AN INSTITUTIONAL APPROACH TO LIVESTOCK DEVELOPMENT
IN SOUTHERN AFRICA

BY

NICHOLAS YINK

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PROMOTOR: PROFESSOR W E KASSIER
CO-PROMOTOR: DR G J YAM ROOYEN

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To my parents
who are the best of friends
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CHAPTER ONE
INTRODUCTION

This study has two major objectives. The first is to show that conventional approaches to analyzing the problems of the livestock subsector in southern Africa are inadequate. The second is to propose an alternative approach, and on this basis to formulate more relevant development strategies.

In order to set the scene for the attainment of these objectives this chapter contains an overview discussion of agricultural development theory and its application in southern Africa in the next two sections. A description of the conventional view of the problems of the livestock subsector is used to motivate the general hypothesis of this study in section three. Section four contains a description of the data base to be used in the testing of this hypothesis. This is followed by a description of the chapter outline of the study in section five.

A note on the nomenclature used in this study is necessary. In referring to the self-governing and independent national states, the term 'homelands' or 'reserves' is generally used. This should not be construed as carrying any value judgement, but is used in the interest of brevity. Further, the term 'livestock' is at times used interchangeably with specific categories such as especially cattle, and also sheep, goats and pigs. The context within which it is used will make clear the specific category being referred to.

1.1 Approaches to development world-wide

The aim in this section is to analyze the trends in development thought which are pertinent to this study rather than to provide an exhaustive description of the literature on development. This latter has been ably presented by Coetzee (1980), while other contemporaries include Killick (1980), Livingstone (1981) and Streeten (1981). Earlier reviews include Meier and Baldwin
(1959), Hoselitz (1960), Hayami and Ruttan (1971), Streeten (1972) and Morawetz (1977), while later work includes Lewis (1984) and Littelem (1984). Reviews of the literature which addresses the general approaches to agricultural development include Thornton (1975) and Reynolds (1975). A later review which specifically addresses the agricultural development problems of sub-Saharan Africa is found in Elchle and Baker (1982).

It is often assumed that development theories have evolved linearly from some early misconceptions to modern approaches which are more robust in their ability to explain the nature of the development problem. This kind of interpretation of the changing views on development should be regarded with the necessary amount of skepticism. Development theory, as is the case with economic theory in general (e.g. Neumark, 1978) often draws on past theories and advances in more or less frequent cycles of knowledge.

Given this caveat, a number of distinguishing features of development theories can be identified as they have changed over time. First, little attention was paid initially to the problems of agriculture, and second, efforts were initially aimed at the development of countries and not of people. This emphasis on the industrial development of countries has been traced to the perception that there was a labour surplus in the agricultural sector of less developed countries (cf. Muller, 1986: 71-74). The shortage of capital meant that this labour stayed in the agricultural sector, instead of being reallocated to industry (Livingstone, 1981: 1). Two further underlying reasons for this perception can however also be identified, given that contemporary interest in the development of these countries can be traced to the post-World War II years.

First, the success achieved by the Marshall Plan in the

1 Schlesinger (1965: Chapter 22) describes the political background to this awakening of interest in the Third World by the Truman and Kennedy Administrations in the USA.
reconstruction of Europe was evidently due to the massive transfer of capital which took place. In 1949 the US Administration therefore committed itself to placing the technical resources of the United States at the disposal of the poor countries, in the belief that technical assistance would achieve as much as a capital transfer, and at a lower price (Galbraith, 1979: 29). Second, the field of economic theory had undergone a major transformation in the pre-war period with the publication of Keynes' General Theory (1936) and the new emphasis on the macroeconomic approach.

There was however early recognition that the resultant macroeconomic models could not serve as general theories of development. This was based on recognition of the importance of agriculture in development (e.g. Rais and Feld, 1961; Johnston and Mellor, 1961). The new research on agricultural development has covered many issues, and the microeconomic emphasis of this research is evident from a small sample of problems addressed in the literature (cf also Mellor, 1986: 68). These include for example the taxonomy of farmers (e.g. Miracle, 1968), the political economy of agricultural development (e.g. Parsons, 1978; Schultz, 1978); the interrelatedness of agriculture with the rest of a developing economy (e.g. Shub, 1968; De Janvry, 1985); the role of risk aversion and the adoption of innovations (e.g. Clawson, 1970; Valsesia, et al., 1979; Feder, et al., 1985; Just and Zilberman, 1985); equity and efficiency in agriculture (e.g. Hayami, 1983; Ranis, 1983; Rausser, et al., 1983); and farming systems research (e.g. Maxwell, 1986).

In the 1970's there arose a divergence of approach between the agricultural and general development scholars. The latter, only indirectly realizing the importance of agriculture in development, broadened their approach to take account of the whole rural sector. The integrated rural development paradigm was born (e.g. Auly, 1978; Birowo, 1983; Johnston and Clark, 1983; Ruttan, 1984). A further refinement was accomplished when the objective of development was changed to that of meeting Basic Needs (e.g. Streeten, 1981). Integrated rural development and the
meeting of basic needs have been seen as the end result of the
evolution of development thinking, to the extent that they
represent a 'new consensus' with regard to the objective and
objective function of development (e.g., Jolly, 1977). However,
Streeten (1981: 334) himself warns that the basic needs
strategy should not be regarded as more than a supplement to
other approaches. The integrated rural development approach also
lost popularity in the late 1970's as it failed to address the
central problem of achieving a reliable food surplus (Eicher and
Baker, 1982: 52-63) and did not account for the scarcity of
managerial talent required to implement the elaborate social
engineering models (Ruttan, 1975; Shuh, 1978; Melior, 1986:
73).

The study of economic development came under increasing criticism
at the same time that the 'new consensus' was reached (cf. eg
Bauer, 1981; Little, 1982; Lal, 1983). The criticism was based
mainly on the perceived need to 'return to the market', i.e., to
rediscover neoclassical microeconomics in analyzing the problems
of developing countries. Counter-arguments to this criticism (cf.
eg., Toye, 1984; Stewart, 1985) rely on a restatement of the
tenets of conventional development economics and their macro
viewpoint.

To the extent that this debate led to a questioning of the
validity of development models there also ensued a broadening and
deepening of these models in four different ways (Livingstone,
1981: 2-14). These include the deepening of local research; a
new emphasis on the particular problems of different regions of
the world; a recognition of the political dimension of
development and the assimilation of research results from other
academic disciplines. These interrelated facets are discussed
briefly in turn below as they have affected the theoretical
approaches to agricultural development.

1.1.1 The small farmer approach

The 'new consensus' notwithstanding, much research was still
being conducted on various other aspects of economic development, including the field of agriculture. This latter field of study was one of the areas where the neoclassical microeconomic theory still found some application. It was also within this framework of agricultural development theory that the 'poor but efficient' hypothesis of Schultz (1964) was formulated. In this view peasant farmers were allocatively efficient, and technology transfer was needed to increase farm production. Although the hypothesis has been subject to a rigorous critique in subsequent years (cf Eicher and Baker, 1982 : 105 - 108 and Adams, 1986 for the relevant references) it did establish an important point, namely that at least some farmers would benefit from technology transfer.

This perception created the conditions for one of the only truly successful agricultural or rural development programmes, namely the Green Revolution\(^2\). The programme had insidious beginnings in India (Hopper, 1978 : 69):

'The 1966 precursor of summer's heat arrived in Delhi by mid-March. The prevailing wind had backed from northwest to southwest, from carrying the cool breezes of the plateaus of Turkestan to pushing before it the warm winds of Arabia and the Indian Ocean. The ceiling fans at the Delhi School of Economics spun wildly in an effort to cool the bodies, if not the tempers, of those participating in a seminar on the possible and probable consequences to India of a massive introduction of high-yielding seeds of dwarf wheat and rice varieties. The seminar participants were government bureaucrats, scholars from agricultural and general universities, a sprinkling of foreign advisors and expatriate technical assistants, and a few political leaders, including, when time permitted, India's minister of agriculture.\(^2\)

Within the first few hours of a three-day meeting, the

\(^2\) Blyn (1983) and Leaf (1983) provide recent evaluations of the effect of the Green Revolution in India.
discussion focused on a call by many participants for government prohibition of further imports of high-yielding seeds and for government efforts to ban the spread to farmers of the genetic stocks of dwarf materials then available on the research stations of the nation. Despite the protests of the few, the meeting carried a clear consensus for prohibiting the entry and use of the new varieties. Fortunately for the nation's hungry masses, the politicians ignored the consensus. The high-yielding, dwarf genes were imported from Mexico and the Philippines. Some 18,000 tons of dwarf wheat seed arrived in Bombay from Mexico in late spring of 1966, the largest seed transfer in world history. By 1970, India's wheat production had doubled the previous record of 1965.¹

It is a well-established fact that India is today a net exporter of grains and that the Green Revolution did not lead to greater inequalities in income distribution as was at first feared. The technology transfer model, it would seem, had been vindicated with a vengeance despite the fact that experts were predicting gloom even in later years (cf Dandekar, 1975 for one example). Two other successes in agricultural development however serve as a caution against oversimplification.

Despite the seemingly socialist view of the new government, as well as drought conditions, commercial farmers in Zimbabwe have increased maize output by 90 per cent since 1980. The increase in production of maize by peasant farmers has however been more spectacular - output has increased by 253 par cent in the same period (Financial Mail, 1985b : 51-54) although most peasant farmers farm on marginal land (Shumba, 1984 : 91). Whereas peasant farmers never produced more than 14 per cent of Zimbabwe's maize crop prior to 1981, their contribution was 41 per cent in 1982, which dropped to 35 per cent in 1984 as a result of the drought (Financial Mail, 1985b : 51-52).

Apart from the measures which were introduced to change the nature of tenure for peasant farmers the Zimbabwean government
also instituted price and marketing measures to encourage production. Zimbabwe maize prices were, for example, increased by more than 40 per cent for the 1980/81 growing season (Financial Mail, 1981: 1564) and by more than 50 per cent between 1982/83 and 1984/85 (Financial Mail, 1984: 88). Further, peasant farmers are paid promptly — usually within two weeks of delivery, and are supplied with bags and other means of storing grain (Financial Mail, 1985b: 52-54). Attempts are being made to provide crop collection depots as close as possible to the farmers and to improve the quality and quantity of extension workers (Financial Mail, 1985b: 52).

The People’s Republic of China, having undergone three decades of upheaval, introduced the xiren xie or responsibility system in the agricultural sector in 1978 (Economist, 1986: 36). Under this freer system rural communes have been subdivided into smaller units and the peasant farmers given more autonomy over what they grow and how much they sell for. Concomitantly, rental contracts on private plot ownership were increased from three to fifteen years and the official purchase price of grains was increased by 40 per cent between 1979 and 1984 (Economist, 1984: 69). The result has been a complete transformation of the rural economy (cf eg Rowan, 1981).

China has become the world’s largest wheat producer (Economist, 1985: 13), increasing real rural incomes by 12 per cent per year between 1979 and 1983, and decreasing grain imports (Economist, 1984: 69). The proportion of farmland sown to cash crops has also increased, making the country the world’s largest cotton producer in 1985 (Financial Mail, 1985a: 56). The sales of fertilizer and tractors have also increased (Economist, 1986a: 69).

Neither Zimbabwe nor China have escaped the side-effects of these reforms in terms of for example higher food prices for the urban population, budgetary strains as a result of export losses. Neither of these two cases also relied solely on technology transfer to ensure stable food supplies. The lessons to be
learned are therefore more complex. There is however one factor which is common to all three these examples, namely that they were aimed at supporting the small farmer. It is also evident that the agricultural sector cannot be seen in isolation from the rural sector in general nor from the national economy (Mellor, 1986).\(^3\)

1.1.2 The spatial dimension

Earlier attempts at building general theories of development were based on assumptions which did not hold for all the development regions of the world. For a variety of reasons, not least of which was the late stage at which African countries gained independent voices in the United Nations, research interest in agricultural development in sub-Saharan Africa gained momentum only in the early 1960's (Eicher and Baker, 1982: 8, 17). A singular feature of much latter-day research on agricultural development in this region is the pervading sense of failure and disillusionment with past efforts, and fear of an impending crisis (cf eg Eicher, 1982; Ghai, 1983; Wheatcroft, 1983; Time, 1984; Green and Singer, 1984, as well as official reports, including FAO, 1980; World Bank, 1981).

These gloomy predictions are no less surprising given that research aimed at understanding the small farmer and the decision making process in peasant agriculture had an early history in Africa (cf Eicher and Baker, 1982: 67-112 for a wealth of references). This had the advantage of sending some openly ungrounded ideas, such as the cultural barrier hypothesis and the concomitant backward bending supply curves of labour, to an early grave (cf Eicher and Baker, 1982: 28-30). A search for the causes of the state of underdevelopment in Africa was therefore in order, and scapegoats were sought in all quarters.

\(^3\) Killick (1986: 103) quotes Peter Timmer to the effect that: '... getting prices right is not the end of economic development, but getting prices wrong frequently is.'
In keeping with the tradition of development economists to aggregate developing economies by the least tenable measure the first realization, especially after the oil shock of the early 1970's, was that North Africa could be included in data on Africa only at the expense of losing the ability to make gloomy forecasts. The phrase sub-Saharan Africa was subsequently coined. This in itself presented problems, owing to the presence of South Africa and, in earlier years, Rhodesia. Maps of sub-Saharan Africa which have excised South Africa and South West Africa/Namibia are therefore not uncommon in the modern literature (eg World Bank, 1981; Eicher and Baker, 1982; Economist, 1986b).

An example which serves to illustrate the almost willful use of statistics to paint the gloomiest possible picture is the ever-popular use of the declining index of food production per capita measure. Kenya, for example, has an index for 1979-81 of 84 (base year 1969-71)\(^4\). This is often used without further analysis as proof of inability to increase production, despite the fact that the country has followed pricing policies which support both commercial and smallholder farmers (Jabara, 1985). With the same base year however, agricultural exports stood at an index of 387 in 1979-81, and constituted 49 per cent of total exports in 1981. These agricultural exports paid for 28 per cent of Kenya's total imports in 1981. The point made here is that signs of failure will be found if they are looked for, while reality is more complicated (cf also Mosley, 1986).

1.1.3 The political dimension

A more concrete effort to explain the problems of ailing Africa came from the dependency theorists of Marxist persuasion (cf Shaw and Grieve, 1979 for a review of this literature as it applies to Africa). In this view underdevelopment was not seen as a stage of development, but the result of colonial and neo-colonial...
exploitation by the world capitalist system. This literature was supplemented by what Hirschman (1977) termed the micro-Marxists, the best known being Hyden (1980; 1983). In this view underdevelopment is a function of the ability of the small farmer, given the "peasant mode of production", to withstand capitalist penetration, and in so doing frustrate the best-laid development plans. Hyden (1980: 152, 223) first suggested, in true Stalinist and Maoist tradition, that, in order to modernize, the demands of the ruling classes would have to be met by force if necessary. In what has been described by Kasfir (1986: 338) as "a breathtaking change of heart" Hyden (1983: 52, 156) is latterly of the opinion that efforts to assist peasants to get closer to the market may be more effective.

The major weakness of the Marxist view lies in the vagueness inherent in terms such as 'dependency' and 'mode of production', as well as in the lack of an empirical basis for the theories (Killick, 1980: 383; Etcher and Baker, 1982: 40). A major contribution on the other hand, lay in the emphasis placed on the role of the political economy and institutions in the process of development.

The politicians in sub-Saharan Africa have also been blamed for the current malaise. Given that farmers will respond to market incentives, it is argued that successful development will be more a function of external support structures than of making inefficient farmers more efficient (Brett, 1986: 22). These external support structures are provided by the state, and their provision controlled by politicians. The state has failed to provide these structures required for transforming agriculture (Gephart, 1986: 57) and the politicians are to blame (Rweyemamu, 1984: 19; Sandbrook, 1986). The number of things for which the politicians are blamed, the underlying reasons, as well as their degree of culpability, varies according to the views of the specific scholars but a number of common interrelated factors can be identified.

African (or sub-Saharan African) politicians are said to be biased
toward urban areas, because this is where their political constituency lives. Politicians therefore keep food prices low, parastatals large and staffed by friends and relatives, and exchange rates overvalued to protect the purchasing power of urban elites (eg Bates, 1981) despite paying lip service to the importance of agriculture and the rural sector in development (eg Heye, 1976 : 2). Politicians therefore do what they deem necessary in order to survive (Lele, 1984 : 678). Other reasons have however also been advanced for the bias against agriculture.

Eicher and Staatz (1985 : 4) quote Julius Nyerere as saying that the politicians are 'impatient and ignorant', although this must also be seen in terms of the scope of the disaster visited on Tanzania. More concrete reasons are presented by Schultz (1978 : 10-13). These include the colonial heritage and the need for the newly independent governments to consolidate power, an argument also used by Delgado and Mellor (1984 : 666). Further causes are the adverse effects of unstable world prices of farm commodities and inputs and the fear of creating inequality by favouring a rural elite who will have favourable access to the benefits of farm policies (eg Brown, 1978 : 84).

Another major factor to be taken into account is the fact that the bias against the rural sector increases over time, to the extent that one major government intervention creates distortions which creates the need for further intervention (Schultz, 1978 : 12-13). This latter factor has also been seen as a major cause of the proliferation of parastatal organizations and other attempts to replace the market with the 'political' market (eg Gerrard, 1983; Aboyade, 1985; Vengroff and Farah, 1985).

Much of the modern literature on agricultural development in sub-Saharan Africa focuses on the culpability and sometimes the venality of politicians (cf also Bruton, 1985 : 1107). An alternative view is propounded by Wheeler (1984) who presents an econometric analysis of policy and environmental variables include factors such as climate, export prices and political instability. Not surprisingly, the results suggest that some of
the 'failures' of development are caused by such adverse circumstances. It is clear however that adverse circumstances such as drought have a far more debilitating effect than need be, due among others to political mismanagement (Timberlake, 1985). It is also clear that adverse circumstances such as political instability are due to, among others, political mismanagement (eg McGowan and Johnson, 1984).

This brings the analysis back to the problem of aggregation of countries. The political malaise of Africa is not general, nor are the adverse effects of drought (cf Hinderink and Sterkenburg, 1983). No ex-British colony in eastern or southern Africa, with the recent exception of Lesotho, has for example experienced a coup, military or other (McGowan and Johnson, 1984). The experience with smallholder farmers in Zimbabwe during the recent drought also belies the inability of government-initiated efforts to produce a measure of success. The process of learning from success will therefore be advanced more fruitfully by the lessons of experience with small farmer support programmes (eg Clayton, 1983) in contrast to general theories for arbitrarily aggregated geographic regions (eg Killick, 1980).

1.1.4 Research results from other disciplines

The content of development policy is by definition based on a view of both the goals of development and the specification of who is to be affected in the process. Any review of the theoretical content of the study of development will show that there has been a changing view of both the objective and target group over time, and therefore of policy instruments to achieve these goals. This changing view has been influenced by knowledge from other social sciences, for example in the debate over the basic needs strategy, and also from the field of agricultural technical research. In this latter case the experience with the Green Revolution serves as an important contribution. These trends are not discussed in this study. The influence of the neoclassical microeconomic theory on agricultural development is however instructive in this regard.
As was shown previously there has long been recognition, in at least one section of the literature on development, of the importance of the small farmer approach. This has been true both of the theory of development in general and of theories applicable to different geographical areas in particular. Efforts at assistance to peasant farmers in the Latin American region, however, confronted the problem of skewed distribution of land ownership at an early stage (Dorner, 1972). This gave rise to both the institutional approach to land reform of the Land Tenure Centre at the University of Wisconsin-Madison (eg Dorner, 1966) and the structuralist neo-Marxist theories of underdevelopment (cf Coetzee, 1980: 71-88). Little use was however made of the neoclassical microeconomic theory, in contrast to the literature on India and other parts of Asia. Mellor (1970), for example, criticized the methodological and empirical basis of the 'poor but efficient' hypothesis at an early stage, while still recognizing the rationality of peasant farmers. Much of his research attention was focussed on the farmer support paradigm (eg Mellor, 1966; 1967) and its role in the process of development (eg Mellor, 1976; 1983; Mellor and Johnston, 1984) from a neoclassical viewpoint. This has been characteristic of most of the agricultural economic research in that part of the world.

Much of the literature on small farmer development in sub-Saharan Africa makes little use of microeconomic concepts, for example in the work of the Institute of Development Studies at the University of Sussex and authors such as Chambers (1983). Where these tools of microeconomic analysis have been used, it has been within the neoclassical paradigm (cf eg Livingstone and Ord, 1981; Levi and Havinden, 1982).

The robustness of the neoclassical paradigm implies that this approach could be valid. The literature which applies the approach to sub-Saharan Africa was however derived from economies which differ from those of sub-Saharan Africa (Lele, 1984: 677). Failure to adapt these theoretical approaches to African
conditions has led to failure in the past, for example in the experience with large scale agricultural projects (Eicher and Baker, 1982: 49-50) and could do so in the future (e.g. Famoriyo and Raza, 1982).

A further feature of agricultural development theory in general is the relative lack of recognition given to the results of new research in microeconomic theory. A few notable exceptions include Hayami and Ruttan (1971) who analyze induced technical innovation, Collier (1983) and Roemer (1986) who analyze the role of contracts in rural markets, and Low (1982b) and James (1983) on the application of the new household economics approach. In general though, the assumptions of the neoclassical model are accepted without question. This includes the assumption that the institutional framework of society is exogenously determined and stable, although there is increasing recognition of the need for a re-evaluation of this position (e.g. Bruton, 1985; Adams, 1986; and Stiglitz, 1986).

1.1.5 Conclusion

New insight has been gained in the development process in four different ways. First, it is evident that a small farmer approach which takes cognizance of the conditions of the rural sector has been the key to successful agricultural development programmes. This should however not be regarded as a simplistic formula, as the institutional basis of society must be accounted for in implementing such programmes. The cost of implementation must also be weighed against any benefits. Second, theories based on broad geographic generalizations must bear the cost of weak assumptions and weaker predictive power. This is especially true of generalizations about Africa or sub-Saharan Africa where the creation of an image of impending crisis endangers the ability to learn from the small measures of success which have been achieved.

Third, it is easy to prove the culpability of politicians, and this has been well established as far as politicians in Africa
are under discussion. Such a conclusion lays all blame for
development failures at the feet of politicians and leads to
negative policy proposals. This again endangers the ability to
learn from the example of successful political support for
development. Fourth, the results of research in non-economic
disciplines have added to the validity of agricultural
development theories. Ironically, however, little cognizance has
been taken of new approaches to microeconomic theory. In this
regard the institutional foundations of the neoclassical
microeconomic theory should be scrutinized more closely.

A general conclusion is therefore that a development programme
which is based on the recognition of the ability of small farmers
to react to market incentives will be successful in areas where
implementation is politically feasible. Such a programme should
also take proper account of the whole rural environment, include
a farmer support system organized at the local and national
level, and could benefit from the results of new research in
microeconomic theory. There remains however one further
misconception in the literature on agricultural development in
sub-Saharan Africa.

Crotty (1980 : 117) provides the following data. Africa has
some 10 per cent of world population and produces about 2.5 per
cent of world GNP. As a continent it has about 15 per cent of
the arable land in the world, but produces only some 5 per cent
of the world cereal and pulse crop. Given the caveat about
aggregating by geographical area, Africa is poor and her
agriculture unproductive. Africa also has more than a quarter of
the world's grassland but just more than 12 per cent of total
livestock. To this relatively low stocking density can be added
the fact that the land is seen to be overgrazed (eg Timberlake,
1985) and that the productivity of the livestock subsector is
low. Africa for example produces only some 5 per cent of world
beef output, 4 per cent of all meat and less than 3 per cent of

5 These proportions are still substantially the same (World
Bank, 1984).
milk.

Despite the fact that the livestock subsector dominates agriculture by sheer physical size, it receives little research attention. Eicher and Baker (1982) in their authoritative survey of research on agricultural development in sub-Saharan Africa, for example, devote 17 out of 335 pages to livestock research. More than half of these pages discuss aspects of technical research. The livestock subsector should therefore be taken into account in development strategies for the region.

The possibility of successful agricultural development in the various countries of sub-Saharan Africa is therefore not precluded. To this end the possibility of development in southern Africa can be investigated.

1.2 Development strategies in southern Africa

The issue of research on agricultural development in southern Africa can be addressed under the same four points used previously. First, it can be argued that southern Africa is not an arbitrary geographical aggregation. Second, the approaches to agricultural development in the region are discussed, followed by a description of the rural sector and the use of new research in the formulation of agricultural development strategies.

1.2.1 The regional economy of southern Africa

The southern Africa region is normally understood to include South Africa (along with the self-governing and independent national states); Botswana, Lesotho and Swaziland; SWA/Namibia, Angola, Mozambique, Zambia and Zimbabwe. Data with regard to these countries for 1980 are found in Malan (1983: 43-95) and show that the region shares a common economy which is to a large extent dominated by the metropolitan economy of South Africa. A
few indicators from Malan (1983) are summarized below. The southern African region comprises 4,680 million square kilometers, and South Africa makes up 26 per cent of this total. The total population of the area was 66.3 million in mid-1982 (World Bank, 1984). With a population of 30.4 million, there are more than twice the number of people in South Africa than any one of the other countries. South Africa, being bigger in physical and population size, had a GNP of $66.960 million in 1980 (or R109.604 million in 1985) which represented 82 per cent of the gross geographical product of southern Africa. South Africa provided direct employment to 2.4 per cent of the economically active population of southern Africa who live outside her borders, and 7.6 per cent of the non-agricultural population. These latter figures vary from an infinitesimal number from Zambia (727 people out of an economically active population of 2,049 million) to Lesotho, where 21 per cent of the economically active population works in South Africa.

South Africa also provides most of the infrastructure of the region, having generated 77 per cent of the electricity in 1980 and installing 84 per cent of the telephones (1977). A large proportion of the international trade of the region is carried by South Africa's transport network while Botswana and Swaziland, for example, get more than three quarters of their imports from South Africa.

There is therefore ample reason to aggregate the countries of southern Africa into one economic region. This is even more the case if the degree of concentration of the South African economy around the gold mining industry is taken into account. The concentration of economic activity in the PMV area and the ports

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6 Most discussions of southern Africa work on the basis of a geographic definition, which has been shown above to be unsatisfactory for the purpose of analysis. In this study the area which falls under the direct influence of the South African metropolitan economy is used. This definition therefore excludes Angola from the region.
which serve it constituted about 65 per cent of the gross geographical product of South Africa in 1980 (Coetzee, et al., 1985 : 61), which translates to more than half the GNP of southern Africa. Some 12 per cent of the GNP of southern Africa originates in the agricultural sector, while if South Africa is excluded the proportion rises to 28 per cent. These figures are by comparison 23 per cent and 24 per cent for the mining sector.

The agricultural sector of South Africa is said to be unique in the sense that it really consists of two agricultures - a commercial and a subsistence component. Apart from the fact that there can be no watertight differentiation between 'white' and 'black' agriculture as far as objectives, abilities and performance are concerned, these characteristic are also not unique in southern Africa. Namibia, Zambia, Zimbabwe, Botswana and Swaziland all have 'white' commercial farming sectors. What is unique to South Africa is that white farmers farm more than four fifths of the land and that the two agricultures are to a large degree functionally separated by political boundaries.

It is therefore feasible to aggregate the southern African economy as a single unit to the extent that the component parts are influenced by the South African metropolitan economy and the South African political economy. It is however apparent that the design of development policy and its successful implementation are more directly influenced by local circumstances. These include the heritage of past political, social and economic policy as well as the particular natural and physical environment of an area. Agricultural development in southern Africa has been, and will remain, a function of both sub-regional development policies in the various countries as well as of development policies in South Africa. It is therefore justifiable to discuss the development of the South African agricultural economy as a separate entity.

1.2.2 The politics of homeland development

A review of the literature covering the political economy of
agricultural development in South Africa shows little dissent with regard to the most important occurrences in this process. There is however substantial disagreement with regard to the interpretation of these occurrences. The most important policy measures instituted in the period after the unification of South Africa in 1910 include on the one hand the Black Land Act, No 27 of 1913; the Black Administration Act, No 38 of 1927; the Development Trust and Land Act, No 18 of 1936; the report of the Tomlinson Commission (1955); and the subsequent implementation of the policy of separate development by means of political separation and geographic consolidation of the so-called homelands (cf Cobett, 1982: 2-21 for a discussion of these measures). On the other hand they include the establishment of the Land and Agricultural Bank of South Africa in 1912; the Marketing Act, No 26 of 1937; and the Co-operative Societies Act, No 29 of 1939 (cf De Swardt, 1983).

No attempt is made in this study to provide a detailed analysis of the conflicting interpretations of the history of economic development in South African agriculture. Two broad approaches can however be identified, and an understanding of these interpretations is necessary in order to assess current development approaches and development policy.

It is hard to argue the case for starting a discussion of history at any specific point in time, given the danger of ignoring the influence of what went before. The unification of South Africa in 1910 serves however as the starting point of the ability to implement political policies on more than a local basis, and should therefore suffice for a discussion of what can be termed the establishment approach to agricultural development in South Africa. The distinguishing feature of this approach is acceptance of the existence of 'two agricultures'.

7 As with most matters pertaining to black people in South Africa, the names of these Acts has undergone a metamorphosis from Native to Bantu etc. The current official nomenclature is used here. All references to statutes are from the updated Statutes of the Republic of South Africa.
In this view the history of commercial farming in South Africa is an integral part of the socio-political history of the country as this was conventionally interpreted. Until the discovery of diamonds and gold in the latter half of the nineteenth century farmers in South Africa, black and white alike, were for the large part subsistence producers. The creation of mass markets, first in Kimberley and later in Johannesburg, gave white farmers with their supposed natural superiority the markets which they needed in order to commercialize. Black farmers remained subsistence producers. The trend of commercialization largely followed the pattern of other parts of the new world (the USA and the former dominions). This pattern included increasing production, a declining number of farmers, increasing mechanization, the rise of the cooperative movement and increasing state intervention in agriculture (cf eg Burger, 1963; Nel, 1964; Brand and Tomlinson, 1966; Van der Merwe, undated) as interrelated factors. As was the case in the USA (eg Tweeten, 1986) state intervention tended to favour large-scale, capital intensive and supposedly efficient farming over the small farmer (Fiske, 1980). No definitive work on the contribution of agricultural economists in this process has been published, although Behrmann (1964) and Oosthuizen (1986) have described the role and history of farm management research in commercial agriculture.

The other leg of the dualistic agricultural sector was subsistence agriculture, practiced by black farmers in their traditional farming areas. The view was that little had changed in these areas since time immemorial. The farmers were, it was said, tradition-bound, subsistence orientated and inefficient, and little could be done about them until they changed their ways to comply with Western norms of civilization (eg Weidemann and Du Preez, undated; Du Preez, 1975). It was further averred that they produced little, there were too many of them and the population growth rate was high, which meant that large numbers went to find employment in the cities, especially on the mines.
The report of the Tomlinson Commission (1955) was the first official attempt to study the development problems and possibilities of these areas. While the nature of this contribution is discussed later, the reaction of the Government to the report formed the basis of the establishment approach, particularly because the reasons given for the state of affairs in the reserves were not acceptable. This led to a search for other explanations and the major reason put forward was that the farmers themselves were inefficient (cf. Du Preez, 1984; Hamburger, 1986 for two latter-day examples). The policy of homeland development was aimed at making these areas economically self-sufficient (e.g. Smit, 1967; Rutman, 1968; Smit, 1969; Van der Wall, undated) and the mechanism to achieve this was through corporate or project farming. The dichotomy between the assumption of inefficient farmers and a management-intensive solution was an issue which was apparently not addressed. Further, the dichotomy between the resource base of these areas compared to that of White South Africa, as well as the relative strength of the metropolitan economy was solved by the assumption that black workers were visitors only, and that border industry development would allow them to commute to work from their homelands (e.g. Leistner, 1964; 1965; 1968; 1969).

These few examples from the literature describe the basis of an official policy which Johnson (1983: 520-526) has described along with the other examples of social engineering of the twentieth century. The establishment view was however not held by all development scholars. There has long been a questioning of the view of the homelands as self-contained economic units and of the conventional interpretation of the economic history of South Africa. These two issues are addressed below with

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8 A number of homeland development reports, commissioned in the 1970's were also based on the assumption that these areas constituted independent economic entities. Examples include the Swart Commission report on Ciskei (1983); the Rand Afrikaans University report on Gazankulu (1983); the University of Pretoria report on Lepheba (1983); and the Corporation for Economic Development report on KaNgwane (1984).
1.2.3 Research in agricultural economics

Both political and economic factors led to a change in official government policy towards the homelands in the middle to late 1970's, towards a greater recognition of the reality of the integrated economy of South Africa (cf eg Lombard, 1979; 1985; Coetzee, et al 1985; Coetzee, 1986). This new emphasis on regional development has however not been incorporated fully into policy for agricultural development, and these models still largely make use of the 'two agricultures' point of departure. The reason for this would seem to lie in the fact that agriculture is by definition a spatially dispersed activity, and that models of development, as shown previously, in any case took little cognizance of political factors. The political superstructure was assumed to have little influence over the possibility of improving homeland agriculture. One way in which this approach differed from the establishment approach however, is that the efficient farmer hypothesis was accepted at an early stage.

The report of the Tomlinson Commission (1955) gave early recognition both to the importance of agriculture in development and to the advantage of a small farmer approach to development. A clear distinction should however be made between the recommendations of the Commission and the actual policy which was implemented, sometimes in the name of the Commission's findings (cf eg White Paper, 1956; Nieuwenhuysen, 1964). This is not to deny that the Report itself was based on the premise that these reserves could and should be developed as independent economies, and that the implementation of the small farmer approach should be accomplished as a planned process (cf also Tomlinson, 1957), two assumptions which are criticized in this present study.

The 1969 congress of the Agricultural Economics Association of South Africa had as its theme 'The economic development of agriculture in the less-developed areas'. The conference papers
however failed to spell out clearly the role of the agricultural economist in the development process (Fenyes and Van Rooyen, 1985: 277), possibly because with one exception (Brown, 1970) the other papers which dealt with the issue of small farmers did not accept that they were 'poor but efficient' (cf eg Leistner, 1970; Murray, 1970; Weidemann and Smith, 1970).

Van Rooyen (1985), in entering the debate on an article by Du Preez (1984), points to the lack of empirical support given to the various views proposed. Agricultural economists and others in South Africa have researched various aspects of agricultural development, including issues such as agricultural projects (eg De Villiers, 1978; Van Zyl, 1980; Van Rooyen, 1983); development planning (eg Viljoen and Du Preez, 1981; Schoeman and Moody, 1982); and integrated rural development (eg De Villiers, 1980; Jeppe, 1982). The largest part of the research however addressed the issue of small farmer efficiency and strategies to support the small farmer. Most of this research has had an empirical content (cf eg Geyer, 1971; Coetzee, 1977; 1978; 1979a; 1979b; Fenyes, 1978; 1982; Fenyes and Van Niekerk, 1979; Fenyes, Vink and Van Rooyen, 1981; Lyne, 1981; Vink, 1981; Kleyhans, 1983; Bambridge, 1984; Kleyhans and Lyne, 1984; Rose and Tapson, 1984; Van Rooyen, 1984a; 1984b; Fenyes and Groenewald, 1985a; 1985b; Groenewald and Du Toit, 1980; 1985; Lyne, 1985; and Machete, 1985). Eicher and Baker (1982: 47-48 and 105-108) review the research on the small farmer approach in sub-Saharan Africa, and this shows little contemporary work of a comparable nature, especially in terms of the empirical content. Despite this wealth of research however little has to date been translated into executive action in the homelands.

There are two possible reasons for the lack of acceptance of these ideas, apart of course from the seeming inability of policy makers to accept the basic premise that farmers are efficient decision makers. First, much of the research ignores the fact that all rural dwellers in the homelands do not have access to land, are not farmers, and earn most of their income in off-farm
employment. Second, and concomitant to this latter fact, the research has been based on the assumption of separable agricultural economies. Little attention has been paid to the interrelatedness of the homeland economies, the metropolitan economy of South Africa and the commercial agricultural economy. This interrelatedness has been the subject of much of the contributions of disciplines other than agricultural economics.

1.2.4 A new interpretation of agriculture

Bundy (1979: 1-3) summarizes the liberal interpretation of South African history. Contact between the indigenous population and settlers (between black and white) led to the former being dispossessed of their land. This took away the basis of the traditional economy, which was in any case inherently weak. These people, being unable to either adapt the traditional economy or to break away from it, could therefore not compete in the market economy. This formed the basis of the unbalanced and racially determined allocation of the country's resources which persists in modern times (cf Lenta, 1983 for a modern statement of this view). In the liberal view, this unequal allocation should be seen as an aberration which will disappear if market forces are allowed to work (Cobbett, 1982: 1).

A more radical interpretation of South African history also exists. In this radical or Marxist view the growth of the white capitalist economy has been possible only though the exploitation of the black population, an exploitation made possible by racial discrimination and separate development (Cobbett, 1982: 1). Bundy (1979) shows that this radical interpretation arose from dissatisfaction with the inability of proponents of the liberal view to explain certain trends in agricultural production in the years around the turn of the century. These trends revolve around the fact that peasant farmers in South Africa did in fact respond to the market opportunities created by the discovery of diamonds and gold in the last half of the nineteenth century. Instances of this 'unexpected' reaction are documented in Bundy (1977; 1979) and also used by Cobbett (1982) and Louw and Kendall
(1986).

The data that Bundy used to support his views could be criticized to the extent that it is little more than anecdotal (Davenport, 1986: 57-58 discusses the debate). He mostly describes cases where individual farmers or communities exploited the opportunities to produce a marketable surplus, and uses this to prove that all farmers responded positively to the new incentives. This raises two important issues regarding both the use of the data and its interpretation, as well as the Marxian view of exploitation.

It is a well-established fact that per capita agricultural production in the 'reserves' began declining in the 1920s (cf eg Knight and Lenta, 1980; Simkins, 1981a). A further analysis of production data for all the reserves leads to three main conclusions (Simkins, 1981a). First, total production measured at constant prices stayed relatively stable over the period 1918-1965. The increasing population growth rate is therefore responsible for the declining per capita production. Second, the rate of decline increased after 1948 while third, the proportion of subsistence requirements produced remained constant between 1918 and 1955, whereafter it declined rapidly. Lenta (1983) has also identified a declining per capita production in KwaZulu over the period 1867-1977.

There are however six factors which need to be taken into account when interpreting these data, the first being the incorporation into the reserves of new land. Simkins (1981a) does not take this into account, while Lenta (1983: 20) assumes that the maintenance of the man-land ratio was more the result of extension of production to marginal land than of the incorporation of new land. The second factor is the

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9 Interestingly, the report of the Tomlinson Commission (1955: 84) documents the declining proportion of the total maize and sorghum crop produced by black farmers in the period from 1919.
artificiality of population figures as a result of the various laws aimed at resettlement (cf eg Simkins, 1981b; Platzky and Walker, 1985) and the redefinition of boundaries. Simkins (1981b) for example assumes only that 'some' of the 4.01 per cent annual population growth between 1951 and 1970 is due to incorporation of urban areas into the homelands.

The third factor is the influence of the out-migration of the better-educated working males on agricultural output, which is not accounted for by Simkins (1981a), while Lenta (1983:20) pleads lack of detail in the data in making it impossible to calculate the influence of changes in the quantity and quality of labour. The fourth factor, which neither of these authors accounts for, is the influence of farming output by the development corporations on total output, especially in the period since the 1960's. Fifth, both papers calculate per capita production on the basis of total population figures, while urbanization in the homelands has recently been calculated to be as high as 41 per cent (Graaff, 1986). The last factor which has not been taken into account is the variation in conditions between the different homelands. Cobbett (1986:8) shows for example that land availability per household varies from 0.2 hectare in Qwaqwa to 1.5 hectare in Transkei.

The point is that the trends described in this type of research throws little light on the condition of the rural dweller. This is emphasized by the fact that these analyses, although based on the postulation of land shortage, cannot explain the fact that the available land is not fully utilized. Low (1982b:254-259) quotes a number of authors, including Knight and Lenta (1980:191) and Linton (1977) who have observed the extent of unused land in various parts of southern Africa. This does not refer to land which is not used to its fullest potential, but to land which is unused. In Lebowa, for example, the proportion of arable land actually ploughed in a given year has varied from as low as 24 per cent in drought period 1984/85, while it has not been over 62 per cent (1980/81) in the past 10 years (Annual Reports for the relevant years). Bombridge (1985) also estimates
unused land in all the homelands to be one third of available land.

The argument that the peasantry in the South African homelands was exploited to serve the needs of the modern economy has largely been based on the kind of data referred to above. In its basic form, these studies try to show that legislation such as the Black Land Act, No 27 of 1913 and the Development Trust and Land Act, No 18 of 1936 were promulgated with the specific purpose of creating a subservient and unproductive pool of labour for the capitalist economy (cf eg Davenport, 1986). Initially, this labour was required by white agriculture (Morris, 1976; 1977; Lenta, 1983), and later by the mining industry as well (Denoon, 1984/85; 10; Gilliomee, 1985; Keegan, 1985). In the period after 1948 the reserves became the basis of the political ideology of grand apartheid, and took on the role of dumping ground for those people defined as 'surplus' on white farms and in the cities (Gilliomee, 1985; Lipton, 1985; Platzyk and Walker, 1985; Wilson, 1985) and in the process entrenched the migrant labour system (Moller, 1985).

There can be little doubt regarding the effects of the policy measures described above. A note of caution is however necessary with regard to the motives for such policy. Wickens (1981) for example shows that explanations for the promulgation of the 1913 Land Act range from the demand for labour by white farmers to the desire of the Government to reduce racial friction and to the dialectic of exploitation of primitive modes of production by capitalism. These single explanations do not however take into account the diversity of interests and motives within and between the various groups at the time of the promulgation of the Act and

10 This author purports to show that, although the result of contact between peasant and settler societies in other parts of the world always resulted in the exploitation and demise of the former, in South Africa it was different in one respect. Here, as an example of original sin, the peasantry was destroyed to perpetuate a dying industry (being gold mining) (Denoon, 1984/85: 9-10)
thereafter.

The liberal and structuralist views can be taken to task both on the grounds of the data used to support these views and on the basis that they propose simple solutions to complex issues, based on undifferentiated motives. Paradoxically however, these analyses have proved better at explaining the links between the urban and rural, and the indigenous and settler economies over the whole period of South Africa's modern history. This seeming paradox can be explained by referring back to the type of data used by Bundy, i.e. the anecdotal recording of the case histories of individuals and groups.

The view taken in this study is that such data are more than sufficient to show that peasant farmers did react to market incentives, and in fact that they will react in this manner. It would in fact have been surprising if all peasant farmers had reacted in the same manner and at the same time, given the diversity both in market opportunities and in individual circumstances. In this regard Vink (1981) has analyzed the influence of both system and individual characteristics and circumstances on technical and allocative efficiency in production systems and shows how this determines farmer decision making.

What can and should be criticized in the structuralist approach is the view that, because the traditional social structures were not robust enough to remain intact in the face of competition from the settler society, all individuals were not capable of adapting to the new circumstances. This view of an exploited peasantry, barely capable of providing for its own subsistence on overcrowded land, and therefore forced to migrate to the capitalist economy in pursuit of menial jobs, is not far removed from the establishment approach described earlier.

Given the characteristics of migrant workers as relatively better educated and able bodied men, as well as the conditions prevailing in the homelands, it would be more rational to argue
that commercialization has in fact taken place, but not in agriculture (Low, 1982b: 248). This pattern has been the result of the complex of policy, motives and circumstances of South African history. In keeping with the purpose of this study, it will be argued later that new developments in the theory of microeconomics are more capable of explaining these patterns of development in South Africa.

1.2.5 The need for research on the livestock subsector

The earlier discussion on general agricultural development approaches showed that the small farmer paradigm could be fruitful in the formulation of successful development strategies, subject to a number of qualifications. In this section these qualifications have been examined with reference to the situation in southern Africa. It was shown first that the dependence of the region on the South African metropolitan economy made a regional analysis necessary. The extent of the dependence of especially the agricultural sector on local circumstances however made an independent analysis of the South African agricultural economy possible. Second, the salient historical trends in the 'two agricultures' of South Africa were discussed, and it was shown that official policy in earlier years was based on the assumption that there did in fact exist two distinct economies and two distinct agricultural economies.

Recent development policy has shown acceptance of the degree of integration of the South African economy, to the extent that it is facile to deny the fact that there is only one economy. The third point made here however is that this view has not gained acceptance as far as the agricultural economy is concerned. Modern research on agricultural development has largely been within the framework of the small farmer approach. This research has been grounded in empirical studies, and has contributed much to a better understanding of the means to achieve agricultural development. This work is unparalleled by contemporary research on the subject in other parts of Africa, but has one major flaw in the sense that it fails to address the interrelatedness
between the homeland and general South African agricultural economy and the metropolitan economy. In the fourth point it was shown that the structuralist approach did take these interrelationships into account, but in turn was not based on a satisfactory view of the peasant farmer. It could also not properly explain some of the characteristics of the rural economy, such as the motive to migrate and the fact that arable land in the homelands is unused.

In keeping with general models of agricultural development for sub-Saharan Africa, little research attention has been paid to the problems of the livestock subsector in southern Africa. It is a well-known fact that all the indigenous peoples of the region, as well as most of the early settlers, were either pastoral nomads or practiced both cultivation and herding (eg Wilson and Thompson, 1982)\(^\text{11}\). It is also known that, at least in this century, the homelands and other southern African countries have been importers of their staple crops and exporters of animal products. The case for more research on the livestock subsector can also be shown with reference to Table 1.1.

Some three quarters of the land in southern Africa is permanent grazing or woodland, as compared to just over half in other parts of the world. This constitutes 4.77 per cent of the world total, while the region has only 2.29 per cent of the world cattle herd and 2.22 per cent of cattle, sheep, goats and pigs. In comparison with the other regions of the world this could imply either that the region is understocked, or that the grazing resource is of a poor quality.

The question of the quality of the grazing resource can be answered with reference to the physical productivity of the agricultural economy of the various regions relative to each other and to the world average. This is reflected in the last two columns of Table 1.1 which show that 26 times as much crops

\(^{11}\) First published in 1969 as Volume One of the Oxford History of South Africa.
### Table 1.1 The relative productivity of pastoral land

<table>
<thead>
<tr>
<th></th>
<th>Arable</th>
<th>Pasture</th>
<th>Proportion of world total</th>
<th>Crop production/ha</th>
<th>Meat, milk and wool/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pasture</td>
<td>Cattle</td>
<td>Ungulates&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>South Africa&lt;sup&gt;4&lt;/sup&gt;</td>
<td>10.5</td>
<td>69.2</td>
<td>1.17</td>
<td>1.01</td>
<td>1.40</td>
</tr>
<tr>
<td>Southern Africa&lt;sup&gt;5&lt;/sup&gt;</td>
<td>6.0</td>
<td>73.7</td>
<td>47.7</td>
<td>2.29</td>
<td>2.22</td>
</tr>
<tr>
<td>All developing countries&lt;sup&gt;6&lt;/sup&gt;</td>
<td>9.3</td>
<td>53.4</td>
<td>57.4</td>
<td>66.4</td>
<td>63.4</td>
</tr>
<tr>
<td>Developed market economies&lt;sup&gt;6&lt;/sup&gt;</td>
<td>12.5</td>
<td>55.0</td>
<td>24.0</td>
<td>21.6</td>
<td>23.2</td>
</tr>
<tr>
<td>World</td>
<td>10.2</td>
<td>54.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Notes:  
1. The FAO classification of land and output is followed.  
2. Cattle, sheep, goats and pigs.  
3. Kilograms per hectare.  
4. Including self-governing and independent national states.  
5. As defined in this study.  
6. As classified by FAO.

Source: Adapted from FAO, 1984.
are grown on a hectare of arable land as compared to the production of meat, milk and wool on a hectare of pasture. The same ratio for the whole of southern Africa and for all developing countries is 59 times, while for the developed market economies it is 14 times. This does not of course take into account the different products that are produced on the two types of land, but the ratio for the South African agricultural economy is instructive. It is not difficult to show that production in South Africa is closer to potential production than it is in the rest of southern Africa. Using this assumption, and a ratio for South Africa of 22 times, the conclusion can be drawn that grazing land in southern Africa is relatively less unproductive than it is in the world in general. As the ratio for South Africa includes the homelands the 'market economy effect' cannot explain the whole discrepancy between the South African and world ratios.

There is therefore a case for conducting research on the livestock subsector in southern Africa. This argument is strengthened when the problems of the subsector in this part of the world are also taken into account.

1.3 The problems of the livestock subsector

Five general conclusions can be drawn from this analysis concerning the appropriate approach to agricultural development. These can be summarized as follows:

(1) The geographical area of analysis must be rationally defined;

(11) The political economy of development must be taken into account;

(111) A small farmer approach has proved to be the only successful vehicle for development. This approach must account for the whole rural sector, and not assume that
all rural inhabitants are farmers\textsuperscript{12};

\textit{(iv)} Research results from disciplines other than economics and agricultural economics have proved valuable in successful development strategies. New research in microeconomic theory should however also prove to be valuable.

\textit{(v)} More emphasis should be given to the livestock subsector.

Reviews of the literature on the livestock subsector in southern Africa can be found in Little (1980: 34-38); Finkhaeuser and Baker (1982); and Fenyes (1982: 180-186). None of these pretend to be exhaustive and no more recent reviews than these appear to exist. The relevant literature will be referred to in this study. For the purposes of this section it is necessary only to note that little cognizance has been taken of the first four conclusions summarized above. In this regard the conventional view of the problems of the livestock subsector can be analyzed with reference to Table 1.2 below.

The difference in productivity between the commercial agricultural economy of South Africa and that of the homelands as well as surrounding countries is often remarked on. This differential is apparent from Table 1.2, even if, as in the case here, the commercial sector of the other countries is included in their aggregate data.

Table 1.2 shows that most of the land in southern Africa is grazing land. This is true even when Botswana and SWA/Namibia are excluded from the aggregate data. Average yields in South Africa are one and a half times that of southern Africa on dryland, while the discrepancy on pasture is even greater at over 1400 per cent. Although the average quantity of grazing land per

\textsuperscript{12} One could even argue that none of the rural inhabitants are farmers in the Western sense of the word, with the exception of a small handful of commercial producers.
<table>
<thead>
<tr>
<th></th>
<th>Proportion of total land</th>
<th>Production (kg per ha)</th>
<th>Milk, meat and wool Kg per animal</th>
<th>Pasture (ha) per animal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Arable</td>
<td>Pasture</td>
<td>Crops on</td>
<td>Milk on</td>
</tr>
<tr>
<td></td>
<td>11.6</td>
<td>68.0</td>
<td>1 129</td>
<td>55</td>
</tr>
<tr>
<td>South Africa¹</td>
<td>4.4</td>
<td>75.4</td>
<td>722</td>
<td>3.9</td>
</tr>
<tr>
<td>Southern Africa²</td>
<td>6.2</td>
<td>74.4</td>
<td>806</td>
<td>4.7</td>
</tr>
<tr>
<td>Northern Africa³</td>
<td>13.8</td>
<td>76.6</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes:
1. Excluding the self-governing and independent national states.
2. Including the self-governing and independent national states.
3. As above, but excluding Botswana and SWA/Namibia.
- Not applicable.

animal is over six hectares, the figure for South Africa and the homelands is only 1.77 and 1.2 hectares per animal respectively. More detailed analysis shows that this low ratio is shared by Swaziland with 1.3 hectares per animal, while Lesotho has only 0.67 hectares. At the other extreme is Mozambique and Zambia with 30.6 and 18 hectares per animal respectively.

Given biological carrying capacity levels and the observation of environmental degradation, the conclusion is often drawn that southern Africa is overstocked. This raises a logical difficulty of interpretation, in the light of the discussion of Table 1.1. Here it was shown both that pasture is relatively less unproductive and that the stocking rate is lower than in the rest of the world. Crotty (1981: 2) also asserts that the grazing land in the homelands for example is not inferior to that of the rest of the world. The dichotomy posed in these data is not addressed in the literature.

Further problems with the livestock subsector in southern Africa include the fact that the age and sex composition of herds is skewed toward older and less productive animals, that animals are sold at a higher age than is the case with commercial production, and that technical productivity is low. This latter includes factors such as calving rates, mortality rates and milk and meat yields.

A further characteristic of the literature is the almost exclusive focus on the livestock subsector from a country perspective for the purpose of macroeconomic analysis. This is complemented by literature at the micro level which takes little account of the interrelationships between the commercial and subsistence sectors of the agricultural economy. While some attention is given to the ties between subsistence agriculture and the economy at large this mostly takes the form of factoring in the effect of migrant remittances on the purchase of livestock, and little more.

The political economy of the livestock subsector also receives
little attention in the literature, both in studies at the micro
and the macro level. In this regard the literature displays the
same shortcomings as does that which analyzes crop production
strategies. There is a general failure to recognize that all
rural inhabitants are not farmers and also that all livestock
owners are either not farmers or not rural dwellers. There is
also a failure to take account of the interrelatedness of the
southern African political economy.

A sixth general conclusion regarding the appropriate approach to
agricultural development in southern Africa can therefore be
drawn. This is that a less superficial analysis of the problems
of the livestock subsector is required. In this regard the work
of especially four authors provides an important exception to the
conventional views of livestock development policy. The specific
work of these four will be referred to during the course of this
study. In general, Haaland has analyzed the interrelationship
between social systems, the environment and different livestock
systems. Low has studied the livestock subsector in Swaziland
from a household economics perspective, while Runge has used
the livestock subsector of Botswana as an example in arguing against
conventional approaches to these matters. Further, Fenyves has
included the interrelationship between the livestock and crop
farming subsectors in analyzing the problems of smallholder
farmers in Lebowa.

None of these analyses however meet all of the first four
criteria for an appropriate approach to agricultural development.
The hypothesis can therefore be stated:

that a new approach to the analysis of the problems of the
livestock subsector is required;
and concomitantly:

that a new strategy for livestock development is required.

The nature of such an approach will be argued in this study,
using data on the livestock subsector in Lebowa. The data base
which is used in this study is discussed below.
1.4 The data base

Annual reports of the Department of Agriculture and Environmental Conservation of the Lebowa Government have been published since 1969, and these also contain a summary of the results of the annual livestock census conducted by them. A number of caveats are however always necessary when dealing with data collected under difficult circumstances. In this regard a number of checks are available for these livestock data.

First, the method of the census has changed little over this period. Stock counts are conducted at the level of an extension ward on an annual basis. These are then aggregated to the Tribal Authority level. The Department has divided Lebowa into districts, consisting of groupings of Tribal Authorities. These district groupings are generally the same as the administrative districts of Lebowa, and the data are then further aggregated to the district level. Second, although the whole stock count at the ward and Tribal Authority level for all districts was not available for any single year, it was possible to obtain more detailed data. These include data at the ward level for 8 tribal areas in 1984/85 and data from all the tribal areas in all districts for two years, namely 1979/80 and 1980/81. Third, the data at the district level were compiled into a number of time series. Fourth, the ratios of sales, animals slaughtered for own use and deaths were used to identify discrepancies in the data. In these latter three ways the more obvious discrepancies in the published data set were eliminated. Reference is made to the Annual Reports of the Lebowa Department of Agriculture and Environmental Conservation when referring to these data in the text.

Given that the borders of the census areas and of Lebowa have changed over time, among others because of the process of land consolidation, these census data have still to be treated with circumspection. In this regard the analysis will focus mostly on data trends, and ratios are used (eg per hectare, per person).
An income and expenditure survey which was conducted by officials of the Lebowa Department of Economic Affairs in Lebowa during 1984 is also used as the major data source in this study. This survey was conducted during the period when the author was a consultant to this Department. Data pertaining to household income by source, detailed expenditure, demographic characteristics and asset holdings was collected in 26 randomly selected towns and villages. The survey was based on a standard income and expenditure questionnaire used by private market research organizations, and questions pertaining to the ownership of livestock were added. The 638 questionnaires were allocated to each town on the basis of the ratio of its population to the de facto population of Lebowa. Within each town a randomly selected number of households were questioned. These data are referred to in the text as survey data.

It is evident that a survey such as this is biased toward the larger towns. Two corrective measures are taken in this study. First, the data are analyzed for rural and urban towns respectively. Second, data used by Fenyes (1982) in his survey of smallholder farming in Lebowa is used as a control in the case of the rural areas.

A number of other empirical studies of the livestock subsector in southern Africa also exist. The most important sources used here are Groenevald and Du Toit (1981) who conducted a survey of the Bophuthatswana livestock economy, and the survey of Low (1982b) which is focussed on Swaziland. These data sources will be complemented by other empirical studies as the need arises.

1.5 Chapter outline of the study

This introductory chapter serves as background to the conditions necessary to achieve the objectives of this study. The purpose of the chapter was to show that a new approach to agricultural development in southern Africa is required, and to describe the conditions of this approach. The preliminary motivation of the need for a new approach to the analysis of the problems of the
livestock subsector rests on this discussion. In the rest of this study the need for a new approach is more fully motivated and this new approach is described. On this basis policy proposals for livestock development are formulated.

This study takes the microeconomic aspects of the political economy of the livestock subsector of southern Africa as its point of departure. For this reason the macroeconomic sphere is not discussed in any detail. Further, the emphasis will be on the livestock subsector of the homelands in South Africa. Given the interrelatedness of the economy of southern Africa, it can be expected that policy proposals will be relevant for the whole region.

In order to achieve the objectives of this study it is necessary first to survey the field of microeconomic theory. In chapter two the theoretical background to this body of theory is discussed first, followed by a description of new directions in microeconomic research relevant to this study. These new extensions are described in the context of a relaxation of the assumptions underlying the model of general equilibrium, and it is shown that even these extensions do not fully account for the role of institutions in society. The need for an institutional approach is then identified.

Analyses of the livestock subsector in African traditional agriculture have largely been based on microeconomic theory. In chapter three it is shown that most of these analyses are based on an outdated view of this theory, namely the 'tragedy of the commons'. This theory is criticized with regard to its basic assumptions, its faulty logic and the failure of development projects which have been based on the approach. Data from the livestock subsector in southern Africa are then used to show that the approach leads to a better understanding of the problems of livestock owners or of their decision-making environment.

13 The meaning of these phrases will become evident in the analysis.
In chapter four livestock development strategies based on extensions of neoclassical microeconomic theory are discussed. These strategies are shown to be derived from the view that livestock are kept as a 'store of wealth' rather than as a directly productive asset. Although this view is originally derived from the 'cattle complex' construct it can be shown, in its modern form, to provide new insight into the problems of the livestock subsector. A problem exists however in that the policy proposals which are derived from these approaches do not differ from those based on the tragedy of the commons view. These approaches and their policy implications are tested empirically in this chapter. The conclusion is then drawn that a new approach to the problems of the livestock subsector is required.

In order to explain the basis of this new approach, survey data are analyzed in chapter five. In this analysis the holders of livestock are identified and their characteristics with regard to income, expenditure and asset ownership are described. This is followed in chapter six by the postulation of an alternative view of the motive to own livestock. On this basis an approach to the formulation of more relevant policy proposals for the development of the livestock subsector is given. Chapter seven contains a summary of the arguments in this study as well as of the policy proposals.
CHAPTER TWO
THE NEED FOR AN INSTITUTIONAL APPROACH

2.1 INTRODUCTION

Any cursory review of economic models for the development of the livestock subsector will show that these are largely based on microeconomic theory. In this regard a purpose of this study is to establish first, that new developments in neoclassical microeconomic theory have the potential for providing powerful new insight into the processes of development. Second, that although extensions to neoclassical microeconomic theory lead to an improved understanding of the processes of development, they are by themselves not sufficient. Third, that a new approach, consisting of this new microeconomic theory as well as a less rigid view of the role of institutions in society is necessary, especially in terms of explaining the problems of the livestock subsector.

The purpose of this chapter is to analyze new extensions to microeconomic theory and to explain the basis of the institutional approach. This will then serve as background to analyze the efficacy of specific livestock development models which have been proposed in the past, and which are discussed in later chapters. In the next section therefore the theoretical background to the new extensions in microeconomic theory is discussed first. This entails a discussion of the welfare economics construct. This is followed by an analysis of new theories which have resulted from the relaxation of the underlying assumptions of the neoclassical model.

The assumptions of optimizing individuals and of frictionless markets receive attention. As regards the latter, it is shown that the new theories take better cognizance of the influence of institutions on society, while they take little account of the reverse causative effect. When the ceteris paribus assumption regarding institutions is relaxed, the potential for explaining
the ability of society to influence institutions can be exploited. For this reason the basis of the institutional position is explained next.

2.2 THE THEORETICAL BASIS

The scope and content of microeconomics is defined in most textbooks which cover the subject which, in the words of Shubik (1970b: 405)14 is 'many things to many people'. Most people would agree, however that it includes the study of price theory and therefore the theory of the firm, of demand and supply and of consumption, and therefore the theory of choice. In Shubik's view (1970b: 408) it covers 'economic decision-making at the level of the individual or family and the firm.' In this section, the theory of welfare economics is discussed first, followed by an overview of more recent extensions to the theory.

The study of different product and factor markets in isolation is usually referred to as partial equilibrium analysis. This approach takes little account of the effect of occurrences in one market on other markets. These latter effects are the subject of the study termed general equilibrium analysis, which finds its roots in the postulates of utilitarianism (Brittan, 1983). General equilibrium analysis is in turn the basis of welfare economics.

As a branch of economic theory welfare economics is concerned with three interrelated aspects. These are the defining of economic efficiency, the evaluation of the efficiency of different systems of resource allocation and the analysis of the conditions under which social welfare improved as a result of policy intervention. The conditions under which economic efficiency (optimality) is achieved can be summarized in the form

\[ 14 \text{ Shubik (1970b: 408) also provides a gamester's definition of microeconomics: '... economics done by those of us economists equipped with small minds...'} \]
of six assumptions (Bester, 1978: 25-28).

First, in an economy which consists of a number of both producers and consumers, there exists a finite set of perfectly divisible commodities. Second, each consumer is a price taker, is constrained by a budget, and has a well-defined ordinal preference function which yields indifference curves which are smooth and convex. Third, producers are motivated by profit maximization, are constrained by a smooth and convex production possibility set and are price takers. Inputs in the production process are fixed, nonaugmentable, homogeneous and perfectly divisible.

The conditions for optimality in exchange, in factor substitution and in product substitution can be derived from these first three assumptions (Gould and Ferguson, 1980: 440-441). Efficiency in exchange exists if the marginal rate of substitution between any pair of consumer goods is the same for any pair of consumers; efficiency in factor substitution if the marginal rate of technical substitution between any pair of inputs is the same for all producers who use those inputs; and efficiency in product substitution if the marginal rate of transformation in production equals the marginal rate of substitution in consumption for every pair of commodities and for all individuals who consume both (cf also Engelbrecht, 1977: 14-17 for a concise formulation).

The way in which these conditions for optimality are reached are dependent on three additional assumptions regarding the free market system as an institution for achieving optimality.

First, commodities can be apportioned fully and exclusively to the individual economic agents in the sense that a finite quantity of each exists and is reduced when used, i.e. there are no public goods. Second, exclusive and enforceable property rights are defined over all commodities, while third, economic activity takes place in a free market price system in which universal perfect competition prevails. This latter assumption can be replaced by the Lange-Lerner rule (Gould and Ferguson, 1980:
which proposes that a decentralized socialist state can substitute for the market to achieve the same results.

These assumptions regarding the institutional form necessary for achieving the stated conditions of optimality lead to the attainment of general (static) equilibrium in an economy, and this model can be extended to incorporate questions of intertemporal allocation (Bester, 1978: 37-39). The attainment of general equilibrium is however not synonymous with the attainment of maximum general welfare. To achieve the latter a further, heroic, assumption has to be made, namely that there exists a social welfare function which permits a unique preference ordering of all possible situations. The preference ordering will depend on the position of individuals on their own preference scales (Bator, 1957: 23). Acceptance of this assumption reduces the multiple Pareto-optimal points suggested by the general equilibrium outcome to a single point of 'constrained bliss' (Bator, 1957: 28) which represents the maximum attainable welfare.

The necessity for this assumption arose from dissatisfaction with the earlier view that utility was a cardinal concept (Bergson, 1938), but its acceptance could likewise not provide a satisfactory measure of preference between different social states (Arrow, 1950). Further attempts to measure utility (eg Harsanyi, 1955) or to construct preference orderings of social welfare by means of public choice theory (cf Spies, 1981: 36 for references) proved as unsatisfactory, although this latter avenue has yet to be fully explored (cf eg Johnson, 1985a: 15).

It is the assumption of the social welfare function that enables the welfare economist to address the aspect of the welfare effects of different policy interventions (Arrow and Scitovsky, 1969: 1). In this regard criteria can be defined to measure these welfare effects to see if they represent welfare improvements. One example of such a criterion is the compensation principle, proposed by Kaldor (1939) and Hicks (1939).
The theory of welfare economics underwent a number of adaptations as a result of problems known as the Scitovsky paradox (Scitovsky, 1941), the Arrow Impossibility theorem (Arrow, 1950) and the general theory of second best (Lipsey and Lancaster, 1957). These difficulties spelled the end of the search for simple criteria for the establishment of priorities in the ordering of social welfare states (Spies, 1981: 30). Three further difficulties which remained were the question of externalities, of corner maxima and of neutral government intervention.

In a system of competitive markets individual maximizing agents will equate marginal costs with marginal benefits, but marginal cost is not necessarily equal to the marginal resource cost to society (Gould and Ferguson, 1980: 460). An external economy is then said to exist when marginal social cost is less than marginal private cost, and an external diseconomy when it is greater. Together external economies and diseconomies are termed externalities. Unless all the external effects in a market 'add up' to zero, there will be a divergence between private and social costs and/or benefits, and perfect competition will not lead to a Pareto optimum state. The classical remedy to this situation is to levy corrective taxes which ensure equality between private and social costs and/or benefits (Graaff, 1971: 23).

The literature contains many examples of externalities, and almost as many classifications (cf Meade, 1952; Scitovsky, 1954; Bator, 1958; Buchanan and Stubblebine, 1962; Mishan, 1971). One of the causes of externality, that of the collective consumption good, was identified by Samuelson (1954: 387). In its original form, it referred to goods such that one person's consumption did not lead to subtraction of another person's consumption. In this case the market would not determine the optimal level of consumption of such goods, and there would be an incentive for individuals to 'free ride'. Margolis (1955) subsequently showed that this definition of collective
consumption goods was unnecessarily restrictive, in that capacity limitations and congestion were not taken into account. Public goods were later more rigorously defined by Mishan (1971: 13) as those having no attributable resource costs in the long run. The individual would therefore not pay the full cost of using the resource, marginal private and social costs would diverge, and the end result would be the inevitable over-exploitation of the public good. Further clarification came from a closer specification of the difference between public and private goods (Davis and Whinston, 1967: 362-363). A private good is one over which ownership or property rights\(^{15}\) can be exercised and where the act of paying is related to the act of consumption, while the converse is true for a public good.

The vesting of property rights is an institutional problem, as in some cases is the connection between payment and consumption. Davis and Whinston (1967: 361-362) discuss an example whereby institutions are so arranged that people pay for bread in the early morning at a 'revenue centre', and collect the bread later in the day at the 'distribution centre'. There is no contact between the two centres, so that the individual has the incentive to 'free ride', i.e. not pay the correct amount for the number of loaves he intends taking, or even not paying at all. This market failure is caused by the institutional arrangements.

Conversely, where market failure is identified, institutional arrangements can correct the situation, either by vesting property rights, or by providing the correct institutional framework for making the connection between payment and consumption. The technical characteristics of the good will determine whether these institutional arrangements are feasible (Davis and Whinston, 1967: 363).

These institutional arrangements refer to a process of 'internalizing the externalities' and are familiar tools of the

\(^{15}\) A definition of property rights forms part of the discussion in section 2.4.
economic policy-maker. They include prohibition, taxes and subsidies, regulation, voluntary agreements and preventive devices (Mishan, 1971 : 14-16), and are all aimed at equating private and social costs.

The welfare model could also not take account of the problem of calculating so-called corner maxima because of the assumption that all products which can possibly be produced in an economy will actually be produced (Lange, 1942). This difficulty gave rise to the application of models such as linear programming (Spies, 1981 : 38-41). Weintraub (1983) sketches the history of the development of mathematical equilibrium models in general, while Sebestyen (1981) reviews their use in agricultural economics. Another empirical extension which has its roots in welfare theory is that of social cost-benefit analysis (cf eg Van Roor, 1983 : 126-128 for the history of application of this model). A further problem was the assumption that policy makers themselves would intervene 'rationally' to ensure that maximum social welfare is achieved.

A central unsolved dichotomy in neoclassical welfare theory was that policy-makers (government) would be responsible for internalizing the externalities, but that there was no guarantee that governments would act in the manner the theory supposed they would (Rausser, 1962 : 821). The view that policy-makers would act according to a different set of objectives was propagated by a school of thought termed public choice theory (cf eg Downs, 1957; Mueller, 1976; 1979).

The 'pure' theory of welfare has found disciples in the literature on the economics of agricultural resource use, namely the new resource economics (NRE) school. Their solution to the problems raised by the implied assumption that policy makers share the same view of utility as the theory supposes them to hold is simple. The government should be removed from the equation, and all property in natural resources should be private (Anderson and Hill, 1976; Anderson, 1982 : 930-933).
According to Anderson (1982: 928) the NRE builds on the foundations of the standard neoclassical theory by integrating property rights, public choice and Austrian economics to form a new paradigm for solving natural resource problems. In brief, the theory accepts that public goods are an externality, rejects public intervention as a solution on the basis that bureaucrats are not neutral, and suggests that 'privatization' of public goods is the only effective way of internalizing an externality (Runge, 1984a: 4). The implicit assumption of the theory is that property rights can exist in all natural resource assets (cf. Ward, 1982: 942).

Another extension of the 'pure' model is the theory of household economics which rests mostly on the seminal work of Becker (1965; 1976a; 1981) although he gives credit to the influence of other scholars in the formative stages (Becker, 1965: 494), and other authors also contributed at an early stage of the debate (cf Low 1982b for references). The theory arose from dissatisfaction with the narrow, 'black-box' view of consumer choice, and sought to take a broader view of the determinants of consumption (Pollak, 1985: 581). The basic theory has often been restated in the literature, as has its applicability to developing countries. For this reason these two aspects will only receive brief attention, drawing mainly from Low (1982b: 17-21).

In traditional consumption theory, households maximize utility, U, which is obtained directly from purchased goods, Yf, in the form:

\[ U = U(Y_1, Y_2, \ldots, Y_n) \]

subject to the resource constraint:

\[ \sum P_i Y_i = I = W + V \]

where \( P_i \) are the prices of goods, and \( I \) is money income.

15 Cf also Prochaska and Schrimper (1973); Huffman (1976a; 1976b); Rosenzweig (1976); Bryant (1976); and Dunn (1985) for applications to US agriculture.
consisting of earnings \(w\) and other income \(v\).

The household economics approach introduces the concept of \(Z\) goods, \(Z_i\), which are produced by the household using a vector of market goods and a vector of own time, \(T_i\). The household utility function becomes:

\[
U = U(Z_1, Z_2, ..., Z_n)
\]

where the household production function is:

\[
Z_i = f_i(Y_i, T_i)
\]

\[(4)\]

the constraint on the household's available time is:

\[
\sum H_j = \sum T_j \cdot W + \sum_{ji} T_{ji}
\]

\[(5)\]

and the income constraint remains:

\[
I = \sum_{i} P_i Y_i
\]

\[(6)\]

where \(H_j\) is the time available to the \(j\)th household member and \(T_{ji}\) and \(T_{ji}\) are the time spent by member \(j\) in the labour market \((w)\) and in producing \(Z_i\).

If \(E_j\) is the market earning potential of member \(j\) per unit of time, equation (5) can be substituted in equation (2):

\[
I = \sum_{j} E_j T_j \cdot W + V = \sum_{j} E_j (H_j - \sum_{ji} T_{ji}) + V
\]

\[(7)\]

If the value of time spent in producing \(Z_i\) is added, the 'full income' constraint, \(S\), is obtained:

\[
I = \sum_{j} E_j T_{ji} = \sum_{j} P_i Y_i + \sum_{j} E_j T_{ji} = \sum_{j} E_j H_j + V = S
\]

\[(8)\]

Full income refers to the maximum achievable amount of money income, and can be earned by devoting all household resources, including time, to earning income with no regard for consumption. Full income is therefore a constraint on obtaining utility, as it takes into account the fact that time can be converted into goods through money income and also accounts for substitutions between money and psychic income (Becker, 1965: 498). Equation (8) states that the value of market goods plus the opportunity cost of psychic income must equal the value of labour earnings and
other non-labour earnings (Low, 1982b: 19).

The application of these production concepts to the problems of consumer choice leads to a new understanding of household decision making. The framework has four basic elements (Low, 1982b: 19-21). First, goods are not the immediate objects of welfare, but carry attributes which are desired. These attributes are produced within the household. Second, the household combines the time available to its separate members with market-produced goods and services, and these are the inputs in the household production function. In this view the prices of market goods do not enter the consumption function directly, but are seen as changes in the prices of inputs in the household production function. Third, household resources can be transformed into market commodities, given the presence of an external labour market. An individual can sell time in the labour market, and can also buy time in the form of time-saving consumer goods. Fourth, the household faces certain resource constraints in the production and optimizing process. The time of household members is the most notable constraint.

The household economics approach has been applied to a number of areas of household decision making, and empirical application has largely been concerned with the importance of the time constraint (Low, 1982b: 22-25). The apparent paradox, for example, of people in high income countries keeping constant check on time while 'wasting' food and petrol can be explained by the relative value of these inputs in the household production function. Similarly, investment in human capital, labour force participation by women and marriage and fertility are aspects which have received attention in the literature (cf Low, 1982b: 21-25 for references in this regard).

In the words of Graaff (1971: 1): 'Theoretical welfare economics proceeds from a number of assumptions, factual and ethical, which are seldom stated explicitly.' Those assumptions which are necessary for the construction of the general equilibrium and welfare theories were stated earlier, but there
exists a set of postulates underlying even these. Further, there is little unanimity in the literature regarding these latter underlying assumptions, and lists of them of varying length can be found. Three of these assumptions are however important for the purposes of this study. These are:

(i) the assumption of profit and utility maximization;
(ii) the assumption of frictionless markets;
(iii) the ceteris paribus assumption regarding technology and institutions.

The bulk of the literature on new developments in microeconomics finds its origin in varying degrees of relaxation of these assumptions. As will be shown in this study, the economic approaches to development in the livestock subsector are based either on the 'pure' theory, or on the constructs which have emerged as a result of the relaxed assumptions.

The extensions to microeconomic theory which have resulted from the relaxation of the antecedent assumptions of the model are therefore discussed in the next three sections. It will become apparent in the discussion of theories based on the relaxation of the assumptions underlying the neoclassical welfare model that no watertight categorization of these new theories is possible. Such a categorization is also not necessarily desirable. Some of the theories based on a weak assumption of profit and utility maximization are also concerned with frictionless markets, while the degree to which these are based on a ceteris paribus institutional assumption is of interest for the purposes of this study.

2.3 Profit and utility maximization

The assumption that consumers maximize utility given only a budget constraint has long been under assault, partly because of the hedonistic psychological assumptions on which it is based. An early source of dissatisfaction was Thorstein Veblen (as quoted in Baumol, 1985: 9):
The psychological and anthropological preconceptions of the economists have been those which were accepted by the psychological and social sciences some generations ago. The hedonistic conception of man is that of a lightening calculator of pleasures and pains, who oscillates like a homogenous globule of desire of happiness under the impulse of stimuli that shift him about the area, but leave him intact. He has neither antecedent nor consequent. He is an isolated, definitive human datum, in stable equilibrium except for the buffets of the impinging forces that displace him in one direction or another. Self-imposed in elemental space, he spins symmetrically about his own spiritual axis until the parallelogram of forces bears down upon him, whereupon he follows the line of the resultant. When the force of the impact is spent, he comes to rest, a self-contained globule of desire as before.¹

This assumption of economic man has two related aspects, namely self-interested goals and rationality in choosing between means. There has been much study on the effects of relaxing the assumption of self-interest, especially as regards its effect on the internal structure of the household and household decision making. The Rotten Kid theorem has been used to show that altruism can also be a rational response, both within (cf eg Becker, 1976b; Hirshleifer, 1977; Tullock, 1977; Becker, 1977), and outside of the family (cf eg Bolnick, 1979; Roberts, 1984). A concise description of this theorem can be found in Hirshleifer (1985 : 57). Little consensus has been reached on a unified approach, but in the words of Hirshleifer (1985 : 55) : '... the analytically uncomfortable (though humanly gratifying) fact remains : ... a higher degree of cooperation takes places than can be explained as a merely pragmatic strategy for egotistic man.' And (Hirshleifer, 1985 : 56) : 'An even greater "scandal" is the extent of voluntary private provision of public goods.'

The assumption of rationality has also received much research
attention. Hirshleifer (1985: 59-62) gives a review of the most important literature, which he divides into three broad categories. These include lapses of logic, bounded rationality and what is termed 'as if' rationality. Lapses of logic include violations of the laws of inference, the errors made in probability judgements and the perversion of logic by a process called cognitive dissonance (cf Akerlof and Dickens, 1982). This is based on the assumption that the individual wishes to be consistent within him/herself, where this consistency refers to harmony between attitudes and behaviour. The individual will then attempt to rationalize even irrational behaviour.

Further, it has been postulated that under certain conditions people do not even attempt to act or think rationally, and that habit plays a role in decision making. Individuals will not always attempt to strictly optimize, but will 'satisfice' (cf Simon, 1959). There is also the case of self-command, whereby a person will for example make arrangements to ensure that he or she cannot exercise their own preferences under given circumstances (eg don't give me a cigarette even if I ask for one) (cf Schelling, 1984).

The 'as if' models are based on the work of Alchian (1950). In this view it does not matter whether individuals are rational optimizers or not, as the environment or evolutionary processes will allow only rational decisions to survive. The surviving agents behave 'as if' they are able to maximize. Dissatisfaction with this theory has led to a study of the origin of predictable behaviour. Stated briefly, the thesis is that regularities in the behaviour of individuals arise from their inability to distinguish between preferred and less preferred behaviour in the face of uncertainty. Individuals devise behavioural rules (habits) to deal with uncertainty, and these are predictable. A discussion of this approach can be found in Heiner (1983), comments and a reply to this latter article (Bookstaber and Langsam, 1985; Garrison, 1985; Heiner 1985b), and further extensions of the theory (Heiner, 1985a; Wilde, et al, 1985; Ken and Rosenman, 1986).
2.4 Frictionless markets

The assumption that markets are frictionless has many implications. These include the fact that institutions are exogenous and given, that property rights exist in all resources, that perfect information exists, that individuals are optimizers, that transaction costs are zero, ad infinitum. Theories based on the relaxation of this assumption probably find their origin, in the modern literature, in dissatisfaction with the reaction of the neoclassicists to the Theory of Second Best (Lipsey and Lancaster, 1971).

The theorem of second best proves that if, in a general system of equilibrium, one of the Pareto conditions is not met, the other Pareto conditions are no longer desirable, even if they can be met (Lipsey and Lancaster, 1957: 11). The reaction by economists to this proof was much the same as occurred when the optimizing assumption was questioned (cf. Hirshleifer, 1985), namely that the new approach was interesting. Economics, however, was concerned only with those situations where all the Pareto conditions were met simultaneously. In fairness though the theory of second best has been properly accounted for in techniques such as cost benefit analysis.

One of the earlier questionings of the frictionless markets assumption was the x-efficiency theory, first proposed by Leibenstein (1966; 1976; 1978a)17. The theory was proposed as a more general model than the neoclassical theory (Leibenstein, 1978b). In the theory, x-efficiency is defined as the failure to minimize costs, and this can be ascribed both to the lack of motivation for many individuals to maximize and to inefficient markets for knowledge (Leibenstein, 1966). The removal of x-inefficiency can therefore lead to substantial gains in welfare and should be the first objective of policy makers.

17 Cf De Alessi (1983a) for an more exhaustive bibliography on the work of Leibenstein.
The x-efficiency theory has been exposed to substantial criticism. Stigler (1976) maintains that Leibenstein has confused x-efficiency with allocative efficiency, while De Alessi (1983a: 70-72), in analyzing the postulates of the theory, shows that the property rights construct explains the same phenomena better. The x-efficiency theory does also not produce any testable hypotheses (De Alessi, 1983a: 70; cf also Leibenstein, 1983; De Alessi, 1983b for further discussion). The theory receives no mention in a number of authoritative reviews on new directions of the last two decades in neoclassical microeconomic theory (cf Shubik, 1970b; Furubotn and Pejovich, 1972; Reder, 1982; Field, 1983; Hirshleifer, 1985), although some mention is made in work which questions the 'economic man' assumption (Heiner, 1983).

The x-efficiency theory has also been used to criticize the household economics approach (James, 1983), especially as it does not properly address the possibility of sub-optimal choices by consumers (James, 1983: 485-486). The household economics approach is capable of dealing with some sources of misinformation, especially in the version put forward by Lancaster (1966). Unfortunately, household economics has ignored the presence of x-inefficiency in consumption, just as the neoclassical theory of the firm has ignored the presence of x-inefficiency in production (James, 1983: 486). The argument put forward by James (1983) is that x-inefficiency should be taken into account in consumption theory, that this is specially important in developing countries and that recognition of x-inefficiency has policy implications for the process of development.

There are four reasons why the household economics approach as it has developed has limited usefulness (James, 1983: 489-490). First, it makes no allowance for non-maximizing behaviour. Second, it contains the implicit and unrealistic assumption that the attributes available in a product are actually obtained in the process of consumption. Third, it does take into account

-55-
the internal structure and organization of the household, and fourth it ignores the behaviour of the consumer in the post-purchase period.

By contrast, there are a number of reasons why the inclusion of \( x \)-efficiency in the household model could serve to improve the prescriptive powers of this approach (James, 1983: 490-491). First, optimizing behaviour by individuals is not assumed to be self-evident. The psychological assumptions on which the conventional view of optimizing are based are in any case an oversimplification. Second, one manifestation of this oversimplification is that it does not recognize that optimizing behaviour can in any case take place along a continuum of degrees of calculatedness. Some people spend time and effort in making decisions, while others' decisions are so loose they are almost random. In either case individuals do not display the sensitivity to magnitudinal changes at the margin which is assumed in conventional theory. Third, the theory of inert areas must also be taken account of to the extent that opportunities for change from a given position are actually exploited by consumers.

When these three postulates of general \( x \)-efficiency are included in the household analysis it is clear that different conclusions are drawn and that the available policy options will likewise differ. Inefficiencies can occur at the stage of purchasing or producing inputs for the household production process and at the stage of combining those with available time to produce \( z \)-goods with desired attributes (James, 1983: 491).

With regard to the purchase of inputs, the payoff between optimizing and simplifying usually results in a selective rationality on the part of economic man. Selective rationality is a function of the degree of calculatedness of individuals and the divisibility and combination prospects inherent to the inputs which are to be used. It also depends on the extent to which economizing is regarded as a valued trait in a society, on the average level of income in a society and on the internal
relations between members of a household. Higher income and the appearance of stress within a household will, ceteris paribus lead to 'looser' decision making (James, 1983: 493).

With regard to the consumption process, the theory of inert areas must be taken into account. To the extent that individuals are prone to cognitive dissonance they will not necessarily learn from earlier irrational choices. Further, inefficiency will also arise in the process of conversion of inputs into desired characteristics, despite the neoclassical assumption of a unique mechanistic relationship between inputs and outputs (James, 1983: 495). Again, if the individual lacks the necessary skills and resources the technically efficient production function will not necessarily be achievable. Obviously selective rationality and inertia will also influence the degree of effort which is put into decision making in this regard, as will the nature of relationships within the household (cf eg Folbre, 1986).

This brief discussion of x-inefficiency in the household production function suggests that x-inefficiency will be more prevalent in the household production function in a developing country where for example incomes and skills are at lower average levels. Policy measures for development should rather be aimed at removing this source of inefficiency in the short term.

The literature on property rights and transaction costs has also called into question the assumption of frictionless markets. It is not always possible to distinguish between these two approaches, as both make use of the two concepts. The transaction cost approach is to a certain extent an auxiliary model, and the property rights theory is therefore discussed first.

As was shown in section 2.2 the new welfare economics recognizes the existence of externalities, and proposes government intervention aimed at internalizing these external effects. The policy options available can be grouped into two broad categories, namely legislative controls and the creation of
incentives to restrict or augment individual actions. A third policy alternative was identified by Coase (1960), namely no government intervention. The Coase theorem states that as long as some agent in an economy is made liable for an externality, that externality will be resolved efficiently by individuals acting on their own behalf. An important assumption must however be added, namely that transaction costs must be zero or negligible (De Serpa, 1985: 286). As transaction costs are usually high when a large number of people are affected by an externality, the Coase theorem is expected to hold only for situations where small numbers of people are involved.

According to the Coase theorem, it does not matter whether liability is assigned to for example the creator of the external cost or to the person who bears the cost. In this example, freedom from liability for the former and the right to collect damages for the latter are valuable property rights (De Serpa, 1985: 289). The Coase theorem can therefore be stated more formally:

If transaction costs are negligible, an efficient allocation of resources ... will be obtained so long as property rights are clearly defined, regardless of who owns the property right.

Property rights are therefore necessary to achieve general welfare. This raises questions regarding the definition of property rights and their role in shaping market outcomes.

There are many definitions of property rights (cf. e.g. Furubotn and Pejovich, 1972: 1139; Wunderlich, 1976: 947; Castle, 1978: 2; Braden, 1982: 22; Bromley, 1982: 836). These all define property rights, in various permutations and at various levels of abstraction, as the institutional parameter in the allocation of resources. Furubotn and Pejovich (1972: 1139n) draw on: 'Roman

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18 The second part of the theorem states that the first part holds only if income redistribution resulting from the resolution of liability does not affect resource allocation. This implies further that the theorem holds only when a small number of people are involved.
Law, Common Law, Marx and Engels, and current legal and economic studies ... in support of this class of definition. A further common factor in these definitions is that they all equate property rights with private property rights. This is in fact the basic assumption of the property rights literature, and is derived from the Coase theorem.

Property rights are the interface between economic systems and social, legal and political systems, and they find their origin and legitimacy in social norms, legislation and the common law. Microeconomic theorists have traditionally regarded them as an exogenous variable, and individuals are endowed with them much as they are endowed with natural resources (De Serpa, 1985: 542). The prediction that, under conditions of perfect competition, an economy will move from an initial state to a general welfare equilibrium relies inter alia on the assumption of frictionless markets. Frictionless markets are in turn possible only under certain assumptions, as shown earlier, and these are valid in the presence of private property rights (Cheung, 1970: 64).

The problem is however that transaction and enforcement costs cannot be assumed out of existence, especially when some property rights are nonexclusive or nontransferable (De Serpa, 1985: 546). Under these circumstances individuals will allocate resources to obtain or protect property rights unless resources are in general allocated to their enforcement. Transaction and enforcement costs are relevant economic variables, they vary as allocations of property rights vary, so property rights are also economic variables (De Serpa, 1985: 545-546). The property rights literature therefore accepts that property rights are determined as part of the resource allocation process. The aim of the literature is to study the way in which property rights are determined and the result of imperfections in their determination (cf eg Demsetz, 1967; Cheung, 1970; Furubotn and Pejovich, 1982; Buchanan, 1975; North and Thomas, 1977). This approach has two distinct implications for the study of different property systems.
The first inference of the property rights approach is that neither pure common property or private property can exist, given that transaction costs are not zero and that enforcement costs must be incurred. In practice, economic activities all contain a mixture of private and common ownership. De Serpa (1985: 546-547) illustrates this with the examples of agriculture and fishing in the USA. For this reason the number of people who have access to a common resource is an important variable in analyzing common property systems. To this end, the Cournot model of oligopoly can be used to analyze common property situations (cf De Serpa, 1985: 371-377 for an analysis of the Cournot model).

It is accepted in neoclassical theory that an individual will allocate resources to the point where marginal cost is equal to average, and not marginal, revenue in a common property situation. The situation changes however if there are limitations on the number of people who have access to the commons. If only one person has access, the situation is analogous to a private property regime with a monopolist earning the maximum economic rent. When two and more people have access however, economic rents decrease, and with an infinite number economic rent is zero.

There exists a second source of economic rent in a common property regime which arises from the fact that the cost of exploitation is not necessarily uniform for all users (De Serpa, 1985: 548-549). People who do have access therefore have an incentive to reduce production costs and exploit inframarginal rents. By definition however there is no possibility of excluding other users from a commons, and the presence of these economic rents will act as an incentive to potential users. The logic of the property rights approach is then to show that there now exists an incentive for the current users to exclude potential users from the commons. This can be done either through government intervention or by private agreement between current users, and gives rise to two possible outcomes.
First, the common property characteristic is maintained and current users identify the costs of exclusion and of enforcement, and make arrangements to incur these costs. As these arrangements can include government intervention or private agreement, the burden of these costs will vary between alternative situations. The property rights literature does not contain much analysis of this outcome, although Cheung (1970) has proposed that these arrangements be analyzed as aspects of a more general theory of contracts. In this view the problems of common property should not be seen as externalities, but as a failure to conclude 'ideal' contracts. This failure is the result of high transaction and enforcement costs.

Second, if it is technically possible to specify private rights over a common resource and the threat from other users to the economic rents of current users are great enough at any level of enforcement and transaction costs, private rights will be vested. These can be introduced by government action or will evolve via legal action or private agreement. The bulk of the property rights literature has been concerned with this latter problem (cf. eg. Demsetz, 1967; Cfrlacy-Wantrup and Bishop, 1975). This has also led to a large literature on the role of legal instruments in establishing private property rights (cf. eg. Rubin, 1977; Goodman, 1978; Hirshleifer, 1980).

The transaction cost approach takes a wider view of the assumption of frictionless markets. The origin of the approach, which has mostly dealt with the analysis of vertical integration between firms, is described by Polak (1985). The main proposition in the literature is that the modern corporation has evolved as a result of efforts to economize on transaction costs (Williamson, 1981: 1537). As the costs of transactions are influenced by the institutions which govern them, the reverse is also true; the transaction costs influence these institutions. This causal relationship has also been used to explain the family, and the changing structure of the family over time, as an institutional reaction to the cost of undergoing long term contractual relationships.
Proponents of the transaction cost approach are of the opinion that the full potential of the household construct is missed by keeping to the restrictive assumptions of neoclassical theory. If the internal structure of the household is also taken into account further insight can be gained in the behaviour of economic agents (Pollak, 1985: 582).

According to this view the family can then be seen as an institutional solution to 'the incentive and monitoring problems encountered by peer groups and simple hierarchies' (Pollak, 1985: 584). The family is therefore seen as a governance structure rather than a preference ordering. The advantage of this approach is that it can explain the ability of the family to provide incentives and monitor performance in different societies, and that it gives greater insight into allocation and distribution processes within the family.

The family as a governance structure or institution has four distinct advantages (Pollak, 1985: 585-586). These include the incentives which arise from the claims which members have on family resources, and the closer monitoring which is possible by the integration of economic and other activities. They also include the limitation on opportunistic behaviour which stems from altruism and the advantages of family loyalty. On the other hand four distinct disadvantages of the family can also be identified (Pollak, 1985: 587-588). These concern inter-familial conflict, the tolerance of slack performance, the inefficient combination of capabilities in a small group and the inability to take advantage of economies of scale in a small group.

The cost of transacting with the outside world has an influence on the internal structure of the household, and will also be a factor in determining the functions which the household assumes (Pollak, 1985: 588-589). If the cost of procuring insurance from the market or the state is too high, for example, an extended family partly dependent on migrant remittances could
provide a risk-averting alternative. This in turn could lead to methods of predicting what the internal structure of the household will be, and what functions it will perform within a range of institutions which affect transaction costs (cf also Ben-Porath, 1982: 61).

These then are the theoretical constructs which have resulted from a relaxation of the frictionless markets assumption. It must be emphasized further that few hold the 'pure' model to be an accurate description of the real world. The Chicago school, which has traditionally been associated with the 'pure' model, treats the assumptions as a first approximation (Reder, 1982: 11), and works with what has been called the Tight Prior Equilibrium model. Proponents of this model are however prepared to go no further than recognizing the role of implicit contracts (cf eg Rosen, 1985) in explaining only the short run stickiness in prices. They have also incorporated the value and cost of information in the basic model (cf Stigler, 1983).

The NRE, public choice and household theories are all examples of deviations from the 'pure' theory which can however still be described as tight prior equilibrium models. The other theoretical approaches, which have been discussed in the context of a relaxation of the key assumptions of the neoclassical model, are examples of what Reder (1982: 17) calls diffuse prior equilibrium. In this alternative view the 'pure' model is but one of a range of possible outcomes given the institutional parameters within which society exists (Reder, 1982: 17).

These institutional parameters are regarded as exogenous variables in the neoclassical theory if they are in any way taken into account. Field (1984: 690) quotes economists of the stature of Walras (1954) and Samuelson (1947) who explicitly state this assumption, while Hansen (1970) and Debreu (1950) fail even to mention institutions as a variable which can influence

19 Reder (1982: 14n) quotes Arthur Okun (1981) as referring to implicit contracts as the 'invisible handshake'!
the general equilibrium. As will be shown later in the specific context of the livestock subsector, however, both the tight and diffuse prior equilibrium models share at least one common article of faith. In the long run a perfectly competitive market will still be the 'best' solution and this is the ideal to which policy efforts should be directed. To this extent these theories take only a partial view of the role of institutions in society, even though the ceteris paribus assumption is relaxed.

These theories have taken account of the influence of institutions such as property rights, the common law, the family and the modern corporation, on society. When explaining the reverse, namely the influence of society on institutions, they fail however to show more than that society will by increments provide itself with a set of private property rights. The real world shows otherwise, and therefore the basis of the institutional position is described next. This position results when the ceteris paribus institutional assumption is removed completely.

2.5 The institutional assumption

In the words of Shubik (1970: 406): 'Earlier in this century in the United States the institutionalists were driven from the temple. The era of economic theory had begun.' The institutionalists included Thorstein Veblen, John R Commons and Wesley C Mitchell (Bronfenbrenner, 1985), and the rout was all but complete. Little or no mention is made of their work even in standard works on the history of economic thought (cf eg Gill, 1967; Hellbroner, 1972a; 1972b; Napoleon, 1972) of later years, although earlier works included their views (eg Roll, 1938).20 In contrast, more recent work which focusses on the institutional assumption of the neoclassical theory has gone back to the work of these early leaders, as will become more evident below.

20 It is interesting to note however that the Encyclopaedia Brittanica (Vol 6: 333) has an entry on institutional economics.
The era of economic theory was best expressed by Samuelson (1947: 221-222): 'The auxiliary (institutional) constraints imposed upon the variables are not themselves the proper subject of welfare economics but must be taken as given.' Neoclassical economics was institution-free (Schotter, 1981: 149-150; Heiner, 1983: 573; Ruttan and Hayami, 1984: 205). As has been shown in this chapter however the era did not last for long, and recent work on property rights, transaction costs and contract theory have taken cognizance of the role of institutions in an economy, although only in a restrictive manner. New theories have now been proposed which include institutions as endogenous to the economic system.

A review of the literature reveals many different definitions of an institution, although the confusion between institutions and organizations (e.g. by Edwards, 1976: 919) is not often found in modern work. Most definitions equate institutions with 'social arrangements', 'rules', 'collective conventions' etc (cf. e.g. Commons, 1924: 6; Schmid, 1972: 893; Bromley, 1974: 820; Cirlot-Wanstrup and Bishop, 1975: 714n; Bronfenbrenner, 1985: 18-19; Bruton, 1985: 1105). Runge (1983a: 14-18) classifies definitions of institutions at four different levels of generalization.

When institutions are defined in this manner it does not take much to recognize the market itself as an institution (cf. e.g. Bromley and Verma, 1983: 255; Bruton, 1985: 1105; Johnson, 1985a: 5; and Bhaduri, 1986: 267 for this recognition in more recent literature on resource and development economics). What has been missed in neoclassical economics is that the market is only one of many institutions in society, and also that the market is not the only institution which can solve the 'economic problem.' Other means of allocating resources also exist.

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21 As quoted in Ruttan and Hayami (1984: 205n).
For the purposes of this study it is necessary to highlight two features of institutions, namely their function in society and the manner in which they come about. These two aspects are discussed below.

2.5.1 The function of institutions

In the neoclassical view a perfectly competitive economy is an information system wherein the carrier of information is a vector of competitive prices (Hayek, 1945). The information which is carried by these prices includes factors such as the relative scarcity of resources and the location of demand. It is this information which enables agents in the economy, acting in pure self-interest, to allocate resources in production and consumption in such a manner that a Pareto optimum state results.

It is from this perspective that the property rights and household economics approaches are best understood, as they analyze the consequences to an economy when price vectors do not convey perfect information. In these approaches, institutions create the conditions necessary to ensure that markets can convey information in the price vector. Institutions which fulfill this function include for example private property rights and the family.

A perfectly competitive economy is however little more than a theoretical construct, with the implication that real world prices cannot be perfect conveyors of perfect information. In this regard an economic system contains a network of information which is far richer than that described by a price system (Schotter, 1981: 118). In the absence of perfect information in the real world economic agents need information regarding the expected actions of other agents in the economy. The argument is that this information is carried in institutions, whose main function is to coordinate expectations, i.e. to provide assurance regarding one's own actions and the actions of others (cf e.g. Schelling, 1960; Schotter, 1981; Hardin, 1982; Runge, 1981a; 1981b; 1983a). Examples of institutions which fulfill this
function are the common law, common property systems and a vertically integrated industry.

It is obvious from this definition of the functions of institutions that they do not replace the function of market prices. Institutions supplement the market only in those areas where the market cannot function. The implications of this view of the functions of institutions are discussed in Chapter Six. This view however also has implications for the approach to analyzing the origin of institutions.

2.5.2 The origin of institutions

There are in principle three different ways in which institutions are created (Schotter, 1981: 28). In the first instance, institutions emerge as the result of explicit human design. This planning process is referred to in literature as institution building (cf Frey, 1984 for a review of this literature). Second, institutions can result when the agents of society meet and bargain about the type of institution they would like to see created. An analysis of this type of institution creation is presented by Buchanan and Tullock (1962) who study the creation of the institutions of different states in the USA. Third, institutions evolve in some or other manner. It is this last type of institution creation on which the institutional approach is focussed.

The influence of the theory of evolution, as proposed by Charles Darwin, on economic theory has been noted by Schotter (1981: 1-2) and Hirschleifer (1985: 54). These authors quote Adam Smith in 1759, Alfred Marshall in 1890 and Thorstein Veblen in 1898 as referring to the similarity between economics and biology rather than between economics and the physical sciences. The foundation of the economic theory of the origin of social institutions is then the theory of evolution.

Schotter (1981) provides a comprehensive view of this approach, using the assumptions of neoclassical economic theory. He traces
the origin of the view to the work of Karl Menger (1883; translated 1963). In this view man is still an optimizing individual who, in selfishly pursuing his own self-interest, gives rise to institutions. Institutions evolve organically and spontaneously, and there is an invisible hand which guides their creation. They are therefore the adaptive tools of social systems. As with biological systems, if the institutional adaptation to a given set of problems is not the proper one, the social system will die (Schotter, 1981 : 2).

The terminology proposed by Roder (1982) can be used to identify two variants of this model. In the tight prior equilibrium model, institutional adaptations must be in the direction of the creation of the necessary conditions for a perfectly competitive market, otherwise the society will not flourish. The example most commonly found in the literature is once again that of private property rights. Policy in this case should then be aimed at introducing private property rights if these do not evolve spontaneously. Proponents of the diffuse prior equilibrium model on the other hand recognize the fact that the market cannot always provide the correct institutional adaptation. There are therefore situations where institutions which supplement the market are required, such as common property regimes and vertically integrated industries. These institutions will also evolve spontaneously as the cumulative result of the decisions of rational, self-interested individuals.

The tight prior equilibrium model unnecessarily restricts analysis only to market economies, while the diffuse model does make provision for market-supplementing institutions. There are however two things wrong with these approaches.

First, Schotter (1981 : 28) emphasizes the view that institutions evolve as the result of individual, and not collective, behaviour where this individual behaviour is rational and motivated by self-interest. This ignores a further source of institutional change, namely predictable behaviour (Heiner, 1983 : 573). In this approach, optimizing behaviour is not always rational, given
the cost of making decisions and the presence of uncertainty. If an individual therefore faces the prospect of having to make recurrent decisions of this nature, social norms, conventions or rules will be established which substitute for decisions. These norms, rules and conventions, which have their origin in non-optimizing behaviour, are called institutions.

In spite of the neoclassical emphasis on the individual, collective action in the pursuit of collective interests cannot be ruled out. In progressing from his definition of institutions of 1924 referred to earlier, Commons (1934: 69) has defined institutions as follows:

"If we endeavour to find a universal principle, common to all behaviour known as institutional, we may define an institution as Collective Action in control of Individual Action."

Second, these variants of the evolutionary approach to the origin of institutions fail to account for the interrelationship between social systems and nature (Norgaard, 1984), and between institutional and technical change (Hayami and Ruttan, 1971: 59-61; 1985; Binswanger and Ruttan, 1978; Ruttan and Hayami, 1984). This latter aspect should also be taken into account in studying the origin of institutions.

The approach of Hayami and Ruttan (1971) differs from the neoclassical model in that they regard technical change as endogenous to the development process. In agricultural research, for example, changes in relative factor prices increase the demand by farmers for innovations which enable farmers to substitute the now more expensive inputs for those which are relatively cheaper. Farmers will apply pressure on the suppliers of inputs to produce either new inputs or new technical possibilities. Agricultural scientists and administrators respond to the problems of the rural sector by producing these innovations (cf. also Grabowski, 1979: 724-725). Technical progress is therefore a function of both the supply of and demand for innovation. This does not however imply that technical
change can be left to an invisible hand, as the capacity to innovate is in itself a function of institutional innovation (Ruttan and Hayami, 1984: 203).

Institutional change is induced by changes in the demand for and supply of institutional innovation. The source of these changes in supply and demand must therefore be determined in order to explain the origin of institutions (Ruttan and Hayami, 1984: 204; Ruttan, 1982: 304-308; 1984b: 549). In this regard institutions must be regarded in terms of their function as coordinators of expectations, i.e., as providers of assurance. All types of institutions must also be included in the analysis, regardless of their origin. This includes institutions which evolve as a result of social change and those which originate in either a bargaining process or from deliberate social planning. Given this view it is possible to analyze changes in rules or conventions within economic units, among economic units and between economic units and the environment (Ruttan and Hayami, 1984: 204n).

Determinants of the supply of institutional change include the cost of collective action, or the cost of achieving social consensus. This is in turn determined by factors such as cultural tradition and ideology, advances in knowledge in social science and the level of education (Ruttan and Hayami, 1984: 205). A further factor is the balance of power among vested interest groups in society (Ruttan and Hayami, 1984: 213). The determinants of demand on the other hand include changes in factor endowments, technical change and change in product demand as well as the costs involved in institutional change.

This view of the determinants of the demand for and the supply of institutional change is similar to the traditional Marxist view, although it is at the same time more complex (Ruttan and Hayami, 1984: 204-205). Marx regarded only technological change as the source of institutional change, and excluded the possibility of incremental change. Further, the list of supply and demand determinants will differ between different situations.
Ruttan and Hayami (1984: 215-218) provide a preliminary analysis of a model of induced innovation, which includes both induced technical and institutional change. The model differs from the conventional equilibrium model to the extent that these two 'inputs' are included as endogenous variables. The model can be illustrated as a system of interrelationships between resource endowments, technology, institutions and cultural endowments (Ruttan and Hayami, 1984: 216).

The existence of these interrelationships is sufficient proof that institutional change cannot be left to the working of an invisible hand. Conscious, and at times concerted human action is also required in the process of institutional and technical change. These changes also take place within the bounds of the current resource and cultural endowments and of course also influence these endowments.

Knowledge of the origin of specific institutions is necessary in order to be able to predict the determinants and direction of future changes in the presence of policy intervention. It is for this reason also necessary to understand the complexity of the origin of institutions in general. In this regard the induced institutional innovation model captures the interdependencies which underlie human society, rather than relying on linear models of rational, self-interested persons spontaneously creating the rules which govern human affairs.

2.3 Summary and conclusions

This chapter contains a brief overview of new extensions to the neoclassical microeconomic theory. These extensions have been described in the context of a relaxation of the underlying assumptions of the basic model for expositional purposes only. The conclusion was drawn that these extensions do not fully account for the role of institutions in society, and for this purpose an institutional approach is necessary.
When an institution is defined in terms of the rules which structure society, it is obvious that the market is also an institution. Neoclassical economic theory incorporates the role of institutions only in terms of their ability to facilitate the market, while more recent extensions to the theory also account for institutions which substitute for the market in those cases where the latter cannot function. The view taken by proponents of these latter approaches of the origin of institutions is however simplistic. These models describe human society in terms of linear relationships between market failure and institutional creation, with the help of the invisible hand.

An institutional approach is therefore required. In this regard the induced innovation model describes the interrelationships between the elements which comprise society. Knowledge of the origin of an institution as well as its interrelationships with the physical and technical environment is required in order to be able to predict the possibility and direction of future change as a result of policy intervention. For this purpose it is necessary to identify the determinants of the demand for and supply of institutional change.

The need for an institutional approach can also be motivated in the form of an extension to the parable used in many textbooks to illustrate the wonders of the free market. Two people live on an island. The one has many fish and a few loaves of bread. This person prefers bread to fish. The other has a lot of bread and only a few fish. This person prefers fish to bread. In the presence of the Invisible Hand, the wonder of the market unfolds. They trade bread for fish to the point of equimarginal utility. If there are more than two people and they have to produce the bread and fish, then money, price ratios, equimarginal costs and equimarginal returns enter the equation. But what if the one person is an unrehabilitated burglar, the other a ninety-pound weakling? The one a man, the other a woman? The one a layman, the other a lawyer?

The conventional approaches to livestock development in sub-
Saharan Africa can now be discussed in terms of their relationship to specific microeconomic constructs. Their applicability to the real world forms the content of the following two chapters, where the conclusion is drawn that they do not give proper attention to the institutional content of common property.
CHAPTER THREE
THE TRAGEDY OF THE COMMONS

3.1. INTRODUCTION

The misuse of the natural grazing resource of sub-Saharan Africa has achieved the status of received wisdom and has been ascribed among others to the common property character of African traditional land tenure systems. This has led policymakers and consultants to call for measures to privatize property, either by substituting with freehold tenure or by other means of internalizing externalities.

This view of the destruction of the grazing resource is based on the 'tragedy of the commons' hypothesis (Hardin, 1968), which is in turn based on the tight prior equilibrium model of neoclassical microeconomics. The tragedy of the commons hypothesis has also been modelled by means of the Prisoner's Dilemma game, which has likewise resulted in policy prescriptions aimed inter alia at the vesting of private property rights in land.

The association of the livestock subsector in Africa with the Prisoner's Dilemma (PD) game, and by association with the tragedy of the commons view, has been criticized by Runge (1981b; 1983b; 1984b). In this chapter the tragedy of the commons theory is analyzed in the next section, followed by a games theory modelling in terms of the Prisoner's Dilemma game in section three. Section four contains a critique of the theory on theoretical, experimental and empirical grounds.

3.2. THE TRAGEDY OF THE COMMONS

Hardin (1968) regards the overexploitation of a resource with public goods characteristics as inevitable, and has termed this the 'tragedy of the commons'. In discussing this theory with respect to the problems of overpopulation, he used the example of the herdsman with free access to common grazing land (Hardin,
Open access to a pasture resource leads to a situation where the individual grazier does not carry the full cost of the decision to add one more animal to the pasturage, i.e., there is a divergence between private and social cost. The individual, being a rational decision-maker, will add animals to the point where his private cost and benefit are equal. As a result of the divergence between private and social cost, a greater number of animals than would be the case under private tenure are kept on the land. This logic will lead the livestock owner to add successive animals to the resource, a logic which is also true for all the users of the resource.

In earlier times, nature was capable of maintaining a balance between human and animal populations and the available resource base through war, poaching, disease, drought and an unlimited supply of land at low levels of population pressure. In the absence of the former three factors and with increasing population pressure on the land '... ruin is the destination toward which all men rush ...' (Hardin, 1968: 1244).

It is important to note in this regard the context in which the word 'tragedy' is used. Hardin (1968: 162) uses the word in the sense of dramatic tragedy, and quotes the philosopher A N Whitehead (1948: 17): 'The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things.'

Much of the literature which explains overstocking and low productivity in the livestock subsector of communal grazing regimes has used the tragedy of the commons as its theoretical basis (Runge, 1985: 1). This includes especially the literature on the livestock subsector of sub-Saharan and southern Africa. An analysis of this application is found in a book described by

22 The relevant references are given throughout this chapter.
Schneider (1983: 222) as "... at last ... an attempt to analyze the rational pastoralist ... by employing economic models". Cratty (1980) has constructed an economic model of decision-making by cattle keepers, and applied the model to different farming systems. The application of the model to communal grazing systems makes use of the tragedy of the commons hypothesis (Colvin, 1983: 17-18; Schneider, 1983: 223).

The model is based on the assumption that cattle keepers combine the resources under their command for the production of products and services in the most beneficial manner. Resources include land for cattle keeping, time, and other inputs (such as labour, feed, land for other purposes and veterinary services), while activities include rearing cattle for fattening or draft; rearing them for breeding; and breeding itself. Apart from a number of intermediate outputs, final output consists of meat, draft services, manure and milk (Cratty, 1980: 40-41). Figure 1 shows the channels through which inputs and intermediate outputs can be used to produce the final product.

![Economic model of the cattle sector](chart.png)

**Figure 1**: An economic model of the cattle sector

Source: Cratty, 1980: 41.
According to Crotty (1980: 54) the system of land tenure is a major factor determining the relationships described in the model. Under communal tenure more cattle will be kept than under individual tenure (Crotty, 1980: 55-56) and cattle will also reach maturation at an older age and at a higher stocking density, with a resultant effect on productivity (Crotty, 1980: 56). Further, although highly institutionalized forms of communal grazing have been observed, he accepts the postulate of open access to communal resources for analytical purposes (Crotty, 1980: 57). The model is then applied to cattle farming under communal grazing systems as found in Africa (Crotty, 1980: Chapter 9).

Traditional pastoralism has three distinguishing characteristics, namely that pastoral products are generally accepted (ie they have value); that there exists a preference to hold livestock as an asset; and that stock are grazed communally (and concomitantly that concepts of property are not well defined) (Crotty, 1980: 119-121). These characteristics result in an inherent pressure to build up stocks, which pressure is in turn relieved by increased unplanned mortality, general malnutrition, disease, parasitic infestation and intergroup conflict (Crotty, 1980: 126-127).

The influence of colonialism on African pastoralism has been both technological and institutional. The major technological influence has been a reduction in both human and livestock mortality rates. Reduced human mortality has increased the demand for crop land, thereby reducing available grazing land, and also increased the demand for cattle products. Reduced cattle mortality reduces unplanned stock losses which are one of the important factors controlling livestock numbers. The net result is an increased pressure for more cattle products, an increased ability to keep cattle alive and finally overgrazing (Crotty, 1980: 127-128).

The introduction of Western concepts of property has resulted in
similar pressures for overstocking of cattle. More closely defined property rights in the produce of animals creates an incentive to keep more cattle, while better defined ownership of cattle increases the ability of the individual to extract a surplus and reinvest in cattle. Finally, intergroup rivalry has been reduced by colonial and post-colonial governments, thereby removing the last of the traditional checks to overgrazing. According to Crotty (1580 : 129) the effect has been to increase the quantity, but lower the quality of life in these areas.

The existence of public goods externalities leads to the proposal that policy be aimed at internalizing these externalities by means of creating a market in private property rights, providing a disincentive to the keeping of livestock, or prohibiting the overexploitation of the grazing resource (cf eg Crotty, 1980; Lyon, 1982; Slade, 1984; and McCauley and Brokken, 1985 for examples of these proposals). In the first case a market in land or grazing rights will serve to internalize externalities, while in the second case a tax on animals will also achieve the same purpose.

The view that the very existence of common property rights over a scarce resource will lead to a tragedy of the commons can be tested with a game theoretic approach. More specifically, the tragedy of the commons has been described as an example of the familiar Prisoner's Dilemma game.

3.3 THE PRISONER'S DILEMMA

The PD game has been used extensively in political and economic theory to model public goods problems, including the grazing of livestock on common range (cf Runge, 1984b : 158 and 159 for references). The similarity between the PD and the tragedy of the commons view rests on the shared assumption that collective decisions by individuals acting independently of each other will lead to stable non-Pareto outcomes unless enforceable rules are imposed by some outside agent (Runge, 1981b : 597). The PD game was constructed to model these circumstances, so the question is
whether a system of common property rights displays these same features of the game. This can be answered by a more detailed analysis of the game itself and a comparison with the real world situation.

The PD game can be illustrated with reference to a gain-loss table (Runge, 1981b: 597; 1983b: 8) as shown below. The numbers in brackets represent the number of years of incarceration for the first and second prisoners respectively, depending on their strategy choice of whether to confess or not. Each prisoner is interrogated separately.

<table>
<thead>
<tr>
<th>First Prisoner</th>
<th>Second Prisoner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not confess</td>
<td>(1,1)</td>
</tr>
<tr>
<td>Confess</td>
<td>(0,10)</td>
</tr>
<tr>
<td>(10,0)</td>
<td>(5,5)</td>
</tr>
</tbody>
</table>

Figure 2: The Prisoner's Dilemma

If neither confess, each will be imprisoned for one year, while if one confesses he will be set free and the other will be sentenced to ten years imprisonment. If both confess, each will be imprisoned for five years. Each player is therefore faced with the choice of whether to confess or not, and it is assumed that each player is motivated by individual self-interest. This assumption of self-interest leads to the conclusion that the second choice of each player is always better than the first. If, for example, the first prisoner is making the choice, he would prefer to confess regardless of the strategy choice of the second prisoner. The observation remains true when the second prisoner is making the choice, and the end result of a play is that both prisoners confess and are gaol for five years each.

The first point of the game is that the 'best' strategy (neither
confesses) is unstable, as each prisoner has sufficient motive to confess, regardless of the decision of the other prisoner. The resultant non-cooperative equilibrium, where both confess and are gaol for five years each, is Pareto-inferior. This can be illustrated with reference to Figure 3 where the payoff for the first prisoner is measured on the abscissa, and for the second prisoner on the ordinate. Years of incarceration are measured with negative numbers, in brackets, with the payoff for the first prisoner appearing first.

Figure 3: An illustration of the payoff matrix for the Prisoner's Dilemma

Source: Adapted from Shubik, 1970a: 182.
The Pareto optimal surface is WNK, the 'best' outcome is N, while the result of a play (the actual outcome) is L. This equilibrium is stable, non-Pareto optimal and is said to constitute a dilemma. The evidence suggests that people do select this non-cooperative equilibrium outcome when the game is played once without any communication between players. Furthermore, the logic of the game suggests that the noncooperative equilibrium will result even with a repeated play of the game (Shubik, 1970a: 183).

The procedure here is to assume that the second play of the game has been reached. This one-period Prisoner's Dilemma will result in the usual noncooperative equilibrium where each prisoner confesses. However, because each knows he is going to confess in the last play, he might as well also confess in the penultimate play (Shubik, 1970a: 184). The conclusion can therefore be drawn that any finite number of repetitions of the game will end in the dilemma, a conclusion which cannot however be substantiated empirically.

A number of attempts have been made to specify a game-theoretic resolution of the Prisoner's Dilemma model, and Shubik (1970a: 185-190) discusses the pure infinite game, games of economic and social survival and metagames. He comes to the conclusion that the PD model is not strong enough to be descriptive of the complexity of most human systems. Runge (1986: 626-628) also describes the multiperson prisoner's dilemma and comes to the same conclusion. Further evidence is provided by Thompson and Faith (1981). Despite this, the model is still used to describe problems of common property, as well as to prescribe policy measures (cf. og Braden, 1985).

The attainment of the noncooperative Pareto-inferior equilibrium in the PD game can be likened to the over-exploitation of a common property resource, and is based on the assumption of independent decision-making. The PD game is the logical equivalent of the tragedy of the commons view, and leads also to
policy prescriptions which are aimed at internalizing externalities. In game theory terms this would imply a change in the payoff matrix which changes the independent decisions of self-interested individuals.

The assumption of independent or Robinson Crusoe-like behaviour however implies 'separability' of individual cost functions. The proof for this rests on the identification of externalities in a grazing regime on common property and the formal equivalence between separability and the strict dominance of individual strategy. This proof follows Runge (1981b: 598-599).

In a competitive situation, two cattle owners with access to common grazing will have the following cost functions:

\[ C_1 = C_1(q_1, q_2) \]
\[ C_2 = C_2(q_1, q_2) \]

where \( C_1 \) and \( C_2 \) are costs to owners 1 and 2 and \( q_1 \) and \( q_2 \) is the number of cattle grazed by owners 1 and 2 respectively. The cost of grazing for each owner is dependent therefore also on the number of cattle grazed by the other participant, and the functions represent external diseconomies. In order to maximize profits, each owner must equate price \( (p) \) with the common marginal cost:

\[ p = \frac{\delta C_1}{\delta q_1} = \frac{\delta C_2}{\delta q_2} \]

Using the assumptions of welfare economics, maximum welfare in a competitive situation is attained when the joint profit function of the two participants is maximized, where profit \( (\Pi = \Pi_1 + \Pi_2) \) is the difference between total revenue \( (R = pq_1 + q_2) \) and total costs \( (TC = C_1(q_1, q_2) + C_2(q_1, q_2)) \). Therefore:

\[ \pi = R(q_1 + q_2) - C_1(q_1, q_2) - C_2(q_1, q_2) \]

The first-order conditions for a maximum are given as:
\[ \frac{\partial^2 s}{\partial q_1^2} = 0, \quad \frac{\partial^2 s}{\partial q_2^2} = 0, \quad \text{and} \quad \frac{\partial^2 s}{\partial q_1 \partial q_2} = \left( \frac{2\pi}{q_1 q_2} \right) \]

while the second-order conditions are:

\[ \frac{\partial C_1}{\partial q_1} = \frac{3C_1}{3q_1}, \quad \frac{\partial C_2}{\partial q_2} = \frac{3C_2}{3q_2} = 0, \quad \text{and} \quad \frac{\partial C_1}{\partial q_1} = \frac{3C_1}{3q_1} = \frac{3C_2}{3q_2} = 0 \]

(4)

An externality arises when either

\[ \frac{\partial C_2}{\partial q_1} \neq 0 \quad \text{or} \quad \frac{\partial C_1}{\partial q_2} \neq 0 \]

(5)

This latter statement is based on the substitution of equation (2) into equation (4), so that (4) becomes:

\[ \frac{\partial^2 s}{\partial q_1^2} = \frac{\partial^2 s}{\partial q_2} = \frac{\partial^2 s}{\partial q_1 \partial q_2} = 0, \quad \text{and} \quad \frac{\partial C_1}{\partial q_1} = \frac{\partial C_2}{\partial q_2} = \frac{\partial C_1}{\partial q_2} = 0 \]

(6)

and when (6) is true the first-order conditions for a maximum are not met. In the case of the communal grazing regime

\[ \frac{\partial C_2}{\partial q_1} > 0 \quad \text{and} \quad \frac{\partial C_1}{\partial q_2} > 0 \]

(7)

so that profit maximization by the individual participants will not ensure maximum social welfare.

Separability in a function is said to exist (Davis and Whinston, 1982: 244) if and only if

\[ f(X_1, X_2) = f_1(X_1) + f_2(X_2) \]

(8)

We can construct the cost functions of our two participants where these cost functions are interrelated by external diseconomies but are separable in their arguments as follows:

\[ C_1(q_1, q_2) = A_1 q_1^{n_1} + B_1 q_2^{m_1} \]

(9)

\[ C_2(q_1, q_2) = A_2 q_2^{n_2} + B_2 q_1^{m_2} \]

and where the notation has the usual meaning. Profit maximization for the individual is given where price equals marginal cost, thus:

\[ p = \frac{\partial C_1}{\partial q_1} = n_1 A_1 q_1^{n_1-1} \]

(10)
This result shows that in the separable case the marginal cost of each is given entirely in terms of own cattle, so that the externality will affect the overall profit level of the firm but not the optimal output choice by shifting the total cost curve, but not marginal cost (Davis and Whinston, 1962:246-247). Two conclusions follow, namely that the individual must equate marginal cost and price in order to maximize profit in the presence of separable externalities, and conversely if the individual can equate marginal cost and price, separable externalities must be present (Davis and Whinston, 1962:246-247). This has important implications for the analysis of the tragedy of the commons view. First, this view implies that the externalities are separable, and second, it implies that individuals can maximize profits by means of decisions which equate marginal cost and price.

Marginal private cost is lower than marginal social cost in a common property situation, which leads to a higher optimum output level and therefore overuse of the common property (i.e. free rider behaviour). The welfare solution can be achieved by direct constraints on overuse, the traditional tax-subsidy solution or privatization of property rights. These classical prescriptions to internalize the externality are the responsibility of the government. The prescriptions are however also dependent on the assumption of separable externalities. Dropping this assumption implies making the alternative assumption, namely that the externalities are non-separable.

3.4 A CRITIQUE OF THE TRAGEDY OF THE COMMONS

Notwithstanding the wide use of the tragedy of the commons to explain the problems of the livestock subsector, the model has
many flaws. In this section theoretical, experimental and empirical evidence against this view is presented.

These three forms of refutation are used to provide a comprehensive criticism of the hypothesis; only one is necessary. This lies in the nature of the hypothesis, which is classified as a universal statement of the form 'all X's have the property Y'. Universal statements of this form are refutable if false, but not verifiable, even if true (cf e.g. Boland, 1981: 1033).

3.4.1 Nonseparability of cost functions

Runge (1981b: 599-600) shows that in the case of nonseparability the externality enters the cost function of the individual in a multiplicative rather than an additive way. A nonseparable function can be expressed as:

\[ f(x_1, x_2) = f_1(x_1) + f_2(x_2) \]  

(11)

If we assume the cost functions of the livestock owners are of the form:

\[ C_1(q_1, q_2) = A_1 q_1^n + B_1 q_1 q_2^m, \]  

\[ C_2(q_1, q_2) = A_2 q_2^r + B_2 q_2 t q_1^s \]  

then profit maximization by each implies that:

\[ P = \frac{\delta C_1}{\delta q_1} = n A_1 q_1^{n-1} + B_1 q_2^m, \]  

and

\[ P = \frac{\delta C_2}{\delta q_2} = r A_2 q_2^{r-1} + t B_2 q_2 t q_1^s \]  

(13)

The marginal cost of the individual is therefore defined in terms of a variable which he can control as well as a variable which he cannot.
cannot control and the cost functions are therefore inter-
dependent. This implies that changes to the value of the 
externalities (as a result of the actions of another partici-
pant) will not shift the cost curve by only some constant value. 
The individual will find it difficult to follow the marginal cost 
equals price rule of profit maximization (Davis and Whinston, 
1962: 254), and there is no longer a dominant strategy to 
follow. In a formal sense the introduction of private property 
would mean making such a nonseparable case separable, and can be 
regarded as a likely policy option. Interdependence among 
utility functions implies however that it is not the only option 
available, and privatization will in any case not be free of 
transaction costs (Runge, 1981b: 600).

Two possible means of achieving a welfare solution are discussed 
by Davis and Whinston (1962: 256-257). These include mergers, 
which will be a possible end result of privatization in communal 
grazing regimes, and the classical tax or subsidy solution. In 
the case of the latter, the absence of a dominant strategy means 
that the policy maker cannot predict how individuals will react, 
making the tax/subsidy solution infeasible.

3.4.2 Some experimental evidence

It has been shown that the assumption of separable externalities 
underlies the PD game, and that this is a weak assumption. 
Evidence of voluntary behaviour from laboratory experiments is 

It is important to note that the tragedy of the commons view 
predicts that individuals will free ride. If they do not they 
are irrational. Experimental results which show some collective 
action and some free riding among groups of rational participants

24 Trivial evidence in support of the PD is found in the 
noncooperative behaviour of a subsample of economists and 
economics students in one of the experiments cited. The 
expectations of this group could be predetermined by knowledge of 
economic theory in the form of the free rider hypothesis.
are therefore sufficient proof that the PD model does not hold. In a study which analyzes and compares a number of tests of free riding under experimental conditions with the literature on similar experiments, Isaac et al. (1984) come to the conclusion that free riding is neither non-existent, nor is it all-pervasive. The experiments also show that this diversity of results cannot be explained by randomness.

On the theoretical and experimental level then, the tragedy of the commons is a nonsense. Further, the theory rests on the assumption of open access to land. The nature of access to grazing land in traditional agriculture is described next.

3.4.3 Access to the commons in southern Africa

The tragedy of the commons view rests on the assumption that there is open access to land, a view derived from the definition of a public good. The objective in this section is to show that there is a difference between open access and communal tenure, and that recognition of this difference will change the conclusion of the tragedy of the commons view. In order to give effect to this purpose, it is necessary first to define a communal land tenure system. This is then followed by a description of communal tenure in southern Africa.

Man has devised institutions that permit individuals or groups of people to possess or utilize land to the exclusion of others, and the rights inherent in these institutions form the basis of the concept of property and property rights (Demsetz, 1967: 347). A property right is a subset of the concept of property (Scott, 1988: 557), the latter vesting in non-material goods (e.g. copyright), movable goods (a motor vehicle) or in what is termed real property rights (land and its resources).

Possession of a property right does not refer to the material object, but rather to the rights with respect to the material objects (Barlowe, 1978: 395). These rights have a number of distinguishing characteristics, in that they are an attribute of
human beings and not chattels; they involve the right to use of material goods; and they are exclusive, and not absolute rights (Barlowe, 1978: 396). Access to property rights defines income-earning opportunity, while security of rights defines the security of that opportunity.

The association of land with property rights therefore implies the enjoyment of certain rights to land (Pryor, 1972: 406) and the system whereby persons gain these rights to land is called a land tenure system (Dorner, 1972: 17). These rights to land are fragmented in at least three dimensions; namely in time, in space and over multiple uses (Scott, 1983: 558), and can be termed a 'bundle of rights'.

Fragmentation of property rights in time takes place, for example, with leasing agreements, where the lessee has immediate rights which revert back to the lessor after a period of time. Similarly one person can hold farming rights to a portion of a piece of land only (fragmentation in space); also, rights can be to specific uses, such as farming and mineral rights.

The most important components of the bundle of rights include the right: to possess; to use (usufruct); of conditional or unconditional purchase and sale; to lease; to mortgage; to subdivide; to grant easements; and to devise. Furthermore, the exclusive nature of property rights also gives the society/state certain rights to land, regardless of the particular tenure system. These include the right to control the use of land (police power); eminent domain; escheat and the taxation powers of the state.

Police power refers to the power of the state to regulate the rights and use of rights to land, while eminent domain refers to the right of expropriation with fair compensation for whatever purpose the state wishes. By escheat is meant the reversion of estates to the state whenever a person dies intestate and without heirs according to the laws of descent. The state also has the right to levy taxes on real property.
This discussion of the concept of a land tenure system leads to the conclusion that forms of tenure can be distinguished by looking at who holds which rights to land, and in what manner these rights are held. Such a classification is according to a juridical interpretation of the rights to land.

In this regard a communal tenure system is one in which an identifiable group of people has access to specified rights in land. The 'commons' in England, for example, are characterized by access rules which prescribe the nature of the use of the resource (e.g. Foxall, 1979: 56; Runge, 1981b: 596). A communal grazing regime can therefore broadly be defined as one in which an identifiable group of people each have usufruct rights to land, while other rights, e.g. of disposal, are held jointly. Communal tenure should not be confused with open access (Cliracy-Wanstrup and Bishop, 1975: 715; Ronald Johnson, 1985: 373; Runge, 1985: 3). The traditional African land tenure system conformed to this definition, where ownership was vested in the community and usufruct rights were vested in families (Jeppe, 1979: 262-263). In traditional societies in most parts of sub-Saharan Africa land was occupied by the tribe as a whole and was held in trust for the people by the chief (Lesemé, et al., 1980: 176-177).

Each adult member of the tribe was entitled to a residential plot, an arable allotment and access to communal land for grazing, wood and thatch collecting, etc. Households headed by a female were given the same allotment and provision was made for additional land to polygamous households (Lesemé, et al., 1980: 177). These allotments were governed by African law and custom, and the holder, while not able to sell, mortgage or exchange the land, enjoyed permanent and exclusive usufruct.

The land allotment usually reverted to the commonage on the death of the holder, where it became available for reallocation (Lesemé, et al., 1980: 177). Where heirs existed, however, the allotment was inherited, usually through patrilineral, matrilineral or
cognitive lines (King, 1974 : 32).

There were therefore two distinct types of access to rights differentiated according to farming enterprise. The first type (for livestock farming) was one where different people used the same land for individual benefit. The second type (for residential plots and arable land) was one where usufructory rights vested in an individual. Usufruct on arable land was restricted to the time when the harvest was completed; thereafter the land reverted to the commonage until the next crop was planted.

Increasing pressure of population on land has led to modifications to the traditional communal system of land tenure, of which the change to bush fallow is an example. Other factors, such as changes in the economic and political sphere, as well as the growing awareness of the need for change have led to certain evolutionary adaptations to the system. Examples of the rules which specify who has access, and the nature of that access can be found in Hitchcock (1980); Lawry (1983 : 7-9); and Bennett (1984 : 15-16).

This does of course not prove that new rules which serve to control grazing will always replace the former rules, nor does it prove that the new rules, if any, will achieve their purpose. At least, however, the conclusion can be drawn that the presence of any rules negates the tragedy of the commons hypothesis. The likelihood and nature of such rules in the southern Africa region will be a function of the political economy of the region as well as of local circumstances. It would therefore be logical to expect as many adaptations to new circumstances as there are communities. Even if a tragedy of the commons were logically possible, it would not be inevitable.

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25 This refers to the sedentarization of farming where virgin land is cleared, cultivated and then left fallow for later reuse instead of moving to new land (King, 1974 : 38).
3.4.4 Case studies

Proponents of the PD model of common property externalities would expect privatization schemes to succeed in countering the resource deterioration found in communal grazing regimes in sub-Saharan Africa. In this section, two case studies are reported, followed by an evaluation in terms of the outcomes expected by adherents to the approach.

3.4.4.1 A tax on livestock numbers

Crotty (1980) has rejected the privatization of land tenure as being too far-reaching, despite his acceptance of the tragedy of the commons view. He regards privatization as likely to foster inequality, and has proposed a tax on livestock using the commons as an alternative way of maximizing social net revenue. Figure 4 illustrates the way in which a tax on cattle fulfills this function, as well as the optimal level of such a tax.

![Diagram](image)

**Figure 4** : The optimal level of a cattle tax

Source: Crotty, 1980: 140.
The average return to society from cattle on communal grazing is given by $AB$, while $AD$ is the corresponding marginal return and $OG$ is the price of 'other' inputs (as defined earlier). As a result of the fact that cattle are grazed communally, the marginal return to the individual is the same as the average return to society. Individual profit maximizers will keep cattle to the level where their marginal return is equal to marginal cost, i.e. On cattle, which gives rise to a social marginal return of $-BD$.

Social net revenue is however maximized at a stocking rate of $ON$ where social marginal cost equals social marginal returns. A tax of $EC$ will cause individual stockowners to reduce stock to the level $ON$, while any other level of tax will not lead to maximization of social net revenue (Crotty, 1980: 140). The same conclusion can be reached arithmetically (Crotty, 1981: 11-12).

Assume the marginal return to an individual of an additional animal is 0.9 of a unit, and the grazier wishes to add to his existing stock of one animal. Assume further there are 100 animals already grazing on the communal land with a total return of 100 units. Total return to the individual will increase from 1 to 1.8 units, while total social return will decrease to 101 animals x 0.9 units, i.e. 90.9 units. The cost to the rest of the graziers of the additional animal is 9.9 units (9.1 unit decline in total value plus the 0.8 unit increase in value for our individual owner). A tax of 9.9 units on the individual grazier will increase the cost to him of the additional animal by 9.1 units (the tax less the 0.8 unit increment in output). Social and private costs are now equal and no overgrazing will result.

3.4.4.2 Group ranches in Kenya

The Kenyan Livestock Development Project (LDP) initiated in 1968, was one of the earlier attempts by the World Bank to address the perceived problems of overstocking in Africa, inherent to the tragedy of the commons view (Bennett, 1984: 29). The initial objective of livestock development policies after
Independence was to establish individual pastoralists on a particular piece of land in the expectation that they would farm in an ecologically sound manner (Oxbry, 1981: 47). The imbalance between available land and number of pastoralists was however too great to pursue this policy.

The first step in the KLDP was the Land-Group Representatives Act of 1968 which placed the institution of grazing reserves on a formal legal tenure basis (Bennett, 1984: 43). Cognisant of the problems associated with placing individual farmers on private ranches, the new approach was to give private property rights in grazing land to groups based on traditional claims to grazing or on corporate principles (Crotty, 1980: 134).

The land was to be held in common by all the members of the group, while certain other property was held either individually (e.g. residential rights) or by the body corporate (e.g. rights of grazing, tillage, water). The rights to sale of property are exercised by the group representatives with the approval of the government. Although the land is owned communally and animals are herded collectively, the livestock are owned individually. A quota was set for the total number of livestock which could be grazed profitably on each ranch, and assistance in the form of veterinary services and borehole drilling was dependent on the maintenance of this quota. No allocation of grazing rights to individual families was made, and to this extent the establishment of the group ranches meant little more than a legalization of the rights of existing users to graze animals on the land (Davis, 1971; Crotty, 1980: 135; Oxbry, 1981: 50). The ranches were also not fenced because of cost considerations.

Variations on the group ranch approach as it was applied in Kenya are also found in Tanzania, Burkina Faso, Rwanda, Senegal (Oxbry, 1981: 49-50); other parts of West Africa (Riddell, 1982; Oxbry, 1984) and Botswana (Crotty, 1980: 136-139; Oxbry, 1981: 49; Lawry, 1983 and Gulbrandsen, 1985).
3.4.4.3 The tribal grazing land policy (TGLP) of Botswana

Changes which came about in Botswana during the colonial era as a result of factors such as colonial policy, increasing exposure to foreign markets for livestock exports and the modernization of the southern African economy formed the basis of the TGLP (Lawry, 1983: 2). The end result of these changes was that the livestock subsector was characterized by differential production strategies at the time of independence in 1966. Smallholder farmers with small average herds pursued mixed crop/livestock strategies under traditional tenure in combination with migrant labour, and kept cattle for milk and draught, selling an occasional animal to meet cash needs. Owners of large herds on the other hand produced primarily for the market and had de facto land rights by virtue of their ownership of boreholes. These two sectors were to a large extent spatially separated, with the commercial sector having strong ties to the political and future administrative elite (Lawry, 1983: 12).

The first step in the new livestock development policy was the Tribal Land Act of 1968, which transferred land allocation powers from the traditional leadership to District Land Boards (Lawry, 1983: 15). Land policy became the exclusive concern of the central government, giving it the administrative and organizational capability to implement land policy, if necessary against the interests of the traditional leadership.

The TGLP became official government policy in Botswana with the publication of a White Paper (Government of Botswana, 1975) encompassing the national policy on tribal grazing land. The policy was based on a view of the Botswana economy which was shared by most observers and consultants26, namely that the livestock sector formed the basis of the rural economy, represented the most important export base, but was being

26 Lawry (1983: 18-22) provides details of the various conferences and consultancy studies which provided the intellectual justification for the policy.
threatened by an increasingly degraded land base. The agreed cause of environmental degradation was the antiquated land tenure system, and the theoretical construct was the 'tragedy of the commons' (Lawry, et al., 1985 : 17-18).

In terms of the TGLP, the District Land Boards were to divide the grazing areas into three zones, namely commercial ranching areas, communal grazing areas and reserved areas (Moody, 1976 : 345-346). The commercial ranching areas were to be situated mainly in the western sandveld areas which, prior to the introduction of deep-drilling borehole technology in the colonial era, had been used as seasonal pasture only (Hitchcock, 1980 : 9). The introduction of this technology gave the individual responsible for drilling sole usufruct over the water, although by customary law these use rights could not be sold (Hitchcock, 1980 : 8). As could be expected, these use rights had become increasingly concentrated in the hands of large herd owners. The danger of concentration of grazing rights in the hands of a few had been foreseen. A freeze on the drilling of new boreholes was announced in 1973 (Hitchcock, 1980 : 18) while the TGLP provided for commercial ranches to be allocated to groups of smaller owners as well as to individuals.

The second category of land division was the communal grazing areas, mostly situated close to settled villages. The traditional system of tenure was to be maintained, while it was hoped that the movement of large herds to commercial ranches would alleviate grazing pressure. No restrictions were however placed on individuals from keeping herds in both areas (Lawry, 1983 : 23).

The third category was the reserved areas which would be set aside for future use, as a means of protection for those who owned only a few head of cattle, as well as for wildlife preservation, mining and cultivation.

The planning procedures for land use zoning and allocation were also outlined as part of the TGLP. The sandveld cattle posts in
the west were to be zoned as commercial ranches, but for the rest of the country commercial ranches were to be established only after the need for reserved and communal lands had been accounted for. Further stipulations of the TGLP included planning procedures for the granting of leases, access to financing sources for commercial herders and mechanisms to reduce stocking pressure on communal lands (Lawry, 1983 : 24).

3.4.4.4 Evaluation

There are three issues of importance in evaluating the actual outcome of policy in Kenya and Botswana, namely the theoretical basis of the policies, the design of the strategies and their objectives. These issues are discussed in turn below.

The stated theoretical construct on which the TGLP of Botswana was based was the tragedy of the commons view (Sir Seretse Khama, quoted in Moody, 1976 : 344), while the objective of the policy was threefold. First, the objective was to stop environmental degradation; second, to promote equality of incomes in the rural areas; and third, to commercialize the livestock industry on a sustained basis. The sequence of land zoning into communal grazing areas, commercial ranching areas and reserved areas was also important to the extent that the commercial ranching areas would in general be those parts of the country left over after zoning of communal and reserved areas. The reality proved otherwise.

Implementation of the TGLP soon showed up unintended effects, which brought into question the assumptions on which it was based (Hitchcock, 1980 : 16-25). First, the commercial ranches did not prove to be as productive as was assumed they would be, and neither were they necessarily more productive than under the previous grazing regime. Second, the traditional response to drought and bush fires had been to move cattle from one grazing post to another, and fencing would reduce this mobility. Third, by 1979 all the ranches were severely overgrazed, while some cattle owners had removed their herds and had defaulted on their
Fourth, water source ownership became even more concentrated in the hands of the rich, as drilling continued despite the 1973 freeze on new boreholes. Many of the water source owners were civil servants, and few lived on the ranches. Fifth, reserved areas were not set aside, mainly because the vast areas of unoccupied land which were assumed to exist did not. Sixth, the establishment of the commercial ranches led to the removal of 'surplus' people off this land, mainly those who had grazing rights but not water rights. This has led to the creation of a 'squat' class, with wide social implications. Further, no provision was made in the TGLP for non-stockholding groups, most of whom belong to the San (Bushman) ethnic group.

Crotty (1980: 136-139) has predicted that the TGLP would result in an increasingly skewed distribution of wealth in Botswana, the creation of a landless class and a return to overgrazing on communal land made possible by increasing birth rates and lower death rates as a result of the removal of commercial herds. This would pose a threat to the democratic character of the Botswana state, and is based on the assumption that the higher productivity of the commercial ranches would eventually lead to the expropriation of all the land (Crotty, 1980: 138). The actual outcome of the policy to date has been less clear, as increasing landlessness has gone hand in hand with the abandonment of commercial ranches and sustained overgrazing. The failure of the policy in its original form was therefore based on the inability to increase productivity on the commercial ranches and the insufficient attention given to the communal grazing lands.

It can be argued that similar factors led to the establishment of group ranches in Kenya. Here too, the belief was held that individual ranches on private tenure would solve the tragedy of the commons, which in turn led to the expropriation of land by the political and administrative elite and attempts to remove 'surplus' people off the grazing lands (Bennett, 1984: 117). This resulted in attempts to guarantee the rights of the majority of pastoralists through collective ownership of resources. The
implementation of these group ranches however, preceded the TGLP of Botswana, and can be explained only by the belief that there existed sufficient unoccupied areas in Botswana to justify individual tenure (Hitchcock, 1980 : 27).

The experience with group ranches in Kenya and other parts of east Africa has resulted in a pervasive sense of failure (Bennett, 1984 : 125). This failure has been ascribed to weakness in both the design and implementation of the schemes.

First, the planners failed to make provision for both wet and dry season grazing areas on most ranches, with obvious implications for the willingness of herders to take part in the ranch scheme (Fumagalli, 1978 : 58-59). Second, the definition of 'group' for the group ranches was supposed to reflect current social groupings, and was supposed to be fixed. This is logically inconceivable as the composition of social groups changes all the time. The end result was an artificial definition of groups which has led to strategies to circumvent these restraints. Fumagalli (1978 : 59) cites as examples of these strategies the practice of brothers gaining membership of different ranches, of individuals keeping surplus animals on off-ranch areas in the care of other family members, and of ranchers allowing non-members access to their grazing. Third, in Kenya a ranch does not officially exist until it has been registered, that is until all outstanding claims to land have been settled. As this is a lengthy process, participants in the ranch have to wait until they qualify for technical and financial assistance (Bennett, 1984 : 12). Fourth, the perceived need to reduce grazing pressure has led to the imposition of grazing quotas, which are also usually used as a condition for the granting of loans (Bennett, 1984 : 126). These quotas restrict the flexibility of the herder regarding the size and composition of the herd, with the result that few attempts at enforcement of quotas have been successful. Fifth, group ranches place a high demand on administrative capability and finances, both in design and in implementation. The absence of fencing on almost all group ranches in east Africa because of their high cost has for example
enabled herders to circumvent most of the administrative restrictions.

Crotty (1980: 135) argues that these group ranches are likely to evolve into individual and company ranches, which will have the same consequences as the TGLP of Botswana, namely the creation of a squatter class of 'surplus' herd owners. Again, the experience has proved different, as the ranches have simply reverted to communal land.

Livestock development policy in Kenya and Botswana was aimed at reducing environmental degradation and increasing production of livestock and livestock products from the traditional farming sector by means of privatizing land held under communal tenure. In both cases the disruption caused by attempts to introduce individual private tenure led to proposals for the introduction of private tenure on a group basis. Likewise, in both cases a side-effect of policy was that nomadic pastoral production strategies had to become sedentarized.

The process of granting private land rights on an individual basis failed because the rural elite group had more favourable access to land, and used that access to dispossess other holders of land rights. The process of granting private land rights on a group basis in turn failed largely because of conceptual and administrative disabilities. This could imply that private tenure on an individual or a group basis is an incorrect solution to the problem. A more basic reason for the failure of these policies is however that they failed to meet the requirements of the livestock owners. More specifically, a nomadic production strategy is a rational management response to lower the risk of exposure to drought.

To the extent that these two livestock development policies were meant as interventions in a nomadic pastoral regime, they have no relevance to sedentary pastoralists. To the extent that they failed because they were based on an incorrect view of the reasons why a specific production strategy was followed, however,
they provide an important starting point for the construction of livestock development strategies in different circumstances.

Crotty (1980) has predicted that the vesting of individual private land rights in the livestock sector would lead to increasing expropriation of land away from the majority of herd owners as the rural elite finds more benefit in commercial production. The fact that this redistribution of wealth has happened in the absence of increased commercialization of the livestock sector draws into question his assumption that the objective of livestock owners is to maximize profits from livestock farming. This can be related to the theoretical point that dominant strategies do not exist when externalities are nonseparable, and a tax on cattle is therefore impossible to implement. Although the size of the tax can be calculated its effect cannot be predicted in the absence of dominant strategies.

3.4.5 Some empirical evidence

In the tragedy of the commons view all have access to the communal grazing resource, and all have the incentive to keep adding an additional animal to this resource. Livestock numbers will keep on increasing, all grazing land will be overgrazed, and the grazing resource will keep on deteriorating. In this section data from the livestock subsector in southern Africa shows that these conclusions do not hold. Table 3.1 shows the proportion of rural households in Botswana, Transkei and Lebowa who owned cattle in different years.

The differences in these proportions can be ascribed to factors such as the target population for each sample, as well as the year of sampling. What is important however is that a substantial proportion of rural households have no cattle. This could imply that all households do not have access to communal grazing land or that they do not utilize what access they have. Either of these two conclusions will of course refute the tragedy of the commons view. A third possible reason is that all households cannot afford cattle. In this regard the ownership of
small stock, shown in Table 3.2 below, is instructive.

Table 3.1 Cattle ownership in Botswana, Transkei and Lebowa

<table>
<thead>
<tr>
<th></th>
<th>Own cattle</th>
<th>Do not own cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana¹</td>
<td>45.0</td>
<td>55.0</td>
</tr>
<tr>
<td>Botswana²</td>
<td>72.1</td>
<td>27.9</td>
</tr>
<tr>
<td>Transkei³</td>
<td>45.8</td>
<td>54.2</td>
</tr>
<tr>
<td>Lebowa⁴</td>
<td>24.3</td>
<td>75.7</td>
</tr>
<tr>
<td>Lebowa⁵</td>
<td>22.3</td>
<td>77.7</td>
</tr>
<tr>
<td>Lebowa⁶</td>
<td>48.8</td>
<td>51.2</td>
</tr>
</tbody>
</table>

Source: 1 Mtetwa, 1982: 114  
2 Lawry, 1983: 33  
3 Hendricks, 1984: 7  
4 Vink, 1981  
5 Survey data  
6 Fenyes, 1982

Table 3.2 shows that less than a third of the households in the respective samples own any type of livestock. Of these livestock owners, less than forty per cent own small stock only. The proportion of all households who own cattle only is concomitantly low.

A further analysis of the Lebowa livestock census data shows that not all rural inhabitants have or use access to land, whether arable or for grazing. Table 3.3 summarizes this access for 110 extension wards from various parts of Lebowa in 1984/85.
Table 3.2  Cattle, sheep and goat ownership in Lebowa

<table>
<thead>
<tr>
<th>Proportion of livestock owners who own:</th>
<th>Cattle only</th>
<th>Smallstock only</th>
<th>Cattle, sheep and goats</th>
<th>Livestock owners in sample (proportion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebowa 1</td>
<td>16.7</td>
<td>8.3</td>
<td>75.0</td>
<td>26.9</td>
</tr>
<tr>
<td>Lebowa 2</td>
<td>21.5</td>
<td>39.8</td>
<td>38.7</td>
<td>29.2</td>
</tr>
</tbody>
</table>

Source: 1 Visak, 1981  
2 Survey data

Table 3.3  Access to land in Lebowa

<table>
<thead>
<tr>
<th>Percentage of rural households with:</th>
<th>Grazing only</th>
<th>Arable rights only</th>
<th>Grazing and arable rights</th>
<th>Residential only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20.0</td>
<td>23.6</td>
<td>22.0</td>
<td>34.4</td>
</tr>
</tbody>
</table>

Source: Annual Report (1984/85)

It is important to note that the first and third columns refer to people who have grazing rights, and not only to those who use these rights. Less than a third of households use grazing rights, and less than half of all livestock owners keep only goats or sheep. It is valid to conclude therefore that not all people who have access to grazing land use this access.

Table 3.4 shows further evidence against the tragedy of the commons view. The paradox is that this theory postulates individual incentive to increase herd size, while empirical evidence shows that most cattle owners have small herds and there is little evidence that these herds increase over time.

There can be little doubt that communal grazing land in southern
Africa is overstocked and consequently deteriorating. This is by itself however not evidence in support of the tragedy of the commons, as all the communal grazing land is not overstocked. Hendricks (1984 : 9) for example shows that the Libode Magisterial District in Transkei carried 71 714 livestock units in 1983, while the carrying capacity was only 62 619 units. However, 14 of the 29 Administrative Areas which make up the district were understocked according to available carrying capacity. Livestock census data from Lebowa also show that overgrazing does not occur in all areas. Given the conservative stocking rates proposed by the Department of Agriculture and Environmental Conservation, 12 out of 115 Tribal Authority areas were understocked in 1981/82. This represented 8,2 per cent of the total grazing area.

Finally, an increase over time in the national herd has also been used in support of the tragedy of the commons view (cf eg Jarvis, 1980 : 607). Groenewald and Du Toit (1981 : 2) show the increase in the Bophuthatswana herd between 1968/69 and 1976/77. This type of conclusion should be regarded with caution. Survey data from Lebowa show for example that the cattle herd increased from 260 470 in 1968 to 487 675 in 1985. This does not however take into account the changing size of the available grazing land. In the case of Lebowa and other homelands this will also be the result of changing borders as a result of the process of homeland consolidation. Available grazing per head of cattle in Lebowa decreased from 5,4 ha to 3,7 ha between 1972 and 1977, and from 3,7 ha to 3,6 ha between 1977 and 1985. This differential trend can scarcely be in itself interpreted as the inevitability of a tragedy of the commons as the stocking rate has hardly changed over the last eight years.
## Table 3.4 Cattle herd size in southern Africa

<table>
<thead>
<tr>
<th>Area of survey</th>
<th>Year of survey</th>
<th>Herd size (cumulative frequency)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1-10</td>
</tr>
<tr>
<td>Botswana1</td>
<td>1974/75</td>
<td>37.3</td>
</tr>
<tr>
<td>Botswana 2</td>
<td>1980</td>
<td>23.9</td>
</tr>
<tr>
<td>Bophuthatswana3</td>
<td>1976/77</td>
<td>22.5</td>
</tr>
<tr>
<td>Libode, Transkei4</td>
<td>1983</td>
<td>78.2</td>
</tr>
<tr>
<td>Lebowa5</td>
<td>1984</td>
<td>88.1</td>
</tr>
<tr>
<td>Lebowa6</td>
<td>1979/80</td>
<td>62.6</td>
</tr>
<tr>
<td>Naupoort,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bophuthatswana7</td>
<td>1979</td>
<td>49.4</td>
</tr>
<tr>
<td>Transkei7</td>
<td>1979</td>
<td>51.3</td>
</tr>
<tr>
<td>Ciskei7</td>
<td>1979</td>
<td>47.5</td>
</tr>
<tr>
<td>Lebowa5</td>
<td>1984</td>
<td>48.5</td>
</tr>
<tr>
<td>Lebowa6</td>
<td>1979/80</td>
<td>41.7</td>
</tr>
<tr>
<td>Northern homelands8</td>
<td>1964</td>
<td>21.0</td>
</tr>
<tr>
<td>Nata8</td>
<td>1964</td>
<td>30.0</td>
</tr>
<tr>
<td>Western homelands8</td>
<td>1954</td>
<td>33.0</td>
</tr>
</tbody>
</table>

Source: 1 Mtetwa, 1982: 14  
2 Lawrence, 1983: 33  
3 Groenewald and Du Toit, 1980: 229  
4 Hendricks, 1984: 6  
5 Survey data  
6 Feneites, 1982  
7 Sombrido, 1979: 169  
8 Tomlinson Commission, 1955

In summary, five conclusions can be drawn from this empirical evidence which disprove the tragedy of the commons view. First, not all rural inhabitants have access to arable or grazing land. Second, not all those who have access to grazing land actually make use of this access. Third, among those who do use the land,
there is little proof of any tendency to increase herd size. Fourth, not all grazing areas are actually overstocked. Fifth, the increase in aggregate herd size must be treated with caution, as the size of the grazing resource is not fixed.

3.5 SUMMARY AND CONCLUSIONS

In this chapter, the "tragedy of the commons" hypothesis of livestock farming under a communal land tenure regime was studied, and it was shown that this hypothesis was based on the neo-classical view of common property as a public goods externality. Based on this view, livestock development policy would include measures aimed at internalizing these externalities. These include the vesting of private property rights as well as other measures to force or coerce the individual into taking social costs into account in his decision making. Voluntary action is excluded as a solution except under certain restrictive conditions.

When the tragedy of the commons is modelled as a Prisoner's Dilemma game, the fallacy of the argument becomes more evident. In this regard it is shown that the assumption of separable cost functions is a logical conclusion of the assumption of independent decision making. This model then logically restricts the outcome of a communal grazing regime to free riding. This outcome is questioned on a number of grounds in this chapter. First, separability of cost functions is implausible in a common property regime. The source of the separability assumption must be sought in the confusion between open access and common property. Nonseparable cost functions imply that policy measures aimed at internalizing externalities are not the only options available.

Second, experimental evidence shows in any case that individuals will not always free ride. This should not be interpreted as proof of pervasive altruism, rather that human objectives are more complex than only rational self-interest. Free riding is in these terms only one of a number of possible outcomes. Third, it
is shown that the traditional land tenure system in southern Africa has characteristics of common property and not of open access as far as access to grazing rights is concerned. Fourth, case studies of approaches to livestock development based on the privatization of land which have either been proposed or implemented have not led to predicted outcomes. Fifth, empirical evidence from various parts of southern Africa show that free riding does not always occur.

With regard to this latter point it should be emphasized again that it is sufficient to show that free riding is not inevitable in order to disprove the tragedy of the commons. This has been accomplished in this chapter. It is however still true that the livestock subsector is characterized by intractable problems. The empirical evidence given above leads to the conclusion that the problem lies more with small average herd sizes and differential access to grazing. An explanation of these two phenomena can be found in an analysis of the political economy of southern Africa. This forms the subject of the following chapter.
CHAPTER FOUR
THE STORE OF WEALTH

4.1 INTRODUCTION

According to the tragedy of the commons view the communal land tenure system is the major cause of the problems of the livestock subsector. An investigation of this view has shown that livestock development strategies should pay more attention to the role of common property institutions in society. It has also shown that more attention should be given to the actual conditions within which the livestock sector operates.

There exists another theoretical viewpoint regarding the cause of problems in the livestock subsector. This view, in its primitive form, ascribes the problems to the nature of the livestock owner and is termed the 'cattle complex'. The assumption of irrationality among indigenous populations has however long been in disrepute. This has led to the search for rational behaviour within the constraints posed by the particular physical, social and economic environment facing the individual. In this chapter the aim is to trace this change in approach as well as to identify those elements of the environment which influence the way in which people act.

For this reason, the cattle complex view is briefly discussed, followed by an analysis of the 'store of wealth' hypothesis which represents an attempt to recognize rational behaviour in traditional livestock regimes. The empirical verification of this hypothesis is subjected to a critique, and the conclusion is drawn that the hypothesis must either be rejected or that an alternative proof must be found. In this regard a farm household model, based on household economics and family life cycle theory, is described in section four. This model is then used to describe the interrelationships between the rural and urban economy in section five, and between the livestock subsector and other sectors in section six. The conclusion is then drawn that
the farm household model has yet to be used properly in describing the livestock subsector.

4.2 THE CATTLE COMPLEX

A curious episode in the field of anthropology known as the 'cattle complex' view was based on a theoretical approach termed the 'ethnographic present'. The approach consisted of a reconstruction of the pre-colonial past and then an attempt to present the result as contemporary (Bennett, 1984: 6). The perceived fact that cattle were kept as a status symbol, or for social and religious purposes only, led to the conclusion that the livestock owner must be 'modernized', if possible, before development efforts would have any effect (cf Hoyer et al., 1976: 258; Bennett, 1984: 6 for references to Herskovitz, 1926).

Fenyves (1982: 180) also cites modern references from South Africa which propagate the cattle complex view, while Chambers (1983: 77) is of the opinion that it was the experts, rather than the cattle owners, who suffered from a cattle complex. The supposed irrational, emotional and aesthetic attachment of traditional tribesmen was far less easy to prove than the irrational, emotional and aesthetic attachment of the experts to the idea of importing exotic breeds. The view of Herskovitz must therefore be rejected as the sole explanation of the problems of the livestock subsector.

This does not imply that the use of cattle for social and religious purposes does not serve as a motive to keep cattle or that it does not influence the decisions of livestock owners. The relevance of these roles of cattle are discussed in the further sections of this chapter. Two studies of the livestock subsector in southern Africa show however that these traditional roles of cattle should not be over-emphasized. In a survey conducted in the then Rhodesia in the mid-1970's Danckwerts (Undated) discusses such cultural factors and comes to the conclusion that '... none of these factors are of crucial importance ... in the Victoria Province' although '... conflicts
will occur when new output-maximizing techniques are adopted in a situation where traditional customs still exert a strong influence on behaviour. Danckwerts (undated: 10) also shows that two thirds of the direct use value of cattle, excluding traction, is derived from home consumption of milk and slaughter for own use. Eighty-six per cent of this was ascribed to milk consumption.

In a survey in the Amatola Basin in Cittek Steyn (1982: 134) shows that 77.1 per cent of sample households did not slaughter any cattle for tribal ceremonies. Both Steyn (1982: 135) and Danckwerts (undated: 128) show also that bridewealth is paid mostly in the form of cash, although it is still calculated in terms of cattle values.

4.3 LIVESTOCK AS A STORE OF WEALTH

The basis of the store of wealth hypothesis is the distinction between the commercial and economic value of an asset. In this regard wealth can be defined as the accumulation of assets which confer security, prestige and status, while income provides the means of obtaining wealth as well as supporting current consumption (Doran, et al., 1979: 42). In contrast to commercial farmers, traditional livestock owners hold cattle for both wealth and income functions.

Cattle confer status on the owner, and have the added advantage of producing a return on investment in the form of milk, manure, traction power, meat and hides. This is true in most parts of sub-Saharan Africa (cf eg Kenyatta, 1938: 64-65; Fieldler, 1973; and Bambridge, 1979). In addition, cattle can be sold to meet cash needs. This dual status of cattle leads to the expectation that cattle will be sold only to meet specific cash needs, and concomitantly that fewer cattle will be sold in the face of increased prices. Empirical verification of such a

27 These quotes are from paragraphs 14.33 and 14.34 respectively.
negative supply response therefore leads to a theoretical explanation of overgrazing which does not depend on the tragedy of the commons view.

4.3.1 A perverse supply response

In an attempt to prove the store of wealth hypothesis, Doran et al (1979) used data from Swaziland to show that cattle sales are inversely related to both price and rainfall. A statistically significant perverse supply response was measured and used to explain the expected reaction of cattle owners to variables such as price and rainfall, their cash needs and drought conditions. This leads to the conclusion that development policy aimed at introducing technical improvements to livestock farming will be self-defeating.

The use of a measured perverse supply response to prove the store of wealth hypothesis has however been criticized on various grounds. These include objections against the use of aggregate supply functions and lack of differentiation between short and long term functions.

Haaland (1977) shows that it is necessary to analyze the management context of livestock owners in order to evaluate the perverse supply response. Livestock farming differs from crop farming in that while saving and investment are necessary and the herd capital is perishable and must be replaced, investment is possible without the benefit of economic institutions such as markets because one of the main products of herds is lambs and calves etc. If no institutions exist to facilitate growth in the crop production sector, surpluses will be invested in the livestock subsector where this is ecologically possible and politically feasible (Haaland, 1977 : 180).

The implications for a communal grazing regime can be analyzed.

28 Also called a perverse or backward-bending supply response.
For the non-owner of livestock, the only possibility is to allocate time to labour in order to produce subsistence and cash crops. The profits from this activity cannot however be reinvested in the same sector due to the lack of the relevant institutions. The only alternative available is to invest in the livestock subsector (Haaland, 1977: 181). Most of the income from this sector is in the form of capital gains, so that growth in investment leads to decreasing involvement in market transactions.

This latter factor is also relevant to the livestock owner. When faced with a price increase it is rational to sell off unproductive animals. The price response as far as productive animals are concerned will differ according to whether the owner has a large or a small herd. The sale of productive females will in either case lead to a reduction in capital, but it must be remembered that pastoral capital is risky. When the herd size has reached the point where the marginal productivity of additional investment approaches zero, the stockowner will be willing to sell in the face of price increases. The owners of large herds will therefore have a normal supply response for productive females, while the owners of small herds, not wishing to deplete a meagre capital stock, will sell only sufficient animals to meet their consumption needs and may have a perverse supply response (Haaland, 1977: 181).

The lesson to be drawn from the above is that an aggregated supply response provides insufficient verification of the perversity of supply behaviour. This same conclusion holds in a situation where wage-earning alternatives exist, but is not necessarily true if alternative investment opportunities are available.

In addition, ethnographic variations in the degree of market participation throughout Africa show that the cattle complex could be introduced as a further explanatory variable (Haaland, 1977: 182). The commercial supply response of a stockowner is only part of his total supply response, which also includes
culturally-determined transactions. These transactions influence the opportunity cost of commercial transactions. High opportunity costs could therefore also lead to a perverse supply response but cannot be the only explanation.

Jarvis (1980) has on the other hand criticized the study of Doran, et al on four main points of which two are of interest for the purposes of this study. First, a negative price response in the short term is consistent with profit-maximizing behaviour. Second, decisions to sell are based on the profit-maximizing motive and not on cash needs.

Jarvis (1980: 608) regards a negative short-term price response as consistent with profit-maximizing behaviour. Livestock production consists of both slaughter and a change in herd size. A price increase will lead to a desire to increase future slaughter, and to effect this current slaughter will be reduced in order to fatten steers to heavier weights and retain females for the breeding herd. Slaughter will increase in the long run. Löw, et al (1980a: 614) accept that a negative short-run supply response is consistent with both the store of wealth and the profit-maximizing motives, so that it cannot in itself be used to support the store of wealth hypothesis.

Jarvis (1980: 607-610) however explicitly rejects the sale-for-specific-cash-needs hypothesis as an explanation of the negative supply response because if this were true, aggregate cash receipts from cattle sales would vary little from year to year, while the data actually show a significant variation.

The store of wealth hypothesis is based on the argument that livestock are held as a form of wealth rather than as a commercial asset, and that market participation will depend on the cash needs of the individual livestock owner. A case has been made for proof of the store of wealth hypothesis by means of empirical verification of a backward-sloping supply curve. The study of Haaland (1977) and the discussion surrounding the article of Doran, et al (1979), however, both question the
validity of using such a supply response curve for this purpose.

It is therefore reasonable to conclude that a measured perverse supply response is not sufficient proof of the store of wealth motive. This in turn leads to the conclusion that either the store of wealth hypothesis must be rejected, or that an alternative proof must be found. In this regard one of the problems associated with the store of wealth hypothesis lies in the definition of the term itself (Jarvis, 1980: 606). If the view is that livestock are held for their direct benefits such as prestige and products such as milk, only, the conclusion can be drawn that livestock owners are not motivated by market incentives. The store of wealth concept then comes close to the cattle complex definition. Jarvis (1980: 606) proposes an alternative view of the store of wealth.

In this view livestock are a store of wealth precisely because they are regarded as productive assets whose exchange value is established in the market and where the exchange value is determined by their use as a source of meat, milk and hides. Livestock can convert forage into useful products, can transport themselves, present the owner with the inherent possibility of an increase in capital, and are a form of capital which can be liquidated easily. For these reasons the owner derives security from the exchange value of animals, and they confer status and prestige.

Under these circumstances it can be shown that the owner will still keep livestock only as long as the discounted value of daily production exceeds the current market value. As the benefits of an animal as a store of wealth form part of the value of daily production it is clear that this will induce owners to keep animals for longer. Animals cannot be kept beyond a certain age, however, without incurring an economic loss (Jarvis, 1980: 607-610).

In this view therefore livestock are kept principally as a productive asset and the store of wealth benefits are a joint
product with beef and other products. This will in turn induce
the owner to accept a lower monetary rate of return on capital
than would be the case if store of wealth benefits were absent.
Cattle are therefore capital goods and livestock owners are
portfolio managers. Under a communal land tenure system the cost
of keeping an animal is a social cost and overgrazing results,
while the inclusion of non-monetary returns shows that cattle are
slaughtered at the profit-maximizing age.

Within the realm of portfolio theory, this is an outdated
assumption. Conventional portfolio theory regarded the
maximization of discounted expected return on the assets which
comprise a portfolio as the criterion for portfolio selection
(Markovitz, 1952: 77). Taken to the extreme, this means that
investors will concentrate only on that single asset which offers
the largest expected returns, while empirical observation shows
that diversification of assets is the norm. This diversification
is explained in modern portfolio theory by introducing the
variance of return as an explanatory variable in the form of the
expected returns - variance of return (E-V) rule (Markovitz,
1952: 79). This rule states that an investor will select a
portfolio such that, for a given expected return, it will have a
minimum variance of return. Conversely, that portfolio which,
for a given variance of return, gives the maximum expected
return, will be selected. Later modifications to the theory of
portfolio selection include more streamlined estimation
procedures (cf eg Sharpe, 1963); closer specification of the
sensitivity of an asset to market price fluctuations and the
sensitivity of a portfolio of assets to non-market risks
(cf eg Sharpe, 1972); and better methods of measurement of risk
(cf eg Blume, 1971). This modified E-V rule is still the basis
of the modern theory of portfolio selection (Opperman, 1985:
107-108).

Variance of return for an asset is a measure of the riskiness of
holding such an asset, and depends on both market and non-market
risk (Sharpe, 1972: 74). The source of market risk lies in the
difficulty (impossibility) of predicting the future level of
prices in the overall market (Sharpe, 1972: 74). The source of non-market risk on the other hand is the asset or portfolio of assets itself and the environment within which it is held - on the stock exchange this would be the fortunes of the issuer of the stock (Sharpe, 1972: 74). Non-market risk is dependent on the degree of diversification of a portfolio of assets.

At the least, therefore, the nature and degree of non-market risk must be taken into account when applying a theory of portfolio selection to African agriculture. Failure to do so would lead to incorrect predictions of portfolio composition and incorrect use of the profit-maximizing motive. The model used by Jarvis to oppose the store of wealth hypothesis takes no account of either market or non-market risk. The conclusion can therefore be drawn that there is insufficient evidence to reject the store of wealth hypothesis.

An alternative proof of the store of wealth hypothesis is presented by Low, et al. (1980b) who test empirically the relationship between cash needs and marketed supply of Swazi cattle owners. They find that if either the need to purchase food or population growth exceed the increase in the value of the herd then sales will increase, while if alternative cash incomes increase faster than the value of the herd then cattle sales will decline. Cash income from cattle sales can therefore be expected to increase over time as population grows, while it will fluctuate from year to year according to the success of the previous year’s harvest and the availability of alternative sources of income. These results support the sale-for-specific-cash-needs hypothesis, which can in turn be construed as support for the store of wealth view (Low, et al., 1980b: 231).

The concept of livestock as a store of wealth can however be better understood within the social, economic and political context of the livestock subsector. Low (1982b) argues that the theory of household economics can be used to gain a better understanding of this context.
4.4 A HOUSEHOLD ECONOMICS APPROACH

A review of current literature on development shows that there has been little explicit use of the household economics construct as described earlier (cf eg World Bank, 1981; Christensen and Mtutu, 1982; Eicher, 1982; Eicher and Baker, 1982; Delgado and Mellow, 1984; Macion and Spencer, 1984; Eicher, 1985; and Ruttan, 1986). The same conclusion can be drawn from South African sources such as the Carnegie Conference (cf eg Lenta and Maasdorp, 1984 as one example).

There would on the other hand seem to be no a priori reason why the household economics approach could not be used to analyze decision making behaviour in traditional households in developing countries. By contrast, there are a number of reasons why it should have a greater potential for explaining decision making in developing countries as compared to developed countries (Low, 1982b: 26-30).

First, households in developing countries play a larger economic role than is the case in a developed country, and the size and composition of the household can therefore be expected to influence the household production process. Family life cycle, the number of children and the value of children are interrelated aspects which could receive attention in this regard.

Second, the production of z-goods is a non-market production process where household resources and time are combined to produce desired attributes. A proportion of household production in low income countries is for own consumption, and does not enter the market. Household theory should prove to be a useful tool in analyzing the decision process as far as subsistence production is concerned.

Third, much of the interpretation of consumer decisions in economics is dependent on the tastes of the individual, regardless of family composition, stage in the life cycle, socio-economic environment or stage of development of a country. The
conventional theory cannot explain the origin of tastes, while household economics attributes differences in consumer decisions to the resource endowment, earning opportunities, etc. which influence the household production process. As has been shown, these latter factors play an important role in developing countries via their influence on the household as an economic agent. Further, behaviour in developing societies is often explained with reference to different 'values' (e.g., the cattle complex), and this type of explanation is particularly sterile. Differences in socio-economic environment which influence relative costs and production opportunities have been far more powerful in explaining peasant behaviour. To the extent that the household economics approach can better account for these factors it can increase understanding of the decision processes in poor societies.

Low (1982b: 47) also argues that the influence of the South African metropolitan economy on traditional agriculture in southern Africa and the reaction of traditional societies to this influence can be explained better with the use of the household economics approach. On this basis he has proposed a model of the indigenous farm household in southern Africa. The model makes use of household economics theory and the subjective equilibrium theory of the farm household (Low, 1982b: 78).29

4.4.1 Subsistence production and z-goods

In Chapter Two it was shown that a major criticism against the household economics approach is that it fails to account for the interrelatedness between the internal structure of the household and its surrounding environment. In this regard Low (1982b: 78–83) introduces the subjective equilibrium theory of the farm household to account for this factor. More specifically, he argues against the use of the modern version of this theory, and for the original theory as developed by Chayanov (1966).

29 In this study references are made to Low (1982b). This dissertation has also recently been published (Low, 1986).
The concept of the consumer/producer ratio was introduced in this latter theory to account for the effect of a changing household structure on production and income. During the life cycle of a household, this ratio increases over time as children are added to the family, and then eventually decreases. If the concept of the value of time is included, this theory helps to explain both consumption and production characteristics of the household (Low, 1982b: 81).

According to household theory, the household minimizes the cost of production of z-goods, given the full income constraint. The time of different members in a multi-person household is also allocated so as to produce the z-goods as cheaply as possible. Given the assumption that inputs vary proportionately with the amount of z-goods produced (Low, 1982a: 137) the marginal cost of producing a unit of the z-goods is:

\[ C_z = P_x X_i + W_i T_i \quad i = 1,2 \]  

where \( C_z \) is the cost of producing a unit of \( z \); \( P_x \) is the price of input \( x \); \( X_i \) is the amount of input \( x \) required by person \( i \) to produce \( z \) with \( T_i \) the amount of time required; and \( W_i \) is the wage rate of member \( i \). A two-person household is assumed. Given that the marginal cost of each member in producing the z-good will depend on his marginal productivity (\( 1/X_i \) and \( 1/T_i \)) and his wage rate, labour in the household will be allocated according to the principle of comparative advantage. The lowest potential wage earner will be allocated to the production of the z-good unless the high wage earner has an absolute advantage in both wage labour and the production of the z-good.

The production of a subsistence crop combines market inputs and time on the farm to produce subsistence goods, and is therefore equivalent to the production of a z-good. The principle of comparative advantage is likewise applicable in decisions regarding the allocation of labour to wage earnings and to subsistence production. However, the household also faces the possibility of purchasing the z-good in the market. Thus when:
\( P_x < (P_x X_i + W_i T_i) \) \hspace{1cm} (2)

The decision will be to purchase the \( z \)-good at a cost of \( P_x \) rather than to produce it. Low (1982a: 138) rearranges (2) to get:

\( \frac{P_x X_i}{T_i} < W_i \) \hspace{1cm} (3)

where (2) and (3) are generalized for \( n \) household members.

The left hand side of (3) measures the opportunity cost of purchasing the subsistence good for member 1, as it reflects the difference between purchase cost and the market input cost of growing per unit of time spent in production. This will result in a continuum of labour allocation decisions where the person with the highest comparative disadvantage in wage employment will produce subsistence crops. If the household's subsistence requirement has not yet been met the person with the next highest comparative disadvantage in wage labour will assist in the production of the subsistence crop and so forth, until either sufficient crops are produced or the next person's wage rate is greater than the opportunity cost of purchase. After this point the balance of subsistence needs will be purchased. This comparative advantage principle can also be illustrated geometrically (Low, 1982b: 101; 1984: 296).

Other \( z \)-goods are also produced by the household, including the attributes obtained from access to land under traditional land tenure arrangements. In the traditional system individuals maintain land rights as long as they cultivate the land to some extent. Low (1982b: 104-105) shows that both the market and the time costs of maintaining a presence on the land are small. Given the comparative advantage of some members of the household in wage employment, this explains the paradox of low agricultural production and underutilization of land. The continued cultivation of land also provides the household with \( z \)-goods in the form of social security in case of unemployment or old age.

The analysis can also be expanded further to include the
possibility of growing a crop for sale (Low, 1982a: 139) and to account for the riskiness involved in making decisions regarding the allocation of labour time (Low, 1982b: 109-111).

4.2.2 Household economics and the life cycle

Low (1982b: 162) argues that the farm-household model is better at taking into account the influence of changes in the size and composition of households than are conventional models. Conventional analysis, predicated on the hypothesis of declining marginal productivity of land, predicts that a large deficit in subsistence production for a particular household will induce workers to seek wage employment. A positive correlation can be expected between food deficit and wage earnings. This is however not substantiable empirically, and conventional theory cannot explain the paradox. If the family life cycle, or domestic development cycle, is taken into account, however, household theory can explain this observed relationship between subsistence deficit and wage earnings. This can be explained with reference to Figure 5, which is a geometric exposition of the farm-household model. The discussion follows Low (1982a: 140-143).

The horizontal axes measure standard labour units used in crop production (OA) and in wage employment (WH), where labour units are standardized to be equally as efficient as other inputs in crop production. Money income is measured on the vertical axes, and unit costs per standard labour unit, commercial returns and opportunity purchase costs for a crop grown for own consumption or for sale are measured by OC, OM and OP respectively. Constant efficiency in the use of time and market inputs per standard labour unit is reflected in the linear relationships. It can be shown empirically (Low, 1982b: 91 and 134-148) that larger households have access to more land in traditional agriculture, so that constant returns to scale in crop production can be assumed. Labour units show increasing comparative advantage in wage employment from left to right, and this is also reflected in the curved curve line.
Figure 5: The farm household model
Source: Low, 1982b: 112.

The assumption of constant returns in crop production means that the subsistence requirement can be measured in terms of the standard labour units. Say this requirement can be met by OXr labour units, then point a on WW1 measures the wage rate for OXr units. The slope for the opportunity cost of purchase, as measured by OP, is however lower than that of the wage line at point a, so that the labour unit will be allocated to wage employment (cf equation 3). Labour units to the left of Xg will be allocated to subsistence production, and in this case the household will be a deficit food producer, and will purchase (OXr - OXg/OXr) of its requirement. A similar analysis can be carried out for a household with a smaller subsistence requirement, say of OYr1 standard labour units, because of a lower ratio of consumers to workers.

This household will allocate labour to crop production up to the point where the slope of OM equals that of the wage line, as beyond that point the returns to wage labour are greater than those for production of crops for sale. The excess over
subsistence production ($OY_{1} - OY_{r} \div OY_{r}$) will be sold.

This analysis confirms that a surplus food producer could have a greater wage income than a deficit food producer, given that the latter has a higher ratio of consumers to workers in the household. The introduction of the domestic development cycle, through its effect on the ratio of consumers to workers and on the propensity to work, further confirms this result (Low, 1982b: 173-179).

4.4.3 Some implications

The introduction of labour-intensive technology in a developing agriculture has long been propagated (cf eg Spies, 1979: 194-199; Chamber, 1983: 6; Booth and Sundrum, 1985). From the analysis of the farm-household model presented above it is however intuitively plausible to conclude that time-using technology will not be adopted by peasant farmers, even if this technology promises higher yields. Low (1982b: 187-189; 1984: 302-306) uses data from Swaziland to show the rate of adoption of hybrid maize.

The decision to adopt hybrid maize therefore involves more than a comparison between the net return between new and existing technology. It includes also the consumption requirements of the household and alternative wage opportunities (Low, 1982b: 191). Low (1982b: 192-202) has constructed a farm-household model which takes these factors into account. The conclusion drawn is that for some households food requirements can be produced more cheaply with hybrid seed and a reduction in the amount purchased. For other households labour released for wage employment may be able to earn more than the added cost of producing hybrid maize. The new technology will therefore also be adopted. Further, higher wage rates increase the value of time, and time-saving technology will be adopted even more readily. This will not necessarily result in greater marketed surpluses or in farmers switching to commercial production (Low, 1982b: 210). The same conclusion can be drawn regarding other technological
Neoclassical economic theory cannot explain observed rates of adoption of new technology such as hybrid maize. In the same manner, attempts to explain a number of other features of a traditional agricultural economy lead to theories which are inconsistent with observable facts, and an incentive to find new theoretical approaches. The study of migrant remittances for example takes increasing cognizance of the interrelationships between the migrant worker and the rural household (e.g. Knowles and Anker, 1981; Russell, 1984; Lucas and Stark, 1985). The same trend is apparent with regard to studies of the relationship between migration and fertility (e.g. Lee and Farber, 1985; Nerlove et al., 1985; Katz and Stark, 1986).

The farm-household model has been described in some detail above, along with a number of implications which this approach holds for future research on agricultural development. The model can also be used to analyze the political economy of traditional agriculture. In the following two sections the interrelationships between the rural economy, the metropolitan economy and the livestock subsector are discussed with reference to data from various sources in southern Africa.

4.5 HOUSEHOLD ECONOMICS AND LABOUR MIGRATION

Etcher and Baker (1982: 224-226) identify three broad theoretical approaches to the question of migration of labour from rural areas in sub-Saharan Africa. The first of these is the structural-functional approach popular among anthropologists. The basis of this approach is the analysis of the individual decision to migrate (cf. e.g. Segal, 1985). A major weakness of this view is that it ignores the fact that the decision to migrate is usually a household, and not an individual decision (Coles, et al., 1985; Bhattacharyya, 1985).

The second approach is that of the political economists, who view the expansion of capitalism as the main cause of migration by
impoverishing rural areas and encouraging migration. This theme has been especially popular in explaining migration to the mines in South Africa (cf, eg Wilson, 1982; Knight and Lenta, 1980; and Giliomew, 1983). To the extent that the proof of this theory of labour reserves lies in the measurement of a perfectly elastic supply curve of labour (Elkan, 1980: 584), it is untenable. Lucas (1985) has shown that the supply of labour to the South African mines has been upward sloping and inelastic in the period 1946-1980. The land shortage which is supposedly concomitant to this type of exploitation is also not empirically substantiable, as the amount of land under cultivation in the subsistence agricultural economies of Southern Africa has declined over the years (Low, 1982b: 254-257). Fenyes (1986: 3) shows that neither orthodox neoclassical or radical Marxist economists have been able to explain Fischer's paradox.\(^\text{30}\)

The third approach is that of neoclassical economics, and the modern literature is based mostly on the work of Todaro (1969); for example Bell (1972); Elkan (1980); Van der Berg (1981); Muller (1983); and Ault and Rutman (1985). In this approach, the decision to migrate is based on a calculation of diminishing marginal returns to labour in agriculture and a constant wage rate in urban employment. The model has also been refined to take account of non-market factors such as a preference for family living (Knight, 1978); comprehensive push and pull factors, originating in both the urban and rural areas (Muller, 1983: 51); and the risk involved in both farming and wage employment (Stark and Levhari, 1982).

The neoclassical approach also fails to address the problem of underutilization of land, and does not differentiate between members of a household (Low, 1982b: 259). It is widely accepted by now that an analysis of labour force participation must take

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\(^{30}\) This states that (Fischer, 1982: 163): 'Africa's inability to feed itself among vast amounts of "unused" land and record levels of foreign aid is, on the surface, one of the major paradoxes of Third World Development'.

into account the comparative advantage of members of the household in the market sector and in household production (cf also Gronau, 1973; Huffman, 1976a; 1976b).

This view is supported by evidence which shows the selectivity of migration among different age groups, sex and levels of education within southern Africa. Migration rates in the rural population generally increase among higher-educated males in the younger economically active age sets (Low, 1982b: 260-265). Each of these phenomena can be explained by the comparative advantage principle, as male migrants with a higher level of education have obvious advantages given the type of work available. Data from all southern African countries show male absenteeism rates which increase from the age of entering the work force until early middle age (around 40 years) (Low, 1982b: 262-265).

Low (1982b: 260-265) provides evidence in support of the comparative-advantage approach to explaining the occurrence of migration. This evidence is supported by data from Lebowa with regard to the question of land shortage, the frequency of migration by age group, gender and level of education, and the asset accumulation of households over time.

Arable and irrigated land in Lebowa is not fully utilized. Data from the respective Annual Reports of the Department of Agriculture and Environmental Conservation show that at most, 62 per cent of this land was ploughed or planted to a crop in 1980/81. During the drought period of 1981/82 and 1984/85 the level of utilization dropped to below 30 per cent. The proportion has been between 26 per cent and 63 per cent since the 1969/70 season.

Household members from the Grootfontein and Success irrigation schemes in Lebowa who have off-farm employment had, on average, 6.7 years of schooling. Further, their average age was 32 years, and 88 per cent of them are men (Vink, 1981). This compares to an average level of school of 1.8 years for all household heads on the schemes. Survey data in Lebowa are summarized in Table
4.1 and 4.2 below.

<table>
<thead>
<tr>
<th>Age of household head</th>
<th>Average distance (km)</th>
<th>Sex of household head</th>
<th>Average distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30</td>
<td>63.18</td>
<td>Male</td>
<td>111.71</td>
</tr>
<tr>
<td>31-40</td>
<td>105.97</td>
<td>Female</td>
<td>24.21</td>
</tr>
<tr>
<td>41-50</td>
<td>125.16</td>
<td>Both</td>
<td>92.78</td>
</tr>
<tr>
<td>51-60</td>
<td>109.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-70</td>
<td>14.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70</td>
<td>2.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ages</td>
<td>92.78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1) All averages significant at least at the 84 per cent level.

Table 4.1 shows that the distance travelled declines after the age of 50, while male household heads in general travel further to work. Table 4.2 confirms most of the predictions of the farm household model. Household heads who are in wage employment are younger and better educated, and they have a higher level of income. Given household theory, the prediction can also be made that the comparative advantage enjoyed by these male workers declines around middle age. There are three possible reasons for this, starting with the decline in physical strength required for unskilled labour. As the household itself matures younger, probably better educated sons and daughters enter the labour force with an increasing comparative advantage. Also, the asset base, or resources available to the household increases as the household itself matures, and the presence of the household head to manage these resources becomes more important (Low, 1982b : 264), giving him a comparative advantage in household production.

This latter observation is however not borne out by the survey data, as the assets of household heads with wage income exceed
<table>
<thead>
<tr>
<th>Wage income²</th>
<th>Number</th>
<th>Age</th>
<th>Distance to work (km)</th>
<th>Level of school (years)</th>
<th>Income (R per month)</th>
<th>Total assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migrants</td>
<td>296</td>
<td>42.33</td>
<td>32.62</td>
<td>8.72</td>
<td>559.95</td>
<td>18 481.09</td>
</tr>
<tr>
<td>No wage</td>
<td>172</td>
<td>45.94</td>
<td>287.67</td>
<td>6.56</td>
<td>330.66</td>
<td>7 710.67</td>
</tr>
<tr>
<td>All</td>
<td>668</td>
<td>48.11</td>
<td>92.78</td>
<td>6.34</td>
<td>401.75</td>
<td>11 547.01</td>
</tr>
</tbody>
</table>

Notes: 1. All averages significant at the 99 per cent level.
2. Within Lebowa.
3. Includes house, car, insurance and savings.
that of members who remain in Lebowa (Table 4.2). It is however not only the size but also the composition of a portfolio of assets which determine the level of management required. Survey data do not permit such a balancing of age, assets by type and level of education. Further data on the growth of the asset base over time would be required for such a proof.

An analysis of the causes of migration based on the comparative advantage principle leads to a better understanding of the real world situation at both the micro and macro levels. The traditional assumptions of land shortage and declining marginal products in agriculture, which cannot be substantiated empirically, are no longer necessary. Further, because young, better educated males generally join the market for wage employment, the elderly, the women and children, and the less-educated remain behind. The allocation of available household time by these groups will be influenced by the need to perform other tasks such as schooling, child rearing and household chores. The time spent on farm production will thus be reduced especially if yield-increasing technology is also available (Low, 1982b: 267-268).

At the macro level there is therefore a direct link between the level of migration and farm productivity which does not depend on the assumption of zero marginal product in agriculture. The expectation is that rising wages in the off-farm sector will lead to reduced plantings and increased yields, but not to significantly higher total production (Low, 1982b: 277). This latter observation is derived from the fact that no labour will be applied to marginal land.

4.6 IMPLICATIONS FOR THE LIVESTOCK SUBSECTOR

The interrelationships between farming, off-farm employment, migration and the traditional land tenure system have an impact on the livestock subsector. This impact can be analyzed with regard to the household economics approach. More specifically, the model of the farm household developed by Low (1982b) leads to
a better understanding of these interrelationships and their
effect on the livestock subsector.

The first conclusion which can be drawn from this model is that
the composition of a household is dependent on the age of the
head of the household. This is shown in Table 4.3 below.

<table>
<thead>
<tr>
<th>Age of household head</th>
<th>Dependants not in school</th>
<th>Dependants in school</th>
<th>Household size</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30</td>
<td>1.05</td>
<td>1.78</td>
<td>3.83</td>
</tr>
<tr>
<td>31-40</td>
<td>1.25</td>
<td>3.05</td>
<td>5.30</td>
</tr>
<tr>
<td>41-50</td>
<td>1.66</td>
<td>3.56</td>
<td>6.22</td>
</tr>
<tr>
<td>51-60</td>
<td>2.11</td>
<td>3.08</td>
<td>6.20</td>
</tr>
<tr>
<td>61-70</td>
<td>2.76</td>
<td>2.61</td>
<td>5.37</td>
</tr>
<tr>
<td>&gt;70</td>
<td>1.72</td>
<td>3.63</td>
<td>6.35</td>
</tr>
<tr>
<td>All ages</td>
<td>1.70</td>
<td>3.08</td>
<td>5.78</td>
</tr>
</tbody>
</table>

Notes: 1 Average number of persons per household.
2 All averages significant at the 99 per cent level.
3 Includes those too young for school.
4 Row total + 1 for household head.

The second conclusion which can be drawn is that factors such as
the level of expenditure, income and education differ as the
household moves through the family life cycle. This is shown in
Table 4.4 below.

The data presented in Table 4.4 establishes the fact that the
composition and attributes of households change as they move
through the family life cycle. The stage at which a household
finds itself in the family life cycle therefore determines the
availability of labour, and the sources of income which can be
exploited by members of that household. In terms of the farm
household model, this labour will be allocated to one of three
things, namely wage labour, household work or farming.
### Table 4.4 Attributes of households by age of household head

<table>
<thead>
<tr>
<th>Age of head (Years)</th>
<th>Education of head (Years)</th>
<th>Average level of Expenditure (R per month)</th>
<th>Average level of Income (R per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30</td>
<td>10.00</td>
<td>424.75</td>
<td>586.50</td>
</tr>
<tr>
<td>31-40</td>
<td>8.33</td>
<td>363.68</td>
<td>465.19</td>
</tr>
<tr>
<td>41-50</td>
<td>6.71</td>
<td>342.21</td>
<td>427.34</td>
</tr>
<tr>
<td>51-60</td>
<td>4.84</td>
<td>292.70</td>
<td>348.91</td>
</tr>
<tr>
<td>61-70</td>
<td>2.63</td>
<td>273.26</td>
<td>312.35</td>
</tr>
<tr>
<td>&gt;70</td>
<td>1.90</td>
<td>202.82</td>
<td>216.07</td>
</tr>
<tr>
<td>All ages</td>
<td>6.34</td>
<td>329.76</td>
<td>401.75</td>
</tr>
</tbody>
</table>

**Notes:**
1. All averages significant at the 99 per cent level.
2. Does not include expenditure on eg farm inputs, or savings.

Households allocate labour to these alternative opportunities on the basis of the comparative advantage which different members have, given the opportunity cost of each activity. The objective of the household is to optimize the production of desired attributes from z-goods, and time is the most scarce resource. A number of factors which influence the opportunity cost of different types of activity will therefore influence the allocation of labour.

In South Africa, it is obvious that legal measures which controlled the movement of people were a determinant of this opportunity cost. Important aspects include measures which restricted the allocation of labour by market forces and those which increased the riskiness of living in urban areas. The migration of labour in cycles from rural to urban areas is however a feature of most sub-Saharan countries. Other factors therefore also influence the opportunity cost of labour, with as end result the fact that rural inhabitants do not just migrate to the urban areas permanently. One of the important factors is the traditional land tenure system.
The role of the traditional land tenure system is not restricted to that of being a factor of production in farming, and land provides many non-market benefits in the form of a subsistence retreat. This 'pension fund' value of land is common throughout sub-Saharan Africa and is derived from the difference in the relative costs of producing household goods in the rural areas as compared to the urban areas.

As long as the household can maintain access to crop and grazing land by maintaining a presence on that land, it can take advantage of the lower cost of household production in the rural areas. Under traditional tenure most of the inputs required for the production of z-goods have no monetary cost and require only the time input of labour with a relatively low value (Low, 1982b: 232). The traditional land tenure system therefore reinforces the system of migrant labour and low land productivity to the extent that land does not come into the hands of those who would use it productively.

It has been argued that the traditional land tenure system precludes the possibility of investment in land, given the insecurity of tenure and the small size of land holdings. The traditional tenure system does however grant at least de facto security to those who have access to land (Vink, 1986: 26). From a household economics perspective the reason for this lack of investment should rather be sought in its opportunity cost. Whatever the reason, however, the argument applies only to arable land, as there exists a further investment vehicle which has several advantages over arable land, namely livestock.

It has long been noted that migrant workers invest wage earnings in cattle (Low, 1982b: 234, 272) and the conventional view is that this is done in order to build up a herd of a size sufficient to enable the worker eventually to resume full time farming (cf eg Lawry, 1983: 5-6). In the interim a combination of the other attributes of cattle and the land tenure system makes them an attractive form of investment. Cattle are only
sold when subsistence needs are met.

If this view were correct the rate of cattle sales should be lower in small herds as compared to larger herds, while it can be shown empirically that this is not so (Low, 1982b: 235). If cattle are kept for meeting subsistence needs, the subsistence goods per animal will be greater in a small herd and the surplus available for slaughter increases with herd size. Household theory can explain why this relaxation of own consumption pressure does not result in higher sales from larger herds by rejecting the conventional hypothesis. The analysis is based on the familiar assumption that stock sales are a reflection of the willingness or need of a household to exchange cattle for market goods. If this demand for market goods is fixed in the short term the rate of sales will be greater in a small herd than in a large herd. Low (1982b: 237) distinguishes this fixed short term demand for market goods from the target income concept discussed earlier. The former is a function of relative utility and purchase cost in comparison with the cost of producing non-market goods as inputs in the production of z-goods for the household. The determinants of this derived demand for market goods are therefore the price of market goods and their attributes as well as the relative opportunity cost of time in the production of market versus non-market goods. These in turn determine the rate of offtake in the livestock herd. Further empirical verification of the hypothesis is given in Low (1982b: 239-241) and is based on cross section marketing data from Swaziland. This proof rests on the observation of higher selling rates of cattle in regions with low crop potential as well as lower wage incomes, and intraregional selling rates which vary indirectly with the number of wage earners in a household.

The higher selling rates are a direct result of the greater need to use cattle for their subsistence attributes, or in exchange in order to purchase these attributes. Alternative sources of obtaining these attributes, e.g. wage earnings or crop production, reduce the need to sell cattle, and cattle become more important as providers of luxury consumption goods (i.e. as a store of
wealth) (Low, 1982b: 241). These cattle sales should in either case not be confused with commercialization of the cattle subsector. Higher offtake rates in Botswana as compared to Swaziland can for example be attributed to the lower crop production potential in the former country (Low, 1982b: 241).

The household economics approach also provides an alternative interpretation of the causes of overgrazing in the traditional areas. Low (1982b: 242) agrees with the proponents of the tragedy of the commons view to the extent that access to communal grazing lowers the cost of cattle keeping. However, proponents of this view maintain that policy measures which will increase the cost of access to communal grazing will reduce the grazing pressure, as fewer animals will be kept in order to maximize profits. These policy measures are the familiar avenues for internalizing externalities and include outright privatization of tenure and the introduction of grazing fees. As was shown in the previous chapter these policies when applied have a number of undesirable consequences. None of them have also succeeded in making any impression on stocking levels. Other explanations for the high stocking levels should therefore be sought, and the household construct provides interesting insights.

Despite rhetoric to the effect that peasants do not innovate, it is a well-established fact that they do adopt technology which provides attributes which they desire (cf. Low, 1982b: 242 for references in this regard). The obvious implication is that cattle carry attributes which are desired, and that substitute carriers of these attributes are not available or are more expensive. In the household construct, the argument is that the communal land tenure system also enables livestock to provide these attributes at a lower cost than alternative methods by lowering the cost of maintaining them.

In this context it is important to realize that the cattle themselves are kept for both production and consumption purposes. In production, cattle provide milk, meat and hides etc, and these are used by the household as inputs in the production of z-goods
which confer desirable attributes to the household. The communal grazing system, by lowering the cost of keeping cattle, lowers the cost of these inputs with predictable results in the household production process. Increasing the cost of keeping cattle by, for example, privatizing land will certainly change the decision matrix of the household and could induce owners to sell animals at an earlier age, thereby relieving grazing pressure. Cattle are however also kept for consumption purposes and more specifically, as was seen earlier, for luxury consumption. In this sense the animals themselves are z-goods which carry desirable attributes. Experience with schemes to internalize the cost of grazing suggests that they have failed chiefly because they have not reduced this derived demand for cattle as the carriers of desired consumption attributes. Overgrazing will continue until such time as other goods are available which are superior conveyors of these luxury goods. Low (1982b: 244) argues that a change to private tenure would prove to be an effective substitute for cattle in this regard as long as private tenure is not introduced only to increase the cost of keeping cattle. Tenure reform must be designed in such a manner that land becomes an alternative to livestock as carrier of the luxury goods.

In this regard the household approach is also successful in predicting the consequences of the introduction of production increasing technology in the livestock subsector. The influence of such technology on the household production function for z-goods is obvious as it enables the household to produce the same amount of the relevant z-goods at a lower cost, or to produce more z-goods at the former cost level. Again it is important to note that technology will not be adopted if it is time-intensive. The adoption of such technology would however lead to a reduction in stock numbers only if there were no demand for animals as carriers of luxury consumptions goods.

In the household economics view a policy to combat overgrazing successfully would therefore also have to increase the relative cost of obtaining the desired luxury consumption attributes, or
non-market benefits, which cattle confer. This can be achieved either by increasing the cost of obtaining these benefits from cattle or by reducing the cost of obtaining them by other means. Land reform which is designed in such a way that the land itself will be the carrier of these non-market benefits will increase the cost of obtaining them from cattle. Alternatively, a cheaper substitute to cattle as a store of wealth must be found.

4.7 SUMMARY AND CONCLUSIONS

Most approaches to analyzing the problems of the livestock subsector in sub-Saharan Africa have been based on the tragedy of the commons view. An alternative view has been based on the assumption that livestock are kept as a store of wealth. Earlier attempts at proving this role of animals in traditional society included the cattle complex view, which saw the function of cattle as being repositories of non-economic benefits. Further, an attempt to prove that cattle were kept as economic assets was based on empirical verification of a perverse supply response. Neither of these interpretations were found to be tenable, and the household economics approach was proposed as an alternative means of analysis.

The household economics approach, when coupled with the theory of the family life cycle, also termed the domestic development cycle, forms the basis of a model of the farm household. This model is shown to provide a powerful means of analyzing the interrelationships between urban and rural economies in southern Africa. There are however three characteristics of this view as they concern the livestock subsector which are of importance for this study.

First, the conclusion drawn from the farm household model is that, on balance, a change in the communal grazing system is needed to solve the problems of the livestock subsector. In these terms, the policy proposals are disappointing, as they do not differ from those put forward by proponents of the tragedy of the commons view. Second, little cognizance is given to the fact
that people hold livestock for different reasons. Policy for alleviating the problems of the livestock subsector should take into account the range of motives for keeping animals. Third, there is no recognition of the fact that the complex of motives for keeping animals as well as the interrelationship between the livestock subsector and other sectors rest on the rules which determine access to communal grazing land. As such the possibility of induced institutional change is not recognized.

In this regard it is necessary to analyze the motives of different groups of people for keeping animals. This forms the subject of the following chapter.
CHAPTER FIVE
THE LIVESTOCK SUBSECTOR IN LEBOWA

5.1 INTRODUCTION

The purpose in this chapter is to analyze the livestock subsector in Lebowa with the view to gaining a better understanding of its interrelatedness with other sectors of the southern African economy. In the previous chapter it was shown that the farm household model developed by Low (1982b) provided a powerful means of explaining these interrelationships, with one exception. The model as it has been developed does not analyze the livestock subsector in a sufficient degree of detail, and workable policy prescriptions are therefore not formulated.

For this reason it is necessary to expand upon the farm household model as it applies to the livestock subsector. In this regard the second major conclusion drawn at the end of the previous chapter is important, namely that the motive for keeping livestock should be addressed. The view taken in this study is that the farm household model only partially addresses this motive. What it does not address is the question of who keeps livestock. Survey data from Lebowa are used to analyze this issue. For this reason, the next section contains a brief discussion of the Lebowa economy. In keeping with the belief that the southern African economy cannot be analyzed in discrete parts, the focus in this discussion is on the interrelationships between Lebowa households and the broader economy.

In section three the characteristics of Lebowa households are analyzed. These characteristics include household income and its constituent parts, expenditure, and the ownership of assets and the types of assets. This analysis is then used in section four to identify the owners of livestock. The chapter ends with a summary and conclusions.
5.2 THE LEBOWA ECONOMY

The interrelationships between households in Lebowa and the broader southern African economy can be described with reference to a number of characteristics. These are discussed in turn below. First, the structure of households has been described in Table 4.4, where it was shown that average household size is 5.78 persons per household. Of these 3.08 were either too young for school or of school-going age, representing 53 per cent of the average household.

Second, although census data show that only 6.6 per cent of the population were urbanized in 1980, the definition of urbanization should be reexamined. In this regard Koornhof (1982:104) shows that the census defines urban population as only those people living in proclaimed towns, leading to an underestimation of the urban population. Koornhof includes closer settlements, squatter settlements and un proclaimed rural towns of more than 5 000 people in his definition, and comes to an urban proportion of total population of 33 per cent. None of these settlements are dependent on agriculture as a source of income, nor do their inhabitants practice farming to any significant extent. This conclusion is supported by Graaff (1986).

Third, analysis of GNP figures show the extent of the dependence of Lebowa households on employment outside the political boundaries of the homeland. De Villiers (1985:149) shows that 51.7 per cent of GNP came from migrant remittances in 1980 where these are calculated as 20 per cent of migrant earnings. A further 19.2 per cent came from commuter earnings. Fourth, it was shown in Table 4.3 that the average household head travels 92.76 kilometers to work. This is not the distance travelled daily, as it includes migrant workers. Further analysis of the survey data shows that 46 per cent of household heads are either commuters or migrants, while a further 27 per cent find wage employment within Lebowa. The relevant proportions are 48 per cent and 17 per cent for rural households.
Fifth, the level of expenditure by Lebowa households both within and outside the political boundaries shows the interdependence in the commercial sector. Survey data show that households spend 64 per cent of their income outside Lebowa. This proportion decreases as the household head ages. Sixth, de Villiers (1985:136-143) shows also the position regarding the supply of electricity, transport and communications infrastructure as well as the availability of water resources. It is evident from this discussion that these services are interrelated on a regional basis with the broader southern African economy.

The conclusion can be drawn that households in Lebowa must be analyzed in the context of the regional economy. In the following section survey data are used to describe the circumstances of these households.

5.3 THE LEBOWA HOUSEHOLD

In this section the sources of income and asset holding characteristics of Lebowa households are analyzed with a view to showing how the circumstances of households differ. The results of this analysis can then be used to illustrate the characteristics of those households who own livestock.

5.3.1 Household Income

Table 4.5 showed that average household income from all sources was R401.75 per month in 1984. The survey was however designed to be skewed toward households in proclaimed towns, to the officially-defined urban population. This subsample makes up 29 per cent of the total sample, while it was shown earlier that only 6.6 per cent of the de facto Lebowa population lives in these areas. For this reason data from urban and rural areas are analyzed separately in the rest of this study. Table 5.1 shows the average household income per month in rural and urban areas (as officially defined) and on this basis an unbiased estimate of income can be calculated.
Table 5.1  Average urban and rural incomes

<table>
<thead>
<tr>
<th></th>
<th>Number of households</th>
<th>Proportion of sample</th>
<th>Average household income (R per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>452</td>
<td>71</td>
<td>296.15</td>
</tr>
<tr>
<td>Urban</td>
<td>186</td>
<td>29</td>
<td>658.36</td>
</tr>
<tr>
<td>TOTAL</td>
<td>638</td>
<td>100</td>
<td>401.75</td>
</tr>
</tbody>
</table>

The total de facto population of Lebowa was estimated to be 1,838,234 in 1982 (Benso, 1983: 7). If it is assumed that average household size of 5.78 persons as estimated from survey data was also valid in 1982, there were 318,034 households. This assumption can be tested with reference to a t-test on the average household size in urban and rural areas, which shows no significant difference. With an urbanized population of 56.6 percent, the weighted average income per household was R320.06 per month in 1984, giving an annual per capita income of R663. It does not seem necessary to project 1982 population, as the definition of this population includes the shifting of boundaries as well as births and deaths.

A per capita income of R671 compares favourably with the calculated gross national income, projected to 1984, of R730 per person. In the further analysis of data therefore, a differentiation between urban and rural averages will be made where there is a danger of misinterpretation as a result of the built-in bias.

The per capita income calculated above translates to an average annual household income of R3,841, which is hardly a picture of abject poverty. Averages however hide the distribution as well as the level of access to different sources of income. To illustrate these two characteristics it is necessary first to identify the different sources of income. Table 5.2 shows these...
<table>
<thead>
<tr>
<th></th>
<th>Wage of household head</th>
<th>Other household members' contributions</th>
<th>Pension</th>
<th>Migrant remittances</th>
<th>Other sources</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>187,14</td>
<td>43,62</td>
<td>17,62</td>
<td>34,75</td>
<td>13,03</td>
<td>296,15</td>
</tr>
<tr>
<td></td>
<td>(63,2)</td>
<td>(14,7)</td>
<td>(6,0)</td>
<td>(11,7)</td>
<td>(4,4)</td>
<td>(100,0)</td>
</tr>
<tr>
<td>Urban</td>
<td>384,58</td>
<td>179,03</td>
<td>13,30</td>
<td>18,80</td>
<td>62,66</td>
<td>658,36</td>
</tr>
<tr>
<td></td>
<td>(54,4)</td>
<td>(25,3)</td>
<td>(1,9)</td>
<td>(2,7)</td>
<td>(15,7)</td>
<td>(100,0)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>244,70</td>
<td>63,09</td>
<td>16,36</td>
<td>31,10</td>
<td>21,50</td>
<td>401,75</td>
</tr>
</tbody>
</table>

Note: 1 All averages significant at the 99 per cent level.
2 Figures in brackets show row percentages.
3 This includes only those who stay at home.

Table 5.3 Access to sources of income: rural and urban households

<table>
<thead>
<tr>
<th></th>
<th>Wage of household head</th>
<th>Other household members' contributions</th>
<th>Pension</th>
<th>Migrant remittances</th>
<th>Other sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>58,8</td>
<td>24,6</td>
<td>24,1</td>
<td>29,4</td>
<td>10,6</td>
</tr>
<tr>
<td>Urban</td>
<td>80,6</td>
<td>55,9</td>
<td>9,1</td>
<td>11,8</td>
<td>16,1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>65,2</td>
<td>35,7</td>
<td>19,7</td>
<td>24,3</td>
<td>12,2</td>
</tr>
</tbody>
</table>

Note: 1 Proportion of households which have access to each source.
for rural and urban households.

Urban households rely less on pensions and migrant remittances and more on the income of other household members and other sources as an income supplement than do rural households. In general, they are less reliant on the income of the head of the household. While their average monthly income is 122 per cent higher than that of their rural counterparts, the income of the head of the household is 105 per cent higher.

Table 5.3 above shows the proportion of urban and rural households who have access to these various sources of income. This establishes an important point, namely that not only does the average income from different sources differ between urban and rural households, but the number of households who have access to each source also differs. So for example although the average pension in rural households is higher than in urban households, fewer in the latter group have access to this source. Of the households who actually get a pension, the average is R145.53 per month in urban households and only R73.08 in rural households. More urban heads of households have access to a wage income, as do more of their family members.

The occupation of household heads in Lebowa can be grouped according to their place of employment. Table 5.4 below shows the average income of urban and rural households where the head of the household works in Lebowa, commutes, migrates or has no wage income. Table 5.5 shows the proportion of households who do not have access to each source by place of work.

Tables 5.4 and 5.5 show that more than 80 per cent of urban household heads are in paid employment, and that this is the largest source of income for most of these households. A minority of about 20 per cent cite other sources as their major source of income. Few urban heads of households are migrant workers, and less than a third are commuters. More than half of urban households get income from other household members, while less than 15 per cent receive pensions or migrant remittances.
<table>
<thead>
<tr>
<th>Place of work</th>
<th>In Lebowa</th>
<th>Commuter</th>
<th>Migrant</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Wage of household head</td>
<td>551.60</td>
<td>442.99</td>
<td>357.32</td>
<td>281.12</td>
</tr>
<tr>
<td>Other household members' contribution</td>
<td>366.35</td>
<td>236.05</td>
<td>293.07</td>
<td>129.71</td>
</tr>
<tr>
<td>Pension</td>
<td>119.50</td>
<td>68.00</td>
<td>58.00</td>
<td>56.14</td>
</tr>
<tr>
<td>Migrant remittances</td>
<td>196.86</td>
<td>99.29</td>
<td>144.00</td>
<td>90.00</td>
</tr>
<tr>
<td>Other sources</td>
<td>431.45</td>
<td>155.83</td>
<td>138.33</td>
<td>116.67</td>
</tr>
</tbody>
</table>

Notes: 1 Average income only for those who have access to this source. 2 All averages significant at least at the 80 per cent level.
<table>
<thead>
<tr>
<th>Source of income</th>
<th>In Lebowa</th>
<th>Commuter</th>
<th>Migrant</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>Wage of household head</td>
<td>71.4</td>
<td>9.2</td>
<td>13.8</td>
<td>17.5</td>
<td>50.0</td>
</tr>
<tr>
<td>Other household members' contribution</td>
<td>44.4</td>
<td>75.0</td>
<td>51.7</td>
<td>73.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Pension</td>
<td>96.0</td>
<td>94.7</td>
<td>96.6</td>
<td>88.9</td>
<td>75.0</td>
</tr>
<tr>
<td>Migrant remittances</td>
<td>92.9</td>
<td>90.8</td>
<td>91.4</td>
<td>79.4</td>
<td>68.8</td>
</tr>
<tr>
<td>Other sources</td>
<td>79.8</td>
<td>84.2</td>
<td>80.7</td>
<td>95.2</td>
<td>93.8</td>
</tr>
<tr>
<td>Number of households</td>
<td>99</td>
<td>76</td>
<td>58</td>
<td>63</td>
<td>16</td>
</tr>
<tr>
<td>Proportion per type of work</td>
<td>53.2</td>
<td>16.8</td>
<td>31.2</td>
<td>13.9</td>
<td>8.6</td>
</tr>
</tbody>
</table>
Further, the composition of types of income varies according to the place of work of the household head.

In contrast, less than 60 per cent of rural household heads are in paid employment while more than a third of them are migrant workers. These form the largest sources of income for rural households, although a higher proportion have access to pensions and migrant remittances than is the case with urban households. Relatively few household heads from rural areas are commuters.

The data discussed above show the variety of sources from which households get their income. Apart from the effect of factors such as age and level of education, it is plausible to conclude that the level of average household income is also a function of the composition of sources of income. In this regard Table 5.6 shows the correlation between average household income and the various sources of that income.

Although the correlation between the variables is generally not strong, Table 5.6 does confirm the dependence of rural households on the income of the household head and the ability of higher income urban households to supplement income from other sources. Further analysis of the correlation between the sources of income shows a weak but statistically significant inverse relationship between the income of the head of the household and migrant remittances. This expected relationship is of the same order of magnitude for both urban and rural households.

The distribution of income within the urban and rural sectors is shown in Table 5.7. It is evident that most households have below-average incomes. However, a smaller proportion of rural households have below-average incomes, and their income is 55 per cent of the average for rural households. The poorer urban households have only 30 per cent of average income. The distribution of income in the rural areas is therefore skewed towards above-average incomes while the opposite is true for urban households. In proportionate terms the range of incomes is greater in rural areas than it is in urban areas, and there
### Table 5.6  Relationship between total household income and its sources

<table>
<thead>
<tr>
<th></th>
<th>Wage of household</th>
<th>Other household members' contribution</th>
<th>Pension</th>
<th>Migrant remittances</th>
<th>Other income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban : Correlation</td>
<td>0.446</td>
<td>0.377</td>
<td>0.0431</td>
<td>-0.0911</td>
<td>0.859</td>
</tr>
<tr>
<td>Rural : Correlation</td>
<td>0.862</td>
<td>0.474</td>
<td>-0.180</td>
<td>0.0311</td>
<td>0.106</td>
</tr>
</tbody>
</table>

Note: 1 Not significant at a 97.5 per cent level of confidence.

### Table 5.7  The distribution of income

<table>
<thead>
<tr>
<th></th>
<th>Rural households</th>
<th>Urban households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average income(^1)</td>
<td>Proportion of households</td>
<td>Proportion of average income</td>
</tr>
<tr>
<td>Less than average</td>
<td>60.8</td>
<td>55.6</td>
</tr>
<tr>
<td>More than average</td>
<td>39.2</td>
<td>168.9</td>
</tr>
<tr>
<td>Average</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: 1 Average income for rural and urban households respectively.
is therefore a greater disparity in income.

Four general conclusions can be drawn from this analysis of household income. First, urban households have a higher average income than do rural households. Second, the range of income is greater in the rural areas although relatively fewer households have lower than the average rural household income. Third, urban households have better access to wage employment than do rural households. Fourth, both urban and rural households have access to a diverse range of incomes. While rural households rely on pensions and migrant remittances as supplementary sources of income, urban households rely more on the income of family members and on diverse other sources of income.

Both urban and rural households have diverse sources of income, although the actual sources differ between these two groups. The composition of sources of income is obviously a function of the size and composition of the household. To the extent that this is true it provides further evidence in support of the farm household model. In this regard the attributes of households can be analyzed according to the size of the household. Table 5.8 shows the average income by source for rural households.

These data show clearly the difference between urban and rural ways of life. As can be expected, urban incomes decline with increasing size of the household. The wage of the household head, which is the largest component of income for most families, also declines with larger family size, and these trends are in evidence even if household size is grouped into intervals of one and two people. Further, if households are grouped into those with 6 or less people and those with more than 6 people the average household income is significantly different even under the assumption of equal variances.
Table 5.8 Income by size of household

<table>
<thead>
<tr>
<th>Household size</th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households</td>
<td>Rural</td>
<td>105</td>
<td>272</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>74</td>
<td>94</td>
<td>15</td>
</tr>
<tr>
<td>Wage of household head</td>
<td>Rural</td>
<td>193,17</td>
<td>209,70</td>
<td>96.87</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>439,39</td>
<td>374,60</td>
<td>211.35</td>
</tr>
<tr>
<td>Other members' contribution</td>
<td>Rural</td>
<td>30.48</td>
<td>45.33</td>
<td>55.76</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>183.76</td>
<td>174.89</td>
<td>181.22</td>
</tr>
<tr>
<td>Pension</td>
<td>Rural</td>
<td>18.24</td>
<td>15.38</td>
<td>24.89</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>6.30</td>
<td>19.47</td>
<td>9.85</td>
</tr>
<tr>
<td>Migrant remittances</td>
<td>Rural</td>
<td>6.10</td>
<td>31.04</td>
<td>88.27</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>2.70</td>
<td>23.68</td>
<td>59.44</td>
</tr>
<tr>
<td>Other income</td>
<td>Rural</td>
<td>15.84</td>
<td>13.63</td>
<td>6.93</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>90.60</td>
<td>45.20</td>
<td>38.61</td>
</tr>
<tr>
<td>Total income</td>
<td>Rural</td>
<td>263.83</td>
<td>315.08</td>
<td>272.71</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>722.75</td>
<td>637.84</td>
<td>500.55</td>
</tr>
</tbody>
</table>

Note: 1 Significant at an 80 per cent level of confidence. All other averages significant at the 95 per cent level.

The income of rural households with between 5 and 8 people is on the other hand greater than that of the other household size groups, and again the income of the household head is the greatest contributing factor. The average income of the largest household size group is however significantly higher than that of the smallest group despite the fact that the head of the household of the latter group earns less than half the wage of the heads of small families. The largest contribution to this difference is the level of migrant remittances for large families. The explanation for this difference in income for the three household size groups can be found in Table 5.9 which shows some of the characteristics of the head of the household.
### Table 5.9 Household characteristics and access to income

<table>
<thead>
<tr>
<th>Household size</th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportion(^2)</td>
<td>Average</td>
<td>Proportion(^2)</td>
<td>Average</td>
</tr>
<tr>
<td>Other member's contribution(^3)</td>
<td>Rural</td>
<td>16.2</td>
<td>188.24</td>
<td>23.9</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>50.0</td>
<td>367.51</td>
<td>56.4</td>
</tr>
<tr>
<td>Migrant remittances(^3)</td>
<td>Rural</td>
<td>9.5</td>
<td>64.10</td>
<td>27.9</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>2.7</td>
<td>100.00</td>
<td>12.8</td>
</tr>
<tr>
<td>Age</td>
<td>Rural</td>
<td>47.41</td>
<td>49.49</td>
<td>56.69</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>39.26</td>
<td>44.15</td>
<td></td>
</tr>
<tr>
<td>Level of education(^4)</td>
<td>Rural</td>
<td>67.6</td>
<td>8.49</td>
<td>73.2</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>91.9</td>
<td>10.78</td>
<td>89.4</td>
</tr>
</tbody>
</table>

Notes: 1 All averages significant at a 99 per cent level of confidence.
2 Per cent.
3 Proportion of households that have access to this income source.
4 Measured in years of school. Proportion of heads of household who have been to school.
There is a direct positive relationship between the age of the household head and the size of the family, and a negative relationship between the size of family and level of education of the household head. Despite this, rural households with between 5 and 8 members have a higher income from migrant remittances and therefore a higher average income than the smallest family size where the household head is younger and better educated. The largest household size group has an even higher level of migrant remittances. The trend in urban areas differs to the extent that the middle-sized household has the highest income from migrant remittances. Table 5.10 shows the relationship between household size and migrant remittances.

It is evident from Table 5.10 that a greater number of potential wage earners creates the possibility of increasing household income by means of migrant remittances. This does not however imply that these people will seek employment away from home. In this regard Table 5.11 shows the correlation between migrant remittances and a number of variables.

**Table 5.10  Migrant remittances and household size**

<table>
<thead>
<tr>
<th></th>
<th>Household size</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-4</td>
<td>5-8</td>
<td>9+</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migrant remittances</td>
<td>Rural</td>
<td>6.10</td>
<td>31.04</td>
<td>88.27</td>
<td>34.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>2.70</td>
<td>23.68</td>
<td>59.44</td>
<td>18.80</td>
<td></td>
</tr>
<tr>
<td>Number of dependents</td>
<td>Rural</td>
<td>0.96</td>
<td>1.75</td>
<td>3.35</td>
<td>1.83</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>0.86</td>
<td>1.53</td>
<td>2.83</td>
<td>1.39</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. All averages significant at a 0.05 per cent level of confidence.
2. Includes only those who have completed school.
Table 5.11  The determinants of migrant remittances

<table>
<thead>
<tr>
<th></th>
<th>Number of dependents</th>
<th>Age</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Correlation²</td>
<td>22.28</td>
<td>28.05</td>
<td>16.95</td>
</tr>
<tr>
<td>Significance³</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

Notes:  
1. Includes only those who have completed school.  
2. With the level of migrant remittances (per cent).  
3. T-level of significance.

Although the correlation between migrant remittances and the number of dependents who have completed school is not high, it is significantly positive for both rural and urban households. While the same is true for the correlation between remittances and the age of the household head, there is a significantly negative relationship between the level of education of the household head and remittances. Further analysis of the data shows that the better educated are more likely to be commuters or to work in Lebowa itself as was shown in Table 4.12. The group with the lowest level of education does not find wage employment. The better educated group is also more likely to live in the urban areas of Lebowa and to have a smaller family, as survey data show a significantly negative correlation between the size of the household and level of education of the household head for both rural and urban areas. These correlation coefficients are -0.18 and -0.30 respectively.

Although these correlation coefficients do not measure causal relations they do confirm the predictions of economic theory whereby the better educated are more likely to live in urban areas and to find employment. In terms of the farm household model household sizes will be smaller, and other household members are more likely to make a significant contribution to household income. This is confirmed in Table 5.9 which shows the relatively high contribution of other members to the income of
small urban families and the insignificant contribution of migrant remittances to this group.

As the younger household heads in both urban and rural areas are better educated than the older generation it is clear that, other things being equal, there is a trend towards smaller families with higher own income and less dependence on migrant remittances and on migrancy as a source of employment. Further, there will also be a move toward urban conurbations. Whether this will take the form of urbanization within Lebowa or to the metropolitan economy is an issue which lies beyond the scope of this study.

These trends are however not yet well-established, as survey data show that more than two thirds of rural households earn less than R200 per month, and of this group almost 30 per cent earns less than R100 per month. Further, women head 23 per cent of rural households, and the average income of this group is only 64 per cent of households with a father as head. Sixteen per cent of rural household heads also admitted to being unemployed while 19 per cent were pensioners. Data on expenditure patterns also confirm the classification of households as described above.

5.3.2 Expenditure by households

Table 5.12 shows the proportion of expenditure on various items by urban and rural households at different levels of average household income.

The table shows that total expenditure on food declines as a proportion of income for the higher income groups. This is confirmed by further analysis which shows statistically significant correlation coefficients of -0.83 and -0.86 between the proportionate expenditure on food and the group mean income as measured in Table 5.12 for urban and rural households respectively. There is also a statistically significant correlation between this measure of income and expenditure on clothes for rural households of -0.69. None of the other correlation coefficients are significant. Increasing incomes are
<table>
<thead>
<tr>
<th>Level of income</th>
<th>Food Urban</th>
<th>Food Rural</th>
<th>Clothes Urban</th>
<th>Clothes Rural</th>
<th>Furniture Urban</th>
<th>Furniture Rural</th>
<th>Other household Urban</th>
<th>Other household Rural</th>
<th>Average income Urban</th>
<th>Average income Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100</td>
<td>69.0</td>
<td>73.9</td>
<td>4.4</td>
<td>6.7</td>
<td>13.7</td>
<td>2.2</td>
<td>29.9</td>
<td>14.7</td>
<td>91.25</td>
<td>77.39</td>
</tr>
<tr>
<td>101 - 200</td>
<td>54.4</td>
<td>52.6</td>
<td>10.3</td>
<td>9.0</td>
<td>8.4</td>
<td>5.8</td>
<td>21.2</td>
<td>18.5</td>
<td>172.29</td>
<td>159.00</td>
</tr>
<tr>
<td>210 - 300</td>
<td>39.4</td>
<td>40.9</td>
<td>8.7</td>
<td>8.0</td>
<td>7.2</td>
<td>8.4</td>
<td>22.1</td>
<td>15.8</td>
<td>273.43</td>
<td>266.76</td>
</tr>
<tr>
<td>301 - 400</td>
<td>31.7</td>
<td>34.3</td>
<td>8.3</td>
<td>7.5</td>
<td>9.2</td>
<td>8.0</td>
<td>18.4</td>
<td>15.4</td>
<td>374.10</td>
<td>363.87</td>
</tr>
<tr>
<td>401 - 500</td>
<td>29.4</td>
<td>30.6</td>
<td>8.9</td>
<td>7.7</td>
<td>6.4</td>
<td>7.1</td>
<td>20.1</td>
<td>14.7</td>
<td>466.21</td>
<td>462.91</td>
</tr>
<tr>
<td>501 - 600</td>
<td>25.3</td>
<td>23.9</td>
<td>7.4</td>
<td>7.2</td>
<td>14.6</td>
<td>6.2</td>
<td>23.0</td>
<td>17.3</td>
<td>574.71</td>
<td>565.68</td>
</tr>
<tr>
<td>601 - 700</td>
<td>24.0</td>
<td>24.7</td>
<td>10.5</td>
<td>5.0</td>
<td>11.3</td>
<td>7.1</td>
<td>17.5</td>
<td>17.7</td>
<td>654.33</td>
<td>650.75</td>
</tr>
<tr>
<td>701 - 800</td>
<td>19.4</td>
<td>18.7</td>
<td>3.8</td>
<td>6.1</td>
<td>5.9</td>
<td>5.2</td>
<td>25.1</td>
<td>26.3</td>
<td>751.40</td>
<td>766.80</td>
</tr>
<tr>
<td>&gt;800</td>
<td>15.2</td>
<td>15.5</td>
<td>7.1</td>
<td>5.6</td>
<td>6.5</td>
<td>5.2</td>
<td>23.0</td>
<td>19.6</td>
<td>1331.98</td>
<td>1177.78</td>
</tr>
<tr>
<td>All</td>
<td>21.9</td>
<td>23.4</td>
<td>7.6</td>
<td>7.3</td>
<td>7.7</td>
<td>6.7</td>
<td>22.1</td>
<td>17.2</td>
<td>658.37</td>
<td>296.15</td>
</tr>
</tbody>
</table>
therefore associated with a declining proportionate expenditure on food for all households and on clothes for rural households.

As was shown in the previous section, there is a significant positive correlation between income and household size. The proportion of expenditure on basic goods should therefore be higher in large families. This is confirmed in Table 5.13 where survey data show that the proportion of expenditure on food increases with a larger household size. Despite the myth of a tradition-bound rural population which produces food for its own subsistence, rural households spend a larger proportion of their incomes on food than do their urban counterparts. Expenditure on investment goods for both rural and urban households exceeds the combined expenditure on clothes and furniture. It is also evident that the larger households have less money left over to spend on non-food items. The expenditure on investment goods for the largest household size group in rural areas is a quarter of expenditure on food, while for the smallest households this proportion is 50 per cent.

The relatively high proportion of spending on investment goods by both urban and rural households of all sizes should be seen in the context of the land tenure issue. Rural inhabitants own their homes, but not the land on which it is built, which is held in trust by the state (in this case the Lebowa Government) and allocated by the Tribal Authority. Urban dwellers on the other hand have until recently been able only to rent their homes. This limit on the incentive and ability to invest in real immovable property has its effect in a channeling of funds to other investment opportunities. In this regard it is also necessary to analyze the asset holdings of households.
Table 5.13 Proportionate expenditure by household size

<table>
<thead>
<tr>
<th>Household size</th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>10.4</td>
<td>23.2</td>
<td>33.6</td>
<td>21.9</td>
</tr>
<tr>
<td>Rural</td>
<td>34.3</td>
<td>33.6</td>
<td>41.9</td>
<td>35.0</td>
</tr>
<tr>
<td><strong>Clothes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>7.0</td>
<td>7.5</td>
<td>5.7</td>
<td>7.6</td>
</tr>
<tr>
<td>Rural</td>
<td>7.6</td>
<td>7.2</td>
<td>7.3</td>
<td>7.3</td>
</tr>
<tr>
<td><strong>Furniture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>7.7</td>
<td>7.7</td>
<td>7.0</td>
<td>7.7</td>
</tr>
<tr>
<td>Rural</td>
<td>7.6</td>
<td>6.2</td>
<td>7.4</td>
<td>6.7</td>
</tr>
<tr>
<td><strong>Investment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>26.3</td>
<td>21.5</td>
<td>21.5</td>
<td>23.6</td>
</tr>
<tr>
<td>Rural</td>
<td>17.7</td>
<td>15.3</td>
<td>10.8</td>
<td>15.1</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>household</td>
<td>21.2</td>
<td>23.6</td>
<td>17.3</td>
<td>22.1</td>
</tr>
<tr>
<td>Rural</td>
<td>18.0</td>
<td>17.4</td>
<td>15.2</td>
<td>17.2</td>
</tr>
</tbody>
</table>

Note: 1 Expenditure on children's schooling, saving and insurance premiums.

5.3.3 The ownership of assets

The level of asset holding and the composition of the asset portfolio for those who have access to each item is shown for urban and rural households respectively in Tables 5.14 and 5.15 at various levels of average household income.

What is immediately evident is that the vehicle of the average household is more valuable than their home when measured only for those who own a vehicle. Even when measured over all households, vehicles are more valuable than homes in the urban areas. In the rural areas they are worth 20 per cent of the value of homes. In both these cases the value of the home must be discounted for the fact that it cannot be sold. The measured value is therefore

31 The discussion in this section excludes livestock. These assets are analyzed in section 5.4.
<table>
<thead>
<tr>
<th>Level of income</th>
<th>House</th>
<th></th>
<th>Savings</th>
<th></th>
<th>Insurance</th>
<th></th>
<th>Vehicles</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(R per month)</td>
<td>Value</td>
<td>Proportion</td>
<td>Value</td>
<td>Proportion</td>
<td>Value</td>
<td>Proportion</td>
<td>Value</td>
<td>Proportion</td>
<td>Value</td>
<td>Proportion</td>
</tr>
<tr>
<td>&lt;100</td>
<td>0</td>
<td>0,0</td>
<td>0</td>
<td>0,0</td>
<td>0</td>
<td>0,0</td>
<td>0</td>
<td>0,0</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td>101-200</td>
<td>1 902</td>
<td>49,1</td>
<td>508</td>
<td>13,1</td>
<td>569</td>
<td>14,6</td>
<td>900</td>
<td>23,2</td>
<td>3 978</td>
<td>100,0</td>
</tr>
<tr>
<td>201-300</td>
<td>2 050</td>
<td>11,4</td>
<td>467</td>
<td>2,6</td>
<td>15 500</td>
<td>86,0</td>
<td>0</td>
<td>0,0</td>
<td>18 017</td>
<td>100,0</td>
</tr>
<tr>
<td>301-400</td>
<td>5 556</td>
<td>19,0</td>
<td>408</td>
<td>1,5</td>
<td>17 188</td>
<td>61,5</td>
<td>4 814</td>
<td>17,1</td>
<td>27 866</td>
<td>100,0</td>
</tr>
<tr>
<td>401-500</td>
<td>3 350</td>
<td>14,3</td>
<td>563</td>
<td>2,5</td>
<td>15 763</td>
<td>67,4</td>
<td>3 700</td>
<td>15,8</td>
<td>23 966</td>
<td>100,0</td>
</tr>
<tr>
<td>501-600</td>
<td>6 257</td>
<td>24,9</td>
<td>553</td>
<td>2,2</td>
<td>19 800</td>
<td>92,1</td>
<td>5 220</td>
<td>20,8</td>
<td>25 110</td>
<td>100,0</td>
</tr>
<tr>
<td>601-700</td>
<td>4 800</td>
<td>14,8</td>
<td>425</td>
<td>1,3</td>
<td>23 980</td>
<td>73,1</td>
<td>3 500</td>
<td>10,7</td>
<td>32 885</td>
<td>100,0</td>
</tr>
<tr>
<td>701-800</td>
<td>5 500</td>
<td>21,5</td>
<td>800</td>
<td>2,9</td>
<td>12 763</td>
<td>46,5</td>
<td>7 867</td>
<td>29,1</td>
<td>27 450</td>
<td>100,0</td>
</tr>
<tr>
<td>&gt;800</td>
<td>16 392</td>
<td>23,8</td>
<td>870</td>
<td>1,3</td>
<td>37 588</td>
<td>54,5</td>
<td>14 079</td>
<td>20,4</td>
<td>68 939</td>
<td>100,0</td>
</tr>
</tbody>
</table>

Notes:  1. Average only for those who own the asset.
       2. Significant at a level of less than 85 per cent.
Table 5.15 The asset portfolio of rural households

<table>
<thead>
<tr>
<th>Level of Income (R per month)</th>
<th>House Value (R)</th>
<th>House Proportion (%)</th>
<th>Savings Value (R)</th>
<th>Savings Proportion (%)</th>
<th>Insurance Value (R)</th>
<th>Insurance Proportion (%)</th>
<th>Vehicle Value (R)</th>
<th>Vehicle Proportion (%)</th>
<th>Total Value (R)</th>
<th>Total Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100</td>
<td>1 401</td>
<td>37.7</td>
<td>335</td>
<td>9.1</td>
<td>0</td>
<td>0.0</td>
<td>2 000</td>
<td>52.2</td>
<td>3 831</td>
<td>100.0</td>
</tr>
<tr>
<td>101 - 200</td>
<td>2 238</td>
<td>13.4</td>
<td>278</td>
<td>1.7</td>
<td>10 000</td>
<td>60.0</td>
<td>4 150</td>
<td>24.9</td>
<td>16 669</td>
<td>100.0</td>
</tr>
<tr>
<td>201 - 300</td>
<td>4 184</td>
<td>26.3</td>
<td>389</td>
<td>2.4</td>
<td>6 983</td>
<td>43.8</td>
<td>4 375</td>
<td>27.5</td>
<td>15 547</td>
<td>100.0</td>
</tr>
<tr>
<td>301 - 400</td>
<td>5 347</td>
<td>20.9</td>
<td>548</td>
<td>2.1</td>
<td>13 985</td>
<td>54.8</td>
<td>5 667</td>
<td>22.2</td>
<td>25 553</td>
<td>100.0</td>
</tr>
<tr>
<td>401 - 500</td>
<td>10 560</td>
<td>35.0</td>
<td>555</td>
<td>1.9</td>
<td>19 746</td>
<td>42.2</td>
<td>6 333</td>
<td>21.0</td>
<td>30 190</td>
<td>100.0</td>
</tr>
<tr>
<td>501 - 600</td>
<td>7 344</td>
<td>26.3</td>
<td>422</td>
<td>1.5</td>
<td>12 893</td>
<td>46.6</td>
<td>7 187</td>
<td>25.7</td>
<td>27 591</td>
<td>100.0</td>
</tr>
<tr>
<td>601 - 700</td>
<td>6 000</td>
<td>24.7</td>
<td>875</td>
<td>3.6</td>
<td>11 400</td>
<td>47.0</td>
<td>6 000</td>
<td>24.7</td>
<td>24 275</td>
<td>100.0</td>
</tr>
<tr>
<td>701 - 800</td>
<td>8 746</td>
<td>20.2</td>
<td>950</td>
<td>2.2</td>
<td>23 672</td>
<td>54.8</td>
<td>9 867</td>
<td>22.8</td>
<td>43 238</td>
<td>100.0</td>
</tr>
<tr>
<td>&gt;800</td>
<td>18 679</td>
<td>24.6</td>
<td>1 000</td>
<td>1.3</td>
<td>43 000</td>
<td>55.7</td>
<td>13 125</td>
<td>17.4</td>
<td>75 810</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Average: 4 957 | 14.1 | 514 | 1.7 | 18 718 | 60.7 | 7 285 | 23.5 | 30 854 | 100.0

Notes: 1. Average only for those who own the asset.
2. Significant at a level of less than 90 per cent.
more a reflection of cost or use value than of real value in exchange.  

Tables 5.14 and 5.15 show also that urban households own more assets than their rural counterparts, and that the average value of each asset they hold is also higher. Table 5.16 shows that assets are skewedly distributed both within urban and rural households.

Table 5.16  The distribution of assets

<table>
<thead>
<tr>
<th>Average assets*</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of</td>
<td>Proportion of</td>
<td>Proportion of</td>
</tr>
<tr>
<td>households</td>
<td>average assets</td>
<td>households</td>
</tr>
<tr>
<td>Less than</td>
<td>73.7</td>
<td>20.6</td>
</tr>
<tr>
<td>average</td>
<td>77.7</td>
<td>25.4</td>
</tr>
<tr>
<td>More than</td>
<td>26.3</td>
<td>32.1</td>
</tr>
<tr>
<td>average</td>
<td>22.3</td>
<td>35.9</td>
</tr>
<tr>
<td>Average</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: 1 Average assets for urban and rural households respectively.

Although poorer urban households own a lower proportion of average assets than do the poorer rural households, they constitute a smaller proportion of the population. The result is that the wealthier households own a smaller multiple of average assets than do their rural counterparts. The reason for this lies in the number of households who have access to assets. This is discussed in Table 5.17.

32 This is also true for insurance policies, which constitute a high proportion of total assets. These can therefore be regarded as unrealizable assets. Livestock are however realizable assets. The relationship between the ownership of livestock and other assets is discussed in section 5.4.
Table 5.17 Access to assets for urban and rural households

<table>
<thead>
<tr>
<th>Level of Income (R per month)</th>
<th>&lt;400</th>
<th>&gt;400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>House</td>
<td>96.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Savings</td>
<td>34.8</td>
<td>54.0</td>
</tr>
<tr>
<td>Insurance</td>
<td>8.5</td>
<td>17.5</td>
</tr>
<tr>
<td>Vehicle</td>
<td>7.7</td>
<td>10.0</td>
</tr>
</tbody>
</table>

More rural households have access to a home than do urban households, and the wealthier rural households have more access to savings, insurance and vehicles than do their poorer counterparts. A greater proportion of both poorer and wealthier urban households have access to these latter assets than do rural households. The distribution of assets is therefore determined by the types of assets held. This can be assumed to be a function of factors such as age and level of education of the household head and therefore of household size. Table 5.18 shows asset holding by size of the household to illustrate this proposition.

Table 5.18 shows that the largest households have fewer assets than the small and middle-sized households in the urban areas, and that these latter two groups have the same level of total assets. In the rural areas on the other hand the large and small families have the same level of assets, which is less than half of the level of assets of the medium sized group. The composition of these assets is also shown in Table 5.18. The smallest households in the rural areas have more savings and insurance, as well as higher-valued vehicles than do the largest households, while the value of their houses is lower. Again, the value of the house must be seen in terms of construction cost and use-value rather than a realizable exchange value. Further
Table 5.18 The distribution of assets by household size

<table>
<thead>
<tr>
<th></th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>House</td>
<td>3025.67</td>
<td>1747.55</td>
<td>4369.57</td>
<td>5292.39</td>
</tr>
<tr>
<td>Savings account</td>
<td>496.35</td>
<td>197.62</td>
<td>486.17</td>
<td>265.81</td>
</tr>
<tr>
<td>Insurance</td>
<td>13261.54</td>
<td>2045.95</td>
<td>12370.53</td>
<td>3614.96</td>
</tr>
<tr>
<td>Vehicle</td>
<td>4412.84</td>
<td>671.43</td>
<td>4087.34</td>
<td>1037.87</td>
</tr>
<tr>
<td>Total</td>
<td>21196.83</td>
<td>4662.55</td>
<td>21313.61</td>
<td>10211.03</td>
</tr>
</tbody>
</table>

Note: 1 All averages significant at the 86 per cent level.
analysis of these data also shows that more small households in
rural areas have a savings account, insurance and a vehicle than
do large households.

Survey data therefore show that urban households have more assets
than rural households, while the distribution of assets among the
latter is more skewed. Further, the smallest and largest rural
households own the same value of assets, while more smaller
households own movable property. The middle-sized rural
households own more than twice as many assets than do the other
two groups.

5.3.4 Conclusions

A number of conclusions can be drawn from this analysis of the
Lebowa household. Firstly, the income of rural households is more
skewed towards above-average incomes than is the case with urban
households, while the distribution of assets is more skewed for rural households. Second, rural households are
more dependent on migrant remittances than are urban households.
Third, better educated heads of household are more likely to be
employed in Lebowa or as commuters than as migrants, be younger,
have smaller families and to live in urban areas. Their income
is also higher and they are less dependent on the earning
potential of other family members. Fourth, incomes in both urban
and rural areas are skewed distributed and many households
subsist on a small monthly income. This is also reflected in the
high proportion of income which is spent on food, even in rural
areas where households are assumed to have access to land for
subsistence food production. Fifth, expenditure on investment
goods is relatively high despite the level of expenditure on food
and other basic goods.

The analysis of survey data also shows that the characteristics
and attributes of households differ according to the size of the
household. In this regard households were divided into three
groups, namely small (less than 4 members), middle (5 to 8
members) and large (more than 9 members) for urban and rural
areas respectively. In general, the heads of smaller households were younger and better-educated, while in urban areas they had the highest income. The middle-sized group in rural areas had higher incomes and more assets than the other two groups. Large families in urban areas were poorer than the other two groups, while in rural areas their income was greater than that of small families and they owned the same level of assets.

It is within this classification of households that the ownership of livestock can be analyzed.

5.4 THE OWNERSHIP OF LIVESTOCK

Given the 1982 population estimate of Benso (1983:7) of 1,838,234 and an urbanization rate of 6.6 per cent, the calculated number of rural households was 270,806. This assumes an average household size of 6.34 persons as calculated from the survey data. These data also show an average ownership of cattle of 2.2 animals per household, giving a total cattle herd of 594,659. The livestock census data for Lebowa show 510,103 head of cattle as at 31 March 1984. Survey data therefore show a total herd which is 17 per cent higher than the census data. This discrepancy can be the result of a number of factors, chief of which are the unreliability of the population data given the extent of migrancy, and the permeability of the borders as regards the movement of cattle. The average of 2.2 head of cattle per household can therefore be accepted as accurate for the purposes of this study, given the small margin of discrepancy.

A common prediction of both the tragedy of the commons and the store of wealth approaches to livestock ownership is that all households will keep animals. Survey data show however that not all keep animals, and that livestock owners have a number of characteristics which distinguish them from other households. These characteristics are analyzed next.
5.4.1 The characteristics of owners

Data in Table 3.1 show that 22.3 per cent of rural households own cattle. As the concomitant figure for urban households is 5.9 per cent, further analysis will concentrate on rural households only. It is however necessary to note that there are people who live in the proclaimed towns who own cattle. Their total ownership is equal to 2.2 per cent of the total herd, or 12,911 animals. Further, survey data show that those households which have a woman as head own an average of 0.64 head of cattle each. The ownership of the major part of the cattle must therefore be sought in male-headed rural households.

Data in Table 5.8 show that rural households of between 5 and 8 people have a higher income than either smaller or larger households. In Table 5.18 it was shown that these same households also own more assets of all types than do other households. The prediction can be made that these households will also own more livestock, and this is reflected in Table 5.19. These data also show that more of the largest households own both cattle and smallstock, and that they own the largest number of smallstock. The average number of cattle per owner is however highest for the medium-sized household, and this group constitutes the largest livestock herd owners.

A clue to the characteristics of cattle owners can be found in the differences between owners and non-owners. In this regard the prediction according to the tragedy of the commons view has been noted. The prediction of the household economics approach on the other hand is that those people who have sufficient surplus funds to invest in cattle will do so. Cattle owners will therefore have higher incomes than non-owners. As surplus funds are mostly generated by migrant labour earnings, cattle owners will be older, have a higher level of education and will travel further to work. Lastly the prediction of both the farm household model and Haaland (1977) is that people invest in cattle because of a lack of alternative investment opportunities. These assertions can all be investigated on the basis of data shown in Table 5.20.
Table 5.19  Livestock ownership by household size

<table>
<thead>
<tr>
<th>Size of household</th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle Households</td>
<td>105</td>
<td>272</td>
<td>75</td>
<td>452</td>
</tr>
<tr>
<td>Cattle per household</td>
<td>0.7</td>
<td>3.06</td>
<td>1.72</td>
<td>2.29</td>
</tr>
<tr>
<td>Owners</td>
<td>8</td>
<td>72</td>
<td>21</td>
<td>101</td>
</tr>
<tr>
<td>Cattle per owner</td>
<td>9.25</td>
<td>11.57</td>
<td>6.14</td>
<td>10.26</td>
</tr>
<tr>
<td>Smallstock Households</td>
<td>105</td>
<td>272</td>
<td>75</td>
<td>452</td>
</tr>
<tr>
<td>Smallstock per household</td>
<td>1.04</td>
<td>3.61</td>
<td>4.44</td>
<td>3.15</td>
</tr>
<tr>
<td>Owners</td>
<td>12</td>
<td>95</td>
<td>30</td>
<td>137</td>
</tr>
<tr>
<td>Smallstock per owner</td>
<td>9.08</td>
<td>10.35</td>
<td>11.19</td>
<td>10.40</td>
</tr>
</tbody>
</table>

First, these data seemingly confirm that cattle owners have a greater income than non-owners while further analysis shows that only their income from pensions is significantly greater. There is in any case not a sufficiently large difference in average incomes to warrant assuming that all owners have more surplus funds for investment than non-owners. In this regard reference should also be made to the skew distribution of both income and assets among rural households.

Second, these data show that cattle owners are older than non-owners, as is predicted by the farm household model. There is however no significant difference in the mean level of education of owners and non-owners, while the latter travel further to work. More detailed analysis shows that of those who do own cattle, the average ownership of non-migrants is almost five times that of migrants. The average ownership of higher income migrants is also only 75 per cent of the level of ownership of low income migrants, at a household income of R250 per month.
Table 5.20  The characteristics of cattle owners

<table>
<thead>
<tr>
<th></th>
<th>Owners</th>
<th>Non-owners</th>
<th>T-level</th>
<th>F-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure (R per month)</td>
<td>285.55</td>
<td>227.92</td>
<td>0.987</td>
<td>0.999</td>
</tr>
<tr>
<td>Assets (R)</td>
<td>11114.9</td>
<td>7109.92</td>
<td>0.944</td>
<td>0.995</td>
</tr>
<tr>
<td>Income (R per month)</td>
<td>320.18</td>
<td>289.24</td>
<td>0.721</td>
<td>0.999</td>
</tr>
<tr>
<td>Age (years)</td>
<td>54.25</td>
<td>49.04</td>
<td>0.999</td>
<td>0.8562</td>
</tr>
<tr>
<td>Education (years)</td>
<td>4.95</td>
<td>5.34</td>
<td>0.582²</td>
<td>-</td>
</tr>
<tr>
<td>Distance to work (km)</td>
<td>102.60</td>
<td>117.83</td>
<td>0.58</td>
<td>0.935</td>
</tr>
<tr>
<td>Smallstock (number)</td>
<td>8.67</td>
<td>1.56</td>
<td>0.999</td>
<td>0.999</td>
</tr>
<tr>
<td>Household size (number)</td>
<td>7.14</td>
<td>6.11</td>
<td>0.999²</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes: 1  Confidence level for accepting unequal mean values.
        2  Confidence level for accepting equal variance.
        3  Confidence level under the assumption of unequal variances.

Third, survey data show that livestock owners have a significantly larger net worth than non-owners, and this is true for the average value of all assets. In this regard Table 5.21 also shows a number of combinations of assets which make up the asset portfolios of rural households. It is evident from these data that the majority of cattle owners also own other assets, although a large proportion of these are unrealized assets.

Fourth, it could be argued that most people are too poor to be able to afford to free ride, given the price of cattle, and that they will therefore buy smallstock. Data from Table 5.20 show that cattle owners own more than five times as many sheep and goats than do non-owners of cattle.
Table 5.21 Portfolio composition for rural households

<table>
<thead>
<tr>
<th>Number of households</th>
<th>Cattle only</th>
<th>Cattle and house only</th>
<th>Cattle, house and savings</th>
<th>Cattle and other assets</th>
<th>Other assets and no cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>48</td>
<td>31</td>
<td>101</td>
<td>351</td>
</tr>
<tr>
<td>Proportion</td>
<td>0</td>
<td>10.6</td>
<td>6.9</td>
<td>22.3</td>
<td>77.7</td>
</tr>
</tbody>
</table>

The conclusion can therefore be drawn that the typical cattle owner is a male household head who lives in the rural areas, and who is older, has a higher income and owns more other assets than non-owners. Further, the chances are that he is head of a household of between 5 and 8 people. This conclusion is confirmed by data presented in Table 5.22.

Table 5.22 The correlation between herd size and other characteristics

<table>
<thead>
<tr>
<th>Correlation coefficient</th>
<th>Expenditure</th>
<th>Assets</th>
<th>Income</th>
<th>Age</th>
<th>Education</th>
<th>Distance to work</th>
<th>Smallstock</th>
<th>Size of household</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.149</td>
<td>0.383</td>
<td>0.16</td>
<td>0.003</td>
<td>0.047</td>
<td>-0.03</td>
<td>0.554</td>
<td>0.006</td>
</tr>
<tr>
<td>T-level</td>
<td>0.999</td>
<td>0.999</td>
<td>0.999</td>
<td>0.051</td>
<td>0.686</td>
<td>0.481</td>
<td>0.999</td>
<td>0.102</td>
</tr>
</tbody>
</table>

Note: 1 Confidence level for a significant correlation.

There is no significant correlation between herd size and age, level of education, size of household or the distance travelled to work. There is however a significantly positive relationship between herd size and level of income and the ownership of other assets, including smallstock. It is in this light that the characteristics of herd owners can be studied. Table 5.23 shows
the characteristics of owners of different sized herds.

Table 5.23 Characteristics of herd owners

<table>
<thead>
<tr>
<th>Herd size</th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in sample</td>
<td>49</td>
<td>34</td>
<td>18</td>
</tr>
<tr>
<td>Assets (R)</td>
<td>688,63</td>
<td>7516,32</td>
<td>29436,11</td>
</tr>
<tr>
<td>Income (R per month)</td>
<td>304,20</td>
<td>255,97</td>
<td>484,94</td>
</tr>
<tr>
<td>Age (Years)</td>
<td>54,1</td>
<td>55,9</td>
<td>51,6</td>
</tr>
<tr>
<td>Education (years)</td>
<td>4,7</td>
<td>4,6</td>
<td>6,4</td>
</tr>
<tr>
<td>Smallstock</td>
<td>6,7</td>
<td>5,2</td>
<td>20,0</td>
</tr>
<tr>
<td>Distance to work (km)</td>
<td>99,1</td>
<td>125,1</td>
<td>69,6</td>
</tr>
</tbody>
</table>

Note: 1 All averages significant at the 99 per cent level of confidence.

It is evident that while the owners of between 5 and 8 cattle have more other assets than the owners of small herds, they have a lower income, are older, own fewer goats and sheep than other herd owners and travel further to work. The owners of large herds are on the other hand better off in all respects than other owners.

The proportion of the total cattle herd in Lebowa owned by these respective groups is shown in Table 5.24. The owners of large herds own more than two thirds of the total herd owned by rural households, or 65.8 per cent of the total herd of Lebowa. The survey data however include two observations which could be seen as statistical outliers. If these are excluded the owners of more than 9 cattle own 50 per cent of the total herd of Lebowa.
Table 5.24  Ownership of the total herd

<table>
<thead>
<tr>
<th>Herd size</th>
<th>1-4</th>
<th>5-8</th>
<th>9+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in sample</td>
<td>49</td>
<td>34</td>
<td>18</td>
</tr>
<tr>
<td>Average number of cattle</td>
<td>2,73</td>
<td>6,03</td>
<td>38,72</td>
</tr>
<tr>
<td>Cattle per subgroup</td>
<td>133,77</td>
<td>205,02</td>
<td>696,96</td>
</tr>
<tr>
<td>Proportion</td>
<td>12,9</td>
<td>19,8</td>
<td>67,3</td>
</tr>
</tbody>
</table>

Note: 1 Owned by rural households only.

The conclusion drawn thus far is that there is a skew distribution of both income and assets in the rural areas, and that the owners of cattle have a higher average income and level of assets than non-owners. Further, the owners of large herds are wealthier than the owners of small herds. This is confirmed in Table 5.25.

The correlation between the number of cattle owned and these characteristics is also stronger when measured only for cattle owners. This is shown in Table 5.26.

These data show a weak inverse relationship between the number of cattle owned and age, and a weak positive relationship between ownership and level of education. Further, the data show a strong correlation between the ownership of cattle and sheep and goats, as well as other assets, and a weaker but significant positive relationship with total income.
### Table 5.25  Characteristics of owners of large herds

<table>
<thead>
<tr>
<th></th>
<th>Herd size</th>
<th>T-level&lt;sup&gt;1&lt;/sup&gt;</th>
<th>F-level&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;9</td>
<td>&gt;9</td>
<td></td>
</tr>
<tr>
<td>Expenditure (R per month)</td>
<td>262.90</td>
<td>389.94</td>
<td>0.862&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Assets (R)</td>
<td>7141.63</td>
<td>29436.41</td>
<td>0.999</td>
</tr>
<tr>
<td>Income (R per month)</td>
<td>284.45</td>
<td>484.94</td>
<td>0.951</td>
</tr>
<tr>
<td>Age (years)</td>
<td>54.83</td>
<td>51.56</td>
<td>0.688&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Education (years)</td>
<td>4.63</td>
<td>6.44</td>
<td>0.895</td>
</tr>
<tr>
<td>Distance to work (km)</td>
<td>109.76</td>
<td>69.61</td>
<td>0.725&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Smallstock</td>
<td>6.22</td>
<td>20.0</td>
<td>0.999</td>
</tr>
<tr>
<td>Household size</td>
<td>7.05</td>
<td>7.56</td>
<td>0.603&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: 1  Confidence level for accepting unequal mean values.  
2  Confidence level for accepting equal variances.  
3  Confidence level under the assumption of unequal variances.

### Table 5.26  Correlation coefficients for herd owners

<table>
<thead>
<tr>
<th></th>
<th>Expenditure</th>
<th>Assets</th>
<th>Income</th>
<th>Age</th>
<th>Education</th>
<th>Distance to work</th>
<th>Smallstock</th>
<th>Household size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation coefficient</td>
<td>0.175</td>
<td>0.68</td>
<td>0.254</td>
<td>-0.113</td>
<td>0.133</td>
<td>-0.047</td>
<td>0.591</td>
<td>-0.046</td>
</tr>
<tr>
<td>T-level</td>
<td>0.919</td>
<td>0.999</td>
<td>0.896</td>
<td>0.738</td>
<td>0.814</td>
<td>0.362</td>
<td>0.999</td>
<td>0.355</td>
</tr>
</tbody>
</table>

Note: 1  Confidence level for a significant correlation.
It is not immediately apparent why owners of large herds should be younger and better educated than owners of small herds. The answer is however to be found in a comparison of the age and level of education of owners of small herds and those households who do not own cattle. This is shown in Table 5.27. The owners of small herds are older, less educated and have larger families than the non-owners. Further analysis therefore shows that there is no significant difference in age, level of education and household size between owners of large herds and non-owners.

Table 5.27 Characteristics of owners of small herds

<table>
<thead>
<tr>
<th></th>
<th>Owners of small herds</th>
<th>Non-owners</th>
<th>T-level(^1)</th>
<th>F-level(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>54.83</td>
<td>49.04</td>
<td>0.999</td>
<td>0.943</td>
</tr>
<tr>
<td>School</td>
<td>4.63</td>
<td>5.34</td>
<td>0.849(^3)</td>
<td>-</td>
</tr>
<tr>
<td>Household size</td>
<td>7.05</td>
<td>6.1</td>
<td>0.998(^3)</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes: 1 Confidence level for accepting unequal mean values.  
2 Confidence level for accepting equal variances.  
3 Confidence level under the assumption for unequal variances.

The objective of this detailed analysis has been to build a typology of rural households with respect to the ownership of cattle. In this regard rural inhabitants can be divided into those who do not own cattle, those who own small herds, and those who own large herds. The characteristics of these groups can be summarized briefly.

First, owners of small herds constitute 82 per cent of all livestock owners, and 18 per cent of rural households. This translates to approximately 50,000 households who own between a third and a half of the total cattle herd. This group of owners is older and less well educated than both owners of large herds and non-owners while they do not have a higher income or greater net worth than non-owners. Their families are also larger than
those of non-owners. Further analysis of data in Table 5.24 shows that owners of small herds (less than 9 head) own an average of 4.1 cattle each.

Second, owners of large herds constitute 18 per cent of all livestock owners or 4 per cent of rural households, and number approximately 11,000 households. These people have a significantly higher income and net worth than other groups, but they do not differ in level of education or age from non-owners. They are however both younger and better educated than the owners of small herds. The data also show that they own more of each individual asset type than both other groups. This group owns on average 38.72 head of cattle each. If the more conservative estimate is taken, their average herd size is 18.6 cattle.

The identification of the characteristics of cattle owners leads to a better understanding of the identity of owners. This issue is discussed next.

5.4.2 The identity of owners

Within the framework of the farm household model a number of predictions can be made regarding the motives to keep cattle. First, households which have a surplus of income available for investment are likely to keep cattle. Second, better educated individuals have a comparative advantage in employment as migrants. They are likely to use surplus income to invest in cattle. Third, as these individuals age, they are likely to build up a herd. Better educated and younger people will therefore have smaller herds, and a motive to build up their herd. Fourth, this leads to the conclusion that older people will have more cattle. Fifth, the more cattle a person owns, the fewer other assets he or she will have. Sixth, it can be expected that as the general level of education of the rural population improves over time, the owners of large herds will be less well educated than their younger counterparts.

Survey data from Lebowa show that these predictions are not valid.
without qualification. Further evidence is found in an analysis of those household heads who find employment as migrants or as commuters. This is shown in Table 5.28 below.

Table 5.28  The characteristics of migrants and commuters

<table>
<thead>
<tr>
<th></th>
<th>No cattle</th>
<th>1-8 Head</th>
<th>&gt;9 Head</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households</td>
<td>176</td>
<td>40</td>
<td>3</td>
<td>219</td>
</tr>
<tr>
<td>Proportion of rural</td>
<td>50.1</td>
<td>48.2</td>
<td>16.7</td>
<td>48.5</td>
</tr>
<tr>
<td>households</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>44.7</td>
<td>47.3</td>
<td>48.0</td>
<td>45.2</td>
</tr>
<tr>
<td>Education</td>
<td>6.4</td>
<td>7.1</td>
<td>5.7</td>
<td>6.5</td>
</tr>
<tr>
<td>Smallstock</td>
<td>1.9</td>
<td>6.5</td>
<td>12.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Cattle</td>
<td></td>
<td>3.92</td>
<td>10.67</td>
<td>0.86</td>
</tr>
<tr>
<td>Migrant and commuter</td>
<td>275.36</td>
<td>256.82</td>
<td>83.33(1)</td>
<td>269.34</td>
</tr>
<tr>
<td>wage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total income</td>
<td>310.16</td>
<td>292.07</td>
<td>163.3(1)</td>
<td>304.9</td>
</tr>
<tr>
<td>Total assets</td>
<td>6437.89</td>
<td>6811.38</td>
<td>8283.33</td>
<td>6531.39</td>
</tr>
</tbody>
</table>

Note: 1 Not significant at the 80 per cent level of confidence.

Table 5.28 shows that only half of all household heads find employment as migrants or as commuters and that the incidence of employment outside Lebowa decreases as the size of the cattle herd increases. On average, these people own less cattle and smallstock than non-migrants and non-commuters, and this is also true for the different cattle herd sizes. As herd size increases both the migrant and commuter wage and the total income of the workers decreases. Further, although the age and level of education of migrants follows the trend as predicted by the farm household model, this must be seen in terms of the proportion of household heads who find employment as migrants or commuters.
Those migrants and commuters with the highest income do not own cattle although they have as many other assets as do the owners of small herds, and only 43 per cent of all migrants and commuters keep cattle. The predictions of the farm household model are therefore at best valid for those households who both migrate or commute and who own cattle. A different explanation is required for the other households who constitute the majority of the rural population.

In this regard it has been shown that high-income households are more dependent on wage income from commuting or employment within Lebowa than on income as migrant workers. The logic of the farm household model, where surplus income is invested in livestock, is not necessarily true only for income from migrant labour. If it is further accepted that a large proportion of other assets are held in an unrealized form such as houses and insurance, the farm household model leads to the prediction that surplus wages from any source will be invested in livestock. This serves to explain further the concentration of livestock ownership among those rural households with a higher income. The prediction of the farm household model can therefore be accepted, namely that higher-income households will keep cattle as an alternative investment in those cases where they have access to grazing rights.

Owners of small herds are in general older and less educated than other households although the half of them who find employment as migrants or commuters are better educated than those who do not. By definition these people have grazing rights, and it can therefore be assumed that they live in tribal areas. Non-owners on the other hand do not have grazing rights and do not necessarily live in tribal areas.

The position as regards the owners of large herds is different. Survey data show that 11 of the 18 owners of large herds give their occupation as 'unemployed', 4 of the 18 regard themselves as self-employed and 3 as falling in the 'professional' category. Survey data do not, however, show what the status of these owners
is, although it is possible to deduce their status from the survey conducted by Fenyes (1982) and the work of Scott (1986). Table 5.29 shows data from Fenyes (1982). The majority of this sample of owners of large herds are tribal leaders, elders or councillors.

The proportion of owners of large herds as surveyed by Fenyes (1982) coincides with the proportion found in the survey conducted for this study, as does the average herd size for the owners of large herds. It is therefore possible to conclude that the owners of large herds are drawn, among others, from the ranks of the tribal leaders, elders and councillors. Further, Scott (1986: 186) shows that two thirds of a sample of businessmen in Gazankulu own cattle, with an average herd size of 21 head of cattle each (Scott, 1986: 197). The conclusion can therefore be drawn that the owners of large herds are drawn from the leadership eschelon, including both the traditional and non-traditional leadership group in Lebowa.

<table>
<thead>
<tr>
<th>Table 5.29</th>
<th>The status of owners of large herds¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportion of large herd owners</td>
</tr>
<tr>
<td>Tribal leaders</td>
<td>46.7</td>
</tr>
<tr>
<td>Tribal elders and councillors</td>
<td>37.3</td>
</tr>
<tr>
<td>Other</td>
<td>16.0</td>
</tr>
<tr>
<td>All</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Note: ¹ All averages significant at the 80 per cent confidence level.


These data confirm the trends identified on the basis of the
survey data. They also show that the owners of large herds are

to the largest extent members of the rural leadership group.
This small group of people therefore own the majority of the
cattle and smallstock in Lebowa. Survey data show that the total
size of the group is approximately 11 000 households, while a
further 50 000 households own the rest of the cattle and in
excess of 200 000 households own no cattle.

5.5 Summary and conclusions

The objective in this chapter was to identify those households in
Lebowa who own cattle. In this regard the interrelationships
between Lebowa households and the broader southern African
economy were discussed first, followed by an analysis of the
characteristics of households. The major conclusions drawn in
this analysis was that there exists a skew distribution of both
income and assets, and that the characteristics of households are
dependent on household size.

These conclusions were then used to identify the owners of
cattle. In this regard survey data show that medium-sized
households own more cattle and sheep than do the smaller and
larger households respectively. This led to the assumption that
cattle owners had more assets and a higher income than non-
owners. As this assumption was shown to be valid, livestock
owners could be identified on the basis of the number of cattle
owned.

An analysis of those who do not own cattle and those who own
small and large herds respectively shows that the owners of large
herds are drawn largely from the traditional and non-traditional
leadership group, while owners of small herds are ordinary tribal
members. Non-owners are either landless tribal members or do not
live in tribal areas.

The conventional analyses of the livestock subsector are all
based on an assumption regarding the motive to hold livestock.
Neither the assumption of profit maximization inherent to the
tragedy of the commons view nor the assumption that cattle are kept for cultural and religious purposes only can be substantiated as the sole motive for owning livestock on the basis of the data presented here. There is some evidence however that some owners at least keep livestock for each of these reasons. There is also evidence that some owners keep livestock for their non-monetary benefits, such as milk and meat for own consumption and their investment value. This complex of motives for the ownership of livestock is used in the following chapter as the basis of an institutional approach to livestock development policy.
CHAPTER SIX
AN INSTITUTIONAL APPROACH TO THE POLITICAL ECONOMY OF LIVESTOCK DEVELOPMENT

6.1 INTRODUCTION

The objective in this chapter is to show that an institutional approach to the development of the livestock subsector is required. The need for such an approach is based on the conclusion that conventional approaches are inadequate, and on an analysis of the livestock subsector in Lebowa. The data analyzed in the previous chapter show that the owners of livestock can be divided into two broad categories, and that there are therefore at least two different types of livestock owners. If the more conservative estimate from the survey data is accepted, then, contrary to the general belief in the African custom of sharing and equality, the core of the herd is owned by a small group of people who constitute 3.9 per cent of the rural population and own at least half of the cattle. These cattle owners are of the same average age and have the same level of education as does the population at large. They are, however, wealthier and have larger incomes. These owners are drawn from the leadership echelon, and they have a larger average herd of cattle and smallstock than do other owners.

The rest of the herd is owned by a group of people who live within the tribal system and are older and have less education than the rural population at large. They own small average herds, and have lower incomes and fewer assets than other owners. This group constitutes 18.4 per cent of the rural population. These data show further that a third of the rural population has neither grazing nor arable land rights. An important conclusion which can therefore be drawn from the analysis in Chapter Five is

33 These two groups are referred to in this chapter as the 'ownership group'.
that the traditional tribal system of grazing tenure where all
the members of the tribe had grazing rights no longer exists in
its original form. To ignore this conclusion would mean
perpetuating the error of the 'ethnographic present'. This is
especially true in terms of the findings of Danckwerts (Undated)
and Steyn (1982) referred to in section 4.2 above. This
conclusion also recognizes the fact that not all rural people
live within tribal structures.

In order to achieve this objective the next section contains a
theoretical explanation of why the communal grazing regime has
evolved in its current form. This approach is applied to the
current situation in Lebowa in section three, and is followed by
a description of an alternative analysis of common property
regimes in section four where it is shown that common property
arrangements do have an institutional content, despite the view
inherent to the conventional approaches. This latter analysis
makes possible the formulation of more relevant policy measures
for livestock development which take account of the institutional
content. Examples of policy measures for institutional change
are discussed in section five.

6.2 THE THEORY OF RENT-SEEKING

In the theoretical discussion in Chapter Two it was shown that
the pace and direction of institutional change was the result of
factors which determine the supply of and demand for such change.
Supply determinants include the cost of collective action and the
level of influence of vested interest groups. Demand
determinants on the other hand include factor endowments,
technical innovation, changes in product demand and the cost of
changing the rules of the game. This latter determinant is in
turn itself derived from the power of vested interest groups.

The analysis of the livestock subsector in Lebowa has shown that
there is inequitable access to the grazing resource, and that
ownership is skewed distributed for those who do have access.
This leads to the conclusion that the ownership group has a
vested interest in the present system. The conclusion could also be drawn that the current system has come about at least partly as a result of this vested interest. In this regard it is necessary to ascertain the origin of the motive of this group to maintain access to the grazing resource. It is argued here that the answer should be sought, among others, in the process of rent-seeking.

The principle of economic rent or quasi-rent has long been established in economic theory and was central to the theories of both Ricardo and Marx (cf Terreblanche, 1986: 136, 139 and 176). These rents are defined as the return to fixed production factors net of the return to variable factors used in the same production process. Quasi-rents are the returns to a factor which is fixed only in the short term (Barnock, et al. 1984). In a perfectly competitive economy economic rents are just sufficient to cover the cost of using the resource in the long run. Inframarginal users of a resource can however earn quasi-rents by for example exploiting short run factor supply rigidities or by innovation. A further source of such rents arises from government intervention in the economy.

As the potential exists for inframarginal producers to earn rents arising from government intervention, they have an incentive to maintain their competitive advantage. This can lead to the allocation of resources to the process of becoming or remaining an inframarginal or below average industry cost producer, a process which has been called rent-seeking (Krueger, 1974). The competition for these rents can either be legal, such as obeying for minimum wages or high administered prices, or it can be illegal, such as bribery or smuggling (Krueger, 1974: 291; Wade, 1985; Jegannathan, 1986).

Two elements of this model are important. First, rent-seeking leads to a welfare loss in a perfectly competitive market. This

34 It should be noted that vested interests are not necessarily malevolent.
loss is greater than that associated with forms of intervention which do not create rents, for example an import tariff as opposed to a quota (Krueger, 1974: 300-301). For this reason the welfare loss associated with rent-seeking should not be seen as evidence against all types of government intervention. Further, we do not live in a first best world, and it is possible to show that rent-seeking can be a good or a bad in a second-best world (cf. Rausher, 1982: 823 for references).

Second, in the neoclassical view rents do not exist in a common property regime (cf. eg. Gordon, 1954: 130-131; Bell, 1986). The user of a common property resource will allocate inputs to a production process beyond the level of profit maximization because he does not incur the full cost of production. Given the critique of this neoclassical view in Chapter Two however, it is evident that there is no reason to accept this assumption of zero economic rents in a common property regime. In the first place those with access to the common property can also be inframarginal producers (Ronald Johnson and Lipech, 1982: 1006). In the second place they have an incentive to limit access to as few entrants as possible and thereby create inframarginal rents (Johnson, 1985: 373). There is therefore an incentive to allocate resources to competition for the rents from a common property resource.

Conventional analyses of the livestock subsector are based on the assumption of rent dissipation within a communal tenure regime. This is true for both the tragedy of the commons and the store of wealth approaches, as is evidenced by the similarity of their resultant policy proposals to privatize land tenure. The rejection of the assumption of rent dissipation necessitates a new explanation in which rents play a central role. Such an explanation is given in the next section, where it is also shown that rent-seeking in the livestock subsector has been achieved through the limitation of access to the grazing resource.
6.3 A Tragedy of the Chiefs

The economy of southern Africa was described in Chapter One. The development of this political economy has had five important influences on the Lebowa household. First, the land ratio has weakened as a result of both increased population growth rates and of resettlement (Platzky and Walker, 1985). The traditional tribal system has as a result changed to the extent that all households no longer have access to residential, arable and grazing rights. Table 3.3 shows that only a fifth of rural households have access to all three land rights, while more than a third of the households have residential rights only.

Second, there has been an increase in the number of jobs in wage employment both within and outside the political borders of Lebowa. This increase is manifested in a long term trend and does not take into account the influence of changes in the business cycle. Third, an increasing number of households have become 'urbanized', both within the rural areas and in proclaimed towns (cf Graaff, 1986). Fourth, the traditional tribal leadership group has attained political power within Lebowa and the other homelands as evidenced by the composition of the respective Legislative Assemblies. Further, this leadership group retains the right of land allocation, and is not in favour of relinquishing this right (Fenyes and Groenewald, 1985a).

Fifth, given the farm household perspective the conclusion can be drawn that the security value of land rights has increased as a result of the above four factors. This includes the increased pressure of people on land, political as well as economic insecurity in wage employment and the uncertainty of getting a

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35 The word is used with the same meaning as in the phrase the tragedy of the commons, and does not ascribe motives of exploitation to the ownership group (cf section 3.2).

36 In Lebowa, for example, 60 of the 100 seats in the Legislative Assembly are reserved for makgoshi or chiefs, as are 5 of the 10 Cabinet Posts (DBSA, 1986:12).
house in urban settlements as was shown in Table 5.17. It also includes the fact that access to land rights is certain only for those who can stay in the favour of the leadership group which controls land allocation (cf eg Haines et al, 1984 : 13-24).

Although an exhaustive historical interpretation of the influence of these factors on the Lebowa household falls outside the scope of this study, it is argued here that the owners of large herds had both the motive and the opportunity to build a vested interest in preferential access to land rights, and specifically to grazing rights. Further, data from Fenyves (1982) and Fenyves and Groenewald (1985a) show that the tribal leadership group regards it as in their own interest to maintain this preferential access, while ordinary tribal members were found to support a variety of tenure changes.

The owners of large herds own at least half of the cattle in Lebowa and the tribal leaders among them allocate grazing rights also to other owners. These other owners have small herds, and cannot therefore produce income from their herds in any useful manner. They are therefore not inframarginal producers. Data on herd turnover for different herd sizes are not available for Lebowa, but average turnover is so low that it is possible to assume that the owners of large herds also do not keep animals primarily to produce an income. Aggregate herd turnover is shown in Table 6.1.

These data show that herd turnover is less than 7.5 per cent, where turnover includes all types of cattle sales, and sales at auction. The influence of the drought on turnover is also evident from the high death rate. Further, even at an average price of R400 per animal the average income from sales for those households who own cattle can be estimated at less than R200 per annum, given the sales ratios in Table 6.1.
Table 6.1  Herd turnover in Lebowa, 1980/81 - 1984/85

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio of sales to Total herd</th>
<th>Ratio of deaths to total herd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980/81</td>
<td>7.5</td>
<td>262.2</td>
</tr>
<tr>
<td>1981/82</td>
<td>6.5</td>
<td>297.4</td>
</tr>
<tr>
<td>1982/83</td>
<td>7.1</td>
<td>165.2</td>
</tr>
<tr>
<td>1983/84</td>
<td>5.1</td>
<td>70.5</td>
</tr>
<tr>
<td>1984/85</td>
<td>5.6</td>
<td>75.8</td>
</tr>
</tbody>
</table>


These data justify the conclusion that the owners of large herds also do not keep cattle primarily for the generation of income and that inframarginal production is not the reason for the creation of a vested interest in the grazing resource. By elimination therefore rent-seeking has been achieved through attempts to limit access to the grazing resource. Although the survey data show clearly that access to grazing has been limited this has not led to the elimination of overgrazing. The extent of overgrazing is shown in Table 6.2.

The recommended stocking levels of the Lebowa Department of Agriculture and Environmental Conservation were used to calculate the extent of overgrazing, and all animals were included as large stock unit equivalents. It is evident from Table 6.2 that more than 90 per cent of the commons is overgrazed. More than a quarter of the area is however grazed to within 150 per cent of the recommended stocking rate.
Table 6.2  The extent of overgrazing in Lebowa, 1981/82

<table>
<thead>
<tr>
<th>Utilization of carrying capacity (%)</th>
<th>Proportion of Tribal Areas and the size of commons</th>
<th>Western Region</th>
<th>Eastern Region</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportion</td>
<td>Area (Ha)</td>
<td>Proportion</td>
<td>Area (Ha)</td>
</tr>
<tr>
<td>&lt;100</td>
<td>7.1</td>
<td>16 181</td>
<td>10.8</td>
<td>11 275</td>
</tr>
<tr>
<td>101-150</td>
<td>11.9</td>
<td>21 115</td>
<td>18.9</td>
<td>13 951</td>
</tr>
<tr>
<td>151-200</td>
<td>14.3</td>
<td>29 377</td>
<td>18.9</td>
<td>14 473</td>
</tr>
<tr>
<td>201-300</td>
<td>28.6</td>
<td>42 379</td>
<td>17.6</td>
<td>10 376</td>
</tr>
<tr>
<td>301-400</td>
<td>28.6</td>
<td>10 418</td>
<td>16.2</td>
<td>7 416</td>
</tr>
<tr>
<td>&gt;400</td>
<td>9.5</td>
<td>12 221</td>
<td>17.6</td>
<td>3 561</td>
</tr>
</tbody>
</table>

Note: 1 All averages significant at the 70 % level of confidence.

Source: Lebowa Department of Agriculture and Environmental Conservation.

It is also evident that smaller commons are less severely overgrazed than larger ones and that the eastern regions, with a higher rainfall, are also relatively less overgrazed than the western regions. Further analysis of data from 7 tribal areas in the Thamamoo District during 1984/85 shows that there is a significantly positive correlation of 0.68 between the population pressure on land and the extent of overgrazing. There is also no significant correlation between population pressure and the size of the grazing resource. These are then the two major problems of the livestock subsector, namely low herd turnover and overgrazing, which occur despite the limitation of access to the

37 These data were obtained from the detailed livestock census data on which the Annual Report of the Department of Agriculture and Environmental Conservation is based, and which were referred to in Section 1.4 of this study.
Mickens (1981) has cautioned against simple explanations of the motives of individuals and groups in interpreting complex historical occurrences. The motives of the owners of large herds in limiting access can also not be ascribed to a single motive, and must necessarily include factors such as the investment value; the maintenance of tribal customs; the maintenance of their own prestige; the desire to keep the commons in customary ownership; and protection of owners of small herds by those owners of large herds who are traditional leaders. For both traditional and non-traditional leaders the motives could also include the desire for commercial gain and the benefits obtained from livestock products, such as milk and meat, for own use. Likewise, the extension of this limit to access to owners of small herds could also be the result of a complex of motives for both the tribal leadership group and the small herd owners themselves. These motives could include the maintenance of traditional customs, the direct benefits from animal products, investment value and protection for this group by the tribal leaders as forms of reciprocity, redistribution and exchange (cf eg Van Rooyen, 1983: 214).

The cause of the problems of the livestock subsector can therefore be ascribed to a complex of motives which include the tragedy of the commons as well as the nature of traditional society. This view does not however give paramountcy to these two causes, and inclines motives derived from features such as the influence of the integrated economy of Southern Africa, the changing nature of the tribal system and the influence of factors such as resettlement and internal urbanization within Lebowa.

Two major changes which have taken place in the livestock subsector include the concentration of between a half and two thirds of the cattle herd in the hands of four per cent of the rural population, and the fact that less than a quarter of rural households utilize grazing rights. Tribal leaders form part of the group who own the most cattle, and tribal leaders control
access to grazing. This group has therefore been an important factor in the evolution to the current situation. Given the complex of motives, mostly benign, which can be ascribed to this group, and given Whitehead's (1948: 17) definition of tragedy it would not be amiss to speak of a 'Tragedy of the Chiefs' or leadership eschelon rather than a tragedy of the commons.

The second major objective of this study was to propose more relevant development strategies for the livestock subsector, based on an alternative view of the current problems. A theoretical approach which confirms the institutional content of the commons and which increases the range of policy alternatives beyond that of internalizing externalities is therefore described next.

6.4 INSTITUTIONS AND THE ASSURANCE PROBLEM

The discussion of the Prisoner's Dilemma game in Chapter Three showed that this model cannot capture the complexity of common property institutions. This conclusion is also true for variants of the game such as repeated plays and the multi-person Prisoner's Dilemma. The reason for this conclusion is threefold (Runge, 1986: 628). First, the assumption of dominant free-rider behaviour does not make provision for the possibility of cooperative behaviour. Second, it does not take into account the effect of one person's expectations of the actions of other people, thereby ignoring interdependence among decision-makers. Third, it therefore does not deal with the uncertainty which arises from this interdependence.

Further, acceptance of the tragedy of the commons view inherent to the Prisoner's Dilemma reduces the possibility of institutional forms of land tenure to two, namely individual and common (Field, 1985: 364). In the discussion of the concept of land tenure systems in section 3.4.2 however it was shown that such systems are defined according to the manner in which the rules of the system specify who owns which rights, in what way and at what time. There are therefore many different types of
land tenure which range from a lack of rules (open access) to formal rules set in common law (private property rights). The conclusion is that common property rules exist in many permutations, and there are many different types of common property.

The function of rules in a common property system are the same as the rules in any other type of institution, namely to provide assurance by coordinating the expectations of others' actions and thereby to reduce the uncertainty inherent to situations of interdependent decision making (cf eg Lave, 1985).

6.4.1 The Assurance Problem

The acceptance of nonseparable externalities in communal grazing regimes suggests that uncertainty is the main problem, and that institutions are a major determinant of individual actions. This emphasis on the institutional environment allows reformulation of the problem of the commons as a problem of cooperation, known in game-theoretic terms as the Assurance Problem (AP). Such a reformulation is effected by Runge (1981b: 600-601; 1983b: 13-17; 1984b: 160-162; 1986: 628-631) and can be described by means of the 'Battle of the Sexes' game, whose payoff matrix is shown in Figure 6 below.

The man prefers to go to the dog races and the woman prefers to go to the ballet. They both would, however, prefer to go together to either entertainment than to split up and go alone. There are therefore two equilibrium points, namely both going to the ballet or both going to the dog races. The result of this construct, namely that the woman would prefer to go to the dog races with the man above going to the ballet alone and vice versa, is that both parties gain from adhering to any rules which they may make. Once an agreement is made, they have no incentive to defect, and the problem is then to be assured regarding the other person's actions. They must correlate their expectations and cooperate through some rule which assures that they go out together (Runge, 1981b: 601). A graphical explanation of the
payoff matrix in Figure 7 shows how the attainable set is expanded as a result of the cooperative rule.

<table>
<thead>
<tr>
<th></th>
<th>Woman</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ballet</td>
</tr>
<tr>
<td>Ballet</td>
<td>(1,2)</td>
</tr>
<tr>
<td>Dogs</td>
<td>(-1,-1)</td>
</tr>
</tbody>
</table>

Figure 6: The battle of the sexes

Figure 7: Payoff space for the battle of the sexes.

Source: Runge, 1981b: 601

It is easy to show that the shaded area represents the achievable outcomes when individuals choose their strategy independently and there is no cooperation between them (i.e., the prisoners' dilemma). Suppose that the woman goes to the dog races and the man makes a random choice between ballet and the dogs. Their payoffs are
shown by line LJ. If the man flips a coin to choose then, given the payoff matrix shown above, his expected payoff is \(\frac{1}{2} \times 2 + \frac{1}{2} \times (-1) = \frac{1}{2}\), and her payoff is \(\frac{1}{2} \times 1 + \frac{1}{2} \times (-1) = 0\). This gives point N on the graph, with the payoff pair \((\frac{1}{2}, 0)\). If each tosses an unbiased coin then the four strategy pairs of the payoff matrix has a profitability of \((\frac{1}{2})^2 = \frac{1}{4}\) each. The expected utility of both the man and the woman is \(\frac{1}{4}(2) + \frac{1}{4}(-1) + \frac{1}{4}(-1) + \frac{1}{4}(1) = \frac{1}{4}\), giving the payoff pair \((\frac{1}{4}, \frac{1}{4})\) shown as point F. Various profitability combinations will trace out the convex hull shown in Figure 7. The non-cooperative attainable set is then shown as the shaded area of the graph. The attainable set is however increased to include the whole area bounded by LKJ when coordinated strategies are used. When players recognize that their choices are interdependent and they devise coordinated strategies then cooperative solutions such as point M become attainable (Runge, 1981b: 601).

It can also be shown that, given the assumption of the AP, the free-rider equilibrium is no longer unique (Runge, 1984b: 160-161). If two individuals \((K = 1, 2)\) can choose between one of two strategies \((0 \text{ and } 1)\) then the payoff, \(p^K\) is a well-ordered function of their strategy choices. The individual strategies are given as \(i\) and \(j\), and it is assumed that 0 represents free rider behaviour and 1 some positive contribution to a public good (eg withdrawing livestock from the commonage). The payoff to each player is then given as

\[
p^K = p^K(i, j) \text{ where } k = 1, 2; \ i = 0, 1 \text{ and } j = 0, 1
\]

while the preference orderings for the players are

\[
p^1 (1, 1) > p^1 (0, 0) > p^1 (0, 1) = p^1 (1, 0) \quad (2)
\]

and

\[
p^2 (1, 1) > p^2 (0, 0) > p^2 (1, 0) = p^2 (0, 1) \quad (3)
\]

where \(>\) implies 'strictly preferred to'.

The Pareto-optimal outcome is joint contribution \((1, 1)\), while
both joint free riding \((0,0)\) and joint contribution are equilibria. The reason these are both equilibria can be deduced from equations (2) and (3). For joint free riding, \(F_1(0,0) > F_1(1,0)\) and \(F_2(0,0) > F_2(0,1)\) while for joint contribution, \(F_1(1,1) > F_1(0,1)\) and \(F_2(1,1) > F_2(1,0)\). There is also no strictly dominant strategy, as the AP implies that joint action (whether joint free riding or joint contribution) is preferred in public goods situations. In contrast to the tragedy of the commons view multiple equilibria are therefore possible and the free rider equilibrium is no longer unique.

This enlarging of the set of attainable solutions beyond free rider behaviour requires coordinated strategies on the part of the players. These coordinated strategies will in turn be feasible only when players' choices are interdependent as a result of nonseparable externalities and, as a result, they devise rules which provide assurance regarding the expected actions of others. By implication, the rules which arise from the AP are therefore a mirror of institutional rules which arise within society as endogenous responses to the uncertainty which is inherent to the interdependence in social and economic interaction (Runge, 1981b: 601).

The AP provides an appealing alternative view of the common property externalities inherent to the communal grazing regime by placing emphasis on interdependence and uncertainty as factors in individual decision making. The acceptance or rejection of this view has obvious implications for policy formulation, as does the acceptance or rejection of the tragedy of the commons view. In the next section the assumptions underlying these two views are contrasted, and the policy implications of the alternative view, based on the AP, are enumerated.

6.4.2 The Assurance Problem and the Prisoner's Dilemma

The PD game has been widely used to model the neo-classical view of common property externalities. Recognition of the existence of these externalities has led to the identification of free
rider behaviour as dominant, and therefore to policy proposals aimed at internalizing externalities and countering free riding. The aim in all these proposals is to coerce or encourage individual decision makers into introducing social costs in their optimizing behaviour. A further option is that of voluntary agreements (Mishan, 1971: 16). These are however assumed to be too expensive to negotiate and maintain in the face of dominant free rider behaviour as to be impractical in all but small groups.

There has been some discussion in the literature regarding the definition of separable and nonseparable externalities (cf Oosthuizen, 1977: 89-90 for references in this regard), and the conclusion has been drawn that separable externalities are not a common phenomenon. No notice is taken of the fact that the tax/subsidy solution is impossible in the presence of nonseparable externalities. Further, Baumol (1976) has shown that separable externalities are not only implausible, but impossible.

When common property institutions are modelled as an AP, the externalities are shown to be nonseparable. The AP is therefore able to take interdependence and uncertainty in individual decision making into account and provides a better description of the voluntary agreements which are found, even among large groups, in public goods situations. In a situation of interdependence between decision makers coordinated expectations are a sufficient condition for voluntary contributions to public goods, regardless of group size or the absence of outside enforcement (Frohlich and Oppenheimer, 1970).

It is important to note that the AP does not predict that institutions which enhance assurance through coordinated strategies will arise in all common property situations. Rather, it infers that such institutions are possible as endogenous responses in the absence of a dominant free rider incentive (cf eg Smith, 1980). A further conclusion is that, once a cooperative strategy has been accepted, it is self-reinforcing. The achievement of common property rules is not costless,
providing its own incentive to retain them especially in the face of even higher transaction costs involved in privatization (Runge, 1981: 602; 1983: 15-16).

The AP does also not infer that enforcement is unnecessary, as some enforcement of cooperative agreements is likely to be required. There is however no reason to predict that this enforcement will have to come from outside, as it may readily emerge from within the group. Enforcement from within or outside the group is not necessary if a cooperative institutional rule exists which provides complete certainty regarding the actions of others. This is however a limiting case, and it can be expected that enforcement is necessary when strategies are imperfectly coordinated (Runge, 1981: 603).

It is however necessary to note that it has been found that if endogenous changes to rules in a common property regime are not forthcoming, regulation by an external authority is also unlikely to succeed (Libecap and Wiggins, 1984; 1985; Wiggins and Libecap, 1985). The reason for this is that if participants cannot reach agreement among themselves they will oppose regulation. The reasons for opposition usually include the establishment of vested interests in the rent which is currently gained by participants. In this regard Libecap and Wiggins (1985: 713) come to the conclusion that agreement must be reached before participants have been able to establish vested interests. In this view there is doubt about the ability of policy makers to increase the efficiency of resource use if this has redistributive consequences and the groups harmed have political influence. Policy aimed at adapting common property rules needs to take these vested interests into account. This also serves as an additional caution to reliance on externally imposed regulations.

Acceptance of the AP as a model of common property leads to policies which are based on an acceptance of the influence of the specific resource constraints of an environment on institutional innovation. In situations where cooperative rules are likely to
facilitate the achievement of development objectives these should be allowed (or assisted) to be evolved. Where the cost of maintaining or achieving such rules is too high, outside enforcement could be necessary if cooperative rules are desirable. If not, the introduction of private property rights (in land or some other instrument) could achieve the desired objectives. Common property does therefore not imply an absence of institutional content and common property institutions are subject to change. The set of achievable policy measures is therefore extended beyond the choice between internalizing externalities and doing nothing to include measures which will bring about institutional change. In the following section examples of appropriate policy measures are discussed.

6.5 POLICY PROPOSALS

It has been postulated in this study that an institutional approach can provide a better solution to the problems of the livestock subsector than is the case with the conventional approaches. In such an institutional approach it is necessary to specify the determinants of the potential demand for and supply of institutional change in order to be able to determine the direction which such change will take. Given knowledge of these demand and supply determinants, it is also possible for the policy maker to induce institutional changes by various means aimed at influencing these determinants. Such measures should be seen as additional to the well-known policy instruments which aim to change institutions in a more direct manner.

The determinants of the supply of institutional change include factors such as the current availability of resources and technology as well as cultural endowments. They also include vested interests in the current system. The demand determinants on the other hand include the current level of resource use, changes in the political economy which increase the availability of alternative investment opportunities and the vested interests of those who are at present afforded protection by the current system. These factors need to be taken into account in the
design of a strategy for induced institutional innovation.

The purpose in this section is not to specify these demand and supply determinants in any detail, as existing knowledge of local circumstances is not sufficient. For this reason it is necessary first to motivate the need for change in broader terms. The elements of a strategy for the development of the livestock subsector can then be derived.

6.5.1 The equity principle

The neoclassical microeconomic model, in what has been termed the Tight Prior Equilibrium variant, has little to say about equality. The extent of this lack of concern is reflected by Johnson (1973: 54) who regards the concern with equality in part as '... a naive and basically infantile anthropomorphism'. This extreme view was based on the assumption that the market would by definition provide society with a just distribution of income and wealth. This assumption has in turn long been questioned (cf eg Knight, 1935: 54-58; Hayek, 1960: 93-100) and it is accepted that redistributive policies are required to further the ends of fairness or justice in society.

There is evidence, based on the assumption that utility functions are interdependent in the consumption of both private and public goods, that income redistribution could be a necessary condition for the achievement of Pareto optimal efficiency (Hochman and Rodgers, 1969). It remains true however that in most cases there is a trade-off between equality and efficiency (Okun, 1975: 88). The fact that such a trade-off exists means that an equal distribution of income can only be achieved at a cost, and this has led to the postulation of theories of what constitutes justice in society. Examples of such theories include Rawls (1972), Thurow (1973) and the theories of fairness and super-fairness which have received research attention (cf Baumol,

38 As quoted by Okun (1975: 5n).
Both the practical aspect of having to consider the costs of a redistributive approach as well as the logic of these theories of justice lead to the conclusion that equality of opportunity is more achievable and more desirable than equality of income and wealth (Okun, 1975: 75). If equality of opportunity is however interpreted as meaning that all must have a perfectly equal opportunity in society, it is also not achievable (Okun, 1975: 76). This has led to the principle of fair or equitable access as a measure of achieving justice in society. This principle of justice in society is also in accord with one of the assumptions underlying the attainment of efficiency in the economy via the market mechanism, namely that of free entry to and exit from markets. It can therefore be postulated that economic efficiency can be promoted by measures which allow fair access to the market, i.e. by applying principles of justice to public policy.

In view of this a Rawlsian view of a fair society seems justified (Rawls, 1972). To Rawls, if the world were fair, we would willingly enter it randomly. This is not the case as regards the livestock subsector in Lebowa and the other homelands, nor is it the case in the southern African political economy in general. Proposals to change the institutions which structure the livestock subsector should take this principle of justice into account in the design of a more efficient system. In this design the economic, social and natural environment at the local level would also have to be taken into consideration.

6.5.2 The commons as a policy alternative

Policies based on the conventional approach to the problems of the livestock subsector have failed because they have been aimed at the removal of the existing tribal land rights system, and do not take account of the economic, physical and social environment within which livestock holders operate, nor do they take account of changes to this environment (Lawry, 1985: 61-62; Lawry, et al, 1985: 19; Runge, 1986: 631). These authors also identify
a number of reasons why changes to the communal grazing regime should retain common property characteristics.

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

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

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

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

In principle, policy for the development of the livestock subsector should therefore not aim to remove all common property institutions. This does not imply that private use rights cannot
be promoted, but only that in many cases communal use rights should be maintained (Runge, 1986: 632).

The arguments in favour of common property institutions given above are to a large degree also valid for the situation in Lebowa. In this respect it is however clear that the current common property rules cannot be maintained as they promote neither efficiency nor equity for all rural households. To privatize tenure would however remove the protection which common property affords those who have access at present, and increase the skew distribution of ownership. It is therefore clear that changes to the current tenure are desirable, and that these changes can include both private and common land rights. These changes need to be adapted to the natural environment and the southern Africa political economy.

This study has shown that there are three factors which should be taken into account in the formulation of a development strategy for the livestock subsector. First, policy measures should be aimed at ensuring equitable access to the livestock subsector. Second, policy measures should include changes to the common property institution which maintain the common property characteristic. Third, policy measures should take into account the specific natural and social environment within which they are to be introduced. Important elements of this environment include the nature of tribal society as it exists today, the level of adherence to traditional practices, the nature of rural society in general, the current distribution of both access to grazing and ownership of livestock, current vested interests, the current degree of overgrazing and the interaction with the southern African economy.

The success of a development strategy is necessarily derived from the objectives of that strategy. In this regard the motives of individuals for owning livestock are important. Conventional approaches to the livestock subsector have been based on the assumption that livestock are kept for monetary gain (the tragedy of the commons), for religious and cultural purposes (the cattle
complex) or as a savings bank which also provides non-monetary and monetary benefits (the store of wealth). The view taken in this study is that the motive for ownership differs between individuals and groups in society, and can in effect include all of the above motives.

Development based on the small farmer approach implies that the objectives of development should be derived from the objectives of the participants in the process of development. For this reason the objective of a livestock development strategy should be to allow people to keep livestock for the purposes which they desire. This should however be balanced with the proviso that the ends of society should also be furthered, and this is patently not the case when the grazing resource is overexploited, or when there is no fair access to that resource. A development strategy should therefore aim to achieve three things, namely that individuals and groups of people should be able to keep livestock for the purposes which they desire, that the grazing pressure on the veld should be reduced, and that there should be fair access to the grazing resource in order to promote the efficient exploitation of this resource.

To the extent that a strategy achieves a balance between the interests of individuals and groups in society, these three objectives will be mutually reinforcing. A strategy for development of the livestock subsector which takes the three aforementioned factors into account, as well as these objectives, can now be formulated.

6.5.3 Induced Institutional Innovation and the Commons

Communal grazing tenure is a major feature of the livestock subsector in Lebowa and policy alternatives include changes to this system of tenure which can retain common property characteristics. Further, it was shown in Chapter Two that there are three ways of bringing about institutional change. These include institution-building and the negotiated creation of institutions as direct approaches, and induced institutional
innovation as a more indirect approach. It can be argued that induced innovation conforms more closely with the small farmer approach to development as it gives greater recognition to the ability of the individual to make rational decisions. In this sense it also relies more on the participation of the inhabitants of the areas which are to be developed than do the direct approaches. Whereas a development strategy should include direct and planned institutional change, it can however be argued that greater emphasis should be given to induced change than has been the case until now.

It is evident that the small farmer approach, and by implication the process of induced institutional change, requires a detailed knowledge of local circumstances. The policy maker is therefore faced with a conundrum, as it is not easy to gauge what the exact conditions are at the local level.

Two important points should be made in this respect. First, it is usually not possible to predict the exact reaction of people to policy interventions. It is also not desirable to try and make such predictions. Knowledge of local circumstances will however enable the policy maker to at least predict the direction of the reaction, and it is to this end that information is necessary. Second, given the small farmer support approach, it is not necessary to always have detailed knowledge of local circumstances, as such knowledge is in any case carried within the community. The policy maker needs only to know enough to be able to propose alternative policy instruments, while it is for the community and the individual to decide on the desired development. This latter point is not valid when the direct approach to institutional creation is followed. Here, it is also not possible to predict the reaction to policy interventions, while detailed knowledge of local circumstances is required in

39 In this regard Brand (1985: 9) quotes Hunter (1978: 31) to the effect that: 'The village people have two thirds of the necessary information in their heads - they are "living data banks"..."
fitting institutional design to human society.

There are in principle two things that the policy maker needs to know regarding local circumstances. The first, which is easily measured, is the current state of the grazing resource. This will determine the need for urgency in implementing development policies and can also serve as an indirect indicator of the degree of social coherence in rural society. The second is knowledge of the current rules which define the common property institution. Although it can be expected that there are rules which are common to all social groupings, local variations in rules must also be expected. Knowledge of such rules can be gained indirectly, or directly by asking. In the former case indicators such as the existence of intracommunity strife, the distribution of assets and income within the community, the presence or absence of tribal leaders and the reaction of individuals and groups to induced technical and institutional change can serve to show the nature of current rules.

There exists a further method of ascertaining both the knowledge of local conditions required, as well as the efficacy of various policy proposals. This method implies the testing of the various policy options by means of pilot projects. Such pilot projects are already under consideration or in implementation in various parts of southern Africa and examples of these are given where relevant in the following paragraphs.

Given knowledge regarding these two factors it is postulated here that a development strategy for the livestock subsector can be built around the interrelationship between the level of overgrazing and the degree of adherence to current common property rules by different groups within each specific community. In this regard a matrix which describes the various

40 The experience in the 'coloured' rural area of Ebenezer in the North Western Cape is instructive, as the commons is not overgrazed while cooperative practices among individuals are still followed. (Personal Communication by Mr F H J Coetzee, who has conducted research in the area).
permutations in local conditions can therefore be proposed as is shown in Figure 8. As both of the factors exist in a continuum rather than in discrete units, such a matrix will consist of an infinite number of 'cells'. These can however be reduced to four 'cells' if only the more typical cases are taken as being representative of all communities. Once the circumstances in a community have been identified and the specific combination of the two factors ascertained the strategy can be operationalized by means of relevant policy measures. These policy measures can be derived from the institutional approach which has been postulated in this study, or they can take the form of more direct institutional interventions. Examples of policy measures for the different types of local circumstances are given below. It is of course not possible to predict beforehand what the outcome of such proposals will be and it is necessary that pilot projects be undertaken where possible and feasible.

It is hard to believe that there can be many cases where there is conflict among tribal members and under-utilization of the grazing resource. In these cases the area will be characterized by a monopoly of ownership of livestock by the leadership eschelon and is an extreme case of a tragedy of the chiefs. In these circumstances the rights of the non-leadership group cannot be protected, and the policy maker has few options to exercise. Available options will include the provision of alternative grazing rights, or alternative sources of monetary and non-monetary income for those who have no grazing rights. In extreme cases consideration may have to be given to removing the monopoly rights of the leadership group.

The situation where there is harmony among tribal members and underutilization of the commons, or in any case less severe overgrazing, presents an interesting conundrum for the policy maker. The temptation must be either to intervene where this is not necessary, or not to intervene when conditions point to increased overgrazing in the future. These situations call for caution, and where conditions lead to the conclusion that the
**Increased adherence to social rules**

<table>
<thead>
<tr>
<th>Increased Overgrazing</th>
<th>EXTREME TRAGEDY OF THE CHIEFS</th>
<th>THE IDEAL SITUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Provision of alternative grazing rights.</td>
<td>1) Ascertain whether this situation will last. If affirmative, no policy measures required.</td>
<td></td>
</tr>
<tr>
<td>2) Provision of alternative monetary and non-monetary benefits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Removal of monopoly power by encouragement or coercion.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE MOST PREVALENT SITUATION</th>
<th>TRAGEDY OF THE COMMONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Induced institutional innovation.</td>
<td>1) Privatize tenure.</td>
</tr>
<tr>
<td>2) Intervene directly by means of institution-building.</td>
<td>2) Marketable grazing rights.</td>
</tr>
<tr>
<td></td>
<td>3) A tax on cattle.</td>
</tr>
<tr>
<td></td>
<td>4) Enforcement of cattle numbers.</td>
</tr>
</tbody>
</table>

*Figure 8*: A policy matrix for institutional change.
stocking levels are set to increase, appropriate policy measures should be implemented. These policy alternatives are substantially the same as those which can be proposed for the fourth situation.

Many examples where there is no conflict among tribal members and severe overgrazing of the commons. Such a case will be characterized by an absence of social rules governing grazing rights, and represents a true tragedy of the commons. The policy options in this case are familiar.

It can be inferred from survey data that in most areas of Lebowa there is a varying level of adherence to common property rules, and varying levels of severity of overgrazing. Differing degrees of social cohesiveness and of free riding can therefore be expected among communities. Again, policy alternatives should be selected and adapted in such a manner that they fit local circumstances. It is in these circumstances that induced innovation has the greatest potential for success.

Policy alternatives can address the physical, technical or institutional aspects of the livestock subsector in a specific area. The interrelatedness of these factors will of course mean that a change in one should be designed to induce changes in the others. Changes to the current stocking level can serve as an illustration.

A perceived level of stocking which is in excess of the carrying capacity of the veld is usually seen in terms of too many animals per unit of land. This usually leads to proposals to decrease the number of animals. There are however two other ways of alleviating the situation, namely by increasing the land, or by improving the quality of the land. Again, the argument is usually that the level of stocking should be decreased before proper veld management practices can be introduced. This is however not always the case, and where overstocking is not pathological current levels can be maintained on improved grazing.
The reaction of livestock owners to such an improvement in the condition of the veld can of course not be easily predicted, as it will depend on their specific conditions. They could either increase their own herds, allow more people access, change the herd composition, do nothing etc. Such a policy intervention could also in turn lead to more conflict or more cohesiveness in the community, again depending on local conditions.

An example of the effect of a change in a technical factor which can induce changes to the natural and institutional factors can be found in the high proportion of bulls in the cattle herd in Lebowa. The number of mature and immature bulls has averaged between 10 per cent and 14 per cent of the total herd between 1979/80 and 1984/85 (Annual Report), which is higher than necessary. If agreement can be reached to cull bulls in exchange for example for an efficient siring service, as is at present in implementation in Ciskei, this could again result in a number of possible outcomes. These outcomes could include an impact on the grazing resource and on the community in general. Given the nature of human affairs, it is again not possible to predict exactly what the outcome will be unless the particular circumstances of the community are known.

Further examples can be given of the effect of an institutional change on both the technical and physical conditions of production. The members of a community of stockowners could for example decide to establish a permanent pasture close to their village and to share the cost of establishment and maintenance. This pasture could for example be used exclusively for grazing smallstock and donkeys, or it could be used in rotation with the natural grazing for cattle. Again, this could lead to changes in livestock management practices and in the levels of grazing pressure. The direction of such change will also depend on the prevailing local circumstances. Another example of an institutional change could be to divide the commons up into smaller commons on which groups of livestock owners can graze their animals (cf eg Field, 1985). Such a proposal has a number of
advantages, including the fact that these groups could agree among themselves on the rules governing the use of the grazing land. A further advantage is that it could present a greater possibility over time for individuals to farm each commons more productively for the benefit of the whole group.

The policy alternatives which have been illustrated thus far have all been concerned with the livestock owner as decision maker and as member of a community. Policy measures should also address the livestock owner within the context of the household. In this regard measures can be introduced which for example change the price ratios of the inputs in the household production function. Given the high value of benefit provided by milk for own consumption, measures which lower the cost of producing milk or which reduce the risk of producing milk for own use could for example induce households to keep fewer animals. It is also possible to envisage circumstances where an ensured supply of milk will lead to a reduction in the number of people who keep cattle.

The examples given above have all involved interventions which could lead to changes in communal tenure rules in an indirect manner. There are in addition many policy measures which have a more direct impact on the current tenure system. These include variants of the group ranch concept and management contracts to farm the commons on behalf of the tribe. Given the poor history of such attempts in other parts of sub-Saharan Africa, however, these alternatives should be regarded with caution. They should also only be considered as second-best measures. As the literature on these policy approaches is large they will not be discussed here.

41 A pilot project currently being implemented in the Bethanie area of Bophuthatswana serves as an example of this proposal.

42 Sandford (1983) gives an exhaustive review of these various options, while Crotty (1980) discusses a specific variant of the corporate model.
The conditions regarding the extent of overgrazing and the degree of social cohesiveness in a specific area will also determine the impact of changes in the agri-support system. In this regard those organizations and systems which support agriculture in general and the livestock subsector in particular should also receive attention. Here again it is possible to induce change by deliberate changes in one factor. There have for example long been attempts to provide stockholders with the services of approved bulls for their cows. These programmes have usually been combined with forced stock reduction schemes, and they have also usually been provided at subsidized cost by the state. This service could be privatized to the extent that individuals could contract to provide bulls. Such a proposal is in accord with the principles of the small farmer approach, and the project in the Ciskei mentioned above, as well as a similar project in Venda serve as examples in this regard.

Speculators have also long played a role in brokering cattle sales for individual stockowners. These people can be given financial assistance to enable the creation of a more efficient market. The marketing of animals for meat is in any case problematic because of the controlled marketing system in South Africa, and policy measures should be aimed at either circumventing or exploiting this system. Circumvention is possible as Lebowa does not fall within a controlled area in terms of the meat marketing scheme, so that local marketing can be encouraged.

Further examples of changes to the agri-support system which can induce technical, physical and institutional change in the livestock subsector can also be found. The improvement of roads could lead to more taxi services and a decreased demand for donkeys. It is also known that in Lebowa the better provision of ploughing services can lead to a reduction in stock numbers. Given the high opportunity cost of time, there is a demand for these services, and it is observed that people will often sell livestock to pay for this service.
These examples of policy measures are all concerned with direct or indirect changes to the communal grazing system. It is of course not clear whether such measures will lead to the commercialization of the livestock subsector, nor is this necessarily desirable in the short term. To the extent that there are individuals who wish to farm with livestock on a commercial basis, however, they should also be accommodated within a development strategy. This issue is not dealt with in any detail here as it has received research attention elsewhere. This research addresses issues such as the segmentation of land in South Africa on a racial basis (cf eg Cobbett, 1986; Coetzee, 1986; and Vink, 1986), the settlement of farmers on newly incorporated land within the homelands (cf eg Vink, 1986; Vink, forthcoming) and measures to deracialize farming in the 'White' farming areas without necessarily changing the Land Acts (cf eg Brand, 1986).

These are a few examples of the type of policy measures which can be introduced as part of a development strategy for the livestock subsector. A singular feature of the institutional approach to the livestock subsector is that the range of possible policy alternatives is increased. This approach makes the conceptualization and design of more innovative policy measures feasible. The one caveat is that policy measures must take account of the natural and social circumstances which prevail at the local level.

It is in this respect also important to gain a better understanding of the direction of change induced by these policy measures. These aspects can for example be tested by means of pilot projects such as those in Bophuthatswana, Ciskei and Venda which have been referred to here. The insight gained from such pilot projects can be an important input in the process of designing policy measures which are tailored to local circumstances.
6.6 SUMMARY AND CONCLUSIONS

The purpose of this chapter was to explain the changes to the communal grazing regime, to evaluate the change, and to propose a strategy for development of the livestock subsector. To this end it was shown first that the communal grazing system had changed as a result of rent-seeking by means of a limitation of access to the grazing resource. Given the generally poor state of the grazing resource however these are not monetary rents created in production. For this reason the motives for limitation of access cannot simply be reduced to that of exploitation at the cost of the community.

The conclusion reached was therefore that the communal grazing system could not be left unchanged, given the poor state of the grazing resource and the skew distribution of livestock ownership. In this regard it was shown by means of an analysis of the Assurance Problem that policy measures should include the possibility of adaptations to the common property institution. An institutional approach to the livestock subsector could therefore be followed.

Given these observations, it was then possible to propose a development strategy which is based on the institutional approach. It was shown that such a strategy should aim to ensure equitable access to the grazing resource, could include the maintenance of the common property features of the grazing tenure, and should take cognizance of local conditions. Further, it should aim to achieve a balance between the interests of different individuals and groups in society. In addition to measures which ensure more equitable access, this implies measures to relieve the grazing pressure being experienced at present, and measures which will allow people to keep livestock for the purposes which they desire.

This in turn enabled the formulation of examples of specific development policies which take into account the natural and social environment of specific communities. Acceptance of the
in Institutional approach mean that the formulation of more innovative policy measures, among others to induce institutional change in society, is feasible. These policy measures should, where possible, be tested in pilot projects.
CHAPTER SEVEN
SUMMARY AND CONCLUSIONS

7.1 INTRODUCTION

The purpose of this study was to analyze the weaknesses of current approaches to livestock development in southern Africa and to propose an alternative approach. In order to achieve this it was necessary first to review current agricultural development approaches and their applicability to southern Africa. On this basis a preliminary analysis of current approaches to livestock development policies could be used as a motivation of the need for a new approach. An analysis of recent literature on microeconomic theory and survey data results could then be used to evaluate current approaches as well as the alternative approach. This analysis could be used as the basis for the formulation of a strategy for the development of the livestock subsector.

In this chapter the method of analysis, the results of the analysis and the concomitant policy proposals made in the study are summarized.

7.2 THE RELEVANCE OF AGRICULTURAL DEVELOPMENT MODELS

Research into agricultural development problems has provided new insight in four different ways. This has resulted in new strategies which are more location-specific, which take account of the political factor, which are based on a small farmer approach and which make use of results from other research disciplines. Research on agricultural development in sub-Saharan Africa has however taken little note of the problems of the livestock subsector despite its importance in terms of the availability of resources.

The applicability of these models to the southern African regional economy was then discussed in terms of these new
Insights. This also enabled a review of current approaches to agricultural development in this region. Again, it was shown that little attention has been paid to the problems of the livestock subsector despite its relative importance in terms of both size and potential. Further, livestock development models have also not included the new insights gained from agricultural development research.

It is against this background that both microeconomic theory and survey data results could be applied in the search for a new strategy.

7.3 RECENT DEVELOPMENTS IN MICROECONOMIC RESEARCH

The theory of welfare economics is concerned with the definition of economic efficiency, the efficiency of different resource allocation systems and policy interventions to improve social welfare. In its pure form the theory has been developed into a rigorous model which describes the conditions for general equilibrium in an economy. The underlying assumptions of the model have however long been questioned.

In this regard three of these assumptions were found to be important for the purposes of this study. These are the assumption of utility and profit maximization, of frictionless markets and the ceteris paribus assumption regarding technology and institutions. The effect on microeconomic theory of relaxing each of these assumptions could then be studied.

The extensions to microeconomic theory which have resulted from the relaxation of these assumptions have increased the predictive power of the model without the loss of rigour. These extensions do not however fully account for the role of institutions in society, and in this regard an institutional approach was found to be necessary. The induced institutional innovation model was therefore analyzed. This approach necessitates knowledge of the origin of an institution as well as the interrelationships between institutions and the physical and technical environment.
Knowledge of the supply of and demand for institutional change enables the policy maker to predict the possibility and direction of future changes in the physical, technical and institutional environment.

7.4 CONVENTIONAL APPROACHES TO LIVESTOCK DEVELOPMENT

The most popular explanation of overgrazing and low productivity in the livestock subsector is based on the tragedy of the commons hypothesis. This model is based on the conventional view of common property as a public goods externality. Livestock development policy would then be based on measures aimed at internalizing these externalities. Further analysis shows however that this hypothesis can be rejected on theoretical, experimental and empirical grounds.

There have also been attempts to explain the problems of the livestock subsector in terms of the supposed irrationality of peasants. These explanations are rejected. An alternative approach which recognizes the asset value of livestock has been based on household economics theory. The resultant farm household model was found to be far better at explaining the current situation in the less developed areas of southern Africa. It does not however take into account the complex of motives which people have for owning livestock. To the extent that policy proposals for livestock development are that the commons should be privatized, the model does not improve upon the tragedy of the commons view.

7.5 THE LIVESTOCK SUBSECTOR IN LEBOWA

The end result of this analysis of agricultural development theory, of microeconomic theory and of conventional approaches to livestock development was the conclusion that an institutional approach is necessary to explain the problems of this subsector. Such an approach would also have to take cognizance of local circumstances and of political factors, and would have to be based on the small farmer approach. In this regard a number of
data sources were used to describe the livestock subsector in Lebowa as well as its interrelationships with the regional economy.

The purpose of this data analysis was to identify those households in Lebowa who own livestock. In this regard, household income, expenditure, and ownership of assets and of livestock were analyzed. The analysis of household income showed that urban households have a higher income than rural households and that they also had greater access to wage employment than rural households. The range of incomes is greater in rural areas, although fewer rural households have below-average income. A further conclusion was that both urban and rural households had access to a wide range of income sources, while the supplementary sources of income for the two groups differed. Rural households depended more on migrant remittances and pensions as supplementary sources.

These data on household incomes were then used to confirm some predictions of the farm household model. A further conclusion was that income was skewedly distributed, both as regards the level and the access to sources of income. More than two-thirds of rural households earn less than R200 per month, and female-headed households earn less than 64 per cent of the income of male-headed households. The data also show that rural households spend a greater proportion of their income on food than do urban households, and that expenditure on investment goods for all households is greater than spending on clothes and furniture.

The analysis of asset ownership shows that urban households are wealthier than rural households, and that asset distribution is more skewed among rural households. Relatively fewer urban households have a house than do rural households, and fewer low-income households own each class of asset than do higher-income households. The survey data also show that household characteristics differ according to household size. In general, the middle-sized families had the highest incomes and owned the most assets.
Further, data on cattle ownership show that it is the high-income, asset-rich households who own the largest cattle herds, while the older, less well-educated household heads own small herds. In total less than a quarter of all rural households own cattle. Corroborating data also show that the majority of owners of large herds belong to the traditional and non-traditional leadership group. This group owns more than half of the total cattle herd in Lebowa while they number less than 4 per cent of the rural population.

Two important conclusions drawn from this analysis is that the motives for ownership could not be ascribed to single factors such as custom or profit maximization only, and that the communal grazing system had changed from former times. The next step in the analysis was therefore to try and explain the relevance of these conclusions for a livestock development strategy.

7.6 INDUCED CHANGE IN THE LIVESTOCK SUBSECTOR

As a first step, an exposition of the theory of rent-seeking made it possible to explain what is regarded as the major cause of change to the traditional communal grazing regime. In this regard it was shown that the skew distribution of ownership could be ascribed more to a tragedy of the chiefs than to the tragedy of the commons. The motives underlying this tragedy of the chiefs could however not be reduced simply to that of exploitation of the grazing resource at a cost to the community.

The Assurance Problem in game theory was then used to explain the nature of institutional change. In this regard it was shown that institutions supplement the market when price vectors do not convey perfect information. They fulfill this function by providing assurance regarding the actions of individuals in cooperative situations. In this way they reduce uncertainty in situations of interdependent decision making. This leads to the conclusion that institutional adaptations to common property rules can include more than just the introduction of private
property rights. They could also be aimed at the maintenance of the common property characteristics of the current tenure system.

The measured skew distribution of livestock ownership, which also implies a higher rate of ownership of other assets, higher income and greater political power, was then used as one reason for proposing changes to the current grazing tenure. A further reason included the poor state of the grazing resource.

In this regard examples of policy alternatives which could be used in common property systems were listed. The basis of these policy proposals was twofold. In the first place policy measures should be designed in such a manner that changes in either technical, physical or institutional factors would induce change in the community. As it is not possible to know beforehand what the exact nature of such change would be, the knowledge necessary to at least predict the direction of change was also discussed. The second basis for policy proposals therefore included a discussion of the influence of social cohesiveness and the extent of overgrazing on induced institutional and technical change.

The guiding principle in the formulation of these policy proposals was taken to be that resources should be used efficiently, and that there should therefore be an equitable distribution of access to these resources. In this manner the ends of social justice would also be furthered.
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