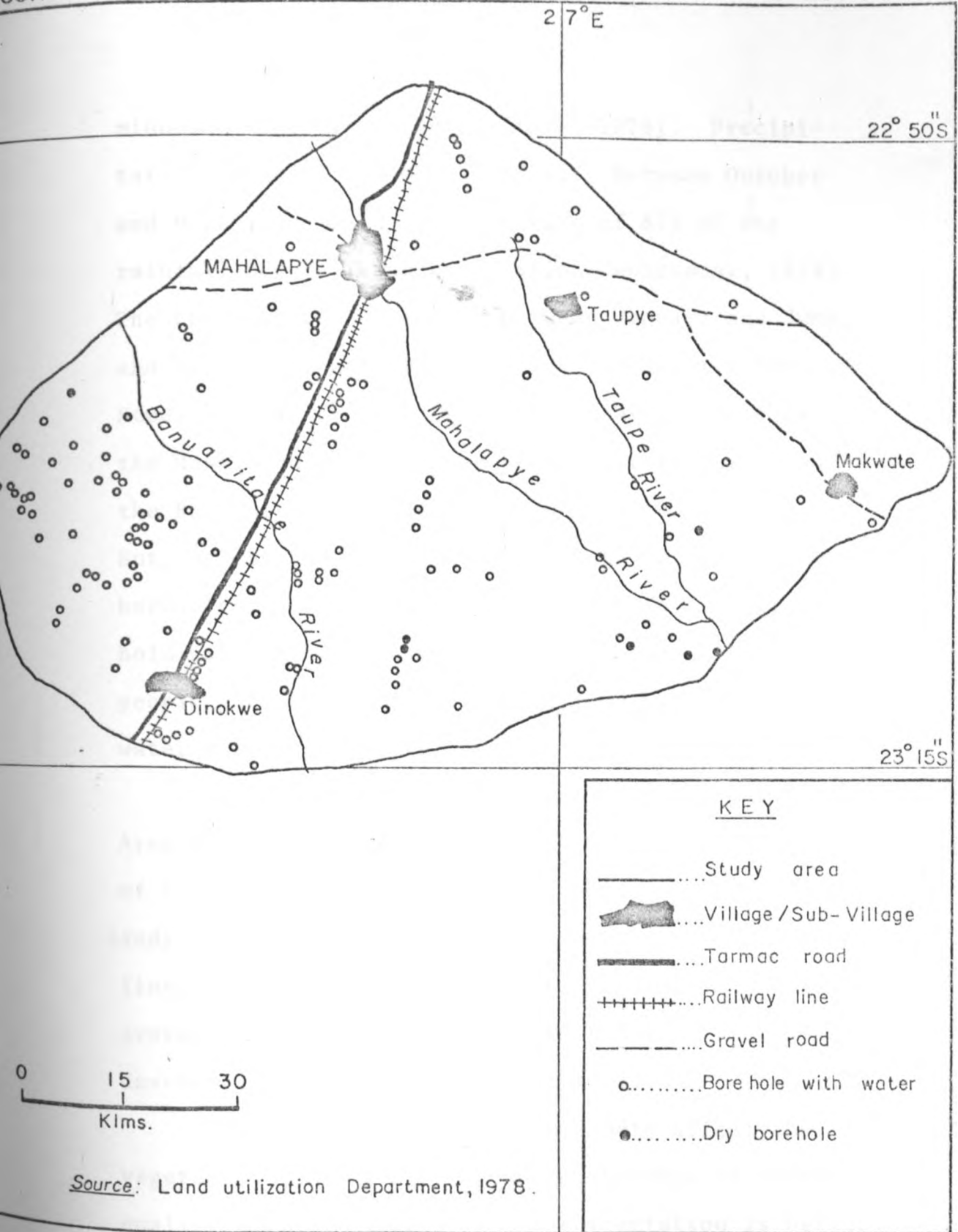
The traditional cattle producers also engage in arable agriculture, most of it at subsistence levels. Traditionally, the wife spends much of her time in cultivation tending the crops while the husband spends much of his time at the cattlepost. Acreages in arable farming are usually bigger for the wealthier farmers and relatively smaller for the poorer ones. The wealthier livestock farmers happen to be also the richer arable farmers. There is therefore, some kind of relationship between cattle ownership and arable farming (Egner, et al, 1980).

In an attempt at optimal use of both communal grazing and arable lands, the Government introduced the Tribal Grazing Land Programme, (TGLP), in 1975 (Botswana Government, 1975). The TGLP essentially seeks to zone all tribal land into commercial areas and communal areas. According to the proposition of the TGLP, all farmers with more cattle than a certain number to be determined by the Land Board in every tribal area will be persuaded to move from the communal to the commercial areas in order to take advantage of better pastures. This undertaking is expected to ease overgrazing in the communal areas. However, farmers moving into commercial zones will be required to rent pastures and provide the necessary infrastru-

cture such as boreholes, fencing material and paddocks. It is hoped that due to the higher levels of cattle management in the commercial zones, the rate of cattle production will attract many eligible farmers to quickly move into those areas despite the increased maintenance costs of keeping their cattle there. Once those farmers with many cattle have moved out of the communal areas, there should be more room for both grazing and arable agriculture for the smaller livestock farmers who cannot afford the rents and other expenses incurred through ranching livestock in the commercial areas.

The study area is the Mahalapye Agricultural Sub-district (Fig. 2.1 and Fig. 2.4). The area includes the main village of Mahalapye, the smaller villages of Taupye and Makwate on the eastern side of Mahalapye, and, Dinokwe to the south along the North-South road that also passes through Mahalapye. The Mahalapye agricultural sub-district lies about 1100 metres above sea level, exceeding the country's average altitude by 100 metres. The climate of this area is not very much different from that of Botswana as a whole. The average summer temperatures range from 20°C to 27°C maximum and from 15°C to 42°C minimum. The winter temperature average ranges from 8°C to 16°C maximum, and from minus 5°C to 20°C

FIGURE 2.4 THE STUDY AREA: MAHALAPYE AGRICULTURAL DISTRICT.



minumum (Ministry of Agriculture, 1978). Precipitation varies from 400 to 500 mm. Between October and March (inclusive), an average of 87% of the rainfall occurs (Land Utilisation Department, 1978). The humidity is 30% to 76% between January and June, and 22% to 48% between August and November. The Study Area is drained by two main perennial rivers, the Mahalapye river on the north-eastern part, and the Bonwapitse river on the south-eastern part. But, as can be seen from Fig. 2.4 there are many boreholes in the area. This is because the rivers hold water only during the rainy season, so that people and livestock have to rely on boreholes for water supply just like the rest of the country.

Compared with Botswana in general, the Study Area has relatively better soil types. The texture of the soil in this area ranges from stoney through sandy loam, loam, to clay which occurs in the drainage lines, valleys and depressions. The soil has an average depth of one metre. Its nutrient status is described as low to moderate (Ibid.).

Rainfall and soil texture both affect the vegetation (Field, 1978). Hence, because of better quality soils in this areas, the vegetation is better than in the rest of the country. Vegetation affects the livestock carrying capacity (Fig. 2.5).

FIGURE 2.5 BOTSWANA POTENTIAL CATTLE CARRYING CAPACITY.

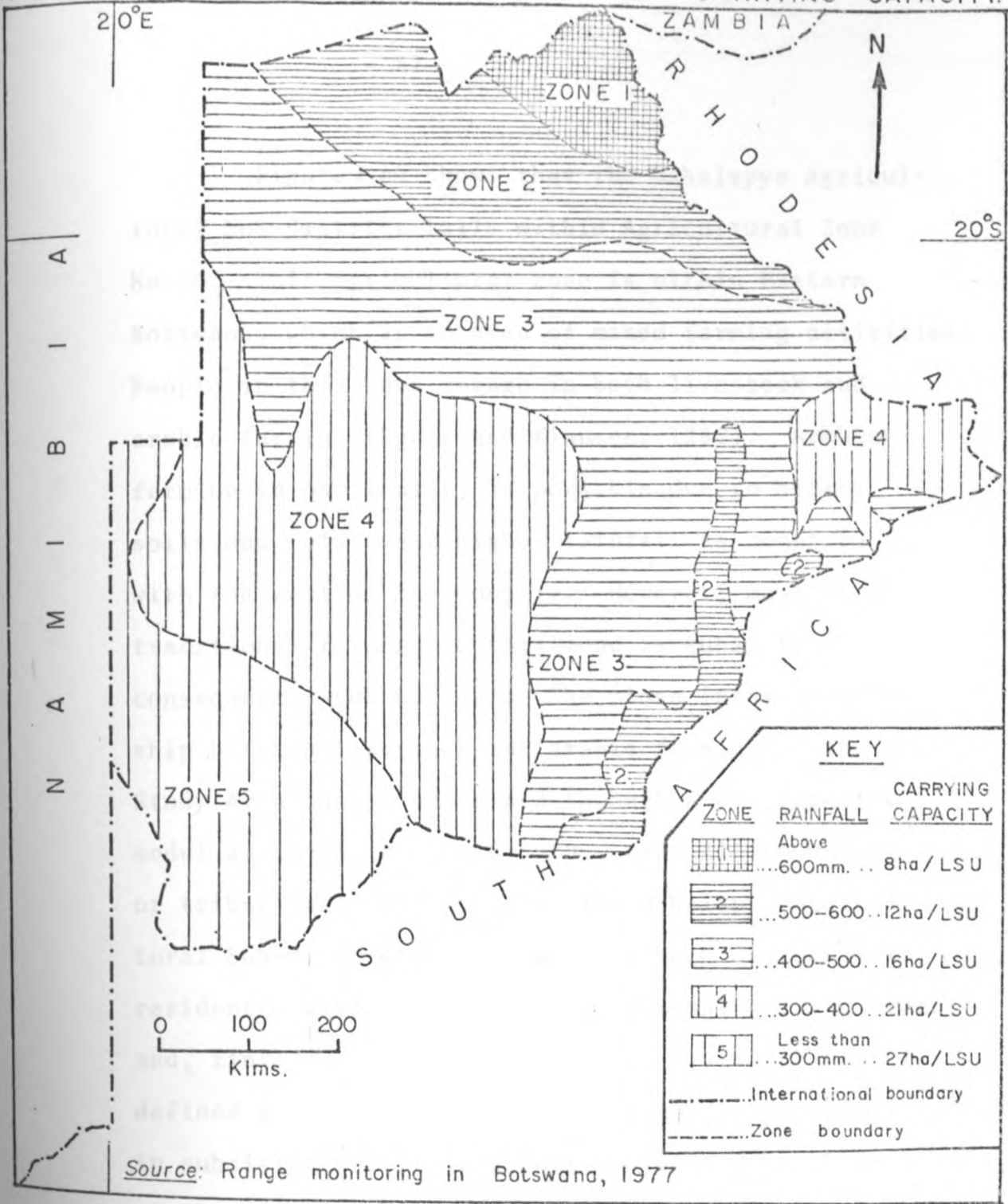


Figure 2.6A shows that the Mahalapye Agricultural Sub-district falls within Agricultural Zone No. 6. This agricultural zone is within Eastern Botswana, which is an area of mixed farming activities. People in this zone engage in both livestock and arable farming (Egner and Klausen, 1980). Arable farming in particular, is possible due to better soils and relatively higher rainfall as compared with the rest of the country. However, most of the traditional farming in this zone is subsistence and consequently sub-optimal. The close interrelationship between livestock and arable farming in the Study Area can be explained through a diagrammatic model as shown in Figure 2.6B. Like all communal or tribal lands in Botswana, the Mahalapye Agricultural Sub-district had originally been divided into residential areas or villages, communal grazing areas, and, finally, arable lands areas. A village can be defined as a settlement where people engage mainly in subsistence farming as opposed to a town where people engage mainly in manufacturing. Hence a village is sometimes known as an agrotown (Schapera, 1958).

The division of land according to its various uses has been fading away since 1968 when the Land Act was introduced. The Land Act of 1968 transferred

FIGURE 2.6A BOTSWANA AGRICULTURAL ZONES

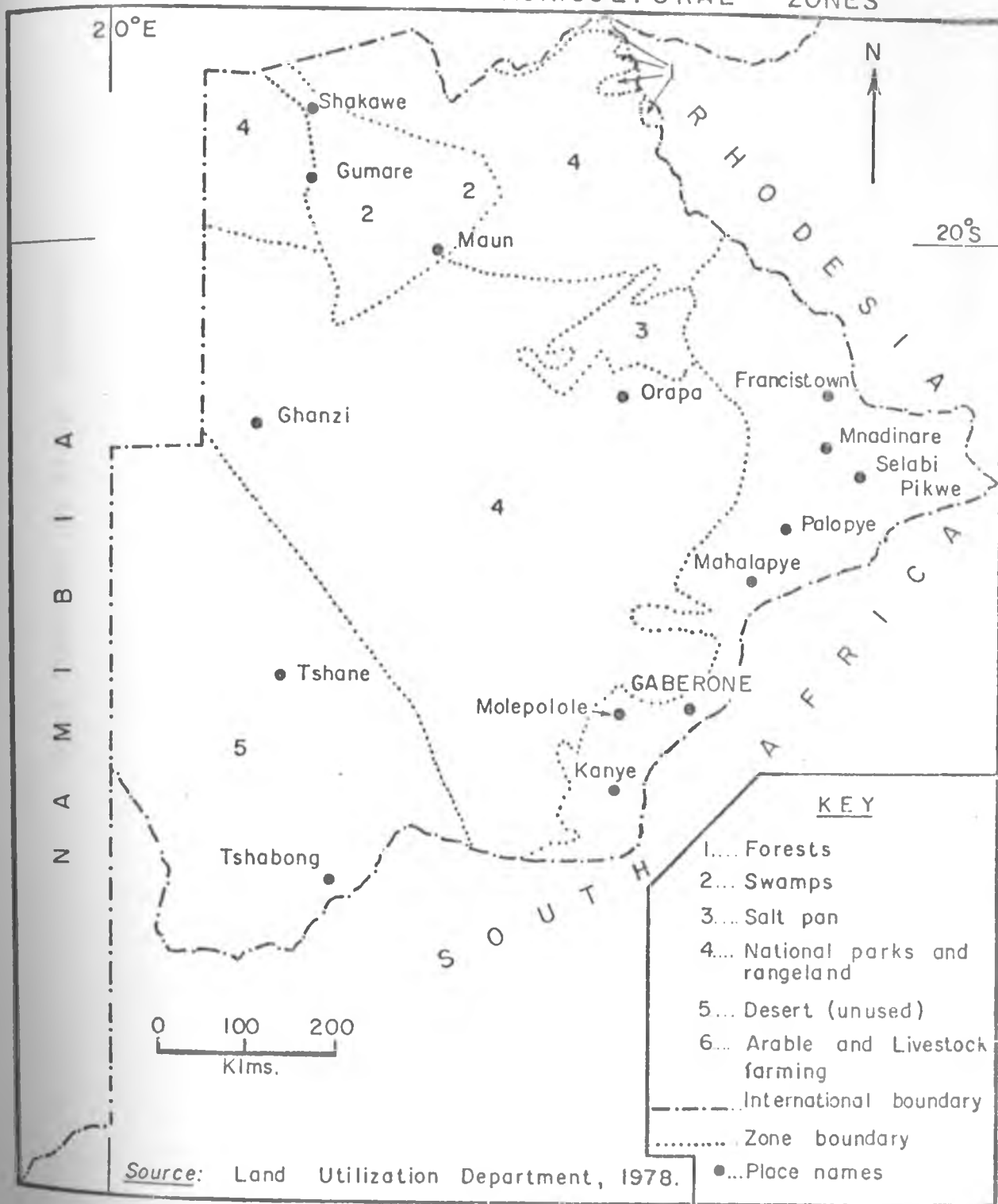
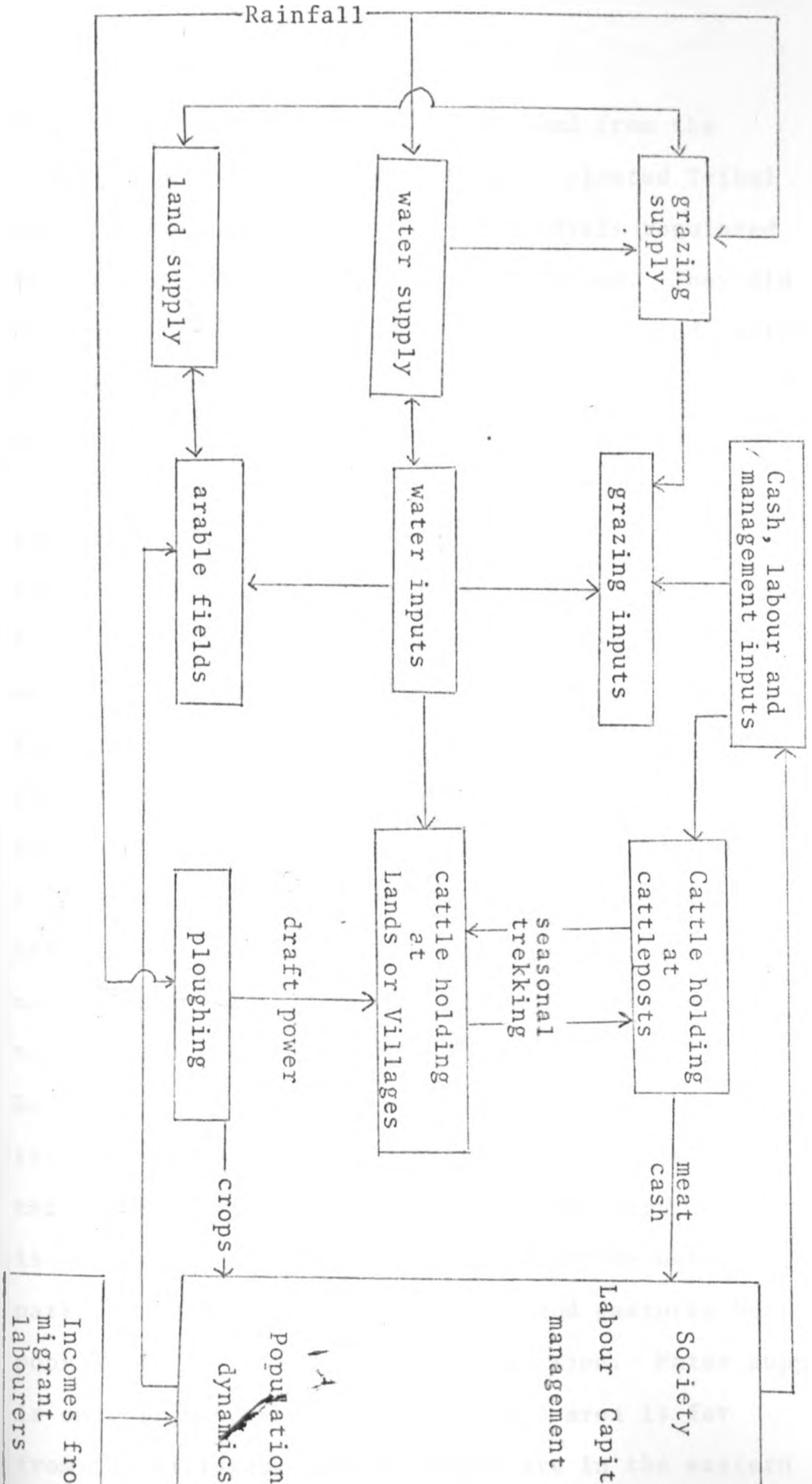


FIGURE 2.6B A MODEL OF CATTLE AND CROP FARMING AND THEIR LINKAGES



Source: Based on Opschoor, 1980.

the authority to allocate tribal land from the tribal chiefs to the democratically elected Tribal Land Boards. Before the Act, the chiefs regulated the economic activity of their tribesmen. They did not allow their tribesmen to live on the land after harvesting the crops. When people finished harvesting their crops they were required to return promptly to the villages and remain there until the chiefs gave them permission to return to their lands when the next ploughing season began. Occasionally they could visit their cattleposts but even then they were not expected to stay there too long. After the Land Act of 1968, farmers are now allowed by the Land Boards to keep their stock on their land and to stay there as long as they wish. Many of them have permanently settled on the arable lands tending both cattle and crops. Consequently it is now not easy to distinguish between the various tribal land use divisions. The only area of Botswana with a single land use activity is part of the western half of the country (Fig. 2.7) where there are very few or no cattle. This part, which is mostly the Kalahari desert, houses the national parks and game reserves. It has good pastures but poor soils to sustain arable production. Water supply is only from boreholes. Since this area is far from the villages, most of which are in the eastern

FIGURE 2.7 DISTRIBUTION OF CATTLE IN BOTSWANA



Source: Field, Potential carrying capacity of Botswana rangeland, 1978.

country, only a few rich farmers keep
e in it. These farmers afford the expenses
rough keeping cattleposts far from their
the tribal lands, most of the cattle
traditional farmers are the local Tswana
cha, 1976). The Tswana type does not
very big animal. Its average mass is
dressed weight, compared with for example,
reed which has an average mass of 250 kg
d weight (Ministry of Agriculture, 1978).
ery few exotic breeds of cattle in the
ibal lands. The Central Statistics
rt of 1978 put their estimate at only 8%
l number of cattle. The Ministry of
has been trying to persuade farmers to
lls of the exotic breeds, especially the
an imported Brahman bulls, in order to
with the local Tswana breed. It has
ered that a cross between a Brahman bull
igenous Tswana cow has a better quality
higher cold dressed weight than an
wana animal, implying more cash per beast
mer if the sale is done directly at
Botswana Meat Commission or the Agricultural
e Societies. The Government has even

a bull subsidy scheme to assist the purchasing exotic bulls for upgrading indigenous breed (Ministry of Agriculture, implementation of this scheme has put some problems to the farmers. The breed is not adapted to the climate of Botswana which is hotter and drier than that of South Africa from where these bulls are imported. Pastures in the communal areas of Botswana are different from those in South Africa. Most of the sweet pastures in Botswana are depleted rapidly after the rains so that cattle have to feed on poor quality pasture during the following rainy season. In South Africa grazing pasture is controlled, the climate is suitable for both arable and livestock farming. There is plenty of water unlike in Botswana where cattle have to walk long distances to the boreholes, rivers to drink. The indigenous Tswana cattle are adapted to the local conditions but the exotic breeds have not. The exotic breeds in Botswana include the Brahman, the Siementaler, and the Tuli. The Tuli originates from southern Zimbabwe and it has adapted to the grazing conditions of Botswana much more than the others, which have been imported from South Africa (Ministry of Agriculture, 1980).

adapted more easily because the climate Zimbabwe is almost the same as that of the other problem with the exotic breeds are more susceptible to cattle diseases of the Tswana type. Cattle disease is one of the major problems in the livestock industry of Zimbabwe especially in the communal areas where the movement of cattle is difficult (Ansell, 1974). The most common cattle diseases are foot and mouth disease, anthrax, quarter evil, tuberculosis and brucellosis (Ministry of Agriculture, 1974). The Government runs a free vaccination programme aimed at the prevention of foot and mouth disease in Zimbabwe since any outbreak of this disease affects the country's earnings of foreign exchange greatly. A cost-benefit analysis of importing exotic breeds of cattle has not been done yet. Therefore it is difficult to say with any measure of certainty that the introduction of exotic breeds is advantageous or disadvantageous to the country as a whole.

The distribution of cattle in the Study Area is similar to that in the rest of the country. This study shows cattle distribution according to sub-districts within Agricultural Zone A. In this table, cattle in Mahalapye can be compared with those in the other sub-districts of the zone.

6. The herdsize section of the table

Table 2.1

Animals and Average Size by Districts and Size of Cattle Holding
- 1980 Agricultural Statistics

SUB-DISTRICTS	Land Area	Cattleposts	Total cattle		Average size of herd	
			Number (000)	Percentage		
Mahalapye	7000 km ²	5,700	31.0	312.0	32.7	54.7
Palapye	6000	3,900	21.2	161.0	16.8	41.3
Serowe	6000	5,100	27.7	285.0	29.8	55.9
Mmadinare	4500	3,700	20.1	198.0	20.7	53.5
TOTAL	23500 km ²	18,400	100.0	956.0	100.0	52.0
<u>HERD SIZE</u>						
1 - 10		2,700	14.8	16.2	1.7	6.0
11 - 20		3,100	16.8	48.6	5.1	15.7
21 - 30		3,100	16.8	80.2	8.5	25.9
31 - 40		2,500	13.6	89.2	9.3	35.7
41 - 50		1,300	7.1	58.6	6.1	45.1

alises the information for all the four
ts, suggests that about half of the total
attleposts have less than 30 head of
. This is a more helpful categorisation
mple arithmetic means shown in the last
he first section of the table. For insta-
rage size of a cattlepost in the Mahalapye
t is shown in the table as 54.7 head of
the Government Report of 1979 by the
logy Unit states that in the Study Area,
households own less than 21 head of cattle
ough and McCarthy (1980) go even further
at 50% of all livestock owners have no
of their own. These farmers without
have very few cattle which do not justify
s of a cattlepost. They share a cattlepost
er who by himself has enough cattle to
attlepost.
mal husbandry standards are generally very
communal lands. The Study Area is no
Low husbandry standards in livestock are
ed by the high mortality rates among the
ne year old calves, leading to slow rates
in head numbers (Cossins, 1980). The
ator of low standards of animal husbandry
pregnancy rates among the cows (Table 2.2).

Table 2.2 CATTLE INVENTORY

Ratio of Births to Cows and Deaths, Sales, Home Slaughter and Purchases to Total Cattle by Districts and Size of Cattle Holding - 1980 Agricultural Statistics

SUB-DISTRICTS	Ratio of Births to Cows	Ratio of Deaths to Total Cattle	Ratio of Sales to Total Cattle	Percentage	Ratio of Home Slaughter to Total Cattle	Ratio of Purchases to Total Cattle
Mahalapye	52.0	10.6	4.2	-	.4	.8
Palapye	50.8	14.9	4.2	-	1.1	.9
Serowe	53.6	14.4	5.4	-	.5	.7
Mmadinare	59.4	13.1	5.9	-	1.0	1.4
TOTAL	55.7	13.0	4.9	-	.7	.9

HERD SIZE

1	10	72.9	37.0	9.3	.6	12.3
11	20	58.9	17.3	6.4	1.6	1.9
21	30	62.8	14.8	4.4	.6	.6
31	40	60.9	16.7	5.0	1.0	1.3

In the traditional set up of communal grazing, herding is often relegated to herders who stay with the cattle in the cattleposts away from home. The herders are only concerned that the cattle have enough grazing and drinking water.

Very little else is done by them to improve cattle management. No culling is practiced. Cows wean naturally, that is, when they are once again pregnant. Where watering points are far, say 10 kilometres, herders normally drive cattle once in two days for watering, yet the Animal Production Research Unit of the Ministry of Agriculture recommends that cattle drink at least twice a day, especially in the areas where grass is insufficient as in those communal areas which are near villages. Conception rates consequently become low amongst the cows. The most limiting nutrients to conception under grazing conditions in Botswana as a whole are stated as phosphorus, crude protein and energy (Ministry of Agriculture, 1977). The problem is that phosphorus is difficult for the small scale farmer to procure since the Botswana Meat Commission, the sole supplier, produces a quantity which is only adequate for 5% of the estimated four million head of cattle. Calf mortality is high partly because the calves are often born during the long dry winter spell when the grass is

scarce. The lactating cows thus do not produce sufficient milk for the calves. The lactating cows at this time are also generally weak physically so that the calves are also often weak so that they succumb easily to diseases. If mating were controlled, calves could be planned for the wet summer spells when the cows could provide sufficient milk for them. Table 3.2 shows the ratios of births to cows, deaths to total cattle numbers, sales to total cattle numbers, home slaughter to total cattle and purchases to total cattle numbers. According to Table 2.2 the calving rate (ratio of births to cows) is around 54% on average in Agricultural Zone No. 6. The Mahalapye Sub-district has a calving rate of 52%. This means that if the cattle ranching conditions were ideal in the study area, the rate of increase in cattle numbers would be almost twice the present rate. Apart from the stated limits which are imposed by the herders on cattle management, water still features as another important constraint on livestock production. Water constitutes 90% of the total mass of young beasts and about 70% of the mass of mature animals (Rose, 1980). There are three sources of water for livestock. There is first the drinking water, secondly the water in the food and thirdly the water produced by the metabolic reactions in the cells (Ibid.).

Early season grass which grows during the rains contains 30% dry matter and 70% water so that an animal consuming 40 kg of this grass would take in 12 kg of dry matter and 28 kg of water. In the dry season (April to October) grass contains only 10% water and 90% dry matter. This means that the bigger proportion of the daily water requirement must be supplied through drinking water. Yet cattle drink more water in summer when the need for it is less (because of fresh grass) and they drink less water in the dry long winter season when the need for it is greater. Wells normally dry up about three months after the rains have stopped. Boreholes normally keep water until the next rainy season. They might dry up if the rainy season is late, and late coming rains are common all over Botswana. When wells dry up, cattle herders drive their stock to dry river beds where they dig for water and water the cattle there until the next rainy season sets in, where upon the herders revert to their former wells for watering livestock. The combination of inadequate water supply and poor pastures also results in high calf mortality rates (shown as the ratios of deaths to total cattle in Table 2.2). With sufficient phosphorus levels, the calving rate increases between 42% and 80% (Ministry of Agriculture, 1977). Although the

Botswana Meat Commission produces phosphorus adequate only for about 5% of the total national herd, it has been discovered that an alternative source of phosphorus might be a mixture of bonemeal and salt in a one to one ratio (Ibid.). The agricultural extension workers are now encouraging livestock farmers to purchase salt and bonemeal for their livestock. The Government makes available small loans to farmers through the National Development Bank to purchase these livestock necessities (National Development Bank Report 1977). It was found during this present research that 19% of the farmers with credit had been granted credit for "livestock feed", which simply means bonemeal and salt, that is, phosphorus.

Table 2.2 also shows that the offtake rate for the agricultural zone No. 6 is 4.9%, the figure that Ryan estimated for traditional farmers of Botswana as far back as 1958 (Chapter One). However, since offtake rate is a measure of the relationship between herdsize and number sold, the percentage could remain the same when actually the volume or total number of cattle sold has increased, depending on the changes in the herd sizes. The ratio of home slaughter to total cattle for the whole area covered by Table 2.2 is small as could be expected. The ~~ratio~~ shows 0.7%, which suggests that

very few cattle indeed are nowadays slaughtered at home for meat. The value of cattle has risen with the rise in cattle sale prices so that farmers are now more reluctant to slaughter them for home needs. The last column, ratio of purchases to total cattle, confirms that cattle being bought by the traditional farmers are very few compared to what they inherit from their parents and relatives. However, there is now a growing tendency by the migrant labourers who work in the South African mines to purchase livestock whenever they return home as Figure 2.6B indicates. Also quite a few young people who are gainfully employed seem to have recently begun to purchase livestock independently of their parents through the National Development Bank loans. It was found during this research that 12% of the farmers with credit are such people.

The lower half of the table shows a breakdown of the information on the upper half according to herd size. As stated before, this portion is a much more helpful reflection of the statistics than the top portion which simply shows the grand averages. The lower part of Table 2.2 first shows that calving rates are highest among the smallest herds, that is, herds with one to ten heads of cattle. These have a calving percentage of 72.9% on the average. The

calving rate declines with growth in herd size per cattlepost. For instance, it can be seen from the table that cattleposts with herds ranging from 101 to 150 beasts have on average calving rate of only 49.6%. This decline in the calving rates with the increase in herdsizes results in part from failure to practice culling. Not all mature cows are reproductive. Farmers are advised by the agricultural demonstrators to remove such cows from their stock in order to raise the calving rates but most of the farmers are reluctant to accept this advice (Doram, et al, 1977) because they are ever optimistic that one day these cows might become pregnant.

Secondly, the lower part of Table 2.2 shows that calf mortality declines with increase in herdsizes. The reason for this is not quite clear. Thirdly, the ratio of sales to total number of cattle seems to confirm the arguments advanced under Chapter one that the traditional farmers keep cattle as a form of bank or insurance. Farmers with more than 150 head of cattle sell only 4.9% of their stock. The reason why the farmers with fewer cattle appear to have a higher offtake than those with more beasts is partly because of the notion of "rate" or "percentage", and partly because in the traditional life styles cash needs in the household do not increase

with the increase in livestock numbers (Ryan, 1958). The same argument explains the trends in the last two columns showing the ratio of home slaughter to total cattle and the ratio of purchases to total cattle.

Table 2.4 shows cattle herd composition for the whole of agricultural zone No. 6. Once again the Mahalapye sub-district can be seen in comparison with the other agricultural sub-districts in Zone No. 6.

An attempt is now made to briefly summarise cattle marketing. Marketing rates are influenced by the needs of the household, the size of cattle herds, the breakdown of the herds, and sometimes the sale prices of the cattle as well (Ansell, 1971). Ryan, however, adds another very important factor or reason for the livestock farmers to sell their animals. He considers that taxes are very important in raising offtake among the farmers (Ryan, 1958). Ryan considers that one reason why freehold farmers sell more cattle than their traditional counterparts is that the former are taxed more fairly than the latter. In Botswana, livestock tax is charged only on cattle and not on goats, sheep, donkeys and horses. Livestock tax is charged according to the number of cattle a

farmer has in a particular year. But before charging any tax on the farmer, the department of taxes first considers the financial inputs the farmer has made on his livestock since the last tax was collected from him. It so happens that sometimes a farmer with quite a big number of cattle might not be charged any tax until he has finished repaying certain loans such as the expenses for drilling a borehole. Perhaps most important is that only the livestock farmers who are selling through the Botswana Meat Commission, the agricultural co-operatives and the Botswana Livestock Development Corporation (i.e. through the channels in the formal sector) may be charged tax on their livestock. These three cattle buying agencies send the receipts of their payments to the department of taxes together with the names and addresses of the farmers. Then the department of taxes follows up these farmers and taxation will be collected in that way. Besides this method, the department of taxes has no other means of collecting cattle taxes from the traditional farmers. Consequently, all farmers who sell through auctioneers, speculators and butcheries do not pay cattle tax. Ryan feels that if all the cattle producers were charged tax, they would be compelled to sell more livestock in order to pay

up the cattle tax. Thus he considers that the relatively higher offtake rate on the freehold farms is not merely a pointer to the fact that these farmers are commercial but also that it is the result of a heavier taxation system on them. The marketing channels which are open to the livestock producers in the Mahalapye Sub-district are many, thus ensuring to some extent that the producer benefits from the competitive system of buying livestock. Farmers can sell their cattle direct to the local butcheries, cattle auctioneers, cattle traders, the Botswana Meat Commission and the agricultural co-operatives. The Botswana Livestock Development Corporation is not operative in the Mahalapye agricultural sub district. The corporation only serves the country's remote areas in the northwest where farmers face problems of distance in selling their stock. However, it was discovered during the field work that some farmers are not aware of all the possibilities for selling livestock which are open to them. 8% of the farmers were not aware of the agricultural co-operative as a cattle marketing agency, despite the fact that it is now being used by the majority of the farmers in this area as Table 2.3 shows. Of the interviewed farmers, 10% did not know the correct procedure for dealing

Table 2.3 Livestock Marketing In Mahalapye

a) Mahalapye Co-op Society

Year	No. of cattle loaded	Average price per beast	No. of farmers
1976	1232	P 163	329
1977	1448	164	330
1978	811	133	414
1979	2266	165	533
* 1980	868	162	568
* up to July			

b) Auctioneers and Traders combined

Year	No. of cattle loaded	Average price per beast	No. of farmers
1976	9321	P 109	926
1977	10454	135	1015
1978	7441	127	826
1979	6998	131	538
* 1980	4496	158	478
* up to July			

c) Sales To The Local Butcheries

Year	No. of cattle loaded	Average price per beast	No. of farmers
1976	1121	P 95	179
1977	1024	100	192
1978	1319	122	213
1979	1394	131	206
* 1980	1501	136	230

Source: Mahalapye Co-operative Society Records, 1980.

directly with the largest cattle buying body, the Botswana Meat Commission. Thus the majority of the traditional livestock farmers have for a long time been selling through the auctioneers and the cattle dealers who have certainly exploited the ignorance of these farmers (McDonald, 1978).

Table 2.3 shows how the livestock farmers of the study area dispose of their cattle. This table does not show any sales to the Botswana Meat Commission because it is concerned with showing only the direct sales to the buying agencies. Farmers in the Mahalapye agricultural sub-district do not generally sell directly to the Meat Commission, rather, they sell to the agencies shown in Table 2.3. The co-operative society, auctioneers and the cattle traders in turn sell directly to the Botswana Meat Commission. It can be seen from Table 2.3 that the agricultural co-operative marketing society is fast taking over the business of livestock purchasing and selling from the speculators. This is the result of successful extension work by the agricultural demonstrators who are rigorously encouraging livestock producers to sell through the government parastatals, namely the Botswana Meat Commission and the agricultural co-operative society. The Government feels that the

auctioneers and the cattle traders exploit the farmers but the Government does not wish to use legislative means to stop cattle auctioneering and trading since the auctioneers and the traders are entitled to their businesses. The Government is trying to persuade the farmers to sell their livestock to the parastatal agencies since these are more fair with the producers and their buying policies are supervised closely by the Government. The Government has no say in the way the totally independent livestock buying agencies conduct their business.

The final section of this chapter will deal with arable agriculture in the study area. Since arable agriculture is not the primary question into which this study is enquiring, it will be dealt with more briefly than livestock farming. Generally speaking, the farmers with many head of cattle also possess larger acreages of arable fields (Rural Income Distribution Survey, 1974). Farmers with fewer cattle generally have smaller acreages of arable lands. This is largely consequent upon the chiefly system of allocating lands which obtained until 1968. The chiefs always rationalised that a poor man with a few or no cattle could not fully utilize a large piece of arable land. The Land

ve not changed this system either. A
mply applies for a specific size of arable
in what was previously designated as
nds areas. The Land Board will then assess
nic means of the farmer and only allocate
rea of land which they feel he can fully
ough arable land is at the moment adequate
esidents of the Study Area requiring it,
rming has very low returns in the communal
eas. This is due to a number of reasons
lude inadequate rainfall, poor farming
lack of capital by the farmers to purchase
rs, late ploughing and planting due to lack
t power, and, the divided attention between
tending and arable farming among households
headed by women. Table 2.4 shows the
rom arable agriculture in the Study Area
e study period. The success of crops in
depends partly on the rainfall of the
year since planting is done during the
nths of November to January, which are
wettest months of the year. Like cattle-
e smaller arable fields are nearest to
ges-while the larger ones are farther away
villages. The reason is the same as the

Table 2.4 Financial Returns From Arable Agriculture -
Mahalapye Agricultural Sub-District

Year	Rainfall (mm)	Average crop value per arable field	No. of arable fields	Total value of crops	% of National Crop produce
1974/75	96.32	PULA 401-00	1950	PULA 781950	13.54
1975/76	151.00	399-00	1997	796803	14.32
1976/77	92.62	415-00	1909	792235	11.49
1977/78	133.85	478-00	2148	1026744	12.66
1978/79	66.92	311-00	1832	569752	14.90

Source: Rainfall: Botswana Meteorological Services, 1981.

Crop

Statistical Bureau of Botswana, Agricultural and Crop Survey, Agricultural and Crop Survey, Agricultural and Crop Survey

attleposts, that is, farmers with fields can afford the travel costs of arable lands.

In conclusion, an attempt will now be made to compare both livestock and arable farming employment in the Study Area.

The village has 14 000 people while the rural sub-district has a total of 140 000 (Central Statistics Office, 1978).

Only 10% of the population are employed gainfully, outside of formal employment. Only 10% of the population employed formally are only 10% of the population (Ibid.).

Of the population employed formally, 20% is 20%. These include agricultural officers, veterinary officers, agricultural officers, veterinary officers, forest workers. The larger part of the population constitute family labour for independence the family labour contributes about 90% of total agricultural labour.

With employment increasing in the Government sectors, this figure has risen to 20%. Livestock farming contributes about 80% of total agricultural output in this area compared with 80% for the whole country (Machacha, 1978).

Due to the strong rural-urban migration of young people, the number of leavers in the study area as well

er rural areas of Botswana, the
family labour that is involved in
s likely to remain the same for quite
his is partly because of the growing
in the industrial towns of the country.
ng the fact that mining has overtaken
the contribution to the GDP in Botswana,
l continue for a long time to dominate
sectors or activities in generating

CHAPTER THREE

METHODOLOGY

Sample Frame

Field work commenced on the first of November, 1980, and ended on the 30th of January, 1981. The Study Area had a total of 140 boreholes with water and 11 boreholes which had dried up at the time of field work. The dry boreholes had silted over the years and they needed to be rebored before they could once again reach the water table. In order to interview 50 farmers without credit, multiple stage random sampling was applied. The first stage was to use the table of random numbers to select 14 boreholes (i.e. 10% of the total with water) from a total of 140 boreholes. The map supplied by the Department of Land Utilisation (Fig. 2.4) shows the positions of the boreholes. Each borehole serves not more than 10 cattleposts, according to the directive from the Department of Land Utilisation. The total number of farmers in the study area is therefore estimated at 1400. From the 14 boreholes selected, a total of 134 cattleposts were registered. The second stage

of sampling randomly selected 50 farmers who had not received any credit out of a sub-total of 134 farmers. The National Development Bank office in Mahalapye (the study area village) had a list of farmers who had received agricultural credit in the study area. This list had a total of 404 names from which 50 were selected with the use of random sampling. However, some of the farmers had received loans for arable agriculture but because of the strong inter-relationship between livestock farming and arable agriculture, both groups had to be included with equal chance in the sample.

The data collected covered the years 1975 to 1980. Since the data was mostly based on the memory of each farmer, it was felt that a longer period could blur the memory of the respondents since they do not keep records of livestock numbers and transactions.

Methods of data collection

Secondary data

The first stage of data collection was to discuss the topic thoroughly with the officers of the National Development Bank in their main office in Gaborone, the capital town of the country. The topic

was also discussed with the officers of the relevant departments in the Ministry of Agriculture headquarters. In this way, secondary data in the form of cattle sales, prices, marketing and distribution of livestock throughout the country was collected for the whole country in general. Following from this, the next stage was to re-discuss the same issues with the officers at the local branch of the National Development Bank and the local officers of the Ministry of Agriculture in the study area. In the study area, the Agricultural Co-operative marketing society, butcheries, auctioneers and private livestock agencies normally bought cattle from the farmers and then re-sold them to the Botswana Meat Commission in Lobatse, some 300 km to the South of Mahalapye along the railway line (Fig. 2.1).

It was felt that the archival information received from the National Development Bank headquarters and the ministry of Agriculture was sufficient to show the trend of cattle sales from the small scale traditional farmers everywhere around the country to the Botswana Meat Commission. Consequently, no study tour was made to the Botswana Meat Commission. The Department of Meteorology was briefly visited in order to obtain the rainfall figures from 1974 to 1980, showing trends in the study area and the

national averages. Most of the desk research was done at the National Institute for Research, Gaborone. This Research Institute has a documentation library which keeps research works on development in the country.

Primary Data

Primary data collection was accomplished with the assistance of the field officers of the National Development Bank and the agricultural demonstrators from the local offices of the Ministry of Agriculture. Being based in the study area, these field officers and agricultural demonstrators had a lot of practical knowledge on the farmers and farming in general as well as on the socio-economic activities and trends in the study area.

Two recording schedules were used to collect data. One recording schedule was used to collect data from the traditional farmers. This schedule was administered personally and the responses were recorded by the researcher. The recording schedules were written in English but the questions were asked in vernacular.

Another recording schedule was prepared specially for the National Development Bank. The National Development Bank is the only government institution

that gives credit to traditional farmers operating on communal grazing areas. The commercial banks lend only to ranchers because these have title deeds to their farms. The purpose of questioning the National Development Bank was to cross check the correctness of the responses by the traditional farmers as well as to obtain extra information which would be useful to the research but might not have been extracted from the farmers.

A vehicle was used to administer the questionnaires. The researcher was accompanied during field work by four agricultural demonstrators and one officer from the National Development Bank. The two recording schedules used for collecting data appear in the Appendix of this thesis.

Data Processing (Preparation)

One of the major requirements of multiple regression analysis is that the data should be normally distributed. There are two principal methods of checking data distribution. First, there is the statistical and secondly the graphical method. Both methods were used to test the distributions of all data used in this analysis.

Normally, statistics shows that a perfectly normal

distribution has a kurtosis of 3.00 and a skewness of 0.00 (Ebdon, 1977; Blalock, 1962). However, the formula used by the Statistical Package for Social Scientists (SPSS) produces 0.00 for the kurtosis and 0.00 for the skewness of normally distributed data. Data used in this thesis was analysed by the SPSS computer package. The graphical method of checking the normality of data distribution employs the use of histograms in order to allow for a visual impression of the distribution curve. When the two tests for normality of distribution were applied on the data one variable, "other income", was found to be not normally distributed. This probably meant that the sizes of incomes that the farmers received apart from livestock were highly variable such that they had no definite pattern. The distribution of this variable was normalised through the use of its square roots. Thus only one transformation was applied to the sets of the data collected from the field i.e. primary data. All the data (raw and transformed) appears in the Appendix of this thesis.

Cattle sale prices in most cattle markets rose between 1975 and 1980 as chapter six shows. Credit also rose in the same period. After normalising the data, it was therefore necessary to detrend all cattle sale prices and all credit figures to the

year 1974. The year 1974 was used as the base year in the thesis. This detrending of prices and credit values removed the effect of inflation on the figures so that what was used in the data analysis was therefore the real cattle sale prices and the real value of credit. Figures showing the cost of living indices were supplied by the Central Bank of Botswana and used to detrend prices and credit values. The table showing the cost of living indices between 1974 and 1980 appears in the Appendix of this thesis.

According to Dinwiddy, Elementary Mathematics for Economists (1966), detrended price = $\frac{\text{price}}{\text{cost of living index}} \times 100$

The 100 in the above formula is the base year; price is the actual price the beast fetched on sale; the cost of living index is for the particular year of transaction. The same formula was used to detrend credit values. In the credit detrending formula, price had to be replaced by credit. The year of transaction was the year the credit was given to the farmer. Cattle sale prices and credit values which appear with the rest of the variables in the Appendix are therefore the detrended ones.

Methods of data Analysis

In order to test the two hypotheses proposed under theoretical framework, a production function and a response (supply) function were used separately. Both of these functions were multiple regression equations. These two functions are based on a number of studies carried out in a number of countries, all of them dealing with the response of traditional livestock farmers to cattle sale prices.

Doram, et al. (1979) used multiple regression analysis to study cattle as a store of wealth in Swaziland. Their dependent variable was the offtake rate while their independent variables were rainfall and cattle prices. Their multiple regression model covered a period of 24 years, from 1952 to 1976. The present study could not cover such a long period since the regression variables used in it such as herd size and other income could not be easily remembered by the respondents to recording schedules beyond five years.

Khalifa and Simpson (1972) also used linear multiple regression analysis to inquire into cattle supply from nomadic societies into markets in the Sudan. They too used the same variables (dependent and independent) as Doram, Low and Kemp. But their

research covered only 10 years, 1961 to 1971.

Ngumi (1976) worked out a statistical model for beef supply in Kenya among the traditional cattle producers in Narok District. He too used multiple regression analysis. The International Livestock Centre for Africa (ILCA) developed a mathematical model of livestock production in conjunction with the Texas A and M university. This method does not use multiple regression. It mainly contrasts cattle production on privately owned ranches with cattle production on communal grazing areas. The model was first introduced into Botswana in 1978 and it has ever since been applied in the country on annual basis. Most important, the model has shown that calving rates (number of breeding female animals divided by the number of lactating calves) reveal the strength or effect of rainfall and pasture conditions on cattle production.

The major problem of the multiple regression model is that the independent variables must be independently observed and not estimated by extrapolation. Traditional farmers, being predominantly illiterate, do not keep records of cattle numbers, births, deaths, sales, on annual basis. For those farmers with credit, this problem did not arise because the National Development Bank kept records

of the herd sizes and composition for every farmer from the time the loan was granted. Therefore in an attempt to solve the problem of poor memory among those farmers without credit, younger members of the same family were requested to remind their elders as the latter were being interviewed. The younger members of the family were school goers and customarily they are very interested in the numbers of their parents' cattle. They can remember when each beast was born or bought as long as they were old enough at that time. The farmers without credit also had relatively fewer cattle than those farmers who received credit. Remembering the herd number and composition was therefore not much of a problem to both the elderly and the younger people.

It was felt that in Botswana the question of cattle supply and indeed that of cattle production is part of the total life of the farmers. The works by the researchers who have been recently cited were therefore modified in such a way as to make the regression models more meaningful. Each of the two functions used in this inquiry had four independent variables as follows:

i. The Production Function

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 \sqrt{X_3} - b_4 X_4 + e,$$

where

Y = herds size or number of cattle in a cattlepost

b_0 = the constant, sometimes shown as A,

X_1 = the amount of credit the farmer has received

X_2 = calving rate of the farmer's herd

X_3 = the other income the farmer earns annually

X_4 = the farmer's immediate needs*

b_1 to b_4 = slopes or regression coefficients

e = the error term.

ii. The Response Function

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 \sqrt{X_3} - b_4 X_4 + e,$$

where

Y = offtake rate i.e. number of cattle sold as a percentage of the total herd size

b_0 = the constant (A)

X_1 = price of one beast

X_2 = herd size or number of cattle in a
cattlepost

X_3 = the other income the farmer earns
annually

X_4 = the farmer's immediate needs*

b_1 to b_4 = slopes or regression coefficients

e = the error term

(* farmer's financial obligations for one year,
caucultated from recording schedule).

In this form, it was felt that the multiple regression analysis would be suitable for testing the two hypothesis of this research. The first hypothesis would be tested directly and comprehensively by the two functions. The results of the analysis of these two functions would lay a base for testing the second hypothesis. In other words this research uses multiple regression technique only as the main tool for investigation. Partial correlations, tables and secondary data are also used to support the multiple regression, especially in testing the second hypothesis. The significance level used for tests is 0.05 (95%).

Expected Achievements of the two functions used
in this model

Since the two equations used in this research are multiple regressions, it is now timely to explain the main features of regression analysis. Essentially, the regression technique is designed to establish the trend or pattern that an activity takes. However, before even attempting to describe the pattern or trend in question, it is necessary first to measure the relationship or association between the components of the activity. In statistical language this measure of relationship would be termed the correlation between the dependent variable and the independent variable(s). After measuring the correlation between the independent and the dependent variables, the variables are then regressed in such a way as to predict the dependent variable from the independent ones. Regression analysis therefore results in a prediction equation. In the Production Function used in this study, for instance, the main purpose is to determine the trend that the independent variables take or follow in order to produce a certain or required number of cattle. In the Response Function, the main purpose is to determine the trend followed by the independent variables

in order for the farmer to sell any amount of cattle that the researcher may choose.

Multiple regression can be explained as the path that the dependent variable takes through the means of the independent variables, resulting in the calculation of the coefficient of multiple determination (multiple R square). The coefficient of multiple determination measures the percentage or proportion of the total variation explained by the independent variables acting together (Blalock, 1962). The implication of this statement is that for each of the two functions used in this thesis, the multiple R square must be at least more than 50% in order for the regression analysis to explain the research problem adequately.

Another important component of multiple regression analysis is the regression coefficient which measures the gradient of any variable. The regression coefficient, also known as the B or the Beta coefficient, is also a measure of elasticity for the variable concerned. There is a notable difference between the B and the Beta coefficients. B is the normal regression coefficient used with a constant in the equation. Beta is the regression coefficient without the constant, i.e. it assumes the constant to be zero. Beta is therefore a weigh-

ted B such that $Beta = B(\frac{s_i}{s_y})$, where s_i = the standard deviation of the independent variable, and s_y = the standard deviation of the dependent variable. The regression coefficients (B or Beta) are uniquely determined if there is no multicollinearity. Multicollinearity refers to a situation in which some or all of the independent variables are highly inter-correlated. Multicollinearity also means that the regression coefficients will fluctuate markedly if a different sample is used from the Study Area (SPSS Manual). If the coefficient of regression has a negative sign for any variable in, for instance, the Response Function, then the response will be variable inelastic i.e. if the variable is price, then the response (the supply) will be negatively price elastic. Price would therefore have an inverse influence on the response or the supply of cattle. Another useful aspect of elasticity comes in when there is a need to adjust one item by another with which it is acting to produce the gradient. For instance, in the Response Function, the elasticity of response would show the percentage change in off-take, resulting from 1% increase in any of the independent variables with which offtake would make a gradient when the other independent variables are held constant.

Finally in the discussion of the expectations from the two multiple regression functions, a more thorough explanation of correlations will now be attempted. The issue of correlation arises partly because the researcher may want to establish cause and effect. Having noted that simple correlation measures the association or strength and direction of relationship between the dependent and the independent variables, it must now be acknowledged that partial correlation is more important than simple correlation in analysing cause and effect. Simple correlation, also known as zero order correlation or the sample linear correlation, assumes a linear relationship between the variables being correlated (Steel and Torrie, 1960). This implies that if the relation between the variables is not linear but curvilinear, simple correlation cannot detect its strength. The simple correlation coefficient will tend to be small yet the actual association could be very strong and significant.

Partial correlation comes in when there are more than one independent variables to be correlated with the dependent one. It uncovers spurious relationships between variables and it also locates the intervening variables in the sequence of causation. It can therefore be used to infer. Spurious correlation occurs

when a variable A is being correlated with another variable B when in fact there is another variable C which is not in the equation at that moment, yet it is the true predictor of B. It might be found out that there is a strong correlation between A and B but that once C is controlled B no longer varies with A. This would mean that the apparently strong correlation between the variables A and B is spurious (SPSS manual, 1971). By computing the first and second order partials (i.e. controlling for one and two variables respectively), the researcher can find the effects of the combined action of the spuriousness and also locate the most contaminating variable. Because it deals with only two variables, zero order or total correlation cannot carry out these tasks. Hence it cannot be used to infer. Partial correlation further exposes the intervening or linking variable in a sequence of causality. A researcher might wish to find out whether or not any three variables A, B and C follow each other in the normal alphabetical order or in a different way, say C, A, B or B, A, C in their magnitude of influence on an outcome. This fact will be especially important when the order of the variables used in the regression functions of this thesis will be determined in the subsequent chapters.

When theory suggests the existence of a positive relationship but the correlation coefficient (zero order) fails to show it, there is reason to suspect that there is a variable or variables which suppress the expected relationship i.e. variable A shows no relationship to variable B because variable A is negatively related to variable C which in turn is positively related to variable B (Ibid.). Thus, partial correlation procedure now arms the researcher with a useful tool to infer from the data.

As can be deduced from the foregoing explanations, regression analysis cannot be discussed independently of correlation, simple and partial. The two are statistically intertwined such that the products of the regression coefficients form the square of the correlation coefficient. To put it another way, the correlation coefficient is the square root of the product of the regression coefficients or their geometric means (Steel and Torrie, 1960).

The notion of the coefficient of determination (R^2) has been explained as the measure of the total variation in the dependent variable accounted for by the regression equation. The coefficient of non-determination, $(1-R^2)$, also known as K^2 , is the unexplained proportion of the total sum of squares, or the variation in the dependent variable unaccounted for by the regression

equation. The coefficient of non-determination is usually the basis of the error term (Fisher, 1971). The K^2 must be less than 50% in order for the regression analysis to be deemed a satisfactory explanation for the problem being investigated. The two multiple regression functions used in this thesis will be analysed or interpreted in this light. It is important also to stress that correlation is used to test the null hypotheses of the regression equation. There are two major null hypotheses that regression equations posit. The first one is that there is no linear relationship between a dependent variable and a set of independent variables. The second hypothesis is that a particular independent variable has no linear effect on the dependent variable once the effects of other independent variables are adjusted for (Ibid.). As can be readily noticed, these two hypotheses both require correlation tests. The tests will be applied in the succeeding chapters where results are given after the analysis is shown.

Actual Computer Analysis

The data used in this thesis covers a period of five years, from 1975 to 1979 as the recording schedule clearly shows. Each one of the 100

farmers interviewed gave information covering a period of five years. Consequently, there were five columns of data, each column for each variable, as given in Appendix A. Each column was the average for the five year period for that particular variable.

Data had been recorded separately for farmers with credit and for farmers without credit. Thus for every variable there were 50 observations for farmers with credit and another 50 observations for those farmers who had not received any credit. The exception was with the variable "credit". This variable was recorded only among the farmers who had received loans. Where bonemeal, cattle feed or salt had been supplied as a loan, the monetary equivalent was recorded.

For each of the two regression equations (Production and Response) there were two computer runs, one run for the farmers with credit and another for those without credit (i.e. a total of four runs). The preliminary results were very poor for all the four runs. None of the runs had an R^2 exceeding 8%. In other words the multiple regression functions had at best accounted for only 8% of the total variation in the dependent variable. In effect, the equations were answering at best only 8% of the research question. The zero order correlations were insignificant while

the regression coefficients showed no slopes, implying that no elasticities could be determined from the equations.

The poor preliminary results were attributed to the fact that the runs were separate for farmers with credit and for those farmers without credit. This separation of the farmers actually meant that the interrelations between the farmers with credit and those without it were not surfacing.

The Students T test was used to examine the differences between every pair of each variable between the two groups of farmers. The test revealed that the differences were real and significant at the 0.05 significance level. The results of the T test appear in the Appendix.

The interpretation of the significance of the differences in the variables was that the farmers with credit were living a different life from those without credit. Hence nothing meaningful could be deduced from regression runs which separated the two groups of farmers. Following from this finding, it was decided that the two sets of data for each function (i.e. the data for farmers with credit, and the data for the farmers without credit) be combined into one function mixing the two groups of farmers. Thus instead of the original four functions there were now only two.

Random sampling was applied to select 25 farmers with credit and another 25 without credit for each of the two functions.

The data was then fed into the computer in the format given in Appendix A. The data was analysed by the Statistical Package For Social Scientists (SPSS) computer package. After the matrices of partial correlations had been printed out, the two final functions had to be run once more, but now according to the sequence of the variables following the sizes of the third order partial correlations.

Format of the results

The regression analysis results can either come out stepwise or optimally, depending on the instruction the computer is given. Stepwise multiple regression gives the results step by step i.e. one variable at a time, controlling for all the others, then two variables and then three in that manner until all the variables come out at once in the final step. The optimal method, on the other hand, simply gives out all the variables at once. In other words optimal regression results are like the final step of the stepwise method.

Step wise Method. Format of the results

Dependent variable (Y)

Variable(s) entered on step (i)

Multiple R..... ANOVA

R square D.F.

Standard Error F

B

Beta

Standard error

F

Constant (A)

Optimal Method. Format of the results

Summary Table

Dependent variable (Y) D.F.

Independent Variables	R ² change	B	Beta	Std. Error B	F	R ²
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X₁

X₂

⋮

X_n

(Constant)

Durbin Watson Test.....

Finally, it is in order to sound at this juncture, a word of warning from other researchers. It is now clear that this research is mostly statistical or quantitative. The comments of Slater and Blalock on quantitative approach to research in Geography are most pertinent:

"With post-war improvements in computer technology, and the availability of increasingly sophisticated electronic computers, the foundations were laid for a cumulatively complex analysis of data. Accordingly, one of the fundamental aspects of the "New Geography" born out of the quantitative revolution, was the use of more and more rigorous techniques of spatial analysis which developed at a pace more-or-less commensurate with the expanded supply of data. There has been a marked tendency towards making the collection of data, measurement, prediction and so on, the central objective of research. Thus, instead of concentrating on the theoretical issues embedded in any substantive attempt at explanation of social reality, relative sophistication in the measurement and description of a set of abstracted relation-

ships has tended to become the major gauge of scientific worth. In the spheres of New Geography, particular variables have been torn out of their context and analysed in isolation from the social totality of which they are only a part" (Slater, 1977).

Slater concludes by saying that the most important thing is to understand the social processes acting upon people in their specific historical and political-economic context (Ibid.).

Another equally useful warning has been sounded by Blalock: "A very real gap exists between the theoretical language used for thinking and the operational language used for testing hypotheses" (Blalock, 1972).

The remarks of both Slater and Blalock will not be interpreted here to mean that quantitative analysis is purposeless. Rather, the remarks will be understood to mean that qualitative approach to research is also vital in solving research problems, especially within the context of peasant communities. Quantitative research is complimentary to qualitative research and neither can substitute the other. Nevertheless, the justification for using the quantitative approach is the fact that qualitative approaches to the question of response are not yet fully developed. However, the

remarks of Slater and Blalock will be taken into consideration in the analysis of the multiple regression functions.

CHAPTER FOUR

THE EFFECT OF CREDIT ON CATTLE PRODUCTION AND OFFTAKE

The purpose of this chapter is to test the first one of the two hypotheses. Briefly put, this hypothesis proposes that whereas agricultural credit to small scale traditional farmers might increase livestock production in terms of cattle numbers, the credit is not likely to raise offtake rates because farmers do not respond to price incentives. This hypothesis covers the first three research objectives of this study. In summary form, these objectives are firstly to study the response to price by small scale traditional livestock herders, secondly, to investigate the effect of credit on cattle production rates among these people and, thirdly, to investigate the effect of credit on the marketing of cattle amongst these traditional farmers.

While it might appear more appropriate to treat the three objectives as three different chapters, it must be recognised that these objectives are very much interrelated in terms of analysis and interpretation so much so that it is only realistic to treat them in the light of the hypothesis that summarises them. Any attempt to present these objectives as

separate chapters would make this study too repetitive and thus unnecessarily long since the multiple regression variables are almost the same for the two functions which analyse the data in order to test this hypothesis. Even more important than the change of the variables is the trend of the variables in terms of interrelationships between them as well as the sequence they take as they give rise to cause and effect. For instance credit could increase the number of cattle (which is the dependent variable in the Production Function). The number of cattle could also raise offtake (the dependent variable in the Response Function). It is therefore not practicable to meaningfully interpret the two regression equations independently of each other. However, initial interpretation will be done separately for each of the two equations. An attempt will be made to avoid unnecessary repetition in this chapter of the general remarks made in the preceding chapters. Notwithstanding the last statement, references will be made to the material of the foregoing chapters as and when the need arises. The main focus of this chapter will be on data interpretation. Regressing the number of cattle with the independent variables (step wise), the following results were obtained.

Variable entered on Step Number 1 Credit

Multiple R = 0.69818 F = 45.652
R Square = 0.48746 D.F.= 1,48
Std. Error = 12.99889 Critical F at 0.05
sig. level = 4.04

<u>Variable</u>	<u>B</u>	<u>Beta</u>	<u>Std Error B</u>	<u>F</u>
Credit	0.02685	0.69818	0.00397	45.652
(Constant)	31.04091		2.49715	154.519

t values (credit) t calculated (0.99) critical t (1.66)
at 0.05.

From the results of Step Number 1, it appears that credit makes a sizeable contribution towards explaining the variation in the number of cattle accounted for by the independent variables. By itself, credit accounts for 48.75% or 49% of the total possible variation in the dependent variable (number of cattle).

Since the critical F (4.08) is smaller than the observed F (45.652), the multiple R (0.69818) is significant at the 0.05 significant level. It is likely therefore that among the farmers in the study area (i.e. among the farmers outside the sample also) credit

accounts for about 49% of the number of cattle a farmer has, on average.

In considering the elasticities of the regression variables or the regression coefficients, it should be recalled that B has a constant while Beta does not. Since the constant (A) in step number 1 is 31, it is not easy to make credit - number of cattle predictions for farmers with less than this constant. The Beta coefficient would be preferable since it assumes a constant (A) of zero. However if the absolute number of cattle brought about by controls in the elasticities is wanted, then the B coefficient is preferable.

In the first step of the regression equation, Beta is 0.69818. This means that if credit (X_1) is increased 10%, the number of cattle would be expected to rise by 6,9818%, i.e. $\hat{Y} = 0.69818X_1$. Using the B coefficient to get the real figures, it would be noted that if credit is increased 10%, then the number of cattle would increase approximately by $31.04091 + 10 (0.02685)$ which is 31.30941. Since the standard error of B is given as 2.49715, the number of cattle would be 31.30941 ± 2.49715 . In the first step, the other independent variables are being controlled, hence the B and Beta coefficients are partials. These coefficients were significant as the ~~t~~ value shows.

account for 54.913% of the variation in "number of cattle". It would be in order now to introduce the notion of R square change. R square change is simply the difference between the R square figures in any two different steps. Between step number one and step number two, R square has changed by $0.54913 - 0.48746$ or 0.06167 . Thus the variable "other income" has added only 6.167% to the explanation of the variation in the number of cattle. Compared with credit, other income makes a very much less contribution to variation in cattle numbers. This is further corroborated by the Beta coefficient which is 0.62654 for credit and only 0.25846 for "other income".

Due to the combined action of "credit" and "other income" the B and Beta coefficients have slightly reduced between step number one and step number two.

The multiple regression equation now becomes

$$\hat{Y} = 0.62654X_1 + 0.25846X_2 \text{ when using the Beta coefficients.}$$

The combined effects of partial regression coefficients are additive. Consequently a unit increase in X_1 and another unit increase in X_2 would change Y by $(B_1 + B_2)$.

Using the B coefficients, the multiple regression equation becomes $\hat{Y} = 23.46 + 0.02409X_1 + 0.35601X_2$.

Considering that some small scale traditional farmers have even less than 10 head of cattle, the B coefficient regression formula once more proves inappropriate for

variation in number of cattle by 2.901%. In the Production Function, therefore, the immediate needs of the farmers do not apparently have a strong influence. The equally small Beta coefficient (0.25056) seems to support this finding.

The multiple regression now becomes $\hat{Y} = 0.43702X_1 + 0.28622X_2 + 0.25056X_3$.

The regression coefficient (Beta) for "credit" keeps dwindling in size as more variables enter the regression equation. The regression coefficient for "other income" has risen with the introduction of the variable "immediate needs" into the equation. These changes are attributable to the relationships between the independent variables as will be demonstrated in the interpretation of partial correlations later on in this chapter. The constant (A or b_0) for the B coefficients acting together has changed greatly from 23.46259 in step number two to 1.61146 in step number three. It will be noted also that the standard error (B) has changed from 4.21027 in step number two to 14.23059 in step number three. Consequently the overall change in the constant is not as big as it appears because while it is 1.61146 in step three, the margin of error (which shows the range of fluctuation) is now very large (14.23059) compared to what it was (4.21027) in the second step. A larger standard error indicates that prediction is now less controllable because the

The noticeable difference between steps three and four is the negative sign of the regression coefficient for the variable "calving rate". The absolute value of B is very large in comparison with other B's. On the other hand, the absolute value of the Beta coefficient for this variable is the smallest in the whole equation. The use of partial correlations will shed some light on this variable. However, one important observation is that this variable also has the least influence on the number of cattle. It introduces an R square change only 0.00043 or 0.043%, thus explaining virtually nothing in the variation of the dependent variable. To conclude the analysis and interpretation of the Production Function, the summary table is being presented.

Table 4.1

Summary Table For the Production Function

Dependent VariableNumber of Cattle

Variables	Simple r	R square	R square change	B	Beta
CRED	0.69818	0.48746	0.48746	0.01682	0.43744
OINC	0.43213	0.54913	0.06167	0.40243	0.29216
IMND	0.59599	0.57814	0.02901	0.02557	0.25869
CRTE	0.30992	0.057857	0.00043	-3.44996	-0.02345
(CONT.)				2.27086	

The conclusions to be drawn from the analysis of the Production Function will be reserved until the partial correlations have been interpreted.

An attempt will now be made to interpret the partial correlations. The simple correlation between "number of cattle" and "calving rates" is 0.30992 but the partials are as follows:-

$r_{12.3} = 0.071$	$r_{12.34} = -0.024$	$r_{12.345} = -0.032$
$r_{12.4} = 0.109$	$r_{12.35} = 0.035$	
$r_{12.5} = 0.108$	$r_{12.45} = 0.072$	

where, 1 = number of cattle, NCTE
2 = calving rate, CRTE
3 = Other income, OINC
4 = Immediate needs, IMND
5 = Credit, CRED.

Looking at the partials, it is noted that the significant change results when "other income" is controlled. The zero order correlation coefficient of 0.30992 drops to a first order partial of 0.071. The implication is that the effect or influence of other income is strong in determining both the number of cattle and the calving rate. This information was not obvious from the simple correlations. It must be borne in

mind, however, that in the analysis of the partial correlations, the main thing is to establish cause and effect rather than quantity. Control of the combined effects of "other income" and "immediate needs" leaves a very small and negative partial correlation coefficient of -0.024. This suggests that the zero order correlation of 0.30992 was spurious since when "other income" is controlled, "number of cattle no longer varies with "calving rates". The variable "other income" therefore seems to be the true predictor of "number of cattle." One would have expected that "calving rate" also has an important influence on the numbers of cattle. The finding that this is apparently not the case is consistent with the negative regression coefficient for "calving rate" and also consistent with the finding in the following chapter that the salaried young people are taking advantage of the credit scheme to purchase breeding cows. In other words, increases in cattle seem to result to a large extent from purchases (from outside the communal areas into the communal areas) and to a less extent on the calving rates.

There seems to be no noticeable indications in the partials between "number of cattle" and "other income". Consequently an attempt will be made to interpret the following pair, i.e. "number of cattle" and "immediate

needs". The zero order correlation between these two variables is 0.59599. The partials for the pair are as follows:-

$r_{14.2} = 0.543$	$r_{14.23} = 0.592$	$r_{14.235} = 0.253$
$r_{14.3} = 0.616$	$r_{14.25} = 0.163$	
$r_{14.5} = 0.181$	$r_{14.35} = 0.253$	

In the first order partials, there are two major observations. Firstly, when the variable "other income" is controlled, the simple r rises from 0.59599 to 0.616. Secondly, when "credit" is controlled, the zero order r falls to 0.181. In the second instance, "credit" is apparently showing as the true predictor of "number of cattle". The implication is therefore that farmers who receive credit are likely to progressively acquire more cattle than those who do not receive it. There are no remarkable fluctuations in the last pair of partials i.e. partials between "number of cattle" and "credit". This finding seems to suggest that there are no intervening variables between the two. The summary table for the partial correlations appears overleaf, showing all the three orders.

Table 4.2

Summary Table For Partial Correlations:

The Production Function.

$r_{12.3} = 0.071$	$r_{12.34} = -0.024$	$r_{12.345} = -0.032$
$r_{12.4} = 0.109$	$r_{12.35} = 0.035$	
$r_{12.5} = 0.108$	$r_{12.45} = 0.072$	
$r_{13.2} = 0.375$	$r_{13.24} = 0.457$	$r_{13.245} = 0.381$
$r_{13.4} = 0.467$	$r_{13.25} = 0.333$	
$r_{13.5} = 0.346$	$r_{13.45} = 0.385$	
$r_{14.2} = 0.543$	$r_{14.23} = 0.592$	$r_{14.235} = 0.253$
$r_{14.3} = 0.616$	$r_{14.25} = 0.163$	
$r_{14.5} = 0.181$	$r_{14.35} = 0.253$	
$r_{15.2} = 0.663$	$r_{15.23} = 0.648$	$r_{15.234} = 0.404$
$r_{15.3} = 0.667$	$r_{15.24} = 0.475$	
$r_{15.4} = 0.480$	$r_{15.34} = 0.404$	

- 1 - Number of cattle (Y)
- 2 - Calving rate X_4
- 3 - Other income X_2
- 4 - Immediate needs X_3
- 5 - Credit X_1

Using the sizes of the third order partial correlations for the sequence of the variables, the Production equation can now be written for the Beta coefficients:

$$Y=0.43744X_1 + 0.29216X_2^2 + 0.25869X_3 - 0.02345X_4$$

The Production Function suggests that agricultural credit to small scale traditional farmers does increase the number of cattle. It appears from this equation that agricultural credit is the primary factor or input in livestock production.

The Production Function has explained about 58% of the variation in the number of cattle, leaving 42% of the variation unexplained. In other words, this regression equation has answered 58% of the research question. There could be a number of reasons for the unexplained variation. They could include the sub-optimal nature of cattle production in cattleposts and the lack of the understanding of animal husbandry on the part of the farmers.

In order to complete the test of the first hypothesis, the second equation, namely the Response Function, will now be examined. The aim of this second multiple regression model is to come up with an equation that will predict offtake rate. The Response Function compliments the Production Function.

The contribution made by the variable "immediate needs" towards explaining the variation in offtake rate is quite big (45.629%). From the results of step number one it is already apparent that the farmers' immediate needs are the major reason for selling cattle.

That the immediate needs are apparently the primary cause for selling cattle among the traditional farmers has many connotations. Firstly, it hints that the cash economy might now be more important than the traditional bartering system in the rural areas. It has to be recognised however that some of the immediate needs were the repayment of the loans. In the following chapter an attempt will be made to show how much of the immediate needs was attributable to loan repayment among those farmers with credit. However, since the Response Function like the Production Function analyses data from farmers with and without credit, it cannot be easy to compute exactly the percentage of "immediate needs" attributable to credit repayment in the equation. If the immediate needs of the farmers are the main factor in selling cattle, then these farmers must be having relatively less "other income" in the form of wages, returns from arable agriculture and small businesses.

However, the Beta coefficient for the "immediate needs"

is still small despite the fact that this variable explains most of the explained variation in cattle sales. A unit increase in "immediate needs" will increase cattle sales by a mere 0.39048. It will be recalled that in the Production Function, "credit", the variable explaining most of the variation in "number of cattle", had a Beta coefficient of 0.69818 in the first step of the step-wise regression. The comparatively smaller Beta coefficient for the variable "immediate needs" seems to suggest that the traditional livestock farmers have a strong tendency to keep their cattle, selling only to satisfy the basic needs. Herskoritz (1926) worked on the cattle complex in East Africa and concluded that traditional cattle herders have a social system that makes them intrinsically conservative with their cattle. The case of this study seems to lend support to the view of Herskoritz in spite of the criticism of the perverse supply hypothesis by Khalifa and Simpson (1972). In this study, the mean of the variable "offtake rate" is 8.06 while that of the variable "number of cattle" is 42.30. Based on the two means, it will be found out that for an average of 42 head of cattle, the average farmer sells only about three animals. Considering that the other income is quite low for the farmers, the means of the two variables seem to

further support the finding that these farmers have a perverse supply of cattle.

Step number two will now be considered.

Variable entered in Step number 2Cattle prices

Multiple R = 0.71212 F = 16.994
R square = 0.50711 D.F. = 2,47
Std.Error = 6.46712 Critical F at 0.05
 sig. level = 3.20

<u>Variable</u>	<u>B</u>	<u>Beta</u>	<u>Std.Error B</u>	<u>F</u>
IMND	0.00688	0.37509	0.00249	8.449
CPRE	0.09346	0.28951	0.00268	6.941
CONSTANT	-13.49842		2.88495	6.811

t values (CPRE): t calculated (0.98) Critical t (1.66)
at 0.05.

The variable "cattle prices" increases the R square by only 5.082% meaning that although this variable is second to "immediate needs" in explaining the variation in cattle sales, its contribution is remarkably smaller.

The Beta coefficient shows that when acting jointly with "immediate needs", a unit increase in "cattle prices" will raise "offtake rate" by only 0.28951. However it is noteworthy that the Beta coefficient for "cattle prices" is positive and not negative or zero. This suggests that the traditional farmers have a positive response, albeit a low one, to cattle sale prices.

Caution has to be exercised in interpreting the regression coefficient for the variable "cattle prices". It should be recognised that cattle sale prices have risen unevenly between the Botswana Meat Commission and the Agricultural Co-operative Societies and the private cattle buying agencies and auctioneers. The majority of the farmers in the sample for this study (69 out of 100) sold either to the Agricultural Co-operative Societies, auctioneers or private agencies. Only 31 of the farmers sold directly to the Meat Commission. This seems to suggest that most of the small scale traditional farmers have not felt the impact of the relatively higher prices offered by the Botswana Meat Commission. It is probable, therefore that both the R square and the regression coefficient for the variable "cattle prices" would have been higher had these farmers been afforded a chance to sell direct to the Meat Commission.

"number of cattle" would raise cattle sales by a meagre 0.28196. Thus the long held view that traditional pastoralists keep livestock as a bank seems to find support from the Response Function of this study. The analysis of the Response Function will be more complete after the partial correlations for its variables are examined shortly.

The coefficients of the other variables in step number three (IMND and CPRE) do not change markedly as the variable "number of cattle" enters the equation. There is therefore no apparently remarkable change to explain.

The fourth and last step of the Response Function will now be examined.

Variable entered on Step number 4other income

Multiple R	=	0.74550	F	=	14.074
R square	=	0.55577	D.F.	=	4,45
Std.Error	=	2.3654	Critical F at 0.05		
			sig. level	=	2.56

<u>Variable</u>	<u>B</u>	<u>Beta</u>	<u>Std. Error B</u>	<u>F</u>
IMND	0.00644	0.36943	0.00238	8.346
CPRE	0.08508	0.24945	0.04096	4.314
NCTE	0.05221	0.27415	0.02476	4.444
OINC	-0.00668	-0.02561	0.02856	0.055
(CONSTANT)			6.17058	4.086

t values (OINC): t calculated (1.26) Critical t (1.66)
at 0.05.

The variable "other income" follows last because it introduces the least change (0.00054) to the R square. Its regression coefficient is negative, thus implying a negative elasticity. The very small and negative regression coefficient of this variable implies that the farmers have small other income which is consequently not effective in influencing cattle sales. The negative sign of the regression coefficient in particular, suggests that if the farmers had large other income, they would sell fewer cattle than they have done during the study period. This is quite logical and it is to be expected since farmers would then satisfy their immediate needs with surpluses from other income, in that way selling fewer cattle. To

conclude the analysis and interpretation of the Response Function, the summary table is being presented. It shows only the important coefficients used to deduce conclusions.

Table 4.3

Summary Table For The Response Function

Dependent VariableOfftake rate

Variable	Simple r	R square	R square change	B	Beta
IMND	0.67549	0.45629	0.45629	0.00644	0.36943
CPRE	0.56331	0.50711	0.05082	0.08508	0.24945
NCTE	0.56411	0.55523	0.04812	0.05221	0.27415
OINC	0.12374	0.55577	0.00054	-0.00668	-0.02561
(CONSTANT)				-12.47328	

This multiple regression model has explained 55.577% of the variation in the offtake rates. In other words the model has answered about 56% of the research question, leaving 44% of the problem unanswered.

The unexplained variation in the offtake rate could be due to the ununderstood complexities in the lives of the traditional farmers.

The partial correlations will now be examined in order to shed more light on cause and effect. The simple correlation between "offtake rate" and "cattle prices" is 0.56331 but the partials are as follows:-

$r_{12.3}$	=	0.4701	$r_{12.34}$	=	0.4621	$r_{12.345}$	=	0.2958
$r_{12.4}$	=	0.5634	$r_{12.35}$	=	0.2974			
$r_{12.5}$	=	0.3057	$r_{12.45}$	=	0.3081			

where,

1	=	offtake rate, OFTE
2	=	cattle prices, CPRE
3	=	number of cattle, NCTE
4	=	other income, OINC
5	=	immediate needs, IMND.

The most conspicuous change surfaces when the variable "immediate needs" is controlled. The coefficient reduces from a zero order of 0.56331 to a partial of 0.3057. This reduction suggests that the immediate needs of the farmers are a strong factor in the prediction of the offtake rates. The variable with the least effect is "other income". This variable actually raises the zero order correlation between "offtake rate" and "cattle prices" by a meagre 0.00009. This

finding seems to confirm the other finding made in the regression coefficients. that the farmers' other income would normally reduce the sales of cattle, but the farmers do not have enough of other income to completely halt livestock sales in the bid to meet their immediate financial obligations. Control of the other variables shows that they have little effect in explaining the cause of "offtake rate". The observations which have just been discussed are replicated in the partials between "offtake rate" and "number of cattle" where control of "immediate needs" introduces the greatest change while control of "other income" yields the least change, which is also the only one that is additive, i.e. it raises the simple correlation from 0.56411 to a partial of 0.56450.

There is a new observation, however, when the partials between the variables "offtake rates" and "number of cattle" are examined:

r14.2 = 0.1244	r14.23 = -0.0809	r14.235 = -0.0349
r14.3 = -0.1261	r14.25 = 0.0985	
r14.5 = 0.0900	r14.35 = -0.0477	

The new observation is that the control of "number of cattle" makes a greater reduction than the control of "immediate needs" on the zero order correlation. The variable "offtake rate" now varies negatively with the variable "other income". This suggests that the offtake rates decrease with increases in "other income", something that has also been suggested in the interpretation of the regression coefficients earlier on.

The partial correlations between "offtake rate" and the final variable, "immediate needs", do not seem to add any new information.

Below is the summary table for the partial correlations of the Response Function, showing all the three orders.

Table 4.4

Summary Table For Partial Correlations:

The Response Function.

$r_{12.3}$	=	0.4701	$r_{12.34}$	=	0.4621	$r_{12.345}$	=	0.2958
$r_{12.4}$	=	0.5634	$r_{12.35}$	=	0.2974			
$r_{12.5}$	=	0.3057	$r_{12.45}$	=	0.3081			
$r_{13.2}$	=	0.4712	$r_{13.24}$	=	0.4636	$r_{13.245}$	=	0.2998
$r_{13.4}$	=	0.5645	$r_{13.45}$	=	0.3120			
$r_{13.5}$	=	0.3207	$r_{13.25}$	=	0.3124			

r14.2 = 0.1244 r14.23 = -0.0809 r14.235 = -0.049
r14.3 = -0.1261 r14.25 = 0.0985
r14.5 = 0.0900 r14.35 = -0.0477

r15.2 = 0.5273 r15.23 = 0.4032 r15.234 = 03.976
r15.3 = 0.5332 r15.24 = 0.5232
r15.4 = 0.6725 r15.34 = 0.5238

- 1 - offtake rate (Y)
- 2 - cattle prices, X_3
- 3 - number of cattle, X_2
- 4 - other income, X_4
- 5 - immediate needs, X_1

Using the sizes of the third order partial correlations for the sequence of the variables, the Response Function can now be written using the Beta coefficients:

$$Y = 0.3976X_1 + 0.2998X_2 + 0.2958X_3 - 0.0349X_4^2.$$

It has been stated that the purpose of this chapter was to test the first hypothesis, which summarises the first three research objectives. In concluding this chapter it is therefore necessary to

review this hypothesis briefly. The hypothesis proposes that whereas agricultural credit to traditional farmers might increase livestock production numerically, it is not likely to increase offtake rates since the farmers do not respond to price incentives. The three objectives summarised by this hypothesis are firstly to study the response to price by the small scale traditional livestock farmers, secondly to study the effect of credit on cattle production and thirdly to study the effect of credit on the marketing of cattle among the traditional farmers. This chapter has tried to demonstrate through the Production Function that credit plays the most important role in increasing the number of cattle. The corrolary of this statement is that the farmers who receive credit stand to gain importantly through increased production of their livestock. The analysis of the Response Function has suggested a low response to cattle prices by the small scale traditional farmers. The effect of the credit on the marketing of cattle (offtake rate) can only be monitored indirectly since it involves both the Production and the Response Functions. The Production Function has suggested that credit is the most influential variable in determining the number of cattle. If the number of cattle was also the most influential variable in offtake rates, then credit

would be certainly influencing offtake rates directly. However the position is that "immediate needs" seems to be influencing offtake rates more than any other variable. It must be recognised that the repayment of credit is part of "immediate needs" so that credit in effect does have some influence on raising offtake rates. Actually, the partial correlation between "credit" and "immediate needs" controlling "number of cattle" is 0.5385, implying that quite a large portion of the immediate needs is attributable to credit repayment. This is shown more clearly in the following chapter where the variables are broken down into their sources. It should be expected anyway, since the other income which could be used to repay the credit has been found to be small in the preceding pages. Apparently, credit does raise both livestock production and cattle sales. However, credit alone has explained about 49% of the variation in the number of cattle while "immediate needs", combining credit repayment with other constituent components such as school fees, food and other domestic needs, accounts for about 46% of the variation in cattle sales. Thus according to the multiple regression model used, credit apparently influences the number of cattle by a greater factor than it influences cattle sales. The research objectives have therefore been covered fully. Conse-

quent upon the findings of the two Functions, the hypothesis should be modified to recognise that agricultural credit raises the production of livestock and increases sales of cattle among the small scale traditional herders despite their apparently low response to prices.

CHAPTER FIVE

CONSEQUENCES OF THE CREDIT SCHEME

The purpose of this chapter is to test the second hypothesis which summarises the last two research objectives. The research objectives are, firstly, to examine the results of the credit scheme among the rural people with special regard to income inequalities, and, secondly, to evaluate the implementation of the Government's strategy of increasing cattle offtake as a dimension of rural development. Summarising these two objectives, the second hypothesis proposes that the Government's credit scheme in its present form is likely to worsen income inequalities among the rural small scale farmers. Unlike the first hypothesis which could be tested by inferring directly from the two multiple regressions, the second one requires that the agricultural credit policy in Botswana be first reviewed, then secondly the research data (primary) be broken down its various components showing the returns from arable farming, small enterprises and wages. Thirdly, inferences have to be made once more from the two multiple regressions in the light of the first two steps.

This hypothesis will be tested within the scope of development as laid down by the Government. The current Development Plan (1976-1981) states that development is expected to be achieved through the application of the country's four planning objectives. These objectives are rapid economic growth, social justice, economic independence and sustained development. This chapter shall concern itself mostly with rapid economic growth and social justice since these two planning objectives seem to contain the basis for the controversy in the use of credit for development. Rapid economic growth employs an efficiency model of production. The efficiency model of production requires that investment be made where it will yield the greatest returns. This is a capitalist model of production. It requires that investment be made where there already exists infrastructure, both social and physical. Infrastructure that attracts large investment in the tertiary sector is found normally in the urban areas of the developing countries. Consequently rapid economic growth tends to be based in urban areas. In the developing countries, the majority of the population live in the rural areas. 80 per cent of the population of Botswana lives in the rural areas. Therefore the majority of the people in Botswana cannot directly participate in rapid

economic growth. The basis for dualism is thus laid. On the other hand social justice, which means equitable distribution of production and welfare, is an egalitarian model of production. The egalitarian model of economic production is associated with Marxism. Marxism argues that inequality and poverty are inevitably produced by capitalist production models. In its attempt to bring about development, the Government of Botswana is thus trying to reconcile two models of production which are apparently opposed to each other.

In an attempt to foster economic development in the livestock sector, the Government in 1964 instituted a credit scheme through the National Development Bank. Credit has been defined as a means whereby a commodity or a service can be obtained immediately but paid for at a later date (Co-operative College of Kenya, 1970). Credit involves three parties, namely, the lender, the borrower and the government (Food and Agriculture Organisation, 1974). The success of any credit programme depends partly on the consistency of decisions taken by these three parties. This consistency is not always easy to achieve since these three parties have different and, often, conflicting motivations. The Government has the overriding control through resource allocation since it funds the national

credit agencies either directly from its treasury or from funds originating outside the country as grants-in-aid or repayable loans.

Credit is one of the principal external sources of capital. Family sources of capital are often inadequate especially in the subsistence production which characterises the small scale traditional farmers. Capital is one of the main factors of production. It is produced by human activity. Where investment plans cannot be implemented because a farmer is unable to raise the required capital internally or externally, finance is identified as a constraint on growth in farm incomes (Mwaba, 1976). However, finance or money, is merely a convenient way of measuring capital (Upton, 1973). The other main factor of production is labour. Marxism argues that more labour should be used so that less capital will be needed. Capitalism, being concerned with maximisation of profits, simply requires an optimal combination of all factors of production. It would appear however, that since subsistence livestock production in Botswana has more people than could be required optimally, the Marxist view cannot readily apply in this sector of the economy. It is not easy for the rural people to sell their labour within their environment. On the other hand the need to develop livestock production in

order to support these people cannot be overemphasised. There is therefore a clear need for credit. The third factor of production, land, will be brought into the discussion later on in the chapter when preservation of rangeland will be dealt with. Entrepreneurship, which is sometimes considered by the economists as the fourth factor of production, will be considered when creditworthiness of farmers will be discussed.

The Botswana National Development Bank is a government owned bank established by an Act of Parliament in 1964. The bank was set up in order to provide credit funds to the rural sector and to reach small farmers and businessmen who do not qualify for loans from the commercial banks. The National Development Bank receives its funds either directly from the Government or, through the Government from donor agencies and countries. These funds are mainly in the form of unrecallable capital which only carries an interest repayment charge. However, some credit funds (Livestock Project II) require both interest and principal repayments to be made to the Government (Wallace, 1980). The policy of the bank is that it must ensure that customers are not saddled with repayments that are beyond their capacity and that its revenue must recover its expenditures. In order for the application for credit to be considered, the propo-

sition must be economically viable, have technical support and benefit the basic economy of the region (National Development Bank Thirteenth Annual Report, 1976).

The National Development Bank is the only agency that gives institutional credit to small scale livestock farmers. The Agricultural co-operatives are only concerned with livestock and crop selling.

In an attempt to demonstrate that credit disbursement by the National Development Bank is associated more closely with the efficiency model of production than with the egalitarian one, Table 5.1 will now be drawn using the primary data of this study.

Table 5.1 Loans By Size (P) and Per Capita.

Type of Loan	No. of holders	Total Amount (P)	Av. Pula Per Loan
Water services	3	3729	1243
Agric. Inputs	21	11529	549
Agric. Machinery	8	7368	921
Livestock	18	19602	1089

Source: Computed from recording schedules.

Water services shown in Table 5.1 were the repairs to boreholes. The agricultural inputs were bonemeal, salt, vaccines, and credit for ploughing and planting. Agricultural machinery included purchases of planters, fencing material and ploughs drawn by oxen. Most of the credit in terms of the number of credit holders as well as the absolute amounts was used for livestock development. Due to the complementarity between arable farming and livestock production among the traditional farmers it is important to recognise the contribution of arable farming to the lives of these people. But until the procedure followed in giving out credit to the farmers is discussed, Table 5.1 cannot show how the disbursement of credit brings about greater income inequalities among the farmers. The procedure followed in giving out loans is the same for all applicants, be they in the Study Area or elsewhere in the country. The discussion of the procedure will, if it is correct, therefore hold good for the whole country i.e. for the National Development Bank's credit policy.

In examining the reasons for giving credit, it will be necessary to consider the cases of both the farmers who succeeded in receiving credit and those who did not succeed. The first thing to consider is the test for the significance of the differences between the means of the same variables

for the two groups of farmers. The student's t test will be used for this purpose. The null hypothesis of the problem is that there is no difference between the means of the populations from which the two samples were taken. Based on the results of the test, it will be possible to conclude whether or not, the farmers who received credit were materially (economically) better off than those who did not receive credit.

Table 5.2A Test of significance of the differences between the means.

Variable	Mean	Diff. in means	Tcal	T tab (0.05)
				D.F.=98
NCTE WC	53.38			
WOC	28.58	24.80	8.56	1.98
OINC WC	891.46			
WOC	440.52	450.94	2.01	1.98
CRTE WC	0.51			
WOC	0.45	0.06	3.06	1.98
IMND WC	1111.96			
WOC	807.22	304.74	23.96	1.98
CPRE WC	149.96			
WOC	127.44	22.52	4.54	1.98
OFTE WC	10.22			
WOC	5.52	4.70	8.71	1.98

WC : with credit;
WOC : without credit;
Tcal : T calculated;
Ttab : T tabulated i.e. critical T

As can be seen from Table 5.2A, the differences between the means were all significant, implying that real differences in the material goods between the two groups of farmers existed. This finding gives a clue as to why other farmers could not obtain credit. Out of the 50 farmers without credit, a total of 23 had applied for credit but had failed to obtain it. The Bank had as usual not given reasons for refusing these farmers credit. Random sampling was then used to select 18 farmers from the 50 with credit and another 18 from the 23 who had failed to obtain credit. The amounts of credit applied for in both cases were tested for the significances of the difference in their means using the t test.

Table 5.2B Test of significance of the differences between the means.

Variable	Mean	Diff. in means	Tcal	Ttab (0.05)
CRED				
wc	766.49	42.63	1.46	2.04
woc	723.86			(D.F.=34)

Source: Compiled from recording schedules.

Table 5.2B indicates that on the basis of the t test, there was no significant difference in the amounts of credit solicited by the two groups of farmers. However, many amounts requested were reduced by the Bank before the applications could be approved as will be shown later on.

This undertaking seems to suggest that the Bank considered the farmers without credit incapable of repaying the loans. From Tables 5.2A and 5.2B it seems almost certain that the two groups of farmers differed in collateral security yet they had requested equal amounts of credit. This apparently suggests that the Bank considers collateral security as an important factor when lending out credit to farmers.

The other factor to be considered here will be the level of education among the two groups of farmers. While the level of education cannot as such account for the reason to acquire or fail to acquire credit, at least it shows the kind of farmers who acquire credit.

Table 5.3 Educational Levels of Farmers in Percentages.

	No Education	Lower Primary	Higher Primary	Secondary School
WC	26	46	20	8
WOC	64	30	4	2

it can be observed that the overwhelming
farmers without credit have no education
while only 26% of those with credit have

suggest that the literate members of
community have taken advantage of credit
in greater percentages than their
counterparts. Considering that Botswana's
population is 75% illiterate, this would imply
that all sections of the population has taken
advantage of the credit scheme.

Another important factor in the consideration of
loans is the other income that farmers
derive from livestock production. Primarily, the other
income returns from arable farming, small
scale wage employment, periodic and permanent.
When available was computed, however, there was
a significant amount which was attributed mostly to income
from relatives, especially working children.
These are the average figures for one year.

Breakdown of "other income" by categories.

Age Group	Arable Agric.	Wages	Businesses	Income Transfers
14-16	34%	22%	41%	3%
17-52	43%	30%	8%	19%

Source: Compiled from recording schedules.

It suggests that in absolute amounts, the non-credit group has twice as much other income as the credit group without credit. Most of their other income comes from business, i.e. small shops, grocery stores and bottle stores (41%). The least contribution to their other income seems to come from income transfers (3%) implying a rather light dependence on their children and other relatives for economic support. On the other hand, most of the other income of the non-credit group seems to come from arable agriculture (43%). A comparatively large percentage of their other income comes from income transfers (19%) implying a rather heavy dependence on their children and other relatives for economic support. The least contribution to their other income comes from businesses. Largely, their businesses

Form of beer brewing, food selling parties
coloring. The findings of Table 5.4 would
first sight to contradict what was said
later Two that the richer cattle farmers
larger arable fields. However, the fact
relatively richer cattle farmers do not
every year. It is quite usual for them
their fields fallow for a year, thus plough-
alternate years. Also in terms of absolute
those farmers with credit make an annual
P302.94 from arable farming while those
without make an annual average of P189.20.
This does not tell much about the economic
situation of the farmers by itself. Considered
the variables that have been broken down
under "mediate needs" almost completes the picture
of the economic lives of the farmers. The figures for
this were arrived at by adding up the finan-
cial losses that the farmers could not avoid,
each year. In a way, this variable represents
the economic situation of the farmers. It will be realised
that the "mediate needs" are greater than the other
variables for both groups of farmers, implying that cattle
are sold in order to make up for the difference.

Table 5.5 Breakdown of "Immediate needs" by categories.

	Av. Amount (P)	School fees	Food/ clothes	Loan repayment	Other
WC	1111.96	14%	36%	30%	20%
WOC	807.22	20%	51%	0%	29%

Source: Based on recording schedules.

The section "other" includes the cost of services such as transport costs, maintenance of property and emergency expenses. The conspicuous finding from Table 5.5 is that apparently food and clothing jointly account for the greatest share of the farmers' financial obligations (51% of the needs of farmers without credit and 36% of those with credit). This finding is seemingly consistent with the popular belief that poorer families spend more of their incomes on food than the richer families. However, if the farmers with credit did not have to repay the loans, probably their expenditure on food and clothes would be more than 36% of their immediate needs. The next important finding from Table 5.5 is that loan repayment apparently accounts for as much as 30% of

the farmers' financial obligations. Actually 30% is the average, the highest figure was 41% for one farmer while the lowest was 24% of the whole expenditure. This seems to suggest that loan repayment has a strong positive effect on raising cattle sales. This could be the case since "other income" does not by itself satisfy the immediate needs. It is further noted that the figure for loan repayment would have been greater if the National Development Bank had not reduced the sizes of the amounts requested by some farmers. The reduction of the sizes of the requests by the Bank was prompted by the Bank's belief that the requests involved apparently exceeded the capability of the farmers to repay them. There were nine such cases.

Table 5.6A Reductions made by the Bank on some loans requested.

R.N.	Requested (Pula)	Granted (Pula)	NCTE	OINC (Pula)	IMND (Pula)
86	2000	1260	60	563	1080
325	1850	1340	51	1863	1155
91	1500	900	23	714	1098
168	1800	780	48	296	1059
311	1200	850	31	359	1090
475	1600	890	56	1618	1040
530	1300	750	42	675	1000
211	1000	800	36	900	1044
256	1600	1000	39	243	1240

R.N. : Random Number of farmer
NCTE : Number of cattle
OINC : Other income
IMND : Immediate needs

The rather substantial reductions effected by the National Development Bank on the amounts of loan requested by the farmers partly explains the good repayment record of the loans maintained by the farmers. It is expected by the Bank that the farmers will have a good enough harvest from their arable farming to enable them to meet their loan instalments partly from the sale of such arable produce. Due to the very low returns from arable produce, instalments are met almost wholly from livestock sales.

In order to illustrate further that the Bank bases its decision to grant any loan more on the material credit-worthiness of the farmer than on anything else, a table of those farmers who had applied for credit but failed to get it will be presented. These farmers had got fair recommendations from their Agricultural Demonstrators just like those farmers who succeeded in receiving the loans. There were 10 such cases in the sample.

Table 5.6B Farmers who were refused Loans.

R.N.	Requested (Pula)	NCTE	OINC (Pula)	IMND (Pula)
149	1800	27	788	788
155	1250	23	250	540
73	1000	17	293	840
109	900	19	310	567
128	2000	21	1598	950
15	1400	18	200	917
102	1600	22	337	674
11	1500	20	997	850
65	1800	26	332	707
138	1000	24	293	848

Source: Compiled from the recording schedules

It can be readily observed from Table 5.6B that the number of cattle among these farmers who were refused credit is less than the number of cattle among the farmers whose loan requests were reduced before they were approved (Table 5.6A). The means for the number of cattle are 43 and 22 for the two tables respectively. Since the average sizes of the amounts requested in Table 5.6B (mean=1425) are approximately the same as those of Table 5.6A (mean=1225) and the immediate needs

still exceed the other income here (means=768 and 540 respectively) as is the case in Table 5.6A (means=990 and 801 respectively), it can be almost certainly concluded that the farmers in Table 5.6B were refused credit because they were considered not able to repay it without difficulties. This finding merely corroborates what the Bank itself has stated, namely that its lending is based on the ratio of the customer's own cash deposits to the cost of the goods financed, i.e. the equity ratio (National Development Bank Thirteenth Annual Report 1976).

Since it was noted in Chapter Two that historically, cattle acquisition has been following the chieftancy line, it appears from the findings of this study so far that credit acquisition will most probably follow hierarchical diffusion. In hierarchical diffusion, the most important people receive the contact first, followed by the second most important and then the less important ones in that order (Abler et al, 1971). Applying this analogy to this study, it could be expected that the relatively better off farmers, most of whom are in the royal family, are likely to form the majority of credit holders. The farmers who have received credit seem to have benefited in terms of increases in cattle numbers over the ~~five~~² years which make up the study

period as Table 5.7 suggests.

Table 5.7 Changes in the means of cattle numbers between 1976 and 1980.

	1975	1976	1977	1978	1979
WC	49	56	63	77	80
WOC	31	28	33	36	38

Source: - Compiled from recording schedules.

Table 5.7 suggests that the poor majority will either remain at the same level or improve very slowly. It would appear therefore that Government's credit policy is aimed at what seems to the Government the best way of increasing the production and therefore the offtake rate of cattle rather than at eliminating poverty among the peasant farmers. Farmers with the ability to repay loans where the collateral security is used are few in rural Africa (FAO, 1974). For instance between 1973 and 1979, the Botswana National Development Bank approved only 4000 agricultural loans (National Development Bank Thirteenth Annual Report, 1976) to an estimated total of 174000 farmers

(Ministry of Agriculture, 1974). It could be argued that not all farmers actually need credit but the fact is that in 1974, 10% of the livestock farmers owned 50% of all the cattle while 20% owned less than 10 head of cattle each (Botswana Government, 1974). Having illustrated that very few of the farmers stand to benefit by the credit scheme, and that these will be the generally better off farmers, an attempt will now be made to consider the Government's reasons for lending exclusively to the farmers who have the collateral security.

One reason for justifying credit is that it is expected to bring about quicker "development". The last chapter has suggested that credit brings about growth in the number of cattle and Table 5.7 has seemingly testified to that effect. The next question is who deserves credit and why? Here the controversy about the use of credit begins.

The National Development Bank argues that since the credit given to farmers is in the form of public funds or external loans to the Bank itself, the Bank has an obligation to ascertain that the loans it gives out to the farmers will be repaid. This consequently makes the Bank be selective in granting loans, and it selects those farmers with adequate collateral security. In other words the Bank argues that it is compelled to foster the efficiency model of

production, i.e. liberal capitalism. In itself the argument of the Bank is a logical one, but it is not easy to see how social justice will be accommodated by this model of production.

Since the National Development Bank was established in order to give credit to the poorer farmers who could not be served by the commercial banks, it is only logical to expect that the Bank will use a somewhat different criterion for lending out credit.

Granting that no two people can have similar ambitions and equal productive capacities, it is not meaningful to support any development model which seeks to bring about egalitarian equality among the target population.

On the other hand it is not in the interests of the target population for the Government to implement any model of production which will exaggerate the socio-economic disparities of the people by supporting the economic programmes of the few.

Consequently, it would be more logical for the Bank to lower its collateral security and to emphasise the importance of the ability of the individual farmer, in giving out credit. Such a scheme is still possible within the efficiency model of development which the Bank is following. It would most probably assist more farmers than the equity ratio criterion and it

would fulfil what the Bank was created for. Although such a credit scheme would still be capitalist oriented, it would apparently bring about greater social justice to the majority of the poor cattle farmers who have no collateral security to obtain loans under the present arrangement. Under such a credit scheme it could also be easier for the Bank to exercise some bias towards the poor since the main criterion would be the competence or the productive capacity of the farmer. Peet (1977) observes that despite its inherently inequalitarian structure, a capitalist model of production which allows for movement from one level of economic well-being to another does not produce social stress or frustration among the lower ranks.

A credit system which emphasises the competence or entrepreneurship of the farmer more than his collateral security would possibly result in some of the competent farmers breaking the poverty cycle within which they are placed at birth. Peet further argues that inequality may be passed on from one generation to the next via the environment of opportunities and services into which each individual is implanted at birth. From the remarks of Peet, one can suppose that a credit scheme based solely on equity ratios would cater to the needs of a certain class of the society only.

Use of credit has a multiplier effect. The

immediate beneficiaries of the credit scheme are the suppliers of the commodities that the credit is used to acquire. Most of the salaried young people who purchase livestock for the first time using the credit facilities actually buy the cattle from the rich farmers who have many cattle. Some of these very rich farmers are operating outside the communal grazing areas on private ranches and freehold farms. The multiplier effect of the credit scheme thus benefits these rich farmers. Since agricultural credit is subsidised (Upton, 1970), it must be seen to benefit its recipients. It would be more logical if the small scale farmers using credit were to buy their stock from Government farms only. In this way the Government would protect the smaller farmers from being possibly exploited by the commercial ranchers. Also this would transfer the multiplier effect of credit to the Government which would then have a chance to re-allocate it for developing the rural areas. The Government has recently introduced the bull subsidy scheme. According to this scheme, farmers are encouraged to buy bulls from the Government at subsidised prices. The normal market price for a mature Brahman bull is P1000, but the Government sells it for P400 only. The farmers who take advantage of the subsidised bull price are the wealthy ones who sell their animals

directly to the Botswana Meat Commission where the sale prices are based on the quality and the mass of the meat. The majority of the farmers sell to the auctioneers, cattle dealers and agricultural co-operatives, all of which do not consider the grade of the animal.

It would seem that the Government is subsidising the production of higher quality beef in order to raise the foreign exchange earnings from the sale of beef outside Botswana. In the process, its action tends to subsidise the rich producers at the expense of the poor producers who are primarily interested in the breeding heifers, whose prices are not subsidised.

Another aspect of the efficiency model of development which apparently strengthens inequality within the livestock industry is marketing. There are four livestock market agencies in Botswana. These are the Botswana Meat Commission, the Agricultural Co-operative Societies, the traders, and, lastly, the auctioneers. All the four market agencies are available to the commercial ranchers and the rich farmers in the tribal grazing lands. However the largest buyer, the Botswana Meat Commission, is not open to the majority of the poorer livestock farmers. In order for any farmer to be able to sell his cattle directly to the Meat Commission, he ~~must~~ be a registered cattle producer. In order to be registered as a cattle producer, a

farmer must have more than 40 head of cattle since he will be expected to send his cattle for sale to the Meat Commission according to quotas. A quota will be given for 10 head of cattle and above. Consequently, many farmers cannot afford to sell directly to the Meat Commission. The average number of cattle sold per annum by the farmers without credit was three head per farmer. The average for the farmers with credit was six head of cattle per farmer per annum. This suggests that even many of these farmers with credit could not sell directly to the Meat Commission without deliberately raising their sales for the purpose of meeting the quota.

Table 5.8 shows the destinations of the cattle sold during the study period in the sample used for this study.

Table 5.8 Destinations of cattle sales in the sample.

	NCTE sold	BMC	Co-op	Traders	Auctioneers
WC	1335	21%	32%	22%	25%
WOC	536	9%	31%	27%	33%

Source: Compiled from recording schedules.

NCTE sold	-	number of cattle sold
BMC	-	Botswana Meat Commission
Co-op	-	Agricultural Co-operative Societies

Table 5.8 suggests that most farmers sell their cattle directly to non Meat Commission markets where they fetch relatively lower prices as will be shown in Table 5.9 shortly. In other words the apparent dualism in cattle marketing could probably be one reason for the perpetuation of inequality of incomes in the livestock industry.

Tables 5.9A and 5.9B show the average annual prices of cattle for the four markets in Botswana. The Meat Commission figures are the averages for the middle grades i.e. Grade 2 and Grade 3. Experience has shown that cattle from the tribal communal areas mostly fetch these two grades (Machacha, 1976) .

Consequent upon this, averages from these grades have been used for comparison with the averages from other buying agencies since they are the best reflection of what the farmers would get from the Meat Commission. Table 5.9A shows the actual prices (averages) for each category for every year between 1975 and 1979 inclusive. Table 5.9B shows the average prices for the Meat Commission (Grades 2 and 3) for the same period but

this time the prices of the other market agencies have been expressed as percentages of the Meat Commission prices. This has been done in order that the differences in prices can be appreciated in the form of ratios.

Table 5.9A Average Prices of Cattle.

	BMC	Co-op	Traders	Auctioneers
	(Pula)	(Pula)	(Pula)	(Pula)
1975	144	128	90	120
1976	162	159	120	131
1977	175	163	118	126
1978	186	148	126	129
1979	210	166	130	140

Source: Compiled from Ministry of
 Agriculture reports.

Table 5.9B Transformation of Table 5.9A to percentages of the BMC prices.

	BMC	Co-op	Traders	Auctioneer
	(Pula)	%	%	%
1975	144	89	63	83
1976	162	90	74	81
1977	175	93	67	72
1978	186	79	68	70
1979	210	79	62	67

Source: Computed from Table 5.9A

Table 5.9A and 5.9B suggest that the Agricultural Co-operative Societies pay second to the Meat Commission. Possibly this is due to the presence of Government advisers in the Agricultural Societies. While the Government expects the Agricultural Societies to be economically self sufficient and to make modest profits, it will not allow them to exploit the cattle producers (Botswana Government, 1975).

Consequently the Agricultural Co-operatives constantly check with the Meat Commission for current prices. Apparently, the auctioneers pay less than the Agricultural Co-operatives but better than the traders. The

apparently better prices of the auctioneers probably result from the competitive nature of the auctioneering business. The traders, on the other hand, are often confronted by the farmers when the latter need to sell quickly and receive the funds readily. Faced with a situation of emergency, the farmer does not consider price differences among the alternative buyers. He simply goes to the nearest or the most familiar buyer. This might be one reason why the farmers have apparently had a rather low response to price increases as suggested by the Response Function. Asked during the field work why they sold to the buying agents used, 18% of the farmers said they trusted the agents, i.e. that the agents would not underpay them; 32% replied that they were prompted by proximity while 50% did not have any definite reason. It would appear that although it might be true that farmers normally decide how to spend the money before selling the cattle, they do not always look for the highest bidder. This seems to give a hint that the marketing of cattle by the traditional farmers is not well organised in the sense that it does not seem optimal.

The issue of the stabilisation fund is yet another indication that the Botswana Meat Commission's quota system strengthens income inequalities within the livestock sector. The Botswana Meat Commission has a

compulsory stabilisation fund. All farmers selling directly to the Meat Commission are charged 5% of the price of each animal. The amount is then credited to the Meat Commission's special account known as the stabilisation fund. The stabilisation fund is used for regulating prices in case they fall considerably for a short time. It would appear that since the majority of the farmers do not sell directly to the Meat Commission, the stabilisation fund contributions from their cattle are in effect used to protect the few wealthy farmers who sell directly to the Meat Commission from sudden drops in prices. In this way livestock marketing apparently becomes a sign of underdevelopment.

To conclude this chapter, it is necessary to consider once more the research objectives and the hypothesis that the chapter sought to investigate and test respectively. The first of the final two objectives sought to examine the effect of the credit scheme on the farmers with special emphasis on income inequalities. Table 5.1 suggested that most of the loans during the study period were used for purchasing breeding heifers. Table 5.7 gave the results of credit by comparing the growth in numbers of cattle between the two groups of farmers. The table suggested that the farmers with credit experienced constant increases in the cattle numbers while those without credit generally

stagnated.

Table 5.2A suggested that farmers who received credit had to have adequate collateral security to cover the loans. This means that farmers who received credit were few compared with the total farming community. It will be recalled that only 4000 out of an estimated 174000 farmers received agricultural loans between 1973 and 1979. The suggestion from these tables is that credit has worsened income inequalities between the farmers who have received credit and those who have not received it. Noting further that Table 5.2A suggested that the farmers who got credit were already better off than those who did not obtain it in terms of income, it becomes even easier to foresee further growth in income inequalities if the Bank continues to use equity ratios as the main basis for granting loans.

The second of the final two objectives sought to evaluate the implementation of the Government's strategy of trying to increase cattle sales as an aspect of rural development. The Government is trying to use higher prices to persuade the farmers to sell more cattle. On the other hand the traditional farmers apparently wish to keep cattle as a form of wealth or a bank. There is apparently a conflict between the action of the Government and the desire of the farmers.

Apparently the farmers sell cattle mainly to satisfy their immediate needs. The problem of Government's strategy of increasing cattle sales is further compounded by the livestock marketing system. The Government controls cattle prices in the Meat Commission and to some extent in the Agricultural Co-operative Societies. The majority of the traditional farmers are unable to sell directly to the Meat Commission where they could fetch higher prices for their cattle. Consequently increases of cattle prices in the Meat Commission and the Co-operatives cannot make an impact on the majority of the farmers especially since the traders and the auctioneers do not apparently base their buying prices on those of the Meat Commission.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This final chapter first presents the summary and conclusions made in this study. After that, the recommendations are made on the basis of the conclusions reached. The first set of recommendations are made for planning and cattle management while the second set are for future researchers in this topic.

The statement of the research problem specified that this study investigates the response to fluctuations in cattle sale prices by the small scale traditional farmers in the light of the implementation of the Botswana Government's policy of raising cattle sale prices as an incentive to increase cattle offtake from the small scale traditional farmers.

This research was carried out within the broad framework of rural development in a centre-periphery setting. The centre-periphery situation in the livestock sector of Botswana becomes clear when one considers that livestock development is geared mainly towards the external market. Livestock marketing reflects the dualism that characterises the whole economy of Botswana.

However, livestock products are the second largest

earner of the country's foreign exchange after minerals. Until 1976 when minerals overtook it as the chief foreign exchange earner, the beef industry had been the backbone of the economy of Botswana. The Government considers that the minerals will one day be exhausted. Consequently it is trying to put the livestock industry on a firm foundation since this industry is likely to resume its dominant role in the national economy after the exhaustion of the minerals. The mining industry has created few jobs so that the vast majority of the labour force still remains in agriculture. About 80% of the income from agriculture is accounted for by livestock and within the livestock sector more than 60% of the farmers are the small scale traditional producers. The complexity of the lives of the traditional cattle farmers cannot be over emphasised. However, their lives must be understood in order for rural development planning to be both relevant and effective.

Multiple regression analysis and partial correlation techniques were the main methods used to answer the research question of this study. Given the subsistence nature of cattle production in the study area, it was not possible to supplement the used techniques with others such as the gross margin analysis and the cash flow analysis which might have been used in commercial

ranching.

Summary and Conclusions

The first hypothesis stated that whereas agricultural credit to small scale farmers may increase cattle production in terms of numbers, it is not likely to raise the offtake rates because farmers do not respond to price incentives. In order to test this hypothesis, the Production Function and the Response Function were studied using multiple regression equations. Partial correlations were also used in order to investigate cause and effect between the variables. The independent variables of the Production Function were credit, calving rates, other income, and, immediate needs. The dependent variable was the herd size or number of cattle. After data processing, the resultant Production Function explained 58% of the variation in the dependent variable. An overwhelming percentage of the coefficient of determination was attributable to credit (49%), leaving only 9% to the rest of the independent variables. This seemed to suggest rather strongly that credit is the main factor in the increase in cattle numbers among the farmers who received it. The partial correlations suggested that credit was also the greatest ingredient

in the immediate needs of the farmers. The simple correlation coefficient between "number of cattle" and "immediate needs" was 0.59599. When "credit" was controlled, the partial dropped to 0.1814.

The conclusion from the Production Function is that credit apparently increases the rate of cattle production and also raises the immediate needs of the farmers in order for them to repay the loans. The independent variables of the Response Function were cattle sale prices, number of cattle, other income, and, immediate needs. The dependent variable was offtake rate. The Response Function explained 56% of the variation in the dependent variable. An overwhelming percentage of the coefficient of determination was attributable to the immediate needs (47%) leaving only 9% to the remaining three independent variables.

Essentially this result suggested that the overwhelming cause of cattle sales was the immediate needs. Considering that credit accounts for most of the immediate needs of those with loans, the conclusion from the Response Function is that credit seemingly influences both the production rate of cattle and the cattle sales positively. Before concluding on the hypothesis being tested, it is necessary to consider cattle prices. Cattle prices accounted for only 5% of the variation in the dependent variable. The coefficient of multiple

regression for this variable was 0.25. The R^2 change introduced by this variable together with the low elasticity of 0.25 suggested that the response of the farmers to prices was low. The hypothesis has to be modified to recognise these conclusions. In connection with this hypothesis, three other conclusions were drawn from this study. The first one is that traditional farmers apparently keep cattle mainly as a form of wealth and to a less extent as a source of income in Botswana. This conclusion was drawn from the suggestion that the farmers sell their cattle only to satisfy their urgent needs. The other suggestion that the farmers are not price conscious also tends to support the conclusion that the cattle are not being kept as a source of income. The second conclusion is that farmers will apparently sell more cattle if their immediate needs are increased. By themselves, increases in cattle numbers do not lead to increases in offtake rates. In Swaziland it was similarly concluded that traditional farmers kept cattle as a form of wealth and that programmes aimed at increasing cattle numbers did not automatically lead to increases in the offtake rates.

There is, however, a possible controversy in a strategy which would raise the immediate needs of the farmers as a way of persuading them to increase offtake while at

the same time affording the farmers the opportunity to sell directly to the better paying Botswana Meat Commission. With higher prices for their cattle, farmers would tend to sell fewer animals. A solution to this conflict is suggested in the Recommendations. The third conclusion is that the majority of the people who are taking advantage of the agricultural credit are the salaried workers from the formal sector of the national economy. These people mainly request and obtain credit in order to purchase breeding heifers, i.e. they are just beginning to be livestock farmers. This suggests that surplus income from other economic activities is being invested in the livestock industry. Also, it would appear that the majority of the credit holders are not the farmers for whom the credit scheme was designed, but the new entrants into cattle farming. The implication here is that the cattle bought by the young wage earners from the formal sector through credit and kept or looked after by their parents in the rural areas are simply some kind of income transfer from the children to the parents.

The second and final hypothesis stated that the Government credit scheme in its present form is likely to worsen income inequalities among the traditional farmers. This hypothesis was tested basically with the insight gained from the two multiple

regression functions and the partial correlations. A table was also constructed from the primary data of the study in order to illustrate that the use of credit had worsened income differences between the farmers who received it and those who did not. Due to the strict demand of the collateral security, the farmers who received credit had already been materially better off than those who did not receive it. It would appear, therefore, that this hypothesis is being accepted without modification. In connection with it, four other conclusions were drawn from this study. The first one is that the monopoly of the Botswana Meat Commission in exporting beef is partly responsible for the dualism in the livestock sector of the economy. The Meat Commission pays higher prices for cattle than any other buying agency but the majority of the small farmers do not have access to this market. Since the small scale livestock farmers do not sell directly to the Meat Commission, the stabilisation fund contributions from their cattle benefits those richer farmers who sell directly to it. This apparently means that livestock marketing in Botswana is a sign of underdevelopment since the poorer farmers seem to subsidise the richer ones. The second conclusion is that some small scale farmers are not aware of ~~all~~ the alternative marketing agencies

available to them. Farmers tend to sell their cattle to the same agents that their parents used. With the passage of time, the traditional farmers have developed strong ties with and trust in the agents they have been dealing with. In such a case, it is normally difficult to convince the farmers that there is a better market for them elsewhere. It is no longer a simple problem of information supply. For instance, the Agricultural Marketing Co-operatives have had to campaign vehemently in order to attract the farmers from their long established selling agents. It is possible, even so, that the recent increase in cattle sales to the Agricultural co-operatives could be attributed to the moderately educated younger farmers who have just begun livestock farming. The third conclusion concerns the economic multiplier in the credit system. Having noted that most of the loans given to the farmers were used to purchase livestock, it follows that the immediate beneficiary of the credit scheme are mainly the suppliers of the breeding stock. These suppliers are the commercial ranchers and a few of the richer traditional farmers.

The final conclusion is that some planning objectives of the Government have been found to conflict somewhat in the traditional livestock industry. The use of credit is apparently serving its purpose, i.e. to increase growth. With this growth, however, has come

worsening inequalities in cattle numbers between the various categories of the traditional farmers.

Consequently, rapid economic growth seems to have been achieved at the expense of social justice.

Recommendations

Under this sub-heading are presented firstly the recommendations for economic planning and livestock management and secondly those for further lines of research. These recommendations are based largely on the summary and conclusions of the study which have just been presented. However the context within which the recommendations are presented needs to be broadened in order to accommodate their ramifications.

A broad classification of a livestock production system is based on the ecological zone in which the system occurs. Any development programme should preserve the ecosystem within which it occurs. For instance, after noting that traditional farmers in Botswana keep cattle as a form of a bank, it would not be logical to continue to increase livestock production without facilitating the increased marketing of livestock in order to preserve the already deteriorating rangeland. The crucial point is whether to

improve the existing pastoral production system along with the welfare of the people living within the ecosystem, or to establish a new production system in a relatively less occupied area. It has been stated that western Botswana is relatively less occupied when compared with eastern Botswana.

Any type of economic change imposed on the small scale traditional farmers in their present areas of operation would naturally be slow. Mere infusion of capital or imposition of new production techniques is not likely to provide ready made solutions.

Economic change here is partly dependent on social change. The traditional farmers are oriented towards subsistence. A new production system in a relatively less populated area could be geared towards the adoption of modern techniques. It could have a defined land tenure system and be oriented towards the market. However, due to the poor organisation of the economic space in Botswana (there are four million head of cattle yet milk is being imported) and the export orientation of the cattle industry, sector wide projects within this industry could perhaps prove to be difficult to implement for the time being. A sector wide project attempts to improve not only one type of production but many different, complimentary types of production, as well as the backwards and

forward linkages in the industry. The livestock industry thus remains a one-commodity oriented project with a narrow production focus, implemented in a circumscribed environment. Having thus broadened the scope and context of the livestock production sector, the recommendations will now be presented. They are aimed at improving the livestock industry in a broad way, yet within the confines of the national planning objectives of social justice, rapid economic growth, sustained development and economic independence.

Recommendations for economic planning and livestock management

The first recommendation is that the farmers should be encouraged to raise the necessary funds for their development programmes through their Agricultural Co-operative Societies so as to reduce total dependence on the National Development Bank. As a way of encouraging the farmers to pool their financial resources through Agricultural Co-operative Societies, the Government should transfer short term loans from the administration of the Bank to that of the co-operative societies. These would be loans for cattle feed, vaccines, ploughing and planting. If the farmers who receive such loans do not have the opportunity to sell

their livestock to the Meat Commission, they could be encouraged to sell them to their Agricultural Co-operative Societies so that the instalments could be collected more easily.

The second recommendation is that the National Development Bank should seriously consider changing the emphasis in the criterion for credit eligibility. Since the Bank was established in order to reach small scale farmers who are by implication poor, the criterion for lending money to them should not emphasise the collateral security. It is recommended that the Bank becomes less strict with the collateral security and rather emphasise the farmer's ability to use the loan profitably. It has been suggested in this study that the use of the collateral security as a pre-requisite to loans tends to worsen income inequalities. It would appear that the use of the farmer's productive capacity as a pre-requisite to loans would be more fair to the farmers and would seemingly work well within the efficiency model of production which the Bank is apparently following. Such a credit scheme would apparently usher in greater social justice since there are possibly more potentially efficient small scale farmers without the collateral security than the farmers who have the collateral security but may not be all that efficient. Use of the credit criterion

which is being recommended here is likely to lessen the conflict between the two national planning objectives of rapid economic growth and social justice.

The third recommendation is that the Government should take over the supply of breeding stock to farmers who use agricultural credit to acquire such stock. The experience of the farmers is that they purchase breeding heifers from the commercial ranchers and from the wealthier traditional farmers at what seems to be exorbitant prices. The natural reaction to this sentiment by the Government might be to increase the alternative sources of breeding stock supplies in an attempt to bring down supply prices. This reasoning is based on the Government's raising prices through competition in the rural areas. However, the small scale farmers have sounded a more serious complaint which deserves prompt attention from the Government. The farmers are complaining that the suppliers of breeding stock sell them heifers which frequently have contagious abortion. Contagious abortion is a cow disease which is transmitted from a cow to its heifer progressively. In neighbouring South Africa, before a cow is sold in a public market as a breeding animal, it must not have suffered from this disease or else it is condemned. Some commercial ranchers buy such condemned heifers

from the South Africa ranchers and then sell them to agricultural credit holders at twice the purchase price.

It would thus be beneficial for the Government to take over the supply to farmers of healthy and satisfactory types of breeding stock.

The fourth recommendation concerns marketing. It is recognised that the Botswana Meat Commission probably cannot afford to lower the quota requirements for the sake of the smaller farmers without disrupting the efficiency of its operations. It is recommended, therefore, that the Meat Commission opens up its own agencies with salesyards in the major areas of the livestock farming industry. These salesyards could be the holding ground where farmers could sell whatsoever number of cattle they wish to sell at any time. The salesyard could wait until the number of cattle it has bought makes up a quota which could then be sent to the Meat Commission in the normal way. The presence of the Meat Commission agencies in the rural areas might also force the other agencies to raise their buying prices in order to survive the competition. Also its presence in the rural areas would ensure that the small scale farmers enjoy the benefits of their contributions to the stabilisation fund, which in turn implies greater social justice.

The fifth recommendation is that because of its sub-optimal production level and also because of its negative effect on pastureland, the cattlepost system of livestock production should be gradually replaced with government supervised low commercial grazing schemes. It is suggested that the areas to be zoned commercial grazing areas under the Tribal Grazing Land Programme be subdivided into areas where syndicates can be formed by groups of small scale farmers, and separate other areas where single farmers can operate, i.e. the more affluent farmers who can survive single handed in the rented commercial grazing zones. For groups of farmers who form syndicates, rentals should be reduced as an incentive to encourage small scale farmers to vacate the overgrazed areas around the villages where it appears cheaper for them to rear cattle. In order to ensure that future generations will also have land, the commercial areas should not be sold to any farmer or groups of farmers. The notion that land belongs collectively to all citizens should be preserved.

The sixth recommendation concerns range monitoring. Botswana is one of the three countries in Africa whose livestock industries are monitored by the International Livestock Centre For Africa (ILCA). The role of ILCA is to work out a system of monitoring

the changes in the rangeland where livestock farming obtains. It is recommended here that ILCA should include in its scope, the monitoring of the changes in the attitudes of the traditional farmers in view of the Tribal Grazing Land Programme and the change in the rural areas from bartering to the cash economy. A clear understanding of the complex life styles of the rural people in general and the livestock farmers in particular is expedient for present and future planning within their ecosystem.

The seventh and final recommendation attempts to bring about some linkage within the livestock industry. Botswana has about four million head of cattle but imports milk. It is recognised that milk forms an important ingredient in the diet of the farmers. However, not all farmers milk all their cows. It is therefore recommended that the Government should encourage dairying as a way of creating linkages within the cattle industry and also as a measure of saving foreign exchange. Before independence in 1966, there used to be a dairy in Mahalapye, the study area. This dairy stopped functioning after independence. Producers used to sell to the dairy and in turn it sold to the public. It is recommended that this practice should be revived and that similar dairies be constructed in other cattle raising areas.

Recommendations for further lines of research

These recommendations are meant for scholars and researchers in this topic. The first recommendation is that future researchers could investigate the possibility of inducing the traditional livestock farmers to invest outside the livestock sector, preferably in manufacturing and industry. This recommendation comes in the wake of the suggestion that these farmers are keeping cattle mainly as a form of wealth and to a less extent as a means of earning income.

If a loan-financed enterprise such as livestock production is both productive and profitable, then the farmer might be faced with decisions on the allocation of his additional income. He must decide between consumption and investment. This decision is influenced by the relative price levels of consumer and investment goods, together with the returns from savings. Researchers could find out how the Government could orient investment towards manufacturing and industry without bringing a conflict between livestock development and the industrial sector.

It is recommended secondly that future research could focus on the relationship between farmers with

cattle and the arable farmers who own no cattle at all. Currently it is not quite clear how farmers with cattle directly or indirectly benefit those without cattle. Cash flow analysis and value added measurements need to be done between these groups since rural development programmes would affect both groups.

Thirdly, scholars might seek to measure the rate of underdevelopment in the agricultural sector. Although the majority of labour in Botswana is employed in agriculture, it must be acknowledged that most of the labour in agriculture is underemployed. For further planning purposes, the Government needs to be supplied with figures estimating the rate of underemployment in agriculture, or else the Government might assume that this labour is optimally employed.

Fourthly, scholars could take a quantitative approach to the study of the effect of rural-urban migration on pastoral farming. It does not seem likely that the emigrants from the rural areas will be attracted back to the rural areas by any improvements on pastoral farming. Development planning programmes in the rural areas ought to take into account the continuous emigration of the potential herdboys as urbanisation continues in the manufacturing towns.

The fifth and final recommendation is that the researchers might examine the causes of the variation in the response of the farmers in different areas of the study area, i.e. analysis of the regression residuals.

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APPENDIX A

Multiple Regression Variables - Raw Data (Detrended)

Five Year Annual Averages for each farmers

Cattle Numbers		Other Income (P)		Calving rates		Credit (P)
WC	WOC	WC	WOC	WC	WOC	
84	27	490	788	0.47	0.46	300
60	23	563	250	0.47	0.65	1260
34	34	0	541	0.54	0.47	1300
89	17	1626	293	0.48	0.67	1350
29	24	2100	0	0.46	0.26	1000
51	19	1863	310	0.52	0.56	1340
23	24	714	140	0.64	0.26	900
63	28	3110	517	0.48	0.57	360
73	20	3300	1160	0.70	0.65	680
48	21	296	1598	0.59	0.57	780
43	33	1080	0	0.56	0.47	900
72	36	2442	639	0.68	0.47	675
69	36	680	374	0.52	0.50	1000
36	34	900	456	0.46	0.50	800
25	31	1018	448	0.50	0.69	1200
60	31	1018	550	0.54	0.48	850
41	32	880	312	0.57	0.63	950
31	25	359	1616	0.32	0.58	850
60	21	489	356	0.48	0.49	450
26	27	1018	378	0.65	0.41	1200
56	28	1618	1172	0.53	0.24	890
42	18	675	200	0.61	0.50	750
63	22	3400	337	0.36	0.41	1150
39	31	243	374	0.62	0.59	1000
40	23	370	558	0.54	0.51	430
56	26	1616	424	0.55	0.50	850
51	27	214	0	0.33	0.41	600
73	39	143	326	0.56	0.38	800
63	24	1950	293	0.34	0.52	1000
79	38	460	490	0.46	0.39	1200
61	44	4070	0	0.72	0.52	500
17	23	2300	706	0.50	0.42	800
94	29	1255	272	0.42	0.36	1000
82	29	1760	1490	0.45	0.21	1100
66	33	376	575	0.47	0.34	550

cont...

93	45	2420	1599	0.58	0.41	750
56	30	262	490	0.57	0.43	1000
42	38	455	284	0.40	0.51	1100
56	24	670	383	0.40	0.30	1100
46	36	1200	237	0.53	0.46	1000
42	33	132	257	0.46	0.44	1000
41	32	630	437	0.31	0.39	500
28	20	664	997	0.68	0.35	480
51	26	87	332	0.50	0.28	750
64	27	100	447	0.40	0.19	1400
25	29	740	414	0.54	0.37	800
41	32	100	378	0.39	0.40	1300
71	30	577	560	0.72	0.45	500
54	34	542	158	0.48	0.41	875

Skew- ness	Skew- ness	Skew- ness	Skew- ness	Skew- ness	Skew- ness	Skewness
0.31	0.38	2.13	1.91	0.33	-0.71	-0.14

Kurt- osis	Kurt- osis	Kurt- osis	Kurt- osis	Kurt- osis	Kurt- osis	Kurtosis
0.48	-0.21	4.33	3.84	-0.06	0.63	-0.66

Cattle Prices (P)		Offtake Rates (P)		Immediate Needs (P)	
WC	WOC	WC	WOC	WC	WOC
216	129	5	2	1144	788
168	125	13	9	1080	540
132	130	9	10	1027	860
126	125	10	17	1120	840
150	123	10	3	1190	860
158	126	12	10	1155	567
128	130	9	11	1098	751
113	126	8	0	1025	517
119	126	9	10	1100	930
130	123	10	5	1059	950
113	124	9	7	1155	1144
144	122	10	7	1156	990
137	128	12	5	1000	808
128	131	11	9	1044	880
122	129	12	5	1036	920
134	133	9	3	1120	890
145	134	12	8	1260	1050
146	128	6	0	1090	608
138	124	7	0	1088	800
135	125	10	7	1050	1005
134	126	11	0	1040	690
139	132	10	2	1000	917
150	123	11	5	1135	674
153	126	12	7	1240	894
136	132	7	3	1150	829
169	131	8	0	1070	790
148	127	9	7	1150	721
154	132	8	8	1080	761
154	133	12	8	1058	848
134	130	8	5	1051	1200
160	126	13	7	1050	1071
150	126	11	5	1000	410
141	125	10	3	1200	850
154	123	13	5	1220	402
166	129	10	4	950	875
128	133	9	7	975	803
158	122	10	6	1175	567
138	128	10	4	1060	1200
136	131	14	7	1200	739
138	130	14	7	1090	1100
148	119	10	4	1135	787
172	133	12	5	1260	535

130	128	10	10	1186	1100
170	130	8	6	1180	850
160	120	14	5	1090	707
160	125	12	5	1138	705
126	130	12	7	1108	612
148	126	10	5	1200	777
150	122	10	5	1175	797
152	129	15	6	1230	452

Skew- ness	Skew- ness	Skew- ness	Skew- ness	Skew- ness	Skew- ness
0.01	0.59	0.61	0.23	0.09	0.18
Kurt- osis	Kurt- osis	Kurt- osis	Kurt- osis	Kurt- osis	Kurt- osis
0.46	0.50	0.36	0.48	0.38	0.49

<u>Normalised Variable</u>		:	<u>Other Income</u>	
<u>WC</u>	<u>WOC</u>		<u>WC</u>	<u>WOC</u>
28.07	22.14		41.95	38.60
23.73	15.81		19.39	23.98
1.00	23.26		49.19	39.99
40.35	17.12		16.19	22.13
45.85	1.00		21.33	16.85
43.18	17.61		25.88	19.57
26.72	11.83		34.64	15.39
55.77	22.74		11.49	16.03
57.45	34.06		25.10	20.90
17.20	39.98		25.77	31.57
32.86	1.00		9.33	18.22
49.42	25.28		10.00	21.14
26.08	19.34		27.20	20.35
30.00	21.35		10.00	19.44
31.91	21.17		24.02	23.66
31.91	23.45		23.28	12.57
29.66	17.66			
18.95	40.20			
22.11	18.89	Skewness	Skewness	
31.91	19.44	0.43	0.51	
40.22	34.23			
25.98	14.14			
58.31	18.36	Kurtosis	Kurtosis	
15.59	19.34	0.38	0.18	
19.23	23.62			
40.20	20.59			
14.63	1.00			
11.96	18.11			
44.16	17.11			
38.29	15.36			
21.45	22.13			
63.80	1.00			
47.96	26.57			
35.42	16.49			

APPENDIX B

COST OF LIVING INDEX

<u>Year</u>	<u>Month</u>	<u>Index</u>	<u>Increase after 12 months</u>
1974	March	100	
1975	March	112,2	12,2%
1976	March	125,8	12,6%
1977	March	143,1	13,7%
1978	March	158,0	10%
1979	March	171,8	18,7%
1980	March	224,3	20,4%

Source: Bank of Botswana Annual Report,
1981, page 8.

APPENDIX C

Student's T tests for the significance of the differences between common variables of the two groups of farmers

Variable	Observed t	Tabulated t	Result
NCTE	8.56	1.98	Difference significant
OFTE	8.71	1.98	"
CPRE	4.54	1.98	"
IMND	23.96	1.98	"
CRTE	3.06	1.98	"
OINC	1.99	1.98	"

NCTE : Number of cattle

OFTE : Offtake rates

CPRE : Cattle prices

IMND : Immediate needs

CRTE : Calving rates

OINC : Other income.

D.F. for each variable = 98

Significance level = 0.05

APPENDIX D

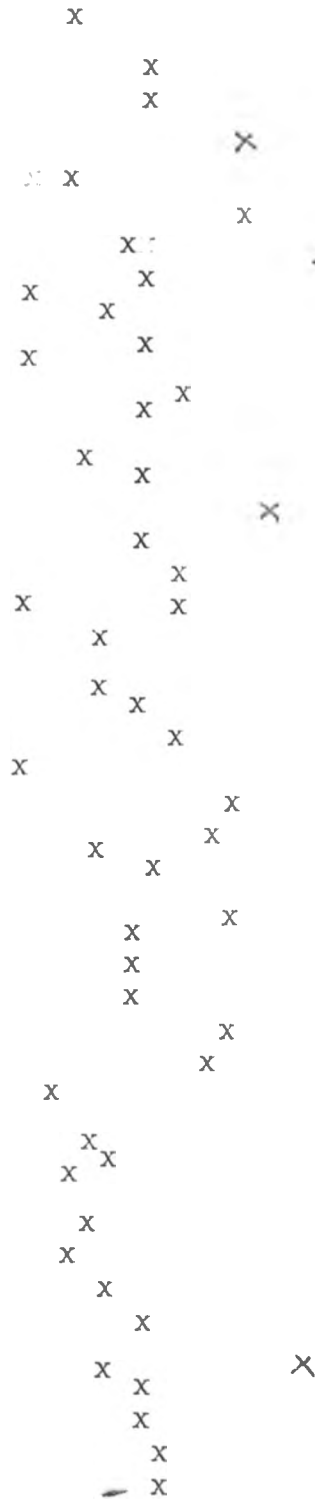
Regression Residuals : The Production Function

<u>R.N.</u>	<u>Residual</u>	<u>R.N.</u>	<u>Residual</u>
496	- 5.13	90	5.91
149	0.99	27	0.78
86	2.00	128	1.55
155	18.79	63	-10.56
280	0.23	188	30.90
357	-18.93	179	-10.45
325	- 1.34	103	23.36
91	7.67	10	13.55
146	-17.51	166	5.25
140	0.64	171	11.81
168	2.69	50	- 0.71
124	11.27	33	9.00
494	7.00	96	- 3.94
317	-16.91	187	- 5.46
211	- 0.93	191	19.91
209	3.81	87	- 0.71
381	- 2.05	47	16.52
558	-19.96	142	4.17
55	- 7.63	108	- 3.04
475	-33.90	72	- 0.62
530	- 4.86	65	- 4.25
99	- 6.80		
21	- 3.48		
90	-15.93		
458	- 8.21		
413	- 2.21		
256	7.30		
111	4.77		
181	- 5.05		

R.N. : Random Number
of farmer

Plot of Standardized Residual

-2.0 -1.0 0.0 1.0 2.0



Regression Residuals : The Response Function

<u>R.N.</u>	<u>Residual</u>	<u>R.N.</u>	<u>Residual</u>
496	- 3.43	90	- 1.52
149	0.38	27	- 1.69
186	3.56	128	1.22
155	- 0.63	63	- 2.51
280	- 2.46	188	- 0.45
357	0.29	179	- 2.29
325	5.79	103	00.20
91	0.51	10	1.30
146	4.20	166	0.23
140	1.35	171	0.93
168	- 1.07	50	4.08
124	- 1.57	33	- 1.73
494	- 1.01	96	0.63
317	3.34	187	1.40
211	- 1.64	191	- 2.04
209	- 0.95	87	0.39
381	- 0.85	47	1.13
558	- 3.33	142	2.64
55	- 3.84	108	- 0.88
475	2.23	72	- 0.85
530	- 3.47	65	3.81
99	1.38		
21	1.01		
90	1.30		
458	- 2.80		
413	- 2.35		
256	1.10		
111	- 3.50		
181	1.46		

R.N. :Random Number
of farmer.

Plot of Standardised Residual

-2.0 -1.0 0.0 1.0 2.0



APPENDIX E

Recording Schedule for Traditional Cattle Farmer

SECTION A

(All Farmers)

Random Sampling Number of Respondent _____

1. No. of your own cattle in your cattle post in the last 5 years.

	1975	1976	1977	1978	1979
Total No.					
Cows					
Heifers					
Steers					
Bulls					
Calves					

2. No. of cattle lent you by friends and relatives.

	1975	1976	1977	1978	1979
Total No.					
Cows					
Heifers					
Steers					
Bulls					
Calves					

3. What is your own holding in small stock?

	1975	1976	1977	1978	1979
Goats					
Sheep					
No. Slaughtered					

4. Which cattle buying agencies do you know?
 - i. private auctioneers
 - ii. agricultural co-operative society
 - iii. any other - specify
5. Are you compelled by your creditors to sell your livestock through a particular cattle agency, if so which? _____
6. If (5) does not hold why do you sell through the agency marked in (4)
 - i. because of prices
 - ii. because the agency is within easy reach
 - iii. because of advice from the agricultural demonstrator
 - iv. any other reason - specify
7. Herds of cattle sold from your cattle post

	1975	1976	1977	1978	1979
Price					
Heifer					
Cow					
Steer					
Bull					
Calves					
Agency used					
Total Amount					

8. Which season were the cattle sold in?

- i. rainy season: October-February
- ii. dry season : March-September

9. Why were the cattle sold?

- i. to meet domestic needs - school fees
 - food
 - clothing
 - funeral expenses etc.
- ii. to repay credit loan
- iii. because of good prices
- iv. any other reason - specify

(Estimate amount for i, ii, iii and iv independently to be able to correlate each figure with total amount shown in (7) above).

10. How often do you meet with your local agricultural demonstrator?

- i. once a month
- ii. once in 3 months
- iii. once in 6 months
- iv. fewer than above

11. Under your present cattle post conditions how many cattle would you like to keep?

- i. up to 20
- ii. up to 50
- iii. up to 100
- iv. more than 100 i.e. as many as I can afford

SECTION B

(Farmers with Credit)

1. Why did you request credit at all? _____
2. How much credit have you received? Convert items e.g. bonemeal, salt, new bulls, tickcides, vaccines, to cash if credit was not hard cash _____

1975	1976	1977	1978	1979
------	------	------	------	------

Amount

3. What did you pledge as collateral to secure the loan? _____
4. How much is your yearly repayment installment? _____
5. How many cattle do you sell annually to meet your installment?

1975	1976	1977	1978	1979
------	------	------	------	------

Number

6. Have you had any problems with repaying the loan? _____ If yes, what was the nature of the problem? _____
7. Has any action been taken against you resulting from your failure to repay the loan? If yes, what action _____
8. Do you hope to request further loans in the future? _____ If yes, for what purpose?
 - i. to enlarge my herd numerically
 - ii. to adequately cater for the existing herd
 - iii. to increase my sales
 - iv. any other reason - specify

9. (a) Would you like to form a syndicate with some other cattle farmers (small scale) and then move into Commercial Areas in accordance with Tribal Grazing Land Policy?

If no, why?

- i. expenses might be too high due to rent I must pay
- ii. I can have no direct control to my cattle
- iii. There is a possibility of being cheated by other farmers
- iv. I do not wish to leave my traditional grazing premises
- v. It will be impossible for me to derive other benefits of cattle like milk, using oxen for ploughing and as bests of burden
- vi. Any other reasons - specify

-
9. (b) If yes, why?

- i. my cattle have better chances to increase numerically in the Commercial Areas because of better grazing and breeding conditions
- ii. loans or credit will be easier to acquire when we are a syndicate and if we are in Commercial Areas
- iii. any other reason - specify

10. If you formed a syndicate and entered a Commercial Area, how many cattle would you like to own?

- i. up to 20
- ii. up to 50

iii. up to 100

iv. more than 100 i.e. as many as I could have

11. Would you still wish to keep small stock i.e. goats, sheep if you moved into Commercial Areas?

_____ why? _____

12. How many times have you shifted your cattle post in the following years?

1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

No of
Times

13. Why did you shift OR not shift?

SECTION C

(All farmers)

1. Can you read and write vernacular?
2. What is your level of formal education?
 - i. no education
 - ii. lower primary
 - iii. higher primary
 - iv. secondary school
3. How many children do you have?
 - i. 0 - 3
 - ii. 4 - 8
 - iii. Over 8
4. How many go to school or have gone to school?
 - i. up to lower primary
 - ii. up to higher primary
 - iii. up to secondary school
 - iv. above secondary school
5. How many have not gone to school at all?
6. What is your other occupation besides cattle raising?
 - i. employed
 - ii. crop raising
 - iii. both i and ii apply
 - iv. no other occupation
 - v. any other response - specify

7. What is your average yearly returns from the other occupation?

Year	1975	1976	1977	1978	1979
Amount					

8. How many of your relatives and your children help you on the cattle post? _____

o. How many non-relatives have you employed, if any?

10. Where is your father's cattle post?

i. he has none

ii. we are sharing this one

iii. at a different location

iv. any other response - specify

11. If your other occupation is subsistence arable farming, do you use your cattle or a tractor to plough?

	1975	1976	1977	1978	1979
Cattle					
Tractor					

12. If the tractor is used or sometimes used, is it yours or hired? _____

13. If tractor is hired, why don't you use your oxen?
- i. they may lose condition and sell cheap
 - ii. they are not enough to use for ploughing
 - iii. they plough slowly so that moisture is lost before one finishes ploughing
 - iv. any other reason - specify
14. How often do you eat the following food items per week?
- i. rice
 - ii. bread
 - iii. meat
 - iv. maize meal
 - v. sorghum porridge
 - vi. drink milk (fresh and sour)
 - vii. greens (i.e. African greens, a lot of which grow wild especially around old cattle kraals)
 - viii. oranges
15. How did you acquire your original herd of cattle
- i. I inherited it from my father
 - ii. I bought the herd piecemeal or all at once
 - iii. I inherited some but also bought some
 - iv. any other possibility (specify)
16. Besides the credit repayment (if you have it) how much have you invested on your cattle?

	1975	1976	1977	1978	1979
Amount					

SECTION D

(Farmers Without Credit)

1. Did you ever apply for any credit? Yes/No
2. Why did you apply for the credit?
 - i. to improve my livestock numerically and qualitatively
 - ii. because of the encouragement given by government through the National Development Bank extension workers
 - iii. any other (specify)

3. How much had you applied for? _____
(Convert items such as salt, vaccines, bonemeal etc. to cash)

4. How many cattle have you had since 1975?

	1975	1976	1977	1978	1979
Number					

5. How much small stock do you keep?

	1975	1976	1977	1978	1979
Number					

6. What did you pledge as security when you applied for credit?
 - i. cattle
 - ii. nothing
 - iii. any other (specify)

7. What other source of income do you have?
- i. nothing
 - ii. occasional employment/permanent employment
 - iii. arable agriculture
 - iv. any other (specify)
8. Give an estimate of the annual monetary returns from (7) above

	1975	1976	1977	1978	1979
Amount					

9. Why did the National Development Bank refuse you credit?
- i. they gave no reason
 - ii. they said my cattle were too few
 - iii. they said I had no potential to repay the credit
 - iv. any other (specify)

APPENDIX F

NATIONAL DEVELOPMENT BANK RECORDING SCHEDULE

1. What is the purpose for your giving out loans to small scale farmers in the open communal areas?
 - i. in order to help them individually to increase their stock
 - ii. in order to help them protect their stock against disease
 - iii. in order to help them purchase cattle feed since pastures are poor in communal areas
 - iv. in order to help them increase offtake for the external market
 - v. any other reason - specify _____

2. How many herd of cattle must a small farmer have in order to be considered by the Bank for any credit?
 - i. not less than 10 herd of cattle
 - ii. not less than 15 herd of cattle
 - iii. not less than 20 herd of cattle
 - iv. not less than 25 herd of cattle
 - v. any other answer - specify _____

3. Would you help any farmer with more than 25 herd of cattle with credit? _____
If yes, why?
 - i. he is still entitled to a credit according to our terms
 - ii. he has a good potential to repay the loan
 - iii. he could utilise the credit better than farmers with fewer stock
 - iv. any other answer - specify _____

4. What collateral security do you require from small scale farmers?
 - i. some of their cattle are pledged according to size of credit
 - ii. life policy is pledged
 - iii. no security is required but the recommendation of the local agricultural demonstrator has a high weighting
 - iv. any other answer - specify _____
5. How long is your grace period?
 - i. no grace period at all since installments are paid once a year i.e. 12 months from date of credit acquisition
 - ii. it is 24 months from date of credit acquisition
 - iii. it varies according to circumstances
 - iv. any other answer - specify _____
- 5b) What interest do you charge on credit? _____
6. How does the bank assist the farmer to utilise the credit properly?
 - i. the bank does nothing to help farmers utilise credit since it believes that they know how to use the credit in accordance with the terms of lending
 - ii. it helps farmers through its field officers
 - iii. it helps farmers through agricultural demonstrators
 - iv. any other answer - specify _____
7. How does the bank expect farmers to raise installments?
 - i. by selling some of their cattle
 - ii. through savings from other incomes
 - iii. any other way - specify _____

8. What happens in case a drought strikes and cattle lose condition?
- i. we halt installments until drought is over
 - ii. we expect farmers to continue as usual with installments
 - iii. we write off the debts
 - iv. any other answer - specify _____
9. What happens if cattle are lost through drought, disease or theft?
- i. the farmers are still liable to repay the loans normally
 - ii. the loans are waved but the farmer still must pay later
 - iii. we write off the debts
 - iv. any other answer - specify _____
10. In the Study Area concerned (i.e. Mahalapye cattle posts) what proportion of farmers with credit have had problems with repaying their loans in the last 5 year period?

	1975	1976	1977	1978	1979
Percentage With Problems					

11. What was the nature of the problems?
- i. farmers did not want to sell cattle to repay the credit
 - ii. cattle markets were closed due to disease outbreak
 - iii. drought reduced cattle numbers and weakened the condition of the remaining ones
 - iv. any other reason - specify _____

12. What measures have been taken against farmers failing to repay their loans?

- i. nothing
- ii. they have been threatened with prosecution
- iii. they have been prosecuted
- iv. any other answer - specify _____