

**TENURE SECURITY AND PRODUCTIVITY IN THE ZIMBABWEAN SMALL
FARM SECTOR: IMPLICATIONS FOR SOUTH AFRICA**

by

GRAHAM MALCOLM MOOR

Submitted in partial fulfilment of
the requirements for the degree

DOCTOR OF PHILOSOPHY

in the

Department of Agricultural Economics

University of Natal

Pietermaritzburg

1996



I hereby certify that the work reported in this thesis, unless specifically indicated to the contrary in the text, is my own original and unaided work.

G.M. MOOR

ABSTRACT

Within the context of sub-Saharan Africa's rising population growth rate and declining agricultural productivity, there is much debate about whether communal land tenure institutions are a constraint on agricultural productivity and transformation in the region. Some argue that tenure institutions have adapted to the needs of the local communities, while others contend that the evolution of tenure institutions is constrained by the actions of vested interest groups and prohibitive transaction costs. This study empirically tested the relationship between land tenure security and agricultural productivity in the Zimbabwean small farm sector. Specifically, the study investigated the interaction between land tenure security and credit use, long-term on farm investments, complementary short-term input use and yield from a sample of 119 Zimbabwean households interviewed during 1995. Implications for land reform in South Africa were derived from the empirical results.

The study area was stratified so as to maximise the variation on the tenure variables measured. Three strata were identified, namely the privately owned small scale commercial sector, the traditional communal area and the government initiated Model A Resettlement Area. Tenure security was estimated as an index, capturing the breadth, duration and assurance of an individual's property rights to land. A simultaneous equation model was estimated using two-stage least squares regression analysis. Empirical results indicate that households with more exclusive and assured property rights invested significantly more in long-term on-farm improvements, applied greater levels of short-term inputs and attained higher yields compared to households with less secure property rights, *ceteris paribus*. Credit use was too infrequent in the sample to warrant statistical analysis.

Given similarities between the Zimbabwean and South African agricultural sectors, the result has two important implications for proposed land reform in South Africa. Firstly, the result lends support to the notion that communal tenure in South Africa is likely to be a constraint on agricultural development. Secondly, any national land reform policy must be accompanied by innovative tenure institution which facilitate economic interaction and internalise externalities on land resettled to individuals or groups. In this regard, the process of institutional change must be impartially administered and well adapted to the particular needs and resource constraints at community level.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks and appreciation to all who assisted my research. I am especially indebted to the following people:

Professor W.L. Nieuwoudt, Head of the Department of Agricultural Economics, University of Natal for his expert guidance, support and inspiration throughout this study.

My colleagues and the staff in the Department of Agricultural Economics, University of Natal, for their assistance and friendship. To Dave Thomson for the numerous hours of discussion, and to Gaylene Moor for her expert proof reading of the draft document. Special thanks to Nikki Mitchell for her unwavering support and encouragement. Your motivation during the difficult times will not be forgotten.

Professor M. Rukuni, Head of the Department of Agricultural Economics, University of Zimbabwe, for assisting me in gathering background information on the Zimbabwean small scale agricultural sector. Mr Philip Mathambo (AGRITEX - Mayo, Zimbabwe) for his assistance in identifying a suitable study area, and for his hospitality and support while I was in Zimbabwe. Sincere thanks also to Tich, my interpreter.

The Centre for Science Development which, through the Agricultural Policy Research Unit, Department of Agricultural Economics, University of Natal, sponsored my research.

Finally, thanks to my parents and family for their support and encouragement throughout my university career.

LIST OF CONTENTS

Page

ABSTRACT

ACKNOWLEDGEMENTS

| | |
|------------------|------|
| LIST OF CONTENTS | i |
| LIST OF TABLES | vii |
| LIST OF FIGURES | viii |
| INTRODUCTION | 1 |

CHAPTER 1 PROPERTY RIGHTS, TRANSACTION COSTS AND 7

ECONOMIC EFFICIENCY: NEO-CLASSICAL THEORY AND

INSTITUTIONAL ECONOMICS

| | | |
|---------|--|----|
| 1.1 | Institutions defined | 7 |
| 1.2 | Property rights defined | 8 |
| 1.3 | Property rights in economic theory | 10 |
| 1.4 | Neo-classical economic theory | 10 |
| 1.4.1 | Economic efficiency in neo-classical economics | 11 |
| 1.4.2 | Limitations of the neo-classical model | 12 |
| 1.4.2.1 | The cost of imperfect information | 12 |
| 1.4.2.2 | Economic incentives | 13 |
| 1.4.2.3 | Ethical considerations | 14 |

| | | |
|------------------|---|-----------|
| 1.5 | Institutional economic theory | 15 |
| 1.5.1 | Economic efficiency in <u>institutional economics</u> | 15 |
| CHAPTER 2 | AGRICULTURAL TENURE INSTITUTIONS | 18 |
| 2.1 | The land tenure institution | 18 |
| 2.2 | Incentive implications of different land tenure institutions | 19 |
| 2.2.1 | Open access | 20 |
| 2.2.1.1 | Economic co-ordination | 20 |
| 2.2.1.2 | Externalities | 21 |
| 2.2.2 | Common property | 23 |
| 2.2.2.1 | Economic co-ordination | 23 |
| 2.2.2.2 | Externalities | 24 |
| 2.2.3 | Private property | 26 |
| 2.2.3.1 | Economic co-ordination | 26 |
| 2.2.3.2 | Externalities | 27 |
| 2.2.4 | State property | 28 |
| 2.2.4.1 | Economic co-ordination | 28 |
| 2.2.4.2 | Externalities | 29 |
| 2.3 | Institutional innovation: The evolutionary theory of land rights | 29 |
| 2.3.1 | A critique of the evolutionary theory of land rights | 31 |
| 2.4 | The supply of institutional innovation | 33 |

| | | |
|------------------|--|-----------|
| 2.5 | The optimal level of institutional change | 35 |
| CHAPTER 3 | THE CONCEPTUAL MODEL: THE LINK BETWEEN LAND TENURE SECURITY AND AGRICULTURAL PRODUCTIVITY | 37 |
| 3.1 | The interaction between tenure security and agricultural productivity | 38 |
| 3.1.1 | Tenure security and the land market | 40 |
| 3.1.2 | Tenure security and on-farm investments | 41 |
| 3.1.3 | Tenure security and access to credit markets | 43 |
| CHAPTER 4 | SAMPLING AND ESTIMATION TECHNIQUES | 46 |
| 4.1 | Sampling techniques | 46 |
| 4.2 | The survey | 47 |
| 4.3 | Description of the survey areas | 48 |
| 4.3.1 | The history of land policy in Zimbabwe | 49 |
| 4.3.2 | Land policy since Independence (1980) | 49 |
| 4.3.3 | The Tanda Small Scale Commercial Sector | 53 |
| 4.3.3.1 | Tenure institution | 55 |
| 4.3.4 | The Tanda Communal Area | 55 |
| 4.3.4.1 | Tenure institution | 56 |

| | | |
|----------------------|--|---------------|
| 4.3.5 | The Mayo Resettlement Area | 57 |
| 4.3.5.1 | Tenure institution | 59 |
| 4.4 | Sampling methodology | 60 |
| 4.5 | Estimation techniques | 61 |
| 4.5.1 | Regression analysis | 61 |
| 4.5.1.1 | Multiple regression | 61 |
| 4.5.1.2 | Simultaneous equation models | 63 |
| 4.5.1.3 | Two-stage least squares regression analysis | 65 |
| 4.5.2 | Probit analysis | 66 |
| 4.5.3 | Principal component analysis | 70 |
| CHAPTER 5 | THE EMPIRICAL MODEL AND RESULTS | 72 |
| 5.1 | Descriptive statistics | 73 |
| 5.1.1 | Household characteristics | 73 |
| 5.1.2 | Land tenure security on arable land | 74 |
| 5.1.2.1 | Land tenure security - Tanda Small Scale Commercial Sector | 75 |
| 5.1.2.2 | Land tenure security - Mayo Model A Resettlement Area | 76 |
| 5.1.2.3 | Land tenure security - Tanda Communal Area | 77 |
| 5.1.3 | Land tenure security on grazing land | 78 |
| 5.1.4 | Empirical measurement of tenure security in the model | 79 |
| 5.1.5 | Land market activity | 83 |

| | | |
|----------------------|--|----------------|
| 5.1.6 | Credit use | 86 |
| 5.1.6.1 | Credit use in the empirical model | 89 |
| 5.1.7 | Long-term investments | 89 |
| 5.1.7.1 | Long-term investments in the empirical model | 90 |
| 5.1.8 | Input use and agricultural productivity | 92 |
| 5.1.8.1 | Input use and yield in the empirical model | 95 |
| 5.1.9 | Control variables in the empirical model | 96 |
| 5.2 | Results of the simultaneous equation model estimating agricultural productivity | 100 |
| 5.2.1 | Structural equations of the simultaneous model | 100 |
| 5.2.2 | Results of the simultaneous model | 101 |
| 5.2.3 | Tenure security and long-term land improvements | 103 |
| 5.2.4 | Tenure security and short-term input use | 104 |
| 5.2.5 | Tenure security and yield | 107 |
| 5.3 | Principal Component regression analysis | 109 |
| CHAPTER 6 | THE INNOVATION OF AGRICULTURAL TENURE INSTITUTIONS IN SOUTH AFRICA | 117 |
| 6.1 | Land policy following the Land Act of 1913 | 118 |
| 6.1.1 | The Land Act of 1913 | 118 |
| 6.1.2 | The Development Trust and Land Act of 1936 | 119 |

| | | |
|------------------|---|------------|
| 6.2 | The current structure of agriculture in South Africa | 120 |
| 6.3 | Public support and land distribution differentials | 122 |
| 6.4 | Property institution differentials | 124 |
| 6.4.1 | Property rights in the commercial farming sector | 125 |
| 6.4.2 | Property rights in the small farm sector | 125 |
| 6.4.2.1 | Communal tenure | 126 |
| 6.4.2.2 | State controlled tenure | 130 |
| 6.4.2.3 | Individualised tenure | 132 |
| 6.5 | Land reform in South Africa - 1996 | 132 |
| 6.5.1 | Land Redistribution | 134 |
| 6.5.2 | Land tenure reform | 135 |
| CHAPTER 7 | POLICY IMPLICATIONS FOR LAND REFORM IN SOUTH AFRICA | 136 |
| 7.1 | The redistribution and resettlement of commercial and state land | 138 |
| 7.1.1 | Scenario one - Individual resettlement under formal private tenure | 139 |
| 7.1.2 | Scenario two - Group resettlement | 139 |
| 7.2 | Tenure reform in communal areas | 144 |
| 7.2.1 | The market for formal private tenure in communal areas | 145 |
| 7.2.2 | Rental markets in communal areas | 147 |
| 7.3 | The importance of the urban/rural link | 151 |

| | |
|---|------------|
| CONCLUSIONS | 153 |
| SUMMARY | 158 |
| REFERENCES | 165 |
| APPENDIX A.1 HOUSEHOLD QUESTIONNAIRE | 176 |
| APPENDIX A.2 LIST OF VARIABLES | 188 |

LIST OF TABLES

| Table | | Page |
|-------|---|------|
| 4.1 | Comparison of land distribution by sector and natural region in Zimbabwe, 1980-1989 | 52 |
| 5.1 | Household characteristics by strata in Manicaland Province, Zimbabwe (1995) | 75 |
| 5.2 | Tenure characteristics on arable land by strata in Manicaland Province, Zimbabwe (1995) | 76 |
| 5.3 | Land market activity by strata in Manicaland Province, Zimbabwe (1995) | 85 |
| 5.4 | Credit use by strata in Manicaland Province, Zimbabwe (1993-1995) | 88 |
| 5.5 | Stock of land improvements by strata in Manicaland Province, Zimbabwe (1995) | 91 |
| 5.6 | Agricultural production by strata in Manicaland Province, Zimbabwe (1993-1994) | 94 |
| 5.7 | Results of the simultaneous model of agricultural production in the small farm sector of Manicaland Province, Zimbabwe (1994) | 103 |
| 5.8 | Correlation matrix for variables in the yield model (Arable land only: n = 119) | 112 |
| 5.9 | Estimated coefficients for the yield equation (OLS) | 113 |
| 5.10 | Principal components extracted from explanatory variables in the yield equation (arable land only: n=119) | 113 |
| 5.11 | Estimated coefficients for the yield equation in original scale (principal component regression) | 116 |
| 6.1 | Farm land per capita of rural population - South Africa (1990) | 124 |
| 6.2 | Comparison of cattle statistics in communal and commercial areas of KwaZulu-Natal (1987) | 131 |

LIST OF FIGURES

| Figure | | Page |
|---------------|---|-------------|
| 3.1 | Secure property rights and agricultural productivity: A conceptual framework | 40 |
| 4.1 | Map of Zimbabwe showing the location of the study area | 55 |

INTRODUCTION

Agriculture in Zimbabwe is characterised by an inherent dualism (Bratton, 1990: 268). In 1989 - after a decade of land reform and redistribution aimed at ensuring a more equitable distribution of land - 4 660 large scale commercial sector (LSCS) farmers held 34.7 per cent of Zimbabwe's agricultural land. By contrast, over one million families occupied 50.1 per cent of Zimbabwe's agricultural land in the Communal Areas (CA), while 53 968 households had been resettled on 3.2 million hectares (10.2 per cent) of farm land acquired by the state for redistribution. Approximately 8 500 small scale commercial sector farmers (SSCS) occupied 4.3 per cent of the agricultural land.

Apart from land distribution differentials, agricultural productivity and levels of resource conservation differ markedly between the large and small famr sectors, despite significant government investment in Communal Area infrastructure and marketing facilities since 1980. Maize yields in the LSCS averaged 4.5 tons per hectare, compared to 1.6 tons per hectare in the small scale commercial sector (SSCS), 1.3 tons per hectare on land resettled since independence and just under one ton per hectare in the CA for the decade ending 1989/90 (Ashworth, 1993). Taking the agricultural potential of land in the different sectors into account, maize yields on the highest potential arable land in the LSCS are 3.6 times as great as yields from the same potential land in the Resettlement Area (RA) and CA (Ashworth, 1993). Moreover, Cliffe (1988) demonstrated that increased yields and marketed production following government investments in the CA and RA are heavily concentrated in the hands of a few individuals.

There is also a degree of differentiation between households within the small farm sector. Small scale commercial farmers achieve higher yields and show increased adoption of production improving technologies and conservation compared to CA farmers in areas of similar agricultural potential (Ashworth, 1993). It is also apparent that income from livestock production in the SSCS is of a greater magnitude and importance than in CAs and RAs (Ashworth, 1993).

One reason for the poor performance of the small farm sector is that, compared with the large scale commercial sector, the small farm sector has historically received little technical and state support (Rukuni, 1990). A second reason for the poor performance of the small farm sector in Zimbabwe is the apparent lack of investment incentives under communal or group ownership. Insofar as property rights in Communal Areas ensure an individual the ability to use land for a certain period of time and for a defined purpose, tenure is secure. However, these limited property rights do not guarantee that individuals can co-ordinate economic activity and reap the benefits of individual effort. Individual property rights to resettled land are even less secure, as individuals are resettled in groups and remain tenants of the state on highly conditional lease agreements (Bratton, 1990: 288).

Of primary importance in this regard is the role of property institutions in manifesting economic incentives within a society. Property institutions facilitate economic co-ordination amongst people by helping them form expectations that can be reasonably held in their dealings with others. By establishing expectations about the rights to resource use in economic activity and about the partitioning of the income stream resulting from economic activity,

different property institutions can be expected to provide different economic incentives to individuals in society.

It is hypothesised that the effectiveness of a particular property institution in manifesting economic incentives depends on the level of tenure security afforded by the institution. Within the broader context of sub-Saharan Africa's (SSA) rapid population growth and declining agricultural productivity, this has led to a growing debate about whether indigenous land tenure systems are a constraint on agricultural productivity and transformation in the region (Feder and Noronha, 1987; Bromley, 1989; Nieuwoudt, 1990; Kille and Lyne, 1993; Place and Hazell, 1993; Bromley and Cochrane, 1994; Bruce and Migot-Adholla, 1994; Lyne and Roth, 1994; Van den Brink *et al*, 1994; Thomson and Lyne, 1995). The debate is somewhat controversial. Some argue strongly for communal ownership (Bromley, 1989; Bromley and Cochrane, 1994; Van den Brink *et al*, 1994) while others argue for individual ownership (Feder and Noronha, 1987; Feder and Onchan, 1987). Yet others contend that alternative, more binding, constraints result in land tenure security having a limited impact on productivity and investment (Place and Hazell, 1993).

Nonetheless, the issue is of particular importance to South Africa as the country is on the threshold of widespread land redistribution and tenure reform (Department of Land Affairs, 1996), and is the focus of the thesis. Specifically, the thesis empirically tests the relationship between land tenure security and agricultural productivity in small scale agriculture. For this purpose, survey data were gathered from the Zimbabwean small scale agricultural sector by the author in April 1995. A follow-up survey of the same households was conducted in August 1995. Background information on tenure institutions and land reforms initiated in

Zimbabwe was researched in collaboration with the University of Zimbabwe, Harare, in 1993. The analysis was confined to the small farm sector since government policies have in the past purposefully favoured large scale commercial agriculture in Zimbabwe, invalidating comparisons between the LSCS and the small farm sector (Ashworth, 1993).

Besides historical similarities between the South African and Zimbabwean agricultural sectors, the Zimbabwean small farm sector was considered appropriate for the study for two reasons. Firstly, the Zimbabwean small farm sector allowed the investigation of the interaction between land tenure security and economic incentives under a wide range of geographically adjacent tenure institutions, including freehold tenure in the SSCS, traditional communal tenure and a government resettlement programme. The co-existence of these tenure options is unique (in sub-Saharan Africa) to the Zimbabwean small farm sector. Secondly, Zimbabwe has experienced more than a decade of land reform and redistribution, following the introduction of land reform policies at independence in 1980.

The analysis is likely to have important implications for land reform in South Africa, especially regarding the effect of incentive distortions under communal land ownership, and the likely impact of a proposed group ownership resettlement model on economic incentives. The latter is particularly important in South Africa where groups of up to 300 families are to be settled on commercial farm land under a group ownership model (Cousins, 1996).

The first two chapters form the theoretical background to the study. Chapter one discusses the nature and role of property rights in economic relations, and introduces the theory of institutional economics. An understanding of institutional economics is imperative since, in

the context of this thesis, land reform implies a change in the existing land tenure institution. Chapter two describes the economic incentives manifest in four idealised property institutions. The chapter concludes with a critical discussion on the prevailing theories of institutional innovation.

Chapter three introduces the conceptual model describing the link between land tenure security and agricultural productivity. Specifically, it describes the relationship between exclusive and assured property rights to land and (a) investment incentives, (b) the availability of resources to finance such investments and (c) the operation of an efficient land market. The data collection and estimation techniques are described in Chapter four. The choice and description of the study area is included in this chapter. One hundred and nineteen small farm sector households were interviewed, in the following three strata; the small scale commercial sector (40), the Communal Area (39) and the Model A Resettlement Area (40).

Chapter five reports the descriptive statistics observed in the sample, after which empirical results are presented. The conceptual model is estimated as a simultaneous equation system using two-stage least squares regression analysis. The results from the empirical models are discussed in the remainder of the chapter.

Before deriving implications for land reform in South Africa, it is first necessary to gain a clear understanding of the requirements of a land reform policy in South Africa. Chapter six provides a selective synopsis of the relevant legislation that shaped land tenure institutions in South Africa since the passing of the Land Act, Act 27 of 1913. Included is a detailed description of the tenure institutions and resultant land use patterns in the commercial and

small farm agricultural sectors. Of importance in this regard is the level of tenure security afforded by the different tenure institutions. Land reforms proposed in the South African government's *Green Paper on South African Land Policy* (Department of Land Affairs, 1996) are introduced at the end of the Chapter.

In the final Chapter the implications of the empirical results for proposed land reforms in South Africa are discussed, with specific reference to the requirements for sustainable land redistribution and communal area tenure reforms.

CHAPTER 1

PROPERTY RIGHTS, TRANSACTION COSTS AND ECONOMIC EFFICIENCY: NEO-CLASSICAL THEORY AND INSTITUTIONAL ECONOMICS

Over the past several decades there has been a renewed interest in institutional economics, giving consideration to the influence of property rights structures and transaction costs on economic incentives and behaviour (Furubotn and Richter, 1990: 1). This has arisen because of a recognition that standard neo-classical analysis is overly abstract and is unable to deal effectively with many problems of interest to policy makers - particularly when transaction costs are greater than zero, and where property rights structures are diverse. This chapter considers the theoretical relationship between property rights and property institutions, introducing the concepts of transaction costs and economic efficiency. The overview is not intended to provide a comprehensive review of the theory. Rather, it emphasises issues relevant to the efficient utilisation and allocation of agricultural land, discussed more fully in Chapter Two.

1.1 Institutions defined

In the context of this thesis, an institution is defined as the set of behavioural rules that govern a particular pattern of actions and relationships in society (Ruttan, 1978). The institutions of a particular society thus reflect the unique social, political and economic setting within which that society finds itself. The ways in which institutions are formulated and enforced make up the legal system of that society (Bromley and Cochrane, 1994).

new
recent
new

Institutions are thus attempts to reduce uncertainty in exchange by defining the rules of the game (Beghin and Fafchamps, 1995). In the area of economic relations, institutions have a crucial role in establishing expectations about the rights to resource use in economic activities and about the partitioning of the income stream resulting from the economic activity (Hayami and Ruttan, 1985: 95). However, the right to a benefit stream defined by a property institution is only as secure as the duty of others to respect the conditions that protect that stream (Bromley and Cochrane, 1994). If the state is unwilling, or unable, to assure the compliance of others with regards to an individual's rights, then the rights are meaningless.

Institutions have a profound effect on the behaviour and future expectations of individuals. In essence, the effectiveness of a particular property institution in manifesting economic incentives that encourage desired behaviour depends on two requisites; how exclusively property rights are defined and how well transaction costs have been curtailed (Nieuwoudt, 1990). These two concepts are introduced in the following section, and are then described in more detail in Chapter Two.

1.2 Property rights defined

Property rights are a particular characteristic of property institutions, a subset of all institutions (Runge, 1985). Property rights specify the norms of behaviour with respect to things that each person must observe in his or her interactions with others, or bear the consequences of non-observance (Furubotn and Richter, 1990: 2). Since economic agents do not operate independently from one another, they face uncertainty as to how the actions of

others affect the way in which their own decisions will result in them receiving economic benefits. Property rights attempt to reduce this uncertainty by providing individuals with information enabling them to form expectations which can be reasonably held in their dealings with others (Demsetz, 1967).

As such, property rights are an endogenous response to the need for economic co-ordination in the face of interdependence, and together with the market serve to reduce real resource losses faced by individuals as a result of imperfect information. These losses are grouped together under the term 'transaction costs'. A broad definition of transaction costs includes costs associated with: (a) the creation or change of an institution; and (b) the use of the institution (Furubotn and Richter, 1990: 8). Dahlman (1979) defines the concept of transaction costs to include search and information costs, bargaining and decision making costs and policing and enforcement costs, as well as the risk and uncertainty associated with the transfer of rights owing to imperfect information.

From an economic perspective, property rights play a crucial role by channelling net economic benefits associated with economic activity to a particular agent. The structure of property rights in a society not only determines who has what claims with regard to income flows generated by the use of a resource such as land, but also the magnitude of these flows. Thus the particular structure of property rights in an economy influences the allocation and utilisation of economic resources in specific and predictable ways (Furubotn and Pejovich, 1972: 1139). Furthermore, by reducing transaction costs and uncertainty, property rights should facilitate land market transactions (Beghin and Fafchamps, 1995).

Since property rights facilitate economic co-ordination in the face of interdependence and imperfect information, the equilibrium choice of property rights is determined by the market for predictable behaviour. Through the forces of demand and supply of predictable behaviour, the optimal structure of property rights will be established.

1.3 Property rights in economic theory

Traditional neo-classical economic theory regards property institutions as exogenous variables, with individuals being endowed with property rights in much the same way as they are endowed with natural resources (Ruttan, 1978: 334). Although an understanding of general equilibrium theory is important in dealing with market relations involved in production and exchange, in the real world the idealised Pareto conditions may not be satisfied. This thesis thus contends that the extension of neo-classical economics to include property institutions as endogenous variables in the economic system is justified for three reasons that will be discussed in the ensuing sections. Before the justifications for this extension are elaborated upon, it is necessary to briefly describe the role of property rights in neo-classical economic theory.

1.4 Neo-classical economic theory

Neo-classical economics is largely concerned with the allocation of resources in a market economy, and is based on two theoretical pillars; the principal of optimisation by individual economic agents, and the co-ordination of their activities through the market (Arrow, 1985: 107). Neo-classical economic theory assumes that the economic system is one in which: (1)

transactions costs are zero and the decision maker operates with "unbounded rationality" (i.e., information desired by the decision maker is obtained and processed at zero cost); (2) firms and individuals act rationally and are profit maximisers; and (3) institutional arrangements play no role in determining equilibrium solutions (Furubotn and Richter, 1990: 11).

1.4.1 Economic efficiency in neo-classical economics

Economic efficiency in neo-classical economics refers to efficiency of resource allocation under market conditions. According to the dominant paradigm of neo-classical economics, the Walrasian general equilibrium model, costlessly determined prices suffice for all allocation problems and a Pareto optimal solution is attained via the market exchange of property rights. In the absence of transaction costs, the initial distribution of property rights does not matter from an efficiency point of view since these rights can be voluntarily and costlessly adjusted to attain the Pareto optimal allocation of rights. Consequently, the concept of efficiency and equity become separable if the neo-classical assumptions hold (Bardhan, 1989: 5). When equilibrium is disturbed in the Walrasian model, a new equilibrium is instantaneously attained because, given zero transaction costs, the cost of adjustment is zero. Under these conditions, all Pareto-relevant externalities would tend to be eliminated in the process of free exchange-contract among affected parties (Coase, 1960). Prices alone are sufficient to ensure that resources are allocated to their highest-valued use, and economic efficiency is ensured (Barzel, 1989: 9).

Economic efficiency is measured using the supposedly value-free criterion of Pareto optimality. A social state is regarded as Pareto optimal if, and only if, no agent's position can

be improved without causing a deterioration in the position of some other agent. Under the neo-classical, costless transactions assumptions, a Pareto optimal outcome will be attained when a set of three marginal equivalencies are satisfied: equal marginal rates of substitution in consumption between consumers; equal marginal rates of transformation in production between producers; and equal overall rates of substitution and transformation. An infinite number of Pareto optima abound, each reflecting different initial allocations of property rights and different power structures in society.

1.4.2 Limitations of the neo-classical model

1.4.2.1 The cost of imperfect information

The process by which resources move to their highest valued use relies on an exchange of property rights (Furubotn and Richter, 1990: 6). In the Walrasian model, commodities and markets are homogeneous, concentrated at a single point in space and exchange is instantaneous. This is not so if transaction costs are positive. In order that rights to an asset be complete, or perfectly delineated, both the owner and the other interested individual in the exchange must possess full knowledge of all the rights' valued properties. While property rights provide information and thereby reduce transaction costs faced by individual economic agents, the processes of defining and enforcing a property rights system are themselves not costless and information is scarce (Furubotn and Richter, 1990: 3). With positive transaction costs, the attributes of the asset are not fully known and exchange that would have otherwise improved resource allocation may be forsaken (Coase, 1988: 12). Under these conditions, prices alone will not ensure the optimum allocation of resources. The level of transaction

costs thus determines the extent to which individual economic agents are able to profitably exchange property rights for mutual benefit. Insofar as neo-classical theory ignores transaction costs, it ignores a fundamental feature of reality (Furubotn and Richter, 1990: 11).

The presence of transaction costs also explains the existence of externalities. Externalities arise when there is a disparity in the incidence of costs and benefits arising from an individual's actions (Bromley and Cochrane, 1994). According to Demsetz (1967) the conversion of a harmful or beneficial effect into an externality occurs when the cost of bringing the effect to bear on the decision of one or more interacting individuals is too high to make it worthwhile. The existence of externalities has a profound effect on economic incentives, because in making economic decisions, economic agents tend only to take cognisance of those effects that have a direct bearing on their own welfare. Since transaction costs prohibit all effects being brought to bear on the decision maker, efficient allocation of resources will only occur to the extent to which externalities are 'internalised' (Baber, 1991: 12).

1.4.2.2 Economic incentives

Institutions define the set of behavioural rules that govern patterns of action and resource use in a society (Ruttan, 1978). By establishing the 'rules of the game' within which individual economic agents must make decisions, the property institution of a society determines who has what claims with regard to income flows generated by the use of a resource such as land, and the magnitude of these flows. The particular structure of property rights in an economy thus defines the economic incentives faced by individual decision makers within a society. By

defining economic incentives, the property rights structure and tenure institution cannot be regarded as exogenous to the economic process.

1.4.2.3 Ethical considerations

Neo-classical economic theory relies on the (supposedly value-free) criterion of Pareto optimality to evaluate different social states. However, in the presence of positive transaction costs, the separability of efficiency from equity breaks down since the efficiency of resource allocation depends critically upon ownership structures and property relations (Bardhan, 1989: 5). Pareto optimality is thus not free of ethical value judgements, since it is based on the premise that the existing distribution and structure of property rights is morally acceptable. But, since no unique Pareto optimal state exists, and there are an infinite number of Pareto optima which reflect alternative initial distributions of property rights, any Pareto optimum cannot be ethically value-free since the Pareto criterion tacitly sanctions the *status quo*.

Since property institutions define the property rights structure prevailing in a society and determine the initial distribution of resources, they determine who has what rights with respect to the income flows generated by the use of resources. The property institutions thus determine the demand for, and supply of, any particular resource and consequently the resource's price. A different set of property rights would therefore lead to a different set of prices. Markets in themselves can therefore neither justify the property rights which structure them, nor the consequences of their operations, and the existing structure of property rights is thus not necessarily morally acceptable.

1.5 Institutional economic theory

Granted that the conventional neo-classical efficiency standards are unsatisfactory, the need arises to move towards a concept that takes fuller account of the real-life constraints that limit individual choices. It is necessary to move beyond the non-ethical or positive approach of neo-classical economics, to include an ethical evaluation of the prevailing property institution and level of transaction costs, and to include property institutions as endogenous variables in the economic system.

Economists have thus given increasing attention to the role institutions play in the operation of economic systems. This approach seeks to extend the range of applicability of neo-classical theory by considering how institutions and transaction costs affect individual incentives and economic behaviour (Furubotn and Richter, 1990: 1). Modern institutional economics focuses on the institution of property and the rules governing property rights, and as such is a useful tool for analysing economic incentives and resource allocation in agriculture.

1.5.1 Economic efficiency in institutional economics.

Assuming different economic agents have different perceptions of the transaction costs and benefits attached to any market exchange of rights, and the only source of valuation of assets or resource claims is the revealed choice behaviour of parties to potential exchanges, there is consequently no means whereby an external observer can determine whether or not observed levels of exchange stop short of an 'efficient' norm (Buchanan, 1986: 94-95) (compared to the

neo-classical assertion that the 'optimal' allocation of resources is determinate, conceptually, to any external observer). Efficiency in resource use *within a given institutional setting* is thus assured, provided market participants remain free to make or refuse exchange.

Implicit in this conclusion is the recognition that the legal assignment of rights within an institution may affect the allocation of resources within a society. Provided rights are clear, agreement on a change of rules within which exchanges take place would result in a new pattern of resource ownership. Agreement on such a change of rules indicates that the new rules are deemed to be more efficient than the old rules, and is in response to changes in the economic, social and political environment of a society. This exchange between sets of constraints is what Buchanan (1991: 5) calls constitutional economics (or institutional economics), with its emphasis centred on the selection of rules, or institutions, that will in turn limit the behaviour of the persons who operate within them, rather than on the given efficiency in a particular institutional setting. As such, institutional economics extends the neo-classical approach to include the reciprocal exchange of liberties (Buchanan, 1991: 6).

Free exchange between institutional settings will occur through the forces generated by utility maximising considerations that move the rules towards that which is 'efficient'. That which is efficient is that which all affected parties agree upon. Efficiency in this sense is concerned with the extent to which the institutions of a society are responsive to the values and choices of individual citizens, rather than with resource allocation within a given institution. If voluntary exchange between institutions is constrained via a political agency, trade between institutions is not possible and the allocative patterns can be labelled as 'presumably inefficient' (Buchanan, 1986: 98). Such property institutions, imposed from above and

regarded as fundamentally unfair by the communities affected, will be inherently unstable due to the political demand for change.

CHAPTER 2

AGRICULTURAL LAND TENURE INSTITUTIONS

It was suggested in Chapter One that efficiency in resource allocation is neither objectively nor independently measurable. As a consequence, attention must be focused on the exchange process itself, and on the incentive structures within the different institutional settings that facilitate individual interaction. Before the process by which individuals chose between property institutions is described, the incentive structures of four idealised property institutions applicable to agricultural land - open access, common property, private property and state property - will be discussed. The remainder of the chapter then critically analyses the prevailing theories of institutional innovation.

2.1 The land tenure institution

The institution whereby individuals gain property rights to land is called the land tenure system. The land tenure system sets out the 'rules of the game', and is fundamental in defining and upholding property rights to land. Important components of any property rights to land include the following: (a) the right to use the asset (*usus*), (b) the right to appropriate returns from the asset (*usus fructus*), and (c) the right to change the asset's form, substance and location (*abusus*), which allows the owner of the right to transfer all rights (through a sale) or some rights (via a rental agreement) in the asset to others at a mutually agreed-upon price (Furubotn and Richter, 1990: 6). Two characteristic property rights are the right to be included in, and to exclude others from, particular benefit streams. Different property

institutions are characterised by different combinations of these basic property rights, and result in different penalty-reward structures (Furubotn and Pejovich, 1972).

Additionally, different tenure institutions provide different levels of tenure security. Tenure security is defined by Place *et al* (1994: 20) as an individual's perception of his/her undisturbed rights to a piece of land on a continuous basis, as well as the ability to reap the benefits of labour and capital invested in the land, either in use or upon alienation. The level of tenure security afforded by a particular tenure institution is thus a function of three components, viz. The breadth, duration and assurance of an individual's property rights, with legal and economic dimensions. The breadth, or robustness, of rights defines the legal quantity or bundle of rights held over the land (use, transfer and exclusion rights). Duration refers to the length of time during which the bundle of rights is legally valid. Assurance defines the certainty with which legal definitions of breadth and duration are held. If legal procedures are unclear, or their outcomes uncertain, tenure is insecure. Thus, while the legal dimension defines the *de jure* composition and duration of an individual's property rights to land, *de facto* tenure security is largely dependant on the assurance with which property rights are held. From an economic perspective, if any one of these conditions is lacking, tenure is not secure (Lyne and Roth, 1994; Runge, 1981).

2.2 Incentive implications of different land tenure institutions

Institutions establish expectations about the rights to resource use in economic activity and about the partitioning of the income stream resulting from economic activity by defining and

upholding property rights. As a result, different property institutions can be expected to provide different economic incentives to individuals within the society.

The incentive implications of four idealised property institutions regarding land, namely open access, common property, private property and state property are examined. Considered in this analysis is the extent to which the consequences of decisions will be brought to bear on the interacting parties (externalities) and the extent to which agents will co-ordinate their activities and interact for their mutual benefit (economic co-ordination). The level of economic co-ordination is an important development consideration since it influences factor mobility, and hence resource allocation (i.e. the extent to which individuals are able to enter into mutually beneficial exchange resulting in land being held by those who value it most highly).

2.2.1 Open access

Open access is best described by the maxim 'everybody's property is nobody's property'. Under open access, institutional rules do not assign exclusive property rights to groups or individuals. This implies that no individual is excluded from the use of, and hence the benefit streams emanating from, the particular resource (land) and all property rights are inclusive.

2.2.1.1 Economic co-ordination

In the absence of exclusive property rights, it is impossible to enter into mutually beneficial exchanges regarding land as transaction costs are infinite since the owner of the land cannot

be identified (Lyne and Nieuwoudt, 1990). Land is lost to the market under open access, and cannot move to its most valued use via market transactions. In the absence of a land market, land is viewed as a costless resource as it has zero opportunity cost, removing the incentive to invest in land saving technology (Nieuwoudt, 1990). Further, since property rights to land are not transferable, land cannot be used for collateral to attract credit.

2.2.1.2 Externalities

Owing to the infinite costs of bringing to bear on an individual decision maker the consequences of his/her actions under open access, the likelihood of free-riding will be pervasive. By means of an example, grazing resources in common rangelands are open to all and are thus regarded as a free good to individual agents. In contrast, society regards grazing as a scarce good (unless it is abundant relative to the demands placed upon it) and private costs and benefits thus differ from social costs and benefits. The equilibrium rate of exploitation under open access occurs where private costs of using the land equal average product, and the resource earns zero rent. If the private cost of keeping cattle on the common grazing land is very low, the equilibrium stocking rate may exceed the maximum sustainable stocking rate.

Under these conditions negative externalities - associated with the over-utilisation and degradation of the land - are not internalised, leading to overgrazing (at least in the economic sense). Perhaps a more serious consequence is that positive externalities - associated with fixed improvements in the land - are not internalised because of the actions of free-riders, and herein lies the 'tragedy of the commons'. Such a divergence between social and private costs

cannot be remedied endogenously as suggested by Coase (1960), owing to the presence of infinitely large transaction costs, and results in non-optimal land allocation and weak economic incentives (Runge, 1981).

While free-riding and resource degradation under open access is well documented (Hardin, 1968; Lyne and Nieuwoudt, 1990), Runge (1981) contends that open access is not synonymous with strict individual dominance, and that open access is characterised by non-separable externalities. Mathematically, $f(x_1, x_2) \neq f_1(x_1) + f_2(x_2)$. Using two cattle owners grazing cattle on a common range with unrestricted access (q_1 and q_2 being the number of cattle grazed by farmer 1 and 2 respectively), Runge (1981) showed that marginal cost is affected not only by the variable under the control of the individual, but also by the other individual's choice variable (the number of cattle grazed). Thus, $C_1(q_1, q_2) = A_1q_1^n + B_1q_1q_2^m$ and $C_2(q_1, q_2) = A_2q_2^r + B_2q_2q_1^s$ and individuals are conditioned by their expectations of the likely behaviour of others. Decision making thus involves interdependent choices made under uncertainty regarding the other agent's actions.

It is argued that the incentive exists for communities to formulate co-ordinate strategies enabling individuals to form more certain expectations as to the strategies pursued by others (Buchanan, 1993: 4). However, incentives to free-ride and capture benefits for free may undermine incentives to organise the collective solution (Runge, 1981), as each individual has the incentive to cheat. Furthermore, endogenous shifts away from open access involve high transaction costs owing to the potentially infinite number of users and are thus made less likely.

2.2.2 Common property

A common property institution is characterised by restricted access. Common property is thus not 'everybody's property' but rather a finite and distinct group of individuals' property (Ciriancy-Wantrup and Bishop, 1975), governed by a set of restrictive (institutional) rules which are agreed upon by the individuals using the resource, and rents accrue to the group as a whole. The individual's right to inclusion in the benefit streams emanating from the land depends upon membership of a particular group or community, and the community in turn must have the right to exclude outsiders. Two basic common property institutions can be identified:

- i) The first relates to user group. Here members of the group exercise their own management decisions within the constraints established by the group as a whole.
- ii) The second relates to non-user groups. Here members of a defined group surrender their use-rights to an elected body, who manages the resource on behalf of the group. Examples of non-user group management institutions include private companies and similar business organisations.

2.2.2.1 Economic co-ordination

Individuals under common property institutions managed by a user group are unable to freely exchange their inclusive use rights, either amongst themselves or with agents outside the group/community, as each individual has an indivisible share of the communally owned

resource. As a result, land markets are constrained since potential buyers/renters wishing to secure exclusive rights must first find and then negotiate with all the group members. The larger the group, the greater the transaction costs and the more constrained the land market will be.

By contrast, successful non-user groups facilitate the development of a land (rental) market - provided free-rider incentives are limited - since the potential tenant need only negotiate with the management committee, regardless of group size. If the benefits from renting the property to an outside agent exceed profits earned by own management, the management body may be urged by its members (the land owners) to enter into a rental contract with an outside agent. The inefficient use of land thus attracts an opportunity cost and efficient resource allocation is enhanced.

2.2.2.2 Externalities

To successfully internalise negative externalities, user groups must be small. Firstly, transaction costs associated with large groups - the costs of negotiating and enforcing the rules - tend to cancel the benefits of collective action (typically, groups of less than six participants can be successful (Olson, 1971: 54)). Secondly, since strict individual dominance no longer applies (Runge, 1981), decision making involves interdependent choices. Each individual has to decide, based on his/her expectations regarding others' actions, whether or not to enter the initial coalition. As group size increases, accountability decreases as the assurance regarding others' actions decreases. Accordingly, the likelihood of collective action decreases on account of uncertainty and higher transaction costs. Even with complete assurance regarding

others' actions, the economic incentive to defect still exists in large groups since marginal private returns to the common resource (communal grazing) exceed the marginal private cost of, for example, keeping an additional livestock unit.

User groups also experience difficulties in internalising positive externalities associated with individual investments. This is because transaction costs associated with the establishment of rules governing a common resource are likely to vary with the complexity of the rules. Thus, while rules regulating group access may evolve endogenously, even small groups will find it difficult to devise rules that partition benefits of collective investments in the same proportion as members share costs. Individual investments in fixed improvements are thus less likely in user groups because of the actions of free-riders.

These problems can be overcome by successful non-user group management organisations. On Maori land in New Zealand, the introduction of a management organisation concentrating managerial power in the hands of an elected management body converted an open access resource into an asset that could be farmed exclusively by the management committee, or leased to a tenant, with the proceeds divided amongst the owners (Lyne, 1994). The operation of an efficient land market compels the management organisation to consider the long-term effects of management decisions, as both positive and negative externalities are internalised by the non-user group. Ideally, the business organisation should allow individuals to be rewarded in proportion to their investment or share in the resource. This ensures that returns to individual investments in the group owned resource accrue to the individual, further increasing investment incentives.

Even though all members of the group may not adhere to agreed upon rules, it is argued that a minimum coalition prepared to observe the rules is sufficient for an endogenous move to a stable structure of well-defined property rights (Runge, 1985). Those adhering to the rules will be better off than if no rules existed, which implies that a certain number of free-riders will be tolerated. Moreover, the incentive to benefit from free-riding in the short run must be measured against the incentive to uphold the co-operative agreement which promotes the welfare of the group as a whole. Rawls (1971, cited by Wade, 1987) has shown analytically that compliance of one individual to the rules can reinforce other players to do likewise.

2.2.3 Private property

A private property right is the right to the exclusive benefit of the income stream flowing from a particular resource. This right includes the right to enter into contracts with other economic agents concerning the benefit stream and is absolute in the sense that it is limited only by those restrictions explicitly stated in the laws of a society.

2.2.3.1 Economic co-ordination

With private property rights, transactions costs are minimised and an economic agent can transfer a resource's entire rent (income) stream through its sale or temporarily transfer a portion of the right through renting. Land is thus highly mobile under absolute private property rights, and competition for rights expressed in market transactions transmits comprehensive information in the form of prices.

Market prices co-ordinate and transmit widely dispersed information which is of mutual benefit to both buyers and sellers. As such, the main role of the market is to reduce the cost of carrying out exchange transactions. Within the market, the price system co-ordinates knowledge dispersed amongst many people. The system works with an economy of knowledge. Only the most essential information is passed on and only to those concerned. Through the price system, the whole acts as one market, since limited individual fields of vision overlap sufficiently so that, through many intermediaries, the relevant information is communicated to all interested parties (Hayek, 1945).

The transferability of land rights under private property institutions assigns an opportunity cost to land which represents the cost of non-transferral, and ensures that the resource moves to its most valued use. At this point, resources are subjectively valued most highly causing private and social costs and benefits to converge.

2.2.3.2 Externalities

In the presence of a well functioning asset market, private property rights confer the benefit stream flowing from the land entirely on the owner of the resource and management decisions influencing future rent streams are internalised either in use or upon alienation (Pasour, 1990: 200). In this way, private property rights compel land owners to consider long-term effects of management decisions and provide economic incentives to invest on that land since the benefits of such investment are to a large degree internalised. The transferability of land rights also allows the individual to use the land as collateral, increasing the individual's ability to invest in the land (Pasour, 1990: 202). In the same way, negative externalities relating to

the consumption effect of possible resource degradation on future generations, are internalised. Decisions which result in reduced incomes in the future are reflected in lower current market values, encouraging the conservation of resources for future generations (Pasour, 1990: 201).

2.2.4 State property

State property exists when the state asserts its right of sovereignty over land, and economic rents from the land accrue to the state. The productivity of agriculture and the level of economic co-ordination under state property will depend on whether state-owned resources are allocated through the market mechanism or by central direction.

2.2.4.1 Economic co-ordination

If allocative decisions are made by central direction, information problems characteristic of public choice planning will prevent resources moving to their most valued use. In the absence of market prices to co-ordinate and communicate the information necessary to allocate resources, central planners must assimilate this dispersed information themselves. Information pertaining to time and place, known only to the individual "on the spot" is lost to the central planner and resource allocation is unlikely to be efficient (Hayek, 1945). These problems would clearly be overcome by allocating state-owned resources through the market.

2.2.4.2 Externalities

Public choice planning (state planning) suffers incentive problems due to the presence of externalities, since democratic participation in public choice planning entails enormous information costs. Individual bureaucrats are given the power to make decisions in a collective choice environment, and face less direct responsibility for their decisions than do entrepreneurs operating under a decentralised market environment. They are thus open to rent seeking which influences resource allocation. Further, positive externalities surrounding individual investments in fixed improvements are not internalised on state owned land. Consequently, unless the individual investor is assured that he/she will reap a sufficiently high proportion of the resultant benefits by means of a long term, inheritable lease, such investment will remain unlikely.

2.3 Institutional innovation: The evolutionary theory of land rights

A growing volume of economic literature on institutional innovation subscribes to the doctrine of institutional change labelled by Platteau (1995: 2) as the evolutionary theory of land rights (ETLR). The core of this doctrine is that new institutions evolve whenever changes in factor endowments, technical change, or preferences that get reflected in price variations give rise to new cost-benefit possibilities to which the old institutions are no longer attuned. Institutional innovation thus arises out of dis-equilibrium in the structure of predictable expectations established according to the existing property institutions, and institutions evolve over time to mediate conflicting interests among individuals (Bromley and Cochrane, 1994). As such,

tenure institutions are regarded as dynamic and are capable of significant autonomous evolution in the right (efficiency enhancing) direction.

This observation fits the Coasian 'transaction cost' (and similar 'imperfect information') theory, which postulates that new institutions and property rights evolve in response to the "desires of the interacting persons for adjustments to new cost-benefit possibilities" (Demsetz, 1967: 350), arising from new technologies that invoke new harmful and beneficial effects to which society has not yet been accustomed.

A common point of departure for the ETLR is the stylised 'tragedy of the commons'. Here, a potential value generating resource is used in common by all participants in the group, extending individualised usage of the resource beyond that level that would be optimally agreed upon as that participant's share in an idealised setting for collectively determined utilisation. As long as land is abundant, the absence of individual property rights does not necessarily have damaging consequences. In terms of externalities, they are of such small significance that it does not pay any one to take them into account. However, when the gains from internalisation become larger than the cost, due to increases in the value of land as a productive asset and/or an increase in the value of information reducing risk and transaction costs following increasing returns attributable to agricultural land, efficiency considerations engender an endogenous shift from communal to more exclusive ownership rights (Ault and Rutman, 1979; Platteau, 1995: 3).

By assigning exclusive rights to a resource (land), individuals are able to freely enter into the exchange economy since they are no longer dependant on the actions of others (as under open

access, and to a lesser extent, common property). The individual has the incentive to use the resource 'optimally' since any departure from efficiency results in opportunity costs that are incurred by the resource owner. Furthermore, the individual maintains private control over the productive resources and is 'at liberty' to use the resources as he/she deems fit, thereby increasing the individual's choice set (Buchanan, 1993: 16). Thus the evolution of secure and marketable rights theoretically represents the optimal institutional setting.

2.3.1 A critique of the evolutionary theory of land rights

The metaphor of the tragic commons suggests that productive tenure reform lies in the demand for increased individual independence, and draws attention to the assignment of separated rights of exclusion to individuals. However, while the ETLR and the 'transaction cost' theory help to identify members who share a common interest in a collective good (for example, more exclusive property rights), both theories fail to take account of the significant costs incurred in achieving the desired assignment of property rights. Such costs arise from collective action - resulting in high transactions costs incurred by large groups with egalitarian shares of the benefits of collective action (Olson, 1971: 34) - and from free-riders who limit the ability of potential gainers to get together and bring about an institutional change.

Implicit in the ETLR is a re-assignment of property rights, which influences the initial distribution of income and wealth. There will thus be resistance to change from those benefiting from the existing property rights structure. The political cost of altering the existing structure of property rights will depend critically upon the relative strengths of the different interest groups affected by the proposed change. The larger the group, the greater

the organisational cost (Olson, 1971: 48). A small group with an interest in maintaining the *status quo* may be able to prohibit institutional change desired by a large number of people.

Reliance on lobby groups to determine the optimal level of institutional innovation may result in unpredictable and undesirable consequences. Since much opposition to endogenous change is likely to come from households whose social security is threatened by enclosure, the transition may not occur until sub-division and degradation of land reduces its social security value to a level comparable with lesser forms of insurance (Lyne and Roth, 1994). Thomson and Lyne (1993) noted that chiefs in rural KwaZulu-Natal resisted the evolution of a rental market in certain areas as they perceived this to reduce their control over land. In the same region, Lyne and Nieuwoudt (1990) noted that stock owners resisted attempts by farmers to rent idle land because their supply of communal grazing diminished when fallow land was cultivated. This economic theory is further corroborated by empirical evidence from Kenya indicating that customary tenure in certain areas of the country only underwent endogenous individualisation (prior to land reforms initiated in the 1950's) in the face of increasing population pressure, over-use of grazing resources and soil erosion (Barrows and Roth, 1990: 270).

On the other hand, the successful lobby for more exclusive rights by a small group may have negative equity implications for households relying on secondary rights to land, as enclosure occurs at the expense of the egalitarian land ethic characteristic of communal tenures. This may result in distress sales, land grabbing and the emergence of a 'landless class'.

Finally, although free-riding is not necessarily a dominant strategy (see Section 2.2.1.2) and enforcement of agreed upon rules is not a logical necessity (Runge, 1981), where strategies are imperfectly co-ordinated, outside enforcement of institutional rules may help achieve Pareto-improvements. This requirement increases transaction costs, further constraining the endogenous institutional innovation.

2.4 The supply of institutional innovation

Constraints on the successful endogenous evolution of property rights often encourages policy makers to carry out administrative reforms, notably the introduction of registered title deeds. The adoption of such 'replacement policies' may have undesirable consequences if they are not well suited to the needs and resource constraints facing the particular community.

Empirical evidence from several African case studies has shown that the exogenous supply of land titling may create rather than reduce tenure insecurity and conflict over land rights. If the formal land code is ambiguous in its definition of rights, and if legal procedures to settle disputes are vague, land holders may not perceive increased tenure security following registration of title. Studies by Roth *et al* (1994: 224) in Somalia and Carter *et al* (1994: 166) in Kenya indicate that title contributed little to investments or land improvements in agriculture. Kille and Lyne (1993) demonstrated empirically that exclusive and assured tenure is a significant determinant of on-farm investments in KwaZulu-Natal, but that these conditions have little to do with land titling. Failure to update title deeds upon transfer further exacerbates disputes and tenure insecurity. A recent sample survey of freehold farmers in KwaZulu-Natal showed that 41 per cent of respondents had insecure property rights because

the farm was registered to a deceased person, and 32 per cent lacked exclusive rights as the same parcel of land was registered to more than one person (Kille and Lyne, 1993).

In addition, an active land market has often not resulted in those regions where land titles were registered. In Kenya, the absence of legal support for registered title deeds following a land registration programme initiated in the 1950's served only to create confusion over property rights and reduced security of tenure (Barrows and Roth, 1990). On the contrary, some titling programmes prohibited all market transfers. In Somalia where land transfers were banned, the rental market virtually collapsed due to increased risk (Lyne and Roth, 1994).

The dangers of instituting land (title) registration in a situation where the property rights market indicates that this would not be the optimal tenure system are essentially threefold. Firstly, by replacing traditional arrangements land registration is likely to extinguish some secondary land rights. Thus, while neo-classical theory implicitly assumes an inverse relationship between exclusivity of property rights and transaction costs, it can be argued that costs associated with increased landlessness and the loss of secondary rights associated with the enclosure of common property may indeed lead to a positive relationship between the exclusivity of property rights to land and transaction costs incurred in negotiations to maintain secondary rights and an egalitarian distribution of land for some individuals (Atwood, 1990; Lyne and Roth, 1994).

Secondly, land registration may have negative equity implications for poorer smallholders. Transaction costs associated with formal private tenure (including fees for lawyers, surveyors

and government officials) vary little according to the size of the farm, placing large land-owners in a position where they are more able to afford land transactions. In addition, wealthier land-owners usually have better access to information and have a greater appreciation of the implications of land registration (Atwood, 1990). Consequently, larger land owners may be in a strong position to exploit poorer, less informed smallholders, resulting in increased landlessness and decreased individual liberty for those without land in communal areas (Feder and Noronha, 1987).

Finally, the state may be unable, or unwilling, to supply the level of public support needed for the impartial implementation and administration of these rights, and land rights may remain unenforceable (Feder and Noronha, 1987). The introduction of non-sanctioned title deeds could introduce or heighten uncertainty, as local institutions are disrupted leading to conflict between existing and new rights. Under these circumstances the costs of entering into land transfers are further compounded by the necessity to discover the legitimate holder of property rights, or to settle disputes in this regard.

2.5 The optimal level of institutional change

The process of institutional change has important implications for proposed land reforms in Southern Africa. It is essential that land reform policies recognise the *status quo*, to avoid conceptualising a complete restructuring of the agricultural sector from within a vacuum. The existing distribution of rights and endowments among individual economic agents, along with the historically determined structure of property rights, are an existential

reality. This reality will consequently define the constraints to, and consequences of, any future land policy.

Clearly, changes in population density, technology and political power are all important in ensuring efficient institutional innovation (Feder and Feeny, 1993: 249). The existence of different interest groups must be recognised to ensure that the evolution of land tenure changes from an unpredictable process to a more pragmatic one. This is essential, as efficient institutional innovation requires a tenure system well adapted to the needs and resource constraints facing the community as a whole. Innovations to the contrary may increase transaction costs and uncertainty, decreasing tenure security and economic incentives.

This implies that, given the heterogeneity and number of agents within society, the efficiency of institutional innovation will depend to a large degree on the efficiency of the democratic process, i.e. the extent to which it is representative of, and accountable to, all members of society. In situations where social and political costs and benefits differ (for example, where politicians gain and hold power by eliciting the support of particular interest groups (Pasour, 1985: 528), or act purely for ideological reasons - as has occurred in South Africa prior to 1992), the state may impose artificial constraints on property institution, inhibiting agricultural development (Baber, 1991: 40).

It must be noted that the democratic process alone will not optimise institutional arrangements, as voters do not have perfect information and democratic choices may not reflect the wishes of future generations.

CHAPTER 3

THE CONCEPTUAL MODEL: THE LINK BETWEEN LAND TENURE SECURITY AND AGRICULTURAL PRODUCTIVITY

From an institutional perspective it is postulated that the evolution of exclusive and enforceable land rights is closely related to increases in population density, advances in farming technology and the emergence of agricultural markets (Feder and Noronha, 1987). According to van den Brink *et al* (1994), tenure institutions in African countries have arisen quite reasonably as a result of productive responses to the felt needs of the communities. However, theory presented in the previous chapter suggests that the evolution of tenure institutions in many African countries may be constrained by the actions of vested interest groups and prohibitive transaction costs.

Within the context of sub-Saharan Africa's rapid population growth and increasing levels of poverty, this has led to growing debate about whether indigenous land tenure systems in Africa are in fact a constraint on agricultural productivity. If this is not the case, the need for widespread and costly tenure reforms and land registration programs in Africa is called into question (Place and Hazell, 1993). In order to test this postulate, numerous recent studies have adopted broad theoretical models describing the relationship between land tenure security and agricultural productivity in sub-Saharan Africa (Kille and Lyne, 1993; Place and Hazell, 1993; Bruce and Migot-Adholla, 1994; and others). Specifically, the studies have investigated the relationship between land tenure security and credit use, on-farm investments in agriculture, complementary short-term input use and yields.

This study adds to the debate, investigating the interaction between land tenure security and agricultural productivity in the small farm sector characteristic of many regions of sub-Saharan Africa, and the likely impact of a group ownership resettlement model on economic incentives. The study differs from previous World Bank and Land Tenure Center studies in that it adopts a broader definition of tenure security, attempting to measure tenure security as a function of the breadth, duration and assurance of an individuals' property rights to land. The analysis is likely to have important implications for land reform in South Africa, especially regarding the effect of incentive distortions under communal land ownership, and the likely impact of a proposed group ownership resettlement model on economic incentives.

3.1 The interaction between tenure security and agricultural productivity

According to economic theory, the efficient and sustainable use of agricultural land requires, firstly, economic incentives to invest in agriculture, and to conserve and improve land. Secondly, it requires the ability to finance such investments in land, improvements and farm inputs. Finally, efficient land use requires an active market to allocate land and other productive resources to their most effective use (Nieuwoudt, 1990). It is hypothesised that the extent to which these conditions are satisfied depends on the level of tenure security afforded by the institutional environment within which farmers operate (Feder and Noronha, 1987). The conceptual model investigating this hypothesis is outlined in the following sections, and is summarised in Figure 3.1.

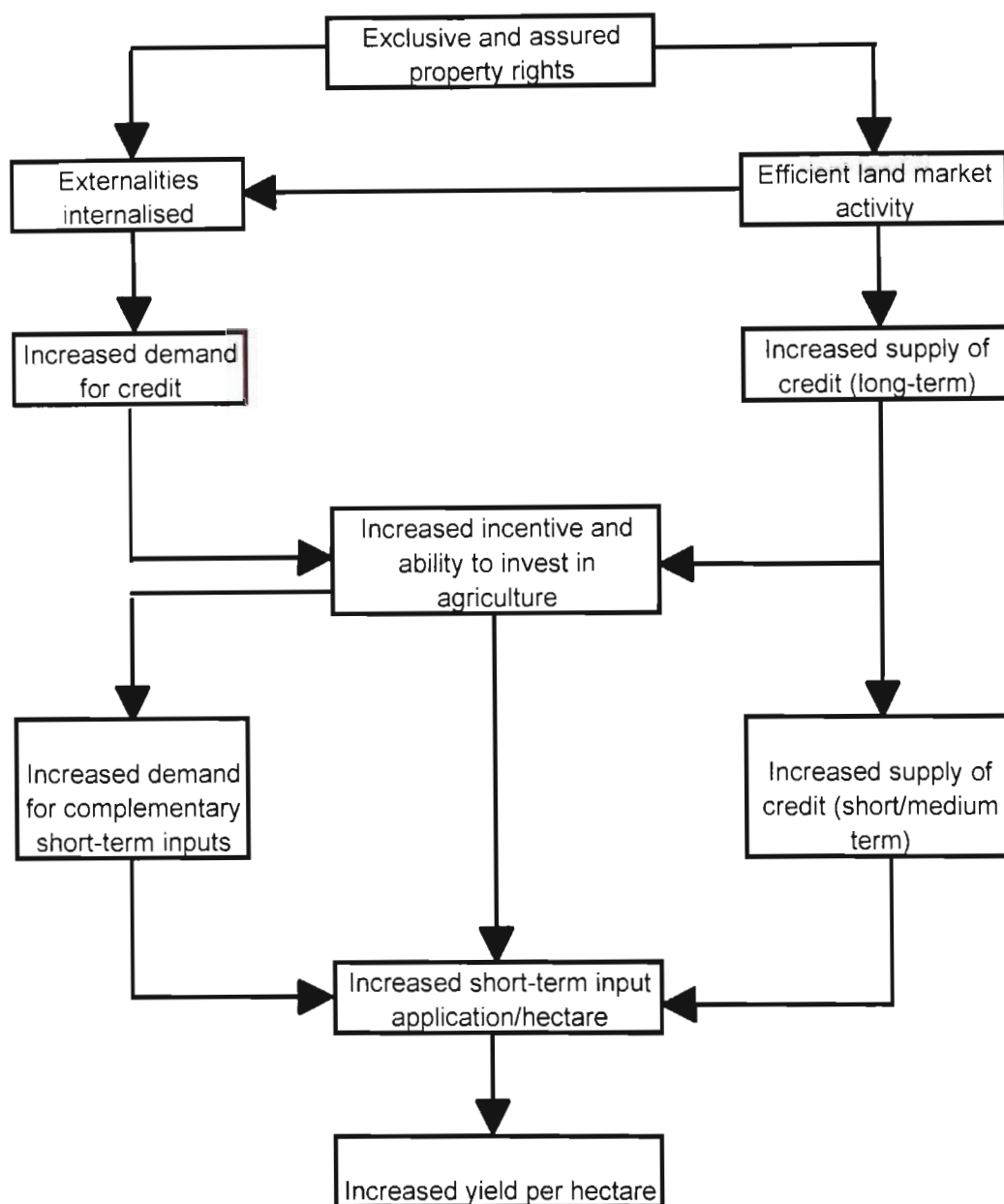


Figure 3.1: Secure property rights and agricultural productivity: A conceptual framework

Source:

Adapted from Feder *et al*, 1988



3.1.1 Tenure security and the land market

Economic theory suggests that exclusive and assured land rights reduce transaction costs, including risk, surrounding land transfers. Expected returns to potential buyers and renters of land thus increase, leading to an aggregate outward shift in the demand curve for land, and the emergence of an active sale and/or rental market. At the same time, land acquires an opportunity cost, penalising the non-use or under-use of land and facilitating the movement of land to more productive farmers, and rents are maximised. This leads to an increase in allocative efficiency. Land will only be left idle or under-utilised if transaction costs are high relative to the rent (because of distortions in the land market) or if farmers have distorted incentives or are not profit maximisers.

Increased allocative efficiency is achieved through either a land sale market or a land rental market. For both sale and rental transactions, an efficient land market requires security of tenure and low transaction costs. Without clearly defined and enforceable property rights, transaction costs incurred in discovering the valid owner and in making and enforcing sale or rental transactions increase. If transactions costs are high relative to the perceived benefits of the transaction, market transfers may be prohibited and allocative efficiency impeded. Sale markets require greater tenure security than land rental markets as they demand a greater bundle of property rights. This is because the seller must transfer all rights to the land, not just use rights as in a rental transaction.

Where farm size is small and households value land for the social security it provides, land saleability may have little bearing on allocative efficiency as there is no guarantee that the

offer price of a productive farmer will exceed the reservation price of land owners with few alternative forms of insurance (Lyne and Roth, 1994). However, an active rental market would still transfer use rights to more productive farmers as there would still be an opportunity cost to penalise under-utilisation. Potential lessors need only rent out land that they do not require in the short-term, and do not suffer a loss in social security. Thus, apart from increasing allocative efficiency, voluntary rental transactions can have positive equity implications for many households. Poorer households unable to use all their land gain rental income and households renting in the land gain opportunities to extend their farming operations. The efficiency and equity advantages of a land rental market have been demonstrated by Thomson (1996) in a study of rental market activity in rural areas of KwaZulu-Natal.

3.1.2 Tenure security and on-farm investments

Exclusive and assured tenure is expected to encourage greater on-farm investment and conservation as the benefits of such investments can to a large degree be internalised, either in use, or if the land right is marketable, upon alienation (Feder and Onchan, 1987). If the rights are transferable, this ensure that a high rate of time preference by resource (land) owners need not imply that the resource will be used too quickly. A land market forces an owner, regardless of his age or time preference, to consider the preferences of future generations when making investment and conservation decisions because current market values reflect future expected income streams (Pasour, 1990: 200-202). Transferable property rights also assign an opportunity cost to land which provides farmers with the incentive to invest in land replacing technologies, such as improved grazing, improved soil fertility and hybrid seeds. It

is expected that tenure security is likely to be less of an issue for short-term input use, provided short-term use rights are secure for the duration of the growing season. Nonetheless, an increased derived demand for *complementary* short-term inputs is expected in areas characterised by more exclusive and assured property rights, while a weaker relationship might be expected for substitutes.

Increased tenure security ensures that investment incentives are retained even when land rights are transferred via a rental agreement. The longer the lease period, the greater the incentive for the tenant to conserve and invest in the land (Pasour, 1990). When the lease period is short, the tenant has less incentive to invest in fixed improvements, but the owner of the property still has the incentive to invest in improvements and conservation, as this will impact on his future rent stream from the resource. However, the level of investment is expected to be less than that of an owner/operator due to uncertainty and moral hazard.

Conversely, the less certain property rights are, the higher the discount rate for future returns, the lower the value of all returns to investments on the land and the smaller the volume of investments undertaken. Without clearly defined rights, transaction costs increase and the actions of free-riders discourage individual investments in land as benefits of such investments are not fully internalised.

Analysis of survey data from numerous World Bank and Land Tenure Center studies testing the relationship between tenure security and on-farm investments have provided generally inconclusive results (Bruce *et al*, 1994: 255). Results from a study in Kenya, Rwanda and Ghana show little relationship between secure land rights and the adoption of land improving

investments (Place and Hazell, 1993). However, these studies either failed to measure tenure security in terms of the breadth, duration and assurance of the property rights held (often measuring tenure security as the presence or otherwise of a land title in situations where this was not a relevant indicator of tenure security), or failed to recognise that secure tenure provides economic incentives to both tenant *and* landlord to invest on rented land (e.g. Place and Hazell, 1993). Where a broader definition of property rights is adopted, research demonstrates a stronger relationship between tenure security and investments. In Rwanda, Blarel's (1994: 87) study showed a positive and significant relationship between tenure security and on-farm investment. Similarly, results presented by Kille and Lyne (1993) show that exclusive and assured tenure is a significant determinant of on-farm investment in rural areas of KwaZulu-Natal, South Africa.

However, secure tenure is a necessary but not sufficient condition for agricultural investment and development. Farmers investment demand may be weak for reasons other than insufficient tenure security. Missing factor markets, inappropriate technology transfers and poorly developed input and output distribution mechanisms may all constrain investment even if tenure is secure.

3.1.3 Tenure security and access to credit markets

Besides increasing the incentive to invest on agricultural land, it is hypothesised that secure tenure and a well functioning land market increases the demand for and supply of resources to finance such investments (Pasour, 1990: 202). The supply of credit, especially formal credit (from formal lending institutions) frequently depends on the borrowers ownership

security, as the provision of land as collateral is a common prerequisite for commercial bank loans. Collateral reduces the lender's cost of information regarding the borrowers credit worthiness and risk of default. By lowering the risk and information costs faced by lenders, collateral can increase the number of profitable lending opportunities and therefore the volume of agricultural credit. Even where land is not offered as collateral, exclusive land owners have, *ceteris paribus*, better access to credit because they are regarded as having higher credit worthiness by virtue of their secure land rights which are implicitly regarded as collateral (Feder *et al*, 1988: 49).

To act as suitable collateral, the bundle of use rights to land must include the right to transfer ownership. Further, lenders require assurance that the occupier of the land is indeed the legal owner. Roth *et al* (1989) describe two other conditions necessary to enhance the collateral value of title deeds. Firstly, there must be a well developed land market that enables lenders to convert mortgaged land into financial assets at reasonable transaction costs upon foreclosure. The greater and more effective the restrictions on land sales, the lower the value of the land as collateral to the lender. Secondly, foreclosure must be politically feasible to reduce the lenders risk of loan losses.

The absence of a land sale market does not necessarily preclude the use of land rights as collateral if land can be rented. By law, the lessee, with the consent of the lessor, is entitled to assign the rights and obligations of a lease to a third party, in this case the lending institution (Kerr, 1984). In the event of foreclosure, the lease is sold at its present value. While long-term lease agreements are likely to be suited for this use, this still represents a

'second best' solution as the collateral value of a transferable lease diminishes over its contractual term.

The supply side effect of secure tenure on formal credit use observed elsewhere (for example, by Feder and Onchan (1987) in Thailand) is not apparent in areas studied in sub-Saharan Africa (Bruce *et al*, 1994: 254). Moreover, it is evident that land titles alone are unlikely to induce the development of active credit markets in sub-Saharan Africa (Migot-Adholla *et al*, 1991). This is likely to be a reflection of the absence of a well functioning land market and other institutional rigidities in capital markets, resulting in low overall use of formal credit in the areas studied. Furthermore, in areas where informal credit use predominates (as found in many areas of Africa (Atwood, 1990)), collateral may be of limited value. This is because informal lenders may not require land as collateral as they are often more able to enforce repayment, hence reducing the risk of default associated with the loan (Feder *et al*, 1988: 45).

CHAPTER 4

SAMPLING AND ESTIMATION TECHNIQUES

To test the conceptual model, household data were collected by means of an interview survey of small-scale farmers in Manicaland Province, Zimbabwe. This chapter describes the choice of sampling technique adopted, and then gives a brief history of land policy shaping property rights in the different agricultural sectors of Zimbabwe. This section draws heavily on research conducted by the author in collaboration with the University of Zimbabwe during April 1993 (Moor, 1994). Finally, the empirical techniques employed to estimate the hypothesised relationships will be discussed.

4.1 Sampling techniques

Simple random sampling is a statistical technique whereby the target population's characteristics are measured by randomly selecting sample units from the study population with equal probability. Theoretically, the study and target populations should coincide, but often this is practically not possible. This is because the sample frame is not always representative, and the sampling variance is large (Barnett, 1991: 105). Associated with non-representation is the possible problem of insufficient variation in the characteristics to be measured, limiting the sample's usefulness in further statistical analysis. These problems can be overcome using stratified random sampling or multi-stage sampling.

Stratified random sampling requires that the target population to be estimated be divided into various strata, often chosen along geographical lines or for other administrative reasons. Within each stratum, a simple random sample of the sampling units are chosen and their characteristics measured. Provided the within stratum variance is less than the between strata variance, the technique will yield a representative sample with less variance than with simple random sampling (Barnett, 1991: 107). Multi-stage sampling stratifies the sample more than once, using different criterion at the different levels of stratification.

4.2 The survey

Data for the study were gathered by means of an interview survey of small scale farmers in Manicaland Province, Zimbabwe, during April 1995. Respondents were revisited in August 1995. The survey was confined to the small farm sector of Zimbabwe as this allowed the investigation of the interaction between land tenure security and economic incentives under a wide range of geographically adjacent tenure institutions, including small scale privately owned farms, communal areas and a government resettlement programme. Moreover, past government policies in Zimbabwe have purposefully favoured large scale commercial agriculture, invalidating comparisons between the large scale commercial sector (LSCS) and the small farm sector (Ashworth, 1993). By contrast, levels of state support within the small farm sector have not varied much between regions. The Zimbabwean small farm sector was considered appropriate for the study given similarities between the South African and Zimbabwean small farm sectors, and Zimbabwe's experience with land reforms in the small farm sector initiated at independence in 1980.

The study area was stratified so as to maximise the variation on the measured tenure variables between strata. Three strata were identified, namely the Small Scale Commercial Sector (SSCS), the Communal Area (CA) and the Model A Resettlement Area (RA). A random sample of households was drawn from each stratum and the household head interviewed: 40 from the SSCS, 39 from the RA and 40 from the CA.

Each respondent was personally interviewed by the author with the aid of an interpreter, thus excluding the possible bias caused by the use of several interpreters. Discussions were also held with officials from government agricultural extension services (AGRITEX) and the Agricultural Finance Corporation (AFC). Amongst the variables measured in the questionnaire (Appendix A.1) were household characteristics, household head characteristics, farm characteristics (including measures of tenure security) and production characteristics. For each respondent, data were gathered on both grazing and arable allotments.

4.3 Description of the survey areas

Three geographically adjacent strata were identified in the Zimbabwean small farm sector. Differences in tenure institutions between the strata are largely the result of past Zimbabwean government policies. Before describing the location and tenure characteristics of the different strata, it is instructive to briefly review the history of land policy in Zimbabwe which shaped the current delimitation of property rights in the country.

4.3.1 The history of land policy in Zimbabwe

Since white settlers first arrived in Zimbabwe in 1896, agriculture in Zimbabwe has been divided along racial lines resulting in a dualistic structure of property rights and land use patterns, with the different sectors characterised by different property institutions. By 1896 just over six million hectares of farming land had been expropriated by the white settlers recruited in South Africa by Cecil John Rhodes, and the first African Reserve, comprising about 23 per cent of all arable land (Deininger and Binswanger, 1992), was established.

The Land Apportionment Act of 1930 institutionalised the racial division of land, classifying the country into European Areas (49,0 per cent), Native Reserves (21,7 per cent) and Native Purchase Areas (7,5 per cent). Approximately 17 per cent of the land was not allocated. In 1969 the Land Apportionment Act was replaced by the Land Tenure Act (LTA). This Act decreased the European area and redistributed some of the previously unassigned areas. The Native Reserves were renamed Tribal Trust Lands, and are now called Communal Areas. At independence 6 000 white large scale commercial farmers owned 15,6 million hectares (46,5 %) of farm land, 700 000 Communal Area farmers owned 16,3 million hectares (49,3 %) and 1,4 million hectares (4,2 %) was owned by approximately 8 500 small scale commercial farmers (originally the Native Purchase Areas) (Vink and Louw, 1990).

4.3.2 Land policy since independence (1980)

Following independence in 1980, the new government of Zimbabwe launched a two pronged development strategy with the stated aim of achieving 'Growth with Equity' (Zimbabwe,

1986). On the one hand, there was an obvious need for direct development within the overcrowded Communal Areas. Given that at independence: (1) the majority of the rural population lived in the Communal Areas, (2) Communal Areas were characterised by increasing population pressure and resource degradation and (3) the basic agricultural support institutions were primarily serving commercial agriculture, the new majority government committed resources to Communal Area sub-sector reforms. Such reforms included infrastructural improvements and the establishment of new rural marketing depots (Davies, 1990), and an increase in the Government guaranteed Agricultural Finance Corporation (AFC) credit extension into Communal Areas via the Small Farm Credit Scheme first initiated in 1978 (Mufuka, 1991).

On the other hand, the demand for a more equitable distribution of land required additional land to be acquired to resettle communal farmers to extend their subsistence base (Davies, 1990). The government initiated a resettlement programme in September 1980, in accordance with the provisions of the Lancaster House agreement. In terms of this agreement, the British Government would underwrite half the cost of settlement, provided that land only changed hands on a 'willing seller - willing buyer' basis. Only 'under-utilised' land could be compulsorily acquired, but would have to be paid for immediately and at the market price (Palmer, 1990). The effect of resettlement on land ownership patterns is shown in Table 4.1.

Table 4.1: Comparison of land distribution by sector and natural region in Zimbabwe, 1980-1989.

| NATURAL REGION | LSCS (%) | | SSCS (%) | | Communal (%) | | Resettled (%) | |
|---------------------|----------|-------|----------|------|--------------|-------|---------------|------|
| | '80 | '89 | '80 | '89 | '80 | '89 | '80 | '89 |
| I | 2,8 | 1,8 | 0,5 | 0,7 | 0,8 | 0,8 | - | 0,9 |
| II | 27,6 | 32,7 | 17,8 | 17,4 | 7,7 | 7,7 | - | 17,9 |
| III | 20,7 | 21,5 | 37,9 | 38,4 | 17,3 | 17,7 | - | 37,7 |
| IV | 25,7 | 21,6 | 36,9 | 36,2 | 44,9 | 44,6 | - | 24,6 |
| V | 23,3 | 22,2 | 6,9 | 7,2 | 29,3 | 29,1 | - | 18,8 |
| Total ¹⁾ | 15680 | 11220 | 1416 | 1380 | 16279 | 16450 | - | 3290 |

1) '000 ha

Source: Vink and Louw, 1990.

Initially, the plan envisaged settling 18 000 families on an area of 1,1 million hectares over five years. However, the first three-year Transitional Plan (1982/83 - 1984/85) redefined the target figure to be settled upwards to 162 000 families on 9 million hectares by as early as 1984 (Vink and Louw, 1990). By the end of 1983, over 2 million hectares of commercial farm land had been purchased by the state for redistribution. However, after 1983 land acquisition showed a marked loss of momentum as the budget fell from Z\$ 25 million in 1980 to Z\$2 million in 1985. By the end of June 1989 the policy had fallen well short of its target; 3,2 million hectares (10.2 per cent) of Zimbabwe's agricultural and were redistributed to 53 968 settler families, including 0,5 million hectares of state land and 2,7 million hectares of land acquired from the predominantly white large scale commercial sector (LSCS) at a cost of Z\$68,9 million. Over 83 per cent of the land had been acquired by 1983/84 (Roth, 1993). After more than a decade of land reforms, land distribution in Zimbabwe still remains highly skewed. In 1989, 4 660 families still held 11,2 million hectares of land in the LSCS, while over one million families live on 16,4 million hectares in the Communal Areas.

To clearly understand the impact of past policies and land ownership patterns on production, it is helpful to look at land ownership in terms of Zimbabwe's land use potential. Zimbabwe can be divided into five agro-ecological zones or Natural Regions (NR), which provide a broad framework for evaluating potential land use, as follows (Weiner *et al*, 1985):

- I. *Specialised and diversified farming region*. This area is well suited to tea, coffee and forest crops, as well as intensive livestock.
- II. *Intensive farming region*. Maize, tobacco, cotton, wheat, other grains and intensive livestock are well suited to this region.
- III. *Semi-intensive farming region*. Best suited to semi-intensive livestock production. Cropping is risky in this region.
- IV. *Semi-extensive farming region*. Livestock is the only sound farming system in this region.
- V. *Extensive livestock region*. Extensive livestock farming is the only possible farming system without irrigation.

From Table 4.1 it is evident that only 8,5 per cent of land in Communal Areas and 18,8 per cent of land in the Resettled Areas is considered to be of high arable potential (NR I and NR II), compared to 34.5 per cent in the LSCS (Vink and Louw, 1990).

4.3.3 The Tanda Small Scale Commercial Sector

The Tanda Small Scale Commercial farming area is situated 155 kilometres east of Harare in Manicaland Province, 32° 15' east and 17° 45' south (Figure 4.1). This area, formerly known as the Tanda Native Purchase Area, was first occupied by small scale commercial farmers in the 1930's.

The area was selected for the study as it is adjacent to both a Resettlement Area and a Communal Area. The nearest town is Headlands which is 45 kilometres away, although most supplies come from Rusape which is 80 kilometres away. These towns provide little employment for the area, with most off-farm workers employed in Harare (this is also the case in the CA and RA). Access to the area is via a poorly maintained dirt road from Headlands, while vehicular access to individual farms is often impossible (most farmers use ox-drawn carts). There is a daily bus service to Rusape, and a twice weekly service to Harare. The Tanda village has a school and two Spaza shops. There is one AGRITEX extension official serving the 52 Tanda farmers.

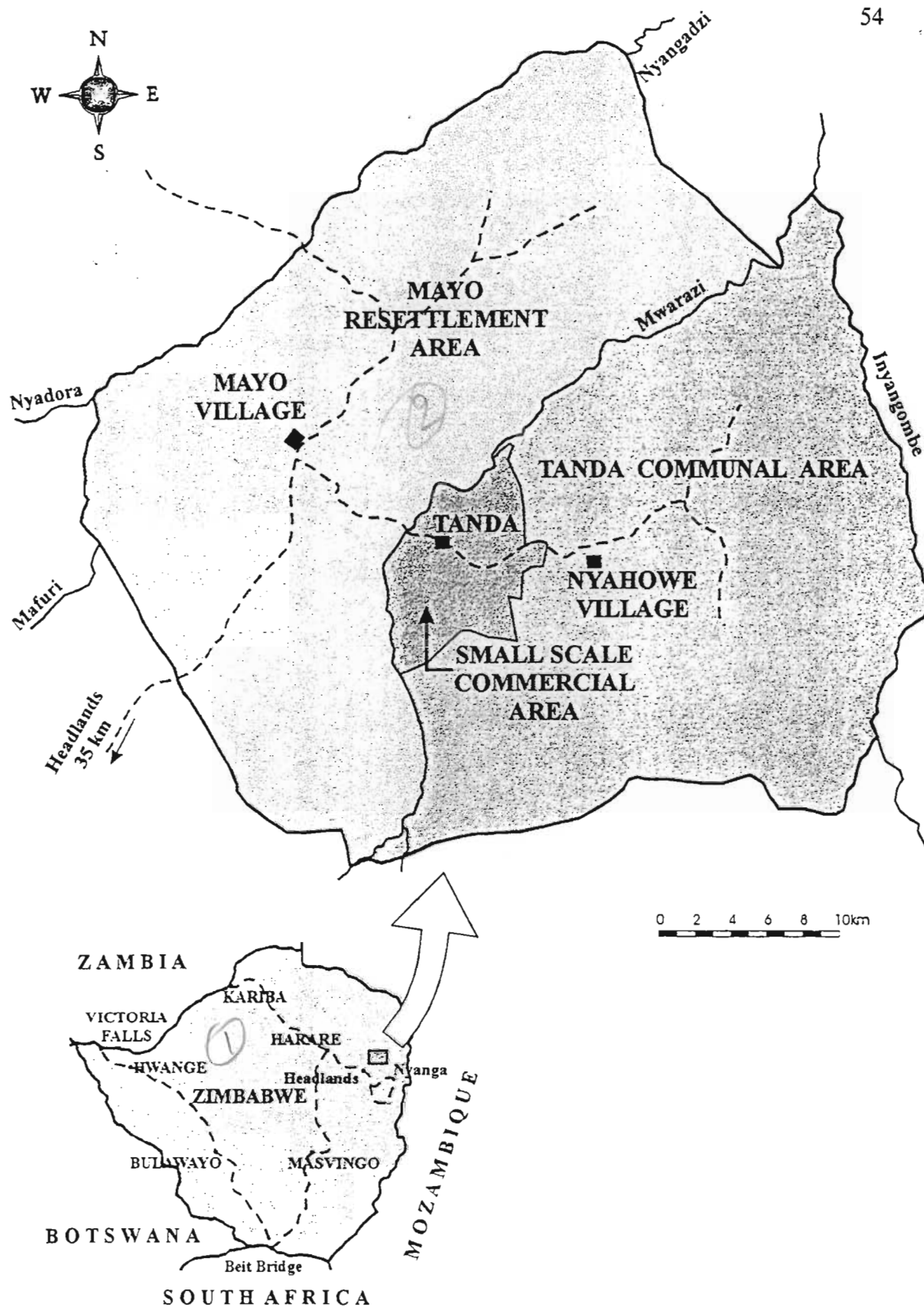


Figure 4.1 : Map of Zimbabwe showing the location of the study area

4.3.3.1 Tenure institution

Land in the SSCS is initially held under long-term lease from the government with an option to purchase. Once purchased, farmers are issued freehold title to the land and are free to enter into land transactions. However, it has been noted that private tenure in the SSCS may be somewhat conditional compared to that on other freehold land held under the statutory law (Ashworth, 1993). Certain usufructuary and secondary rights to freehold land belonging to others are recognised by the state. This is as a result of social customs and traditional family rights becoming intertwined with the often misunderstood concepts and practices of owning land in a freehold sense. Nonetheless, property rights are transferable, which according to Ashworth (1993), has afforded SSCS farmers improved access to credit facilities. The average farm size in the SCSS was estimated by Gustafsson (1987) to be approximately 128 hectares.

4.3.4 The Tanda Communal Area

The Tanda Communal Area is situated just east of the Tanda SSCS, and extends to the mountainous Nyanga Communal Area on Zimbabwe's eastern border with Mozambique. Access to the area is via the same dirt roads as in the SSCS, while vehicular access to individual households is very poor. The area is divided into villages, each controlled by a local headman. Each village has its own communal grazing area. The villages delineate rural communities and have very little infrastructure. There are a number of Spaza shops, a school and an AGRITEX extension office at Nyahowe village. It was estimated that each extension official was responsible for approximately 800 farmers in the Tanda Communal Area.

4.3.4.1 Tenure institution

Land in the Communal Areas is held under a common property tenure institution, with title deeds to the land vested in the State. Communal ownership confers individual rights to plots for houses and arable land, and provides unlimited access to communal grazing land held by the particular community. Exclusive rights to arable land are held for the growing season only, as arable land reverts to communal grazing in the winter months. According to customary law, allocated arable land not utilised reverts to the headman for re-allocation, and the household faces the threat of eviction. However, eviction is a rare occurrence (Muir and Blackie, 1994: 4). As land is socially understood in African tenure, once allocated, the holder has sovereign standing, self determination and an accepted place in the community. While land allocations are not alienable, the continued right to use allotted land is relatively secure for male landholders provided that they meet the moral requirements of community membership.

Prior to 1982, land in Communal Areas was legally held in trust by traditional leaders for the benefit of the community. In 1982, with the passing the Communal Lands Act, legal authority over land allocation was formerly transferred from traditional leaders (chiefs and headmen) to elected district councils. However, according to Rukuni (1990), the *de facto* administration of land in the communal areas has reverted back to traditional leaders. This is confirmed by data collected for this study which indicates that 90 per cent of CA households' sampled believe the land is owned by the chief.

On average, Communal Area's are characterised by increasing population density and declining farm size (1.3 hectares per household in 1983-1984) (Mehretu, 1994: 59). It is estimated by Davies (1990) that the population in the Communal Areas is growing at almost three per cent per annum. The increasing population pressure has contributed to severe land degradation. According to Zimbabwe's Five Year Development Plan (Zimbabwe, 1986), 40 per cent of Communal Areas are regarded as overpopulated, and soil erosion and deforestation have reached critical proportions.

4.3.5 The Mayo Resettlement Area

The resettlement of agricultural land in Zimbabwe was carried out according to five different models. In each case, the legal ownership of the land is vested in the state and settlers are granted occupancy permits, which fall well short of a title or even a lease. Land cannot be sold, sub-divided or inherited (without government approval). The five resettlement models are:

Model A (Intensive) Resettlement model. The land is not owned by the settlers, who are only issued an annual (and conditional) permit to cultivate land. Individual households are allocated five to six hectares of arable land plus access to common grazing (Palmer, 1990). As in the Communal Areas, arable land reverts to communal grazing in the winter months. Resettlement areas are organised into villages, and basic infrastructure is provided. A similar model, Model A (Accelerated), was devised to deal with spontaneous settlements on unoccupied land (Gustafsson, 1987).

The third model, Model B Resettlement, is based on community living and co-operative farming. Apart from ideological considerations, the collective structure is intended to permit the preservation of the high technology production structure of the original commercial farms. Members of the co-operatives run the farms through sets of committees and the proceeds are shared amongst the farmers according to a predetermined formula. Individual rights to land are inclusive, since the land is resettled to a group, with individuals having equal access to the common resource.

The remaining two resettlement schemes are still regarded as experimental, and together account for less than ten per cent of total resettlement. Model C Resettlement provides core commercial estates, surrounded by Model A type small scale resettlement. The Model D scheme utilises commercial ranges as 'holding grazing' areas while neighbouring Communal Areas are reorganised to demarcate arable, grazing and residential areas. This is reminiscent of Betterment Planning experienced in South Africa (see Baber, 1991: 68)

Within the programme, the settlers have overwhelmingly opted for the Model A scheme, with 81,4 per cent of the area and 78,8 per cent of the families settled choosing Model A (Roth, 1990). Twelve per cent of the settlers are settled to Model B, 0,9 per cent on two farms according to Model C and 8,3 per cent on one experimental area under Model D.

The Mayo Resettlement Area was selected for the study as it is typical of a Model A Resettlement Scheme. The Mayo Resettlement Area is located on the western border of the Tanda SSCS and Tanda CA (Figure 4.1). The area was originally made up of large commercial farms bought by the government after 1980 for resettlement. Since 1983, 1355

households have been resettled in the area, divided into 80 villages. Individuals are allocated approximately five hectares of arable land, and each village has its own communal grazing. Access to the area is via the dirt road from Headlands. Access to individual households is better than in the SSCS and CA, but the roads are deteriorating rapidly. Villages have little infrastructure and no formal shops. However, the AGRITEX regional office, the AFC district branch, a grain and fertiliser depot together with a number of shops, schools and a clinic have developed at Mayo village. There are four AGRITEX officials serving the approximately 1355 resettled households.

4.3.5.1 Tenure institution

An individual's rights to arable land under Model A resettlement are defined by the 'permit of occupancy', which offers only temporary use rights and can be revoked at any time by the State. The permit specifies the type of fixed structures (buildings) and land use practices that are allowed on the land and is not transferable. In terms of the permit, disputes are settled by either the village chairperson or the regional Resettlement Officer, who are both appointed by the government. This increases uncertainty as these officials are answerable to the government and not to the people in the community (Mufuka, 1991). Grazing land is characterised by a common property tenure institution. In terms of the law, access to grazing is limited to members of a specific village, and stocking rates are prescribed by the government.

4.4 Sampling Methodology

Having identified the three strata to be sampled, a random sample of individual households to be interviewed was required from each area.

Given the small size of the Tanda SSCS, a simple random sample of households was selected from a complete list of households in the area compiled by the local AGRITEX official. The situation was more complex in the CA and RA. Because of the CA's vast size and poor road infrastructure, only the area accessible by road and immediately adjacent to the SSCS was surveyed. A multi-stage sampling procedure was used to draw the desired sample. Firstly, a sample of villages was randomly selected from a list of villages in the north-western quadrant of the Tanda Communal Area. Next, individuals were randomly selected from household lists for each village. A Similar multi-stage sampling procedure was used in the RA. A sample of villages was drawn from a list of those villages' adjacent to the main access route. From this, a simple random sample of households to be interviewed was drawn.

Although villages were not sampled with probability proportionate to their size, the extent of any bias is likely to be small since all villages sampled were of a similar size. As a result of the sampling methodology employed, all households sampled in all the strata were accessible from the main access roads.

4.5 Estimation techniques

From the conceptual model, it is evident that credit use, long-term land investments, short-term complementary input use and yield are interrelated. For this reason, the effect of tenure security on agricultural investments and productivity was estimated as a simultaneous equation model using two-stage least squares (2SLS) regression analysis. Dummy dependant variables within the simultaneous system were estimated by probit analysis. The presence of multicollinearity was checked for throughout the analysis using matrix decomposition (Judge *et al*, 1988: 870). Severe multicollinearity was encountered during the 2SLS estimation. As a result, a separate 2SLS regression, using principal component regression analysis to rid the data of the multicollinearity, was estimated (Kendall, 1957; Nieuwoudt, 1972). These techniques will be discussed in the following sections.

4.5.1 Regression analysis

4.5.1.1 Multiple regression

The objective of multiple regression analysis is to estimate the mean or expected value of the dependant variable Y on the basis of given values of the explanatory variables X_{ij} . Estimated by ordinary least squares (OLS), multiple regression allows powerful interpretation of data provided the underlying assumptions of both model and technique hold true.

The linear regression model is based on the following assumptions (Gujarati, 1988: 166):

1. The dependant variable (Y) is a linear (or intrinsically linear) function of the explanatory X variables.
2. The X 's are non-stochastic and there is no linear relationship between two or more of the independent variables.
3. The error term (u_i) has zero expected mean and constant variance for all observations.
4. There is no serial correlation of error terms corresponding to different observations.
5. There is zero covariance between u_i and each X variable.
6. The error term is normally distributed.

When these assumptions are violated parameters cannot be estimated, or at best are biased, inefficient or inconsistent. Simultaneous equation models violate the regression assumption that the X variables are either non-stochastic, or if stochastic are distributed randomly of their stochastic error term. In simultaneous models, mutually dependant variables are correlated with the disturbance (error) terms and are not independently distributed of them. OLS regression under these conditions can result in 'simultaneous equation bias'. This leads to estimators that are not only biased, but are also inconsistent (that is, they do not converge on their true value as the population size increases indefinitely). Consequently, the simultaneous equation model must be estimated using either indirect, two-stage or three-stage least squares.

There is one situation where this is not the case - with recursive, or triangular, models. In such models there is only a one-way, as opposed to a two-way, cause and effect relationship. Assuming the error terms are *not* contemporaneously correlated, each equation can be estimated separately using OLS, giving unbiased estimators (that is, if $\text{cov}(u_{1i}, u_{2i}) =$

$\text{cov}(u_{2t}, u_{3t}) = \text{cov}(u_{1t}, u_{3t}) = 0$). In other words, for OLS to give unbiased estimators, the same period disturbances in the different equations must not be correlated.

4.5.1.2 Simultaneous equation models

Simultaneous equation models are appropriate when there is joint dependence of economic variables within the model. They are also appropriate in recursive models where there is contemporaneous correlation between error terms in the different equations (Hsiao, 1986: 113). Unlike single equation models, simultaneous equation models must account for all information from each equation when estimating parameters otherwise they will be biased and inconsistent (Gujarati, 1988: 556).

The theoretical model to be investigated in this thesis requires four equations. The system is recursive and the assumption of zero contemporaneous correlation amongst error terms is not appropriate. This is because it is likely that unobserved household or farm variables in the different equations are correlated, resulting in contemporaneously correlated error terms. According to Hsiao (1986: 113), a triangular model (recursive model) showing contemporaneous correlations of the error terms can be efficiently estimated using 2SLS, provided the model is identified.

In simultaneous systems, the problem of identification refers to the ability to numerically estimate the parameters of the structural equations from the estimated reduced-form coefficients. The structural equations are the full equations to be estimated by the model. The reduced-form equations and associated reduced-form coefficients express each

endogenous variable (the Y 's) in the system in terms of exogenous variables (the X 's) and the stochastic disturbance only. An equation is exactly identified if unique numerical values of the structural parameters can be obtained, and over identified if more than one numerical value is possible for some parameters in the structural equation. Only when equations are exactly or over identified can parameters be estimated because there are enough independent equations to allow estimation of the unknown structural parameters.

Identification can be simply tested using the Order condition as follows (Gujarati, 1988: 584):

If $K - k = m - 1$, the equation is exactly identified and if

$K - k > m - 1$, the equation is over identified.

Where: K = number of predetermined (exogenous) variables in the model.

k = number of predetermined variables in the given equation.

m = number of endogenous variables in the given equation.

The order condition is a necessary, but not sufficient, condition of identification. A more stringent test of identification is the Rank condition, which is both a necessary and sufficient condition for identifying an equation. By the Rank condition an equation is identified if, in a system of g equations, at least one non-zero determinant of the order $(g-1)$ can be constructed from the coefficients of the variables (both endogenous and exogenous) excluded from the particular equation, but included in the other equations in the model.

Each equation in a simultaneous system must be tested for identification to ensure the correct estimation technique is used. The statistical model was found to be identified in each equation, so two-stage least squares regression was appropriate.

4.5.1.3 Two-stage least squares regression analysis

Two-stage least squares regression analysis purifies the stochastic explanatory variable of the influence of the stochastic disturbance term by creating a proxy or instrumental variable for the endogenous variable. The technique involves two successive applications of OLS (Gujarati, 1988: 604). Consider the following model:

$$Y_{1t} = \beta_{10} + \beta_{11}Y_{2t} + \beta_{12}X_{1t} + \dots + u_{1t}$$

$$Y_{2t} = \beta_{20} + \beta_{21}Y_{1t} + \beta_{22}X_{2t} + \dots + u_{2t}$$

Stage 1:

To rid the second equation of the likely correlation between the endogenous explanatory variable Y_1 and the error term u_2 , first regress Y_1 on all the predetermined or truly exogenous variables in the whole system. This affords an estimate of Y_1 that is conditional upon the non-stochastic X 's and a random error component. Y_1 can thus be expressed as $Y_1 = Y^*_1 + e_1$. This no longer violates the assumption that the explanatory variable (Y^*_1) and the error term (e_1) are uncorrelated. The instrument, Y^*_1 , can now be used as a true explanatory variable in the other equations.

Stage 2:

The second stage involves replacing the endogenous explanatory variable with the instruments estimated in Stage 1, and re-estimating the equation by OLS. Equation Y_{2t} is re-estimated as:

$$Y_{2t} = \beta_{20} + \beta_{21}(Y^*_{1t} + e_{1t}) + \beta_{22}X_{2t} + \dots + u_{2t}$$

$$Y_{2t} = \beta_{20} + \beta_{21} Y^*_{1t} + \beta_{22}X_{2t} + \dots + (u_{2t} + \beta_{21}e_{1t})$$

$$Y_{2t} = \beta_{20} + \beta_{21} Y^*_{1t} + \beta_{22}X_{2t} + \dots + u^*_{2t}$$

The final equation is very similar to the original equation for Y_{2t} , the only difference being that Y_{1t} is replaced by Y^*_{1t} . Since Y^*_{1t} is independently distributed of u^*_{2t} , OLS estimation provides unbiased and consistent estimators of the parameters. It is thus seen that the two-stage least squares procedure ‘purifies’ the stochastic explanatory variables of the influence of the stochastic error terms.

Importantly, two-stage least squares estimates may not satisfy small sample properties such as unbiasedness and minimum variance. Thus results from small samples should be interpreted with due caution.

4.5.2 Probit analysis

In the empirical model, long-term investments and complementary short-term input use are captured as dummy variables. Estimation of such models by OLS, assuming the dichotomous Y_i to be a linear function of the explanatory variables (X_i 's), violates three of the OLS assumptions. The violated assumptions are:

i) Non-normality of the disturbances (u_i)

Although OLS does not require the disturbances to be normally distributed, it is assumed for the purpose of statistical inference (Gujarati, 1988: 469). However, for models with a dummy dependant variable (linear probability models - LPM), the disturbance term follows a binomial distribution.

$$u_i = Y_i - \beta_1 - \beta_2 X_i$$

$$Y_i = 1 \quad u_i = 1 - \beta_1 - \beta_2 X_i$$

$$Y_i = 0 \quad u_i = -\beta_1 - \beta_2 X_i$$

The non-fulfilment of the normality assumption is not critical as OLS estimates remain unbiased. Furthermore, as sample size increases indefinitely, the OLS estimators tend to be normally distributed generally.

ii) Heteroscedastic variances of the disturbances

Even if $E(u_i) = 0$ and $E(u_i u_j) = 0$, for $i \neq j$ it can no longer be maintained that the disturbances (u_i) are homoscedastic (of equal variance). This is because the variance of u_i is dependant on the conditional expectation of Y , which depends on the value taken by X (Gujarati, 1988: 471).

Although unbiased, the estimated parameters are no longer of minimum variance. This can be overcome by means of the Goldberger transformation (Gujarati, 1988: 471) or the use of Aitken's generalised least squares (Hill and Kau, 1973).

iii) Non-fulfilment of $[0 \leq E(Y_i/X) \leq 1]$

Since $E(Y_i/X)$ in the linear probability model measure the conditional probability of the event Y_i occurring given X , it must necessarily lie between 1 and 0. However, estimation of the LPM by OLS does not ensure $0 \leq E(Y_i/X) \leq 1$. Thus, despite a number of suggested solutions to this problem, LPM remains a logically unattractive model since it assumes that $P_i = E(Y = 1 | X)$ increases linearly with X .

It is thus suggested that the techniques of logit or probit analysis are used. The choice between the probit and logit model is largely one of convenience and the differences between the two models are slight. The main difference is that the probit model assumes a normal distribution of the error term, while the logit model assumes a logistic distribution

of error terms (Judge *et al*, 1988: 788). Both models take a sigmoid functional form, although the logistic density has slightly heavier (flatter) tails.

To replace OLS estimation of the dummy dependant variables in the two-stage least squares model, the probit model is selected as it rests on the assumption that the disturbances are distributed normally, as in OLS estimation. The standard normal cumulative distribution function associated with the probit model implies that the probability that the i^{th} decision maker selects the first alternative is given by (Judge *et al*, 1988: 787):

$$P_i = F(z_i) = \int_{-\infty}^{z_i} (2\pi)^{-1/2} \exp\{-x^2/2\} dx$$

$$-\infty < Z_i < \infty \quad Z_i = x_i' \beta$$

The final equation derived from the probit model is:

$$E(Y_i|A_i) = \text{prob}(Y_i = 1|A_i) = F(A_i) = F(\beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_m X_{mi})$$

Since F is the normal cumulative distribution function, no matter what value A_i takes, F will necessarily be transformed into the interval of zero and unity (Hill and Kau, 1973). Moreover, the derived functional form is sigmoid in shape which allows any linear or non-linear relationship between X and Y through A to be accommodated (Hill and Kau, 1973).

Probit is estimated by maximum likelihood. Such estimates are consistent, asymptotically efficient and asymptotically normally distributed (Judge *et al*, 1988: 792).

Goodness of fit was measured by the chi-squared statistic and its associated probability. This tests whether residuals are distributed homogeneously around the regression line, and if significant can indicate that a different response model or predictor transformation is required (SPSS-X User Manual, 1975: 614). The associated probability should be near to 0.5 indicating a good fit.

4.5.3 Principal component analysis

Principal component analysis is a data transformation technique whereby the data is transformed to describe the same amount of variance as the original data, with the same number of dimensions (or axes), but in such a way that the first axis accounts for as much of the variation as possible. The second and following axes account for as much of the remaining variation as possible without been correlated to any of the preceding axes. The axes' orthogonal properties are useful in countering problems associated with multicollinearity (Nieuwoudt, 1972).

Each principal component is derived as:

$$PC_i = a_{i1}X_1 + a_{i2}X_2 + \dots + a_{im}X_m$$

4.1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

where: $X_1 \dots X_m$ are independent variables

$$i = 1 \dots m$$

$a_{i1} \dots a_{im}$ are the component loadings.

The component loadings a_{ij} indicate the contribution of each variable X_j to the principal component.

CHAPTER 5

THE EMPIRICAL MODEL AND RESULTS

The conceptual model detailed in Chapter Three can be formalised into a four equation simultaneous equation model for a given household j :

- 1) $C_j = f(X_j^h, X_j^f, X_j^t)$... Credit use
- 2) $L_{ij} = f(X_j^h, X_{ij}^f, X_{ij}^t, C_j)$... Demand for land improvements
- 3) $I_{ij} = f(X_j^h, X_{ij}^f, X_{ij}^t, C_j, L_{ij})$... Demand for complementary inputs
- 4) $Y_{ij} = f(X_j^h, X_{ij}^f, X_{ij}^t, L_{ij}, I_{ij})$... Yield

where C (credit use), L (long-term land improvements) and I (short-term input application) are endogenous variables. The vector X^h is a vector of household characteristics, X^f a vector of farm characteristics and X^t is measure of tenure security.

Equation (1) describes the joint effect of supply- and demand-side factors on the household's use of credit, including household characteristics, farm characteristics and the level of land tenure security. Equation (2) represents the extent of land improvements made on plot i by household head j since the time of acquisition and is a function of X_j^h , X_{ij}^f , X_{ij}^t , together with the supply and demand for credit (C). Complementary short-term input use on plot i by household head j in equation (3) is dependant on the same variables as equation (2), plus the current level of long-term land improvements (L). Finally, yield in equation (4) is determined

by X_j^h , X_{ij}^f , X_{ij}^t together with the extent of land improvements (L) and the level of short-term input use (I).

5.1 Descriptive statistics

Before discussing the empirical model in detail it is necessary to describe the way in which the variables were measured and how they are expected to influence the agricultural productivity model. Households are stratified and group means are presented, together with their associated F -value. A significant F -value requires that one reject the hypothesis that the group means are equal (SPSS Reference Guide, 1990: 62). However, caution is required when drawing inferences based on mean comparisons, as other variables not considered may affect the means in a systematic way.

5.1.1 Household characteristics

Statistics describing household characteristics are presented in Table 5.1. The data show a number of significant differences between household heads in the different strata. Firstly, household heads sampled in the SSCS are on average older than RA and CA household heads. Secondly, RA respondents have been the primary decision makers on the farm for a significantly shorter period of time. This is because the area was only resettled after 1983.

Thirdly, one of the most striking features is that 90 per cent of SSCS farmers sampled are males, compared to 66 per cent of RA farmers and 52 per cent of CA farmers. A similar result was reported in communal areas of KwaZulu-Natal, South Africa (Baber, 1991: 77).

A possible reason for this is that, in the absence of an active land market in the RA and CA, land has a low opportunity. Households, in attempting to maximise their joint utility, consequently assign family members with relatively low opportunity cost of time, such as children, women and old men, to agricultural production. This also provides some evidence of cultivation, thereby ensuring continued retention of rural land rights. This argument is supported by the fact that a significantly greater percentage of CA and RA farmers are part-time farmers.

Table 5.1: Household characteristics by strata in Manicaland Province, Zimbabwe (1995)

| | SSCS (40) | RA (39) | CA (40) | F-Value ⁴⁾ |
|---|-----------|---------|---------|-----------------------|
| Household head characteristics: | | | | |
| Age (Yrs) | 55.43 | 46.69 | 46.55 | 3.47* |
| Sex (% male) | 90 | 67 | 52 | 7.48** |
| Full-time farmers (%) | 93 | 64 | 83 | 5.41** |
| Education ¹⁾ (Yrs) | 6.80 | 6.49 | 6.12 | 0.53 |
| Farming experience ²⁾ (Yrs) | 25.05 | 10.31 | 15.93 | 17.73** |
| Agricultural Training ³⁾ (%) | 40 | 31 | 17 | 2.51 |
| Household composition (#): | | | | |
| Adults | 4.07 | 4.13 | 2.65 | 8.72** |
| Children | 5.85 | 4.44 | 4.30 | 3.27* |
| On-Farm family workers | 4.38 | 4.38 | 3.40 | 5.89** |

1) Number of years formal schooling

2) Number of years the household head has been principal decision maker on the farm

3) 'Master Farmer' or similar agricultural training qualification

4) * $p < 0.05$, ** $p < 0.01$

5.1.2 Land tenure security on arable land

Statistics describing tenure characteristics on arable land from all three strata are presented in

Table 5.2

5.1.2.1 Land tenure security - Tanda Small Scale Commercial Sector

In the Tanda SSCS, land is initially held under a long-term lease from the government with an option to purchase. Once this option has been exercised, individuals can register freehold title to the land and can enter into land transactions.

Table 5.2: Tenure characteristics on arable land by strata in Manicaland Province, Zimbabwe (1995)

| | SSCS (40) | RA (39) | CA (40) | F-Value ¹⁾ |
|---|-----------|---------|---------|-----------------------|
| Possession of current title deed (%) | 42.5 | 0 | 0 | - |
| Perceived breadth of property rights (%): | | | | |
| Right to sell | 48 | 0 | 3 | 127.44** |
| Right to bequeath | 95 | 74 | 100 | 9.03** |
| Right to exclude livestock during winter | 98 | 3 | 2 | 475.00** |
| Assurance of property rights (%): | | | | |
| Incidence of stray livestock at planting | 47 | 79 | 85 | 8.85** |
| Incidence of crop damage by stray livestock | 58 | 82 | 60 | 3.32** |
| Settled out of court (with compensation) | 13 | 8 | 0 | - |
| Stock owner fined in court | 9 | 6 | 0 | - |
| Fine not paid | 0 | 3 | 0 | - |
| Took no action against stock owner | 9 | 21 | 97 | - |

1) * $p < 0.05$, ** $p < 0.01$

Although freehold tenure grants an individual exclusive land rights, *de facto* individual rights vary considerably. Firstly, of the 40 SSCS farmers interviewed, 28 (70 per cent) had title deeds to their land. However, in only 17 cases was the title deed registered in the name of the current household head. In the remaining 11 titled cases, the deeds remain registered to deceased persons as heirs failed to register the change of ownership. Many respondents indicated that this was a result of prohibitive transaction costs surrounding title registration.

Registration costs were reported to be as high as Z\$3 000¹, and legal procedures required households to register title at a central registry in Harare. Secondly, while approximately 95 percent of all SSCS farmers indicated that they could specify the heir to their land, only 47.5 per cent believed that they could sell their land without permission from the government or other family members.

Although 57,5 per cent of all SSCS households reported crop losses following cattle intrusions, 22 per cent of affected households received compensation for their losses. All of the court imposed fines were enforced, increasing the certainty of law and tenure assurance in the SSCS. However, exclusive rights were not assured for all SSCS farmers. Farmers neighbouring the CA who reported cattle intrusions and crop damage by CA livestock were unable to take action against these farmers, because they were unable to identify the guilty CA stock owners. The remaining 69 per cent settled out of court, and did not demand compensation.

5.1.2.2 Land tenure security - Mayo Model A Resettlement Area

Land in the Mayo Resettlement Area is owned by the government, and settlers are issued an annual (and conditional) permit to cultivate five hectares of arable land, plus access to common grazing.

The breadth of rights over arable land in the RA is limited. Households are not allowed to sell their allotted land, and only 74,4 per cent of respondents indicated that they could specify the

¹ At the time of the study, Z\$1 = R0.4

heir to their land without permission from the government. Over 97 per cent of households indicated that they did not have the right to exclude stock owners from their arable lands during winter. Moreover, limited exclusive arable rights are difficult to enforce (lack assurance). Seventy-nine per cent of households reported stray livestock in their fields at the time of planting, while eighty-two per cent of households reported crop losses due to stray livestock. Less than 11 per cent of affected respondents received compensation for crop losses. Eight per cent received out of court compensation, while only two household reported the stock owner to government authorities (resettlement officer). In both cases the stock owner was fined, but one of the fines was not enforced. Twenty-one per cent of affected households took no action against stock owners. A possible reason for this is that allotted arable lands are far from the house (average distance is 1,03 km), making it difficult to trace the guilty stock owner. All remaining households settled out of court and did not demand compensation.

5.1.2.3 Land tenure security - Tanda Communal Area

Title to land in Tanda Communal Area is vested in the State. As long as the family resides in the area, communal ownership confers individual rights to plots for houses and arable land, and provides unlimited access to communal grazing land held by the community.

Individuals do not have the right to buy or sell land in the CA, but they do have the right to bequeath their land to an heir. On allotted arable land, 98 per cent of respondents indicated that they did not have the right to exclude stock owners from their land during winter. As in the RA, exclusive rights to arable land for the growing season are difficult to enforce, with 85

per cent of households interviewed reporting cattle intrusions at the time of planting. Discussions with extension officials and farmers revealed that late planting is a major constraint on production in the Communal Areas (Mathambo, 1995). Sixty per cent of respondents reported crop losses due to stray cattle. None were compensated and no transgressors were reported to the tribal authorities. Only one farmer demanded out of court compensation for crop damage, but the stock owner refused to pay. All of the remaining farmers who experienced cattle intrusions took no action against the stock owners.

5.1.3 Land tenure security on grazing land

The situation on grazing land is even more extreme than that found on arable land in the small scale sector in Zimbabwe. In the SSCS, individual rights to grazing land are exclusive and enforceable. Although 62,5 per cent of households reported having problems with stray cattle entering their grazing lands, 80 per cent of these chased the cattle away, while one farmer reported the stock owner to the courts and was compensated. Moreover, 95 per cent of households adhered to the suggested stocking rates for their farms. By contrast, only ten per cent of RA farmers, and no CA farmers, were aware of recommended stocking rates or rules, to limit livestock numbers. Over 90 per cent of RA and CA farmers reported stray livestock from other villages on their allotted communal grazing, but less than 15 per cent did anything to remove the livestock. Thus, although government rules do exist to control livestock numbers on communal grazing in the RA and CA, communal grazing is *de facto* an open access resource.

5.1.4 Empirical measurement of tenure security in the model

The registration of free-hold title was not considered a suitable indicator of tenure security in the study. Evidence from titling programmes in Africa suggest that title registration is not necessarily synonymous with tenure security (see Section 2.4). Notwithstanding the significant relationship between registered title deeds and on-farm investments in studies by Feder and Onchan (1987), high levels of tenure insecurity can exist even with the possession of title in sub-Saharan Africa. If the formal land code is ambiguous in its definition of rights, and if legal procedures to settle disputes are vague, land holders may not perceive increased tenure security following registration of title. Conversely, it has been argued that investment on agricultural land under customary tenure is sub-optimal because property rights are not clearly defined (Johnson, 1972). This too is an oversimplification. Property rights to land may be well defined under customary law, but the extent of use and transfer rights may be limited. Furthermore, some of these rights may be difficult to enforce.

Besides theoretical considerations, titling was not considered a suitable indicator of tenure security for econometric reasons. The decision to register land title in the SSCS, or to update existing titles, requires purposeful choice by the farmers themselves. Title registration is thus endogenous to the economic - and econometric - system. Estimation of such a system will lead to biased and inconsistent parameter estimates because of heterogeneity between titled and untitled farmers in the sample (Roth *et al*, 1989).

Consequently, tenure security in the empirical model was captured as an index (*TENURE*) measuring an individual's perceived breadth, duration and assurance of property rights over

specific land parcels (on both arable and grazing land). The index was constructed out of the following variables:

- 1) A dummy variable (D1) scoring one if the respondent perceived that he/she had the right to sell the land without the permission of others, and zero if otherwise.
- 2) A dummy variable (D2) scoring one if the respondent was able to specify an heir to the land, and zero if otherwise. This was identified as an important determinant of investment incentives in sub-Saharan Africa by Bruce *et al* (1994: 255).
- 3) A dummy variable (D3) scoring one if the respondent had exclusive use rights to land for the full duration of each year, and zero if otherwise. Respondents who had continuous use rights, but shared the land with other farmers, scored zero for this variable.
- 4) A dummy variable (D4) scoring one if the respondent's recorded property rights were enforced (assured), and zero if otherwise. Households who took no action against stock owners whose livestock strayed onto their arable or grazing lands, or did not receive compensation when it was demanded, scored zero for this variable. It was assumed that households who reported no cattle intrusions on their lands had assured property rights, and scored one for the variable.

The duration of an individual's property rights was not explicitly included in the index. Because land rights in the SSCS and CA are held for at least as long as the person resides on

the land, and no RA farmers were aware of anyone having been evicted from the resettled land since its occupation, the only perceived variation in the duration of land rights is captured in D3.

Based on the assumption that each variable in the index carries an equal weight, the index measures tenure security on a scale of zero (least secure) to four (most secure). Each farmer received a score for tenure security on both arable and grazing land (a different set of weights would produce different scores for tenure security). On average, farmers in the SSCS score highest on the *TENURE* index (3.15), compared to 0.91 in the RA and 1.06 in the CA. Perceived tenure security was expected to impact positively on investment in on-farm improvements and agricultural productivity.

Critical to the empirical model is the assumption that tenure security (*TENURE*) is an exogenous variable. Failing this, the tenure variable may be correlated to the error term in the equation leading to biased and inconsistent estimators of the dependent variable. In order to treat land rights as predetermined, it must be shown that farmers cannot alter specific land rights at will (Place *et al*, 1994: 30). For example, households in traditional communal areas may be able to alter their rights to a specific parcel of land by investing in long-term land improvements, questioning the causality between land rights and long-term investments.

Examination of the relationship between tenure security and the time elapsed since land acquisition showed little correlation, suggesting that individual farmers were unable to alter their land rights from those held at acquisition ($\rho=0,095$ in the SSCS, $\rho=-0,092$ in the RA and $\rho=-0,016$ in the CA). This implies that land improvements accomplished over the time

periods observed in the study are unlikely to have a significant effect on perceived tenure security. Furthermore - with the exception of SSCS farmers eligible for title deeds - farmers in the sample are unable to alter land rights at the time of acquisition. In both the RA and the CA, title to land is vested in the state, and households are subject to exogenously imposed tenure institutions (by the government in the RA, and by tribal customs (and the government) in the CA). The assumption that tenure is an exogenous variable was therefore accepted for the empirical analysis, and is consistent with studies by Feder and Onchan (1987) and Place and Hazell (1993).

This assumption does not disregard the endogenous evolution of tenure institutions. Rather, given the limited time period observed in the sample, it is not expected that significant endogenous tenure innovations would have occurred (the average length of time since the land was acquired by the current household head was 17 years in the sample). Furthermore, problems associated with collective action in large groups (Olson, 1971: 48) and resistance from those who stand to lose from an institutional change may constrain endogenous shifts towards exclusive land rights. Studies in KwaZulu-Natal, South Africa report forcible resistance by stock owners at attempts to enclose arable lands in communal areas (Thomson and Lyne, 1995). Traditional chiefs, with powers enhanced by previous colonial governments, also resist changes to the *status quo*.

In addition, competition from the successful large scale commercial agricultural sector dominant in Zimbabwean and Southern African agriculture has resulted in the increasing marginalisation of agriculture as a source of income in the small scale farm sector, reducing the demand for exclusive rights to agricultural land. In 1980, it was estimated that commercial

farmers in Zimbabwe produced 80 per cent of total agricultural output, and 96 per cent of agricultural sales (Bratton, 1990: 269).

5.1.5 Land market activity

The majority of land parcels in all the strata were acquired through non-market channels (Table 5.3). In the SSCS, 55 per cent of households inherited their land. In the RA and CA, government allocation (82 per cent) and tribal allocation (70 per cent) respectively accounted for most land acquisition.

Despite the existence of freehold title in the SSCS, only 2 households purchased their land from other farmers. This observation is not surprising, given that farms are small and households value land for the social security it provides. The social security value of land is high in rural areas of Zimbabwe, given the absence of a rural government pension programme. With few alternative forms of insurance, there is no guarantee that the offer price of a more productive farmer will exceed the reservation price of the household, and the land market is likely to remain inactive (Lyne and Roth, 1994).

Where farm land is held for reasons other than agriculture, it would still transfer to more productive farmers via an efficient rental market, as the foregone rental would penalise under-utilisers. However the rental market appears constrained in all the strata, despite the presence of potential lessees and lessors. Over one-third of all households interviewed indicated that they would like to rent in additional land, yet none did so.

Table 5.3: Land market activity by strata in Manicaland Province, Zimbabwe (1995)

| | SSCS (40) | RA (39) | CA (40) | F-Value ³⁾ |
|---|--------------|---------|---------|-----------------------|
| Mode of acquisition (%): | | | | |
| Purchase | 5 | 0 | 0 | 2.03 |
| Long-term lease | 40 | 0 | 0 | 25.67** |
| Inheritance | 55 | 18 | 25 | 6.83** |
| Government allocation | 0 | 82 | 5 | 126.28** |
| Tribal allocation | 0 | 0 | 70 | 89.84** |
| Rental market activity (%): | | | | |
| Potential lessee | 33 | 33 | 43 | 0.483 |
| Potential lessor | 25 | 15 | 3 | 4.55* |
| Perceived constraints for lessee ¹⁾ (%): | | | | |
| No land available to rent in | 54 | 62 | 71 | 0.43 |
| Government / tribal prohibition | 0 | 23 | 0 | 4.19* |
| Risk of meeting rental payments | 38 | 23 | 6 | 2.50 |
| Perceived constraint for lessor ¹⁾ (%): | | | | |
| No lessees | 30 | 66 | 100 | 1.64 |
| Government/tribal prohibition | 0 | 34 | 0 | 2.27 |
| Risk of damage / dispossession | 80 | 0 | 0 | 0.72 |
| Uncultivated land area ²⁾ (%) | 42 | 27 | 16 | 13.92** |

- 1) Column may sum to greater than 100 per cent because some farmers indicated more than one constraint.
- 2) Including land left fallow for crop rotations
- 3) * $p < 0.05$, ** $p < 0.01$

In the SSCS, 33 per cent of households wished to rent in additional land, while 25 per cent indicated that they would like to rent out excess land. Forty-two per cent of arable land was left idle, of which only 12 per cent was withheld from production for crop rotations. However, only one rental transaction was reported despite the apparent availability of land (rented out land). Rather, the data suggest that the rental market was constrained by a lack of tenure assurance. Eighty per cent of potential lessors perceived that renting out land was too risky. Thus, the reservation rent of these farmers is likely to be high on account of the high risk (Atwood, 1990). In this situation, the reservation rent of the lessor may exceed the

maximum rent a potential lessee is prepared to pay, and the rental market remains inactive. This is supported by the fact that 38 per cent of potential SSCS lessees indicated that risk associated with not meeting the required rental payment prevented them from renting in land.

In the RA, 33 per cent of households expressed a desire to rent in additional land, yet only 15 per cent would consider renting out land. This was despite the fact that 28 per cent of arable land was left idle, of which only seven per cent was for crop rotations. No rental transactions were recorded. Rather than a shortage of land, a more telling constraint is likely to be the uncertainty amongst lessees and lessors as to the legality of rental transactions in the RA. This was reported by 34 per cent of potential lessors and 23 per cent of potential lessees. Although the 'permit to occupy' land in the RA prohibits land sales, discussions with the government Resettlement Officer suggested that rental transactions were not officially prohibited. However, the fact that the majority of potential lessees (lessors) were unable to find households willing to rent out (in) land supports the contention that the tenure institution in the RA does not provide sufficient information regarding property rights to stimulate an active land rental market.

In the CA, 43 per cent of households expressed a desire to rent in land, while only one household was interested in renting out land. Moreover, only 16 per cent of the arable land was left idle, of which 15 per cent was for crop rotations. At first glance, this suggests that the rental market is constrained by a shortage of land in the Communal Area. However, the fact that very few households are willing to consider renting out surplus land may be the result of extreme tenure insecurity. A lack of tenure assurance for both lessee and lessor has

been identified by Thomson and Lyne (1993) as a serious constraint on the evolution of an efficient rental market under similar conditions in KwaZulu-Natal.

Unfortunately, further statistical analysis on constraints to rental transactions in the Zimbabwean small farm sector was not possible as a result of data limitations. Although beyond the scope of this study, the identification of land market constraints is essential as it impacts directly on economic incentives, and requires further research.

5.1.6 Credit use

Two broad sources of credit were identified in the study area, namely formal lenders and informal lenders. Formal lenders included commercial banks, the government financed Agricultural Finance Corporation (AFC) and co-operatives (the Cotton Marketing Board). Informal lenders included friends and relatives, and informal money lenders. Statistics describing credit use in the small farm sector of Zimbabwe are presented in Table 5.4.

No significant relationship was discernible between tenure security and the use of formal credit for the 1993/1994 and the 1994/1995 seasons. Firstly, even where tenure was most secure (SSCS) there was no evidence of credit being extended from commercial lending institutions. This finding is consistent with other studies in Africa (Bruce *et al*, 1994: 254), and is common where an inefficient land market limits the banks' ability to easily convert land assets into financial assets (Roth *et al*, 1989).

Table 5.4: Credit use by strata in Manicaland Province, Zimbabwe (1993 - 1995)

| | SSCS (40) | RA (39) | CA (40) | F-Value ⁴⁾ |
|--|-----------|---------|---------|-----------------------|
| Source of credit (%): | | | | |
| No credit used | 80 | 75 | 85 | 0.69 |
| Formal lenders: | | | | |
| Commercial banks | 0 | 0 | 0 | - |
| AFC | 10 | 25 | 12 | 2.09 |
| Informal lenders | 10 | 0 | 3 | 2.73 |
| Duration of loan: | | | | |
| 1 year | 75 | 80 | 67 | 0.41 |
| 2 - 5 years | 25 | 20 | 33 | 0.16 |
| Collateral required ¹⁾ (%): | | | | |
| No collateral required | 25 | 20 | 20 | 1.78 |
| Land as collateral | 75 | 0 | 0 | 4.20* |
| Collateral substitute ²⁾ | 0 | 80 | 80 | 10.98** |
| Credit market constraints (%): | | | | |
| Households wishing to borrow | 65 | 46 | 47 | 1.77 |
| Reason for not borrowing ³⁾ : | | | | |
| Credit is not available | 16 | 17 | 11 | 0.17 |
| Repayment risk | 85 | 94 | 79 | 0.45 |
| Land not accepted as collateral | 11 | 6 | 0 | 2.00 |

1) Collateral required for formal credit (no collateral was required for informal loans)

2) Group loans and moveable assets

3) Column may sum to greater than 100 per cent because some households indicated more than one reason.

4) * $p < 0.05$, ** $p < 0.01$

The usefulness of land as collateral depends on the banks' ability to enforce foreclosure on defaulting borrowers. In the SSCS, less than half the respondents had title deeds registered in the current household head's name. The remaining households' had yet to apply for title deeds, or had title deeds registered in the previous heads name, reducing the collateral value of the land. Land in the RA and CA cannot be pledged as collateral since title to the land is vested in the state. In the absence of suitable collateral, the supply of credit from commercial institutions is likely to be constrained. This is because banks have to abide by strict usury laws which dictate a lower rate of interest that would otherwise prevail, given the risks and

transaction costs in extending loans to small farmers without secure collateral (Feder *et al*, 1988: 48).

Secondly, all formal credit used was in the form of government guaranteed AFC short and medium-term loans. Use of AFC credit was reported by 10 per cent of SSCS farmers, 25 per cent of RA farmers and 13 per cent of CA farmers. The data suggest that tenure security is not a significant determinant of AFC credit supply. Although land was pledged as collateral for 75 per cent of SSCS loans, it was not required in the RA and CA. In the RA and CA, 80 per cent of loans were secured with collateral substitutes (group guarantees and moveable assets). Fifty per cent of RA and 20 per cent of CA loans are extended to groups of farmers. This is intended to decrease the lender's transaction costs and risk of default as the incentive lies with the group to thoroughly screen applicants as all group members share joint liability.

Rather than insecure tenure, decreased government commitment to the expansion of credit facilities into the small farm sector since the mid 1980's has decreased AFC credit supply to all small scale farmers (Jayne *et al*, 1994). It is estimated by Chimadza (1994, cited by Eicher and Rukuni, 1996) that Zimbabwe's government credit program is currently reaching less than three per cent of communal households. Discussions with AFC officials revealed that this lack of commitment was the result of the high transaction costs (despite the AFC's preference for group lending) associated with extending credit to the small farm sector, and a default rate of over 40 per cent for RA and CA farmers.

Two constraints on the demand for credit are identified in the sample. Firstly, group cohesion - required for successful group lending - is unlikely to be strong in the small farm sector since

groups were constituted solely for the purpose of accessing credit (Adams and Romero, 1981). This was highlighted as an important constraint on credit demand during interviews with progressive RA farmers, many of whom did not access group loans because of the risk of other group members defaulting. Another pervasive constraint on the demand for formal and informal credit in the small farm sector was the recent severe drought experienced in the region (1992/1993 season). Of those households not using credit, 53 per cent indicated that they would like to do so. However, 86 per cent of these respondents indicated that they did not access credit facilities because of heightened repayment risk following the severe drought.

5.1.6.1 Credit use in the empirical model

Credit use (from formal and informal sources) was too infrequent to warrant further statistical analysis in the empirical model.

5.1.7 Long-term investments

Information on the incidence of six types of land improvements made by the current household head since acquisition was collected from each household interviewed. These data were combined into investments on arable land (soil liming, fencing arable lands and conservation measures) and investments on non-arable land (fencing grazing lands, establishing tree crops and establishing pastures) (Table 5.5). Obsolete investments were excluded from the sample (for example, pastures that were no longer in production, or fencing that was in poor condition).

Table 5.5: Stock of land improvements by strata in Manicaland Province, Zimbabwe (1995)

| | SSCS (40) | RA (39) | CA (40) | <i>F</i> -Value ²⁾ |
|------------------------------------|-----------|---------|---------|-------------------------------|
| Arable investments (%): | | | | |
| Fencing | 90 | 41 | 28 | 23.84** |
| Liming | 15 | 5 | 5 | 1.7 |
| Conservation | 93 | 53 | 58 | 9.45** |
| Non-arable investments (%): | | | | |
| Pastures | 59 | 3 | 0 | 52.09** |
| Tree crops | 90 | 8 | 50 | 47.40** |
| Fencing | 90 | 0 | 0 | 346.54** |
| Moveable assets ¹⁾ (#): | 7.72 | 3.95 | 3.17 | 42.50** |

1) Average number of moveable assets owned (ploughs, carts etc.)

2) * $p < 0.05$, ** $p < 0.01$

5.1.7.1 Long-term investments in the empirical model

Households in the SSCS invested significantly more in all arable improvements than CA and RA farmers (fencing, liming and conservation measures). Furthermore, reported household investments in conservation measures in the RA and CA are likely to be biased upwards, since conservation measures were provided by the state in these areas (surveying and construction of in-field erosion contours).

Investments in livestock production were also greatest in the SSCS. Firstly, fifty-nine per cent of SSCS farmers had established pastures or hay crops. By contrast, less than 3 per cent of RA farmers and no CA farmers had planted pastures. Even on arable land, RA and CA households do not have the incentive to establish pastures for livestock, as arable land reverts to communal grazing in winter. One RA farmer that did establish winter pastures on his allotted arable land was unable to exclude other farmer's livestock from his pastures in winter. It is striking that 44 per cent of the cattle herd in the CA and 30 per cent of the herd

in the RA died as a result of fodder shortages in the 1992 drought, compared to only 22 per cent in the SSCS. Secondly, SSCS farmers established significantly more tree crops, compared to RA and CA farmers (mostly for fuelwood). Finally, over 90 per cent of SSCS farmers erected cattle fences in their grazing lands. However, fencing of grazing lands is prohibited by law in the CA and RA.

For each household, a measure of investment (*INVEST*) was estimated on both arable and non-arable land. Investments in fencing and long-term soil fertility (liming) were considered on arable land, while investments in pastures and tree crops were considered on non-arable lands. Since conservation measures are provided by the state in the RA and CA, and fencing of communal grazing land is prohibited in the RA and CA, they were excluded from the investment adoption model as they do not reflect individual choices. Moveable assets are easily liquidated and their acquisition is thus expected to be less dependent on secure property rights. For this reason, the number of moveable assets owned by a household was not considered in the investment adoption model (although the number of moveable assets could influence the use of short-term inputs and yield).

The variable *INVEST* is a dummy variable scoring one if the household had invested in one or more of the investments considered, and zero if otherwise. The variable only measures the household's decision to invest in the stock of fixed improvements to land, and does not necessarily reflect the effectiveness or extensiveness of their implementation.

5.1.8 Input use and agricultural productivity

Agricultural production varied widely across the strata in the study region. Maize was the predominant crop grown, accounting for 65 per cent of all land cultivated in the sample for the 1993-1994 season. Other crops commonly grown included groundnuts, millet and sorghum. Tobacco was grown on two SSCS farms. Statistics describing farm production characteristics for the 1993-1994 season are presented in Table 5.6.

Land in the RA was of significantly higher agricultural potential than that in the SSCS and CA. Eighty-seven per cent of RA farmers were in NR2 and NR3, suited to intensive or semi-intensive farming. By contrast, 95 per cent of SSCS farms and 100 per cent of CA farms were in NR4, a semi-extensive farming region suited mainly to extensive livestock production. A significantly larger percentage of arable land was cultivated in the CA and RA, compared to the SSCS. Similar results were presented by Weiner *et al* (1985), who conclude that land in the SSCS is under-utilised. However, it is more likely that a greater percentage of land was cultivated in the RA and CA as this is perceived to secure individual rights to allotted arable lands under customary law (see Section 4.3.4 and 4.3.5).

Table 5.6: Agricultural production by strata in Manicaland Province, Zimbabwe (1993-1994)

| | SSCS (40) | RA (39) | CA (40) | F-Value ⁹⁾ |
|--|-----------------|-----------------|----------------|-----------------------|
| Natural region ¹⁾ (NR) | 3.95 | 2.95 | 4.00 | 113.61** |
| Soil Type ²⁾ | 1.85 | 3.74 | 2.12 | 48.71** |
| Area planted (ha) | 8.99 | 3.55 | 3.00 | 61.97** |
| Percentage of total area planted (%) | 58.30 | 72.66 | 83.92 | 13.29** |
| Percentage of total area planted to maize (%) | 60.29 | 77.18 | 59.00 | - |
| Agricultural production - arable land: | | | | |
| Agricultural inputs: | | | | |
| Input expenditure per hectare ³⁾ (Z\$ ⁴⁾) | 235.93 | 253.90 | 199.37 | 0.73 |
| Hired labour per hectare (Z\$) | 158.78 | 17.69 | 18.83 | 6.61** |
| Hired machinery/animals per hectare(Z\$) | 4.73 | 5.79 | 15.24 | 1.77 |
| Agricultural output: | | | | |
| Maize yield per hectare (kg) | 2158.00 | 2603.14 | 978.69 | 15.86** |
| Crop income per hectare ⁵⁾ (Z\$) | 1480.55 | 1621.19 | 423.39 | 12.62** |
| Agricultural production - grazing land: | | | | |
| % of households owning cattle | 100 | 95 | 88 | 2.92 |
| % herd died in the 1992 drought | 22 | 31 | 44 | - |
| Number of cattle owned | 16.12 | 13.63 | 4.85 | 16.79** |
| Veterinary cost per LU ⁶⁾ (Z\$) | 14.34 | 3.03 | 8.07 | 2.36* |
| Income from Cattle sales (Z\$) | 2501.62 | 1465.84 | 641.80 | 7.62** |
| Gross farm income ⁷⁾ (Z\$) | 18016.22 | 7805.45 | 1934.72 | 6.63** |
| Off-farm income ⁸⁾ (Z\$) | 3648.80 | 2381.89 | 2831.50 | 0.33 |
| Total income | 21665.02 | 10187.34 | 4266.22 | 5.51** |

1) NR2 Intensive farming, NR3 Semi-intensive farming, NR4 Semi-extensive farming

2) Soil composition: 1=sandy soil ... 5=clay soil

3) Purchased non-labour cash inputs for *all* crops

4) Zimbabwean Dollar: Z\$1 = R0.4

5) Income from *all* crops sold

6) Livestock Unit (cow, ox or bull)

7) Crop income + Livestock income

8) Re Remitted wages, income from own-business

* p < 0.05

** p < 0.01

The value of purchased non-labour short-term input application was highest in the RA. It is important to note that the recorded value of purchased inputs used in the RA and CA may have been biased upwards, since all RA and CA farmers in the sample were given one 50

kilogram bag of fertiliser and one ten kilogram bag of maize seed as part of a government drought relief programme (Mathambo, 1995). Not surprisingly, yields are highest in the RA, given the region's higher agricultural potential and greater levels of input application. High RA yields contrast with average yields of 1.3 tons per hectare over all RA lands in Zimbabwe in 1989/1990 reported by Ashworth (1993).

A striking difference is evident between arable production in the SSCS and the CA. Although both strata have similar agricultural potential, SSCS farmers achieve more than twice the maize yield than that reported in the CA. Yields in the SSCS and CA are similar to those reported by Ashworth (1993). A contributing factor to this production differential could be the apparent shortage of draught power and equipment in the CA (Feder *et al*, 1982: 33). Communal Area farmers had significantly smaller herd sizes than SSCS and RA farmers, and used three times the value of livestock and machinery contractors per hectare.

The value of inputs used per livestock unit for livestock production is significantly higher in the SSCS. Investment in veterinary supplies per livestock unit averaged Z\$14.34 in the SSCS, compared to only Z\$3.03 in the RA and Z\$8.07 in the CA. This is expected since grazing is an open access resource in the CA and RA, and there is little incentive to for users to keep cattle for purposes other than a store of wealth. The higher percentage of livestock deaths in the RA and CA can be attributed to the lack of incentives to invest in livestock production in these areas.

Finally, although there is no significant difference in the amount of off-farm income received by the households in the different strata, off-farm income as a proportion of total income is much greater in the CA and RA.

5.1.8.1 Input use and yield in the empirical model

For each household, a variable (*INPUT*) was estimated for both crop and livestock production. The variable measured the total cost of all purchased non-labour inputs used per hectare for crop production (seed, fertiliser and pesticides), and the value of all veterinary expenditure per livestock unit for livestock production (including dipping costs). To allow crop and livestock data to be pooled, input use was measured as a dummy variable, scoring one if the respondent reported above average input use per hectare or per livestock unit and zero if otherwise. Binary analysis based on the incidence of input use was not possible because most farmers indicated some use of the measured inputs.

Agricultural output (*YIELD*) was measured as the total value of all crops sold per hectare. Although this measure does not account for on-farm consumption of crops produced, it is assumed that there is no significant difference in on-farm consumption between different farms. The dependant variable was only measured on arable lands. Livestock yield (the value of livestock sold) was not regarded as a reliable indicator of livestock production in the sample. This is because a number of SSCS farmers indicated that they had not sold cattle because they were rebuilding their herds following the severe 1992 drought. As a consequence, livestock off-take was less than ten per cent in all the strata. While low off-take percentages are often associated with communal grazing institutions (Lyne and

Nieuwoudt, 1991), higher off-take rates are more common in the SSCS (Mathambo, 1995). Unfortunately, information on other livestock production measures (for example, calving percentages) was not gathered.

5.1.9 Control variables in the empirical model

A number of control variables were included in the model to capture both observed and unobserved household and farm variations. Firstly, characteristics of the household head are captured. Most important in this regard is the household head's age (*AGE*) and his level of investment in human capital. Older farmers tend to be more experienced ($\rho = 0.71^{**}$). More experienced managers are likely to make informed decisions regarding input use and farm management practices, resulting in increased yields. However, older farmers may face physical constraints in working and managing the farm.

Investments in human capital are captured by the household head's level of formal education (*EDU* - number of years schooling) and investment in post-school agricultural training (*MF*). Better educated/trained farmers are better able to assimilate information and show increased allocative ability, allowing them to adjust faster to changes affecting agricultural production (Feder *et al*, 1982: 32). Consequently, farmers with a greater investment in human capital are expected to invest more in long-term land improvements and complementary short-term inputs, and are likely to attain higher yields. Regular contact with extension officials is also expected to decrease subjective risk and uncertainty surrounding new technologies, facilitating on-farm investments and input use (Feder *et al*, 1982: 30). Contact with AGRITEX extension officials was estimated directly as a dummy

variable (*EXT*), scoring one if the household had contact with an extension official in the past six months, and zero if otherwise. The variable *MF* may also capture a household's exposure to government extension agencies, as extension officials reported concentrated extension effort on farmers who had attended Master Farmer training courses.

The number of years the respondent had been the principal household decision maker (*TIME*) was included in the long-term investment equation. Long-term investments usually have significant capital requirements, placing more established farmers in a stronger financial position to invest. Moreover, as improvements are accomplished over time, the longer the time spent on the land the greater the probability of investment occurring.

The sex of the household head (*SEX*) was captured as a dummy variable scoring one if the household head was a male, and zero if otherwise. In most instances where the household head was a female, the male head was either deceased or was a migrant worker, usually engaged in full-time wage employment in Harare. Input use may be lower in cases where the household head is deceased owing to more stringent capital, management and labour constraints. In the case of wage employed migrant workers, remitted income may alleviate capital constraints leading to increased investment and agricultural productivity. The impact of wage remittances on short-term input use is captured in the variable measuring off-farm income (*LQD*).

Variables controlling for farm characteristics were also included in the model. The farm's agricultural potential was measured in terms of the five agro-climatic or Natural Regions identified in Zimbabwe, providing a broad framework for evaluating land use potential

according to rainfall and geographic locality (see Section 4.3.2). No respondents were recorded in Natural Region One (highest potential arable land) or in Natural Region Five (only suited to extensive livestock production). Agricultural potential was captured in the model by two dummy variables; $N1 = 1$ if Natural Region = 4, and zero if otherwise, and $N2 = 1$ if Natural Region = 3, and zero if otherwise. Respondents in Natural Region Two scored zero for both $N1$ and $N2$. The effect of agricultural potential on the agricultural productivity is thus compared against Natural Region Two (the base category - highest potential arable land recorded in the sample). Data on arable plot-specific soil type (*SOIL*) was included in the equation estimating crop yields from arable lands.

Farm size - measured in hectares - was not included in the model for two reasons. Firstly, the study was confined to the small farm sector of Zimbabwe and the limited range of physical farm sizes observed in the sample was unlikely to have a significant effect on agricultural investments and productivity. Moreover, grazing land in the CA and RA is communally owned so the size of an individual's grazing allotment is indeterminate. Secondly, the physical area of farm land operated may not be a good indicator of farm size if the farming enterprises are not homogenous in the sample. In any event, the expected effect of farm size on agricultural productivity is not clear. Some argue that large fixed costs associated with long-term investments cause a reduced tendency to adopt and a slower rate of adoption on smaller farms (Feder *et al*, 1982: 25). However, the lumpiness of technology may be somewhat mitigated against by the emergence of markets for hired services (for example, tractor hire services were available in the CA). Others (Binswanger *et al*, 1992) support the notion of small farmer efficiency and argue that smaller farms use labour and land more intensively than large farms.

Rather, farm size was measured in terms of gross farm income ($GFI = \text{Total income from crop sales} + \text{Total income from livestock sales}$). Gross farm income is a better measure of farm size as it provides a comparable measure of size regardless of farming enterprise.

Gross farm income also serves as a proxy variable measuring a household's liquidity. For the equation estimating past investments in long-term on-farm improvements, it was assumed that past investments were based on future expected incomes (Kendrick and Jones, 1953; Tweeten, 1962: 237). Following this assumption, farmers with larger current incomes are more likely to have invested in fixed improvements in the past. Furthermore, farmers with larger gross incomes enjoy a higher level of liquidity and are more able to finance long-term investments (Tweeten, 1962: 241) and complementary short-term inputs. Nieuwoudt (1970) showed that farm income was a significant determinant of the demand for fertiliser in South Africa over the period 1943 - 1967.

Non-farm income (LQD) was also included as a proxy for a households liquidity. Farmers with greater non-farm income are expected to invest in more short-term inputs by virtue of their increased liquidity - resulting in increased yields - *ceteris paribus*. Non-farm income includes wage remittances, pension payments, income from self-employment and any other income transfers to the household.

Finally, the number of large livestock units (HSL) owned by a household was included as a proxy for draught power availability. It was reported by extension officials that a shortage of draught power was responsible for untimely land preparation, and consequent poor yields, in the CA and RA.

5.2 Results of the simultaneous equation model estimating agricultural productivity

The theoretical model suggests a simultaneous relationship between credit use, long-term land improvements, short-term input use and yield. Although the model was recursive, it was estimated simultaneously using two-stage least squares regression. This was done because it was assumed that error terms in the different equations were contemporaneously correlated (see Section 4.5.1.2 and Hsiao, 1986: 113). The following section defines the structural equations to be estimated. Results from the two-stage least squares regression analysis are then presented.

5.2.1 Structural equations of the simultaneous model

The theoretical model can be formalised into a four equation simultaneous equation model. The equation estimating credit use was dropped from the final set of simultaneous equations as recorded credit use was too infrequent to warrant statistical estimation. The full empirical model is specified as:

$$INVEST = f(TENURE; X_{ij}^h, X_{ij}^f, u_{ij})$$

$$INPUT = f(INVEST, TENURE; X_{ij}^h, X_{ij}^f, u_{ij})$$

$$YIELD = f(INVEST, INPUT, TENURE; X_{ij}^h, X_{ij}^f, u_{ij})$$

The variables *INVEST* and *INPUT* are endogenous to the system, measuring the incidence of investments in long-term land improvements and short-term input use respectively. The

variable *TENURE* captures an individuals breadth, duration and assurance of property rights as described in Section 5.1.2.5. The vector X_{ij}^h and X_{ij}^f capture household and farm characteristics included in the estimation.

5.2.2 Results of the simultaneous model

In the first stage of the two-stage least squares estimation, the endogenous variables were regressed against all exogenous or predetermined variables in the system. Both endogenous variables (*INVEST* and *INPUT*) were estimated by probit analysis, as they capture long-term land improvements and complementary short-term input use as binary variables. The proxy variables showed reasonable goodness-of-fit statistics. The Chi-squared statistics were not significant and their associated probability was 0.63 for the equation estimating long-term investments (P_INVEST) and 0.44 for the equation estimating complementary input use (P_INPUT). An insignificant Chi-Squared statistic implies that the residuals are distributed homogeneously around the regression line and that a different response model is not required (SPSS-X User Manual, 1975: 614).

Results from the second stage regressions support the hypothesis that tenure security has a positive and significant influence on agricultural productivity. Results presented in Table 5.7 show that farmers with more secure rights are more likely to invest in agriculture, and attain higher yields, than those with less secure rights, *ceteris paribus*.

Table 5.7: Results of the simultaneous model of agricultural productivity in the small farm sector of Manicaland Province, Zimbabwe (1994)

Equation 5.1: Investments in long-term land improvements

$$\begin{aligned}
 INVEST = & 3.9721 + 0.3076 TENURE + 0.0170 TIME + 5.2775 GFI - \\
 & (12.5) \quad (3.9) \quad (1.9) \quad (3.4) \\
 & 0.8080 N2 + 0.0276 EDU \\
 & (-3.5) \quad (0.8)
 \end{aligned}$$

$$\chi^2 = 212.86^{NS} \quad df = 230$$

Equation 5.2: Complementary short-term input use

$$\begin{aligned}
 INPUT = & 4.7754 + 1.1065 P_INVEST - 0.0189 AGE + 2.4290 GFI - \\
 & (12.2) \quad (2.2) \quad (-3.2) \quad (1.7) \\
 & 0.3905 N2 + 0.0189 EXT - 0.3676 SEX \\
 & (-1.5) \quad (0.7) \quad (-1.7)
 \end{aligned}$$

$$\chi^2 = 229.03^{NS} \quad df = 229$$

Equation 5.3.1: Yield from arable lands

$$\begin{aligned}
 YIELD = & -2.6304 + 4.5391 P_INPUT + 0.0322 AGE + 0.4946 MF - 0.5575 NI + \\
 & (-4.5) \quad (6.3) \quad (5.3) \quad (2.8) \quad (-2.5) \\
 & 0.2112 SOIL + 0.0343 HSL \\
 & (2.4) \quad (3.5)
 \end{aligned}$$

$$Adj. R^2 = 61.6\% \quad F\text{-value } 31.53^{**} \quad df = 108$$

Equation 5.3.2: Yield from arable lands

$$\begin{aligned}
 YIELD = & -0.6933 + 1.6834 P_INVEST + 0.6271 MF - 0.4438 NI + 0.1480 SOIL + \\
 & (-1.4) \quad (2.9) \quad (3.1) \quad (-1.7) \quad (1.4) \\
 & 0.0553 HSL \\
 & (5.3)
 \end{aligned}$$

$$Adj. R^2 = 51.0\% \quad F\text{-value } = 24.78^{**} \quad df = 109$$

Notes: a) Figures in parentheses are *t*-Values

b) for $df > 120$:

Pr ($t \geq 1.96$) = 0.05

Pr ($t \geq 2.57$) = 0.01

for $df = 120$:

Pr ($t \geq 1.98$) = 0.05

Pr ($t \geq 2.62$) = 0.01

c) ** denotes statistical significance at the one per cent level

5.2.3 Tenure security and long-term land improvements

Equation 5.1 (Table 5.7) estimates household investments in long-term on-farm improvements. Data from arable and grazing lands were pooled. The Chi-square statistic was not significant and the associated probability was 0.73. All the variables considered in the equation, with the exception of the variable capturing the lowest potential agricultural region (*NI*), were included in the model for theoretical reasons. *NI* was excluded from the model as it had positive (and insignificant) coefficient which is inconsistent with economic theory. A possible reason for this anomalous result is that 95 per cent of SSCS farmers, who have more secure property rights and hence increased investment incentives, are in the lowest potential agricultural region (NR4).

The model was stable and signs of all remaining coefficients were consistent with *a priori* expectations. Most importantly, results show that the probability of investing in on-farm improvements is increased significantly as tenure security (*TENURE*) increases ($t = 3.9$ which is significant at the 99 per cent confidence level). Farmers with exclusive and assured tenure have greater investment incentives as benefits of such investments can be internalised, either in use or upon alienation. This contrasts with results presented by Place and Hazell (1993), who conclude from a survey of farmers in Ghana, Kenya and Rwanda that land rights were not a significant determinant of land-improving investments in the areas studied. The significant result obtained in this study can be attributed to the broader definition of tenure security adopted, and to data stratification designed to maximise variation in the tenure characteristics observed.

The households' gross farm income (*GFI*) is positively related to on-farm investments, and is significant at the 99 per cent level ($t = 3.4$). This is consistent with the assumption that past investment decisions were based on future expected incomes. Farmers with larger farming operations (higher gross farm incomes) also have a greater ability and incentive to invest in costly long-term improvements, as costs and benefits of fixed improvements are spread over a larger volume of output. The positive coefficient for the number of years the household has been on the farm (*TIME* - significant at the 90 per cent level), and the negative and significant coefficient capturing agricultural potential (*N2*), are both consistent with economic theory.

Past investment in human capital (*EDU*) has the expected sign, but the hypothesis that its coefficient equals zero cannot be rejected with any degree of certainty. The insignificant effect of investments in human capital on long-term land investments in the sample is not surprising given that reported levels of education and training did not differ significantly between strata (Table 5.1).

5.2.4 Tenure security and short-term input use

Equation 5.2 estimates investment in short-term inputs in the sample. Once again, data from crop and livestock enterprises were pooled. The Chi-squared statistic was not significant and the associated probability was 0.49. Once again, *NI* was dropped from the equation as it had a positive (and insignificant) coefficient.

Although matrix decomposition indicated that multicollinearity was not severe in the equation, significant zero-order correlations between *P_INVEST* and *TENURE* meant that the separate

effects of tenure security and that of long-term investments on short-term input use could not be isolated ($\rho = 0.84^{**}$). This is not surprising since tenure security had a positive and significant effect on the adoption of long-term investments estimated in Equation 5.1. Consequently, tenure security was omitted from the second equation as its influence on short-term input use is captured in P_INVEST .

Results of the regression indicate that investments in long-term land improvements have a positive and significant effect on the application of complementary short-term inputs ($t = 2.2$ which is significant at the 95 per cent confidence level). In a separate reduced form regression estimating short-term input use, $TENURE$ was retained in the model and P_INVEST was excluded. Tenure security had a positive and significant coefficient in this equation, confirming its influence on short-term input use. This implies that farmers with more exclusive and assured property rights to land are more likely to invest in yield enhancing complementary short-term inputs, *ceteris paribus*.

The household heads' age was negatively and significantly related to the application of purchased short-term inputs ($t = -3.2$). Two explanations are forwarded for this. Apart from physical constraints in working and managing the farm, older farmers may use more traditional agricultural practices. In this regard, cattle manure is used as a natural substitute for purchased fertilisers (Tweeten, 1962: 157). In addition, older farmers are generally more risk averse and may be more inclined to substitute manure and own seed for purchased short-term inputs following the recent severe droughts in Zimbabwe (Mathambo, 1995). Unfortunately, reliable information on the use of non-purchased inputs was not gathered in the questionnaire. Secondly, older farmers are less educated ($\rho = -0.33^{**}$) and are thus less

likely to appreciate the benefits afforded by new technologies (high yielding seed varieties and modern fertilisers) (Feder *et al*, 1982: 32; Hill and Kau, 1973).

The signs of remaining coefficients all conform to *a priori* expectations, but are not significant at the 95 per cent level. Significant zero-order correlations between *GFI* and *P_INVEST* reduced the significance of *GFI* in the regression. To capture the effect of investments in human capital on input use, separate regressions estimating the effect of agricultural training (*MF*) and extension (*EXT*) were estimated. Coefficients estimated in both regressions had a positive but insignificant effect on the application of short-term inputs in the sample, possibly the result of insufficient variation in the data collected (for simplicity, only the equation estimating the effect of extension is presented here). The insignificant effect of extension and training on input use was also reported in a study by Jayne *et al* (1994) for Communal Area farmers in Zimbabwe. They conclude that returns to extension and training (for example, increased adoption of high yielding seeds and fertilisers) may not be fully realised without Government attention to investments in complementary input and output markets, and improved access to rural credit facilities. Another likely explanation for low returns to extension in the Communal Area's reported by Jayne *et al* (1994) could be a lack of investment incentives under communal ownership, corroborated by empirical results in Equation 5.1 and Equation 5.2.

Data on arable and grazing lands were pooled in the first two equations. However, a dummy variable identifying the two regressions was not included in the analysis (see Chow, 1960 cited by Gujarati, 1988: 443). Since all observations pertaining to the household and household head are the same for an individual in the two regressions, the dummy variable

would only capture individual differences in tenure security on arable and grazing land for each household. In this study, these differences in tenure security have already been estimated in the index measuring tenure security (*TENURE*).

5.2.5 Tenure security and yield

The final equations (5.3.1 and 5.3.2) estimate agricultural output from arable lands. Tenure security was not entered directly into the equations as its influence on yield is captured in *P_INVEST* and *P_INPUT*. Unfortunately, the individual influence of *P_INVEST* and *P_INPUT* on output could not be determined in a single equation because of collinearity between the two variables. The collinearity between the two variables is evident in their significant zero-order correlation ($\rho = 0.57^{**}$), which is expected since short-term inputs measured were presumed to be complementary to investments in long-term farm improvements.

To overcome this, it was necessary to enter *P_INVEST* and *P_INPUT* separately into two different equations. The signs of all coefficients in both equations were consistent with *a priori* expectations. The variable *N2* was omitted from equation (5.3.1), while *N2* and *AGE* were omitted from equation (5.3.2), as they had *t*-values less than unity. This is done so as to maximise R^2 . The adjusted R^2 was 62 per cent for the equation including *P_INVEST*, and 51 per cent for the equation including *P_INPUT*.

Farmers who invested more in long-term land improvements and who applied larger applications of complementary short-term inputs, achieved significantly higher yields, *ceteris paribus* ($t = 6.3$ and 2.9 respectively). The positive and significant effect of tenure security on yield was confirmed in a separate reduced-form regression, where *TENURE* was entered into the regression in the absence of *P_INVEST* and *P_INPUT*.

As expected, farmers in areas of better agricultural potential (reflected by the negative coefficient estimated for *NI*) and on better soils (*SOIL*) reported significantly higher yields. Older farmers reported significantly higher yields in Equation (5.3.1). Older farmers are more experienced in the sample and are thus more likely to make yield enhancing management decisions (for example, time of planting and field preparation). The significant effect of good farm management practices on yield is not surprising, given that late planting was identified by extension officials as a major constraint on agricultural production in communal areas (Mathambo, 1995). The result is supported by the positive and significant coefficient estimated for *MF*, measuring a household's investment in agricultural training.

Households' with larger cattle herds (*HSL*) achieved significantly (at the 99 per cent level) higher yields than those with smaller herd sizes, *ceteris paribus*. This implies that a lack of draught power (and possibly manure, used as a natural substitute for purchased fertilisers) is a significant constraint on yield in the Zimbabwean small farm sector. This result emphasises the importance of tenure security on agricultural productivity in the small farm sector. Farmers without exclusive and assured property rights to grazing lands have little incentive to invest in livestock production. As a consequence, livestock mortality reduced RA and CA

herds which directly impacts on yields from arable lands in these areas. The significance of HSL may also be evidence of an imperfect market for contractor services in the small farm sector.

5.3 Principal Component regression analysis

It was demonstrated in Section 5.2 that increased tenure security, increased application of short-term inputs, and long-term land improving investments each have a positive and significant influence on yields recorded on arable lands in the small scale agricultural sector in Zimbabwe. Unfortunately, severe multicollinearity precluded the estimation of the individual effects of these variables on yield in a single equation. Estimation in the presence of severe multicollinearity can result in unstable OLS regression coefficients that can lead to erroneous inferences. To overcome this, the effect of input use and long-term investments on yield are estimated separately in equation (5.3.1) and equation (5.3.2) (Table 5.7).

An alternative estimation procedure - ridge regression - is suggested by Chatterjee and Price (1977: 175). Although ridge regression estimates are biased, they tend to be more precise than OLS estimates in terms of mean square error. The ridge estimates are also more stable in the sense that they are not affected by slight variations in the estimation data. However, the estimation procedure does not reproduce the estimation data as well as the OLS regression, reflected by a reduction in R^2 . Nonetheless, where multicollinearity is suspected, a ridge regression is recommended as the resulting estimated regression

coefficients may suggest an alternative interpretation of the data (Chatterjee and Price, 1977:187).

Ridge regression uses principal component analysis to purge the data of multicollinearity. Regressions on estimated principal components - excluding one, two or three minor principal axes - are calculated and transformed back to the original variables on either the original or standardised scale (GENSTAT, 1995: 268). Unfortunately, ridge regression estimates generated by GENSTAT do not calculate the coefficient standard errors of the regressions on principal components when the minor axes are excluded. For this reason, principal component analysis using the method suggested by Kendall (1957) and Nieuwoudt (1972) is proposed to rid the explanatory variables of multicollinearity, and to re-estimate the regression coefficients for the original variables. This technique yields the same estimates as the ridge regression, but allows an estimation of the *t*-values of coefficients presented in the final equation (having accounted for multicollinearity).

A correlation matrix of the variables included in the yield equation is presented in Table 5.8 (for arable land only). All coefficient signs agree with *a priori* expectations. Significant zero-order correlations between the explanatory variables *P_INVEST*, *P_INPUT* and *TENURE* suggests that multicollinearity is likely to be a problem. Severe multicollinearity is confirmed by the large condition number generated using matrix decomposition (CI = 28).

Table 5.8: Correlation matrix for variables in yield model (Arable land only: n = 119)

| | <i>YIELD</i> | <i>P_INVEST</i> | <i>P_INPUT</i> | <i>TENURE</i> | <i>AGE</i> | <i>NI</i> | <i>N2</i> | <i>MF</i> |
|-----------------|--------------|-----------------|----------------|---------------|------------|-----------|-----------|-----------|
| <i>YIELD</i> | 1 | | | | | | | |
| <i>P_INVEST</i> | 0.386** | 1 | | | | | | |
| <i>P_INPUT</i> | 0.391** | 0.567** | 1 | | | | | |
| <i>TENURE</i> | 0.190* | 0.759** | 0.493** | 1 | | | | |
| <i>AGE</i> | 0.167* | 0.332** | -0.428** | 0.233* | 1 | | | |
| <i>NI</i> | -0.119 | 0.462** | 0.228* | 0.433** | 0.135 | 1 | | |
| <i>N2</i> | 0.073 | -0.417** | -0.198* | -0.386** | -0.133 | -0.862** | 1 | |
| <i>MF</i> | 0.361** | 0.313** | 0.213* | 0.045 | 0.144 | -0.057 | -0.023 | 1 |

Notes: a) ** denotes significance at the one per cent level

* denotes significance at the five per cent level.

Table 5.9 presents results from the second-stage OLS regression estimated for the yield equation described in Section 5.2.1, with the effect of long-term investments, short-term input use and tenure estimated in a single equation. Regression estimates in equation (5.4) are affected by multicollinearity in the sample. The negative coefficient estimated for *TENURE* has the incorrect sign - inconsistent with theoretical expectations and opposite to that in the correlation matrix. Furthermore, the insignificant coefficient estimated for *P_INVEST* contrasts with the positive and significant coefficient estimated for the variable in Equation 5.3.2 (Table 5.7).

Table 5.9: Estimated coefficients for yield equation (OLS)

| | | | | | |
|--|----------|-----------|--------|---------|----------|
| $YIELD = -2.193 + 6.98 P_INPUT + 0.28 P_INVEST - 0.37 TENURE + 0.045AGE +$ | | | | | |
| | (3.66)** | (5.15)** | (0.28) | (-1.95) | (4.35)** |
| $0.32 MF - 0.89 NI$ | | | | | |
| | (1.22) | (-3.38)** | (5.4) | | |
| Adj. R ² = 40.2% df = 112 | | | | | |

Notes: a) Figures in parenthesis are *t*-values;

** denotes significance at the one per cent level

* denotes significance at the five per cent level.

Principal Components extracted from the data are shown in Table 5.10.

Table 5.10: Principal components extracted from explanatory variables in yield equation (arable land only: n = 119)

| | PC ₁ | PC ₂ | PC ₃ | PC ₄ | PC ₅ | PC ₆ |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <i>P_INVEST</i> | 0.41722 | -0.58039 | -0.10414 | -0.10294 | -0.35499 | 0.58448 |
| <i>P_INPUT</i> | 0.58220 | 0.09741 | -0.09614 | -0.13873 | -0.46124 | -0.64056 |
| <i>TENURE</i> | 0.53742 | 0.05196 | 0.17387 | -0.42120 | 0.70568 | 0.05337 |
| <i>AGE</i> | 0.13732 | 0.79888 | -0.08325 | -0.15442 | -0.27196 | 0.48806 |
| <i>NI</i> | 0.38106 | 0.10241 | 0.45994 | 0.78927 | 0.05372 | 0.08326 |
| <i>MF</i> | 0.18460 | 0.04761 | -0.85511 | 0.38205 | 0.29395 | 0.00896 |
| Eigen-value | 2.5875 | 1.3928 | 1.0964 | 0.6042 | 0.2174 | 0.1017 |
| % variation | 43.12 | 23.21 | 18.27 | 10.07 | 3.62 | 1.69 |

The two smallest Principal Components were dropped from the model. The number of components to omit from the principal component regression was determined from the ridge regression. Two components were omitted as this corresponded to the point (estimated by ridge regression) where the improper sign estimated for *TENURE* in the OLS regression took on a positive sign. At this point, the bias parameter (k) equals 0.6, indicating the extent of bias introduced into the estimation ($0 \leq k \leq 1$) (Chatterjee and Price, 1977: 182).

Thus, the standardised yield model in terms of Principal Components is:

$$Z.YIELD = \alpha_1 PC_1 + \alpha_2 PC_2 + \alpha_3 PC_3 + \alpha_4 PC_4 \quad (5.5)$$

This model was estimated using OLS, yielding the following regression:

$$\begin{array}{ccccccc} Z.YIELD & = & 0.206 & PC_1 & - & 0.0296 & PC_2 & - & 0.385 & PC_3 & - & 0.257 & PC_4 & & (5.6) \\ (se) & & (0.0480) & & (0.0655) & & (0.0738) & & (0.0994) & & & & & \end{array}$$

$$\text{Adj. } R^2 = 29.6\%$$

Chatterjee and Price (1977: 176) show the link between the α coefficients of the principal component regression and the β coefficients of the standardised regression model of *YIELD* (*Z.YIELD*). Importantly, the relationship between the α and β coefficients is unique since the principal components are orthogonal.

The relationship is illustrated in equation (5.7) and (5.8).

$$\begin{aligned} Z.YIELD = & \beta_1 Z.P_INPUT + \beta_2 Z.P_INVEST + \beta_3 Z.TENURE + \beta_4 Z.AGE + \beta_5 Z.NI \\ & + \beta_6 Z.MF \end{aligned} \quad (5.7)$$

and

$$\begin{aligned} \beta_1 &= 0.41722 \alpha_1 - 0.58039 \alpha_2 - 0.10414 \alpha_3 - 0.10294 \alpha_4 \\ \beta_2 &= 0.58220 \alpha_1 + 0.09741 \alpha_2 - 0.09614 \alpha_3 - 0.13873 \alpha_4 \\ \beta_3 &= 0.53742 \alpha_1 + 0.05196 \alpha_2 + 0.17387 \alpha_3 - 0.42120 \alpha_4 \\ \beta_4 &= 0.13732 \alpha_1 + 0.79888 \alpha_2 - 0.08325 \alpha_3 - 0.15442 \alpha_4 \\ \beta_5 &= 0.38106 \alpha_1 + 0.10241 \alpha_2 + 0.45994 \alpha_3 + 0.78927 \alpha_4 \\ \beta_6 &= 0.18460 \alpha_1 + 0.04761 \alpha_2 - 0.85511 \alpha_3 + 0.38205 \alpha_4 \end{aligned} \quad (5.8)$$

Substituting the α coefficients from (5.6) into equation (5.8) gives values for the β coefficients:

$$\beta_1 = 0.1697, \beta_2 = 0.1897, \beta_3 = 0.1505, \beta_4 = 0.0764, \beta_5 = -0.3045, \beta_6 = 0.2677$$

and

$$\begin{aligned} Z.YIELD = & 0.1697 Z.P_INPUT + 0.1897 Z.P_INVEST + 0.1505 Z.TENURE + \\ & 0.0764 Z.AGE - 0.3045 Z.NI + 0.2677 Z.MF \end{aligned} \quad (5.9)$$

The standard errors of the β coefficients, $se(\beta_i)$, are obtained from the square root of the variance of the β coefficients, $var(\beta_i)$, in equation (5.10) (Gujarati, 1988:60).

$$var(\beta_i) = \sum_{i=1}^k (\text{PC loading})^2 * var(\alpha_i) \quad (5.10)$$

where k = the number of principal components retained and

α_i = the coefficients of Equation (5.6).

The calculated t -values for the standardised variables are equivalent to those in original scale since scaling does not affect the correlation of the variables. By multiplying the standardised regression coefficients in equation (5.9) by S_y/S_{xi} - the standard deviation of the dependant variable (y) divided by the standard deviation of the relevant explanatory

variable (x_i) - the variables are expressed in original scale (Nieuwoudt, 1972; Chatterjee and Price, 1977).

Table 5.11: Estimated coefficients for yield equation in original scale (Principal component regression)

$$\begin{aligned}
 YIELD = & -0.3698 + 1.5623 P_INPUT + 1.1650 P_INVEST + 0.2439 TENURE + \\
 & \quad (5.59)** \quad \quad \quad (5.82)** \quad \quad \quad (2.96)** \\
 & 0.0063 AGE - 0.0965 NI + 0.8483 MF \quad \quad \quad (5.11) \\
 & \quad (1.38) \quad \quad (-0.35) \quad \quad (2.91)**
 \end{aligned}$$

Adj. $R^2 = 29.6\%$ $df = 111$

Notes: a) Figures in parenthesis are t -values;
 ** denotes significance at the one per cent level
 * denotes significance at the five per cent level.

Comparing equation (5.11) to equation (5.4), the t -values have increased substantially, with the exception of AGE and NI . Recorded yields are significantly greater for households with more exclusive and assured property rights ($t = 2.96$ which is significant at the 99 per cent level). This result is reinforced by the positive and significant influence of P_INPUT and P_INVEST on yields. Households with more secure property rights invest more in long-term land improvements and apply greater levels of complementary short-term inputs, resulting in increased yields from arable lands, *ceteris paribus*. Households who invested more in human capital also achieved significantly higher yields, *ceteris paribus* ($t = 2.91$).

The adjusted R^2 has fallen from 40.2 per cent to 29.6 per cent. This loss in R^2 is expected, given the large bias parameter estimated in the ridge regression (k equals 0.6). There is thus

a trade-off between the models ability to reproduce the estimation data, and improved interpretability of the estimated coefficients.

CHAPTER 6

THE INNOVATION OF AGRICULTURAL TENURE INSTITUTIONS IN SOUTH AFRICA

The objective of this study was to empirically investigate the relationship between land tenure security and agricultural productivity in small scale agriculture, deriving implications for proposed land reform in South Africa. Empirical results presented in Chapter Five indicate that tenure security has a positive and significant effect on investment incentives and agricultural productivity in the Zimbabwean small farm sector. In order to understand the implication of this result on a land reform policy in South Africa, it is first necessary to trace the history of land policy that shaped the innovation of land tenure institutions in the country.

Following a brief and selective synopsis of legislation shaping land tenure in South Africa at present, this chapter analyses the dualistic structure of agriculture in the commercial and small scale South African agricultural sectors. While land was, perhaps inevitably, the focal point of conflict between the white and black population following white expansion from the Cape of Good Hope in the late 17th century, the chapter will focus on legislation influencing land tenure in South Africa implemented since 1913. The chapter concludes by introducing land reforms proposed for South Africa in the Government's *Green Paper on South African Land Policy* (Department of Land Affairs, 1996). The economic implications of alternative land reforms will be discussed in Chapter Seven.

6.1 Land policy following the Land Act of 1913

6.1.1 The Land Act of 1913

The Land Act, Act 27 of 1913, passed by the white dominated parliament of the Union of South Africa, represented the first comprehensive piece of legislation on land tenure in the country as a whole ensuring that access to a legal interest in land depended critically upon race classification (Davis and Corder, 1991: 139).

In accordance with this Act, the greater share of land in the entire country was appropriated for exclusive use by whites. Areas designated for blacks were termed 'scheduled' areas, and included all the then existing 'reserves'², as well as land privately owned by blacks for tribal purposes. In terms of Section 1(1) of Act 27 of 1913, the Act contains two key provisions. Firstly, no person other than a black may, without the approval of the Minister of Education and Development Aid (then the Governor-General), acquire land in a 'scheduled black area' from a black person. Secondly, the Act effectively prohibits land transactions by black persons everywhere outside the scheduled area, unless the approval of the Minister is obtained (Budlender and Latsky, 1991: 116). These scheduled areas, outside which blacks, and within which whites, were precluded from all property rights, totalled approximately 10,5 million hectares, or 8,6 per cent of the total land area of South Africa (South African Institute of Race Relations, 1975: 115).

² In the latter half of the 19th century, land was allocated to blacks in areas termed 'reserves' for exclusive black occupation, but not in ownership.

Two exceptions to the Land Act are noted (Budlender and Latsky, 1991: 116). Firstly, the Act made provision for additional land to be 'released' to blacks in addition to that made available under the Land Act. No land was made available under this exception until the passing of the Development Trust and Land Act, Act 18 of 1936. The second exception was existing land belonging to blacks outside the scheduled areas. Blacks were allowed to acquire property rights to such land with the permission of the Governor-General, but permission was only granted if hardship and a historic claim to the land could be proved.

6.1.2 The Development Trust and Land Act of 1936

With the passing of Act 18 of 1936, the Development Trust and Land Act, the areas to be released in terms of the 1913 Land Act were finalised. The extent of the released areas was approximately 6,21 million hectares, bringing the total land area set aside for blacks in 1936, excluding that land owned by blacks outside the scheduled areas, to 16,71 million hectares, or 13,7 per cent of the total land area of the country (South African Institute of Race Relations, 1975: 115).

The 1936 Development Trust and Land Act further established a statutory trust, now known as the South African Development Trust (SADT), which in accordance with Section 6(1) of the Act became the owner of all state-owned land within the scheduled and released areas (Budlender and Latsky, 1991: 121). This includes all Trust land (land under tribal occupation outside the scheduled areas prior to 1936 and now within the released areas, as well as all land later purchased by the SADT in the released areas) and all tribal land occupied by a tribe in the scheduled areas. A trust fund was formed to purchase all outstanding land in the

released areas, and by 1990, almost all land demarcated as released in terms of the 1936 Act had been purchased (Baber, 1991: 49).

Following the election of the Nationalist government into power in 1948 came further distortions to the rural land economy, and the intention to use the 1913 and 1936 Land Acts as a basis for permanent racial partitioning emerged. While the development of the policy of racial segregation, especially in terms of territory, culminates in the Group Areas Act, Act 77 of 1957, first passed in 1950 (Van Reenen, 1962), this act has little relevance for state land occupied by blacks, since all land falling outside the areas identified by the Group Areas Act, acquired under the Development Trust and Land Act, Act 18 of 1936, is expressly excluded from the provisions of the Group Areas Act.

However, under this exclusion, and in line with the policy of separate development, approximately 157 000 hectares of freehold land held by blacks, acquired outside the scheduled areas (and in white areas before the 1913 Land Act) became subject to expropriation under the Promotion of Bantu Self-Government Act of 1959. Between 1960 and 1982, it is estimated by the Association for Rural Development (AFRA) that 103 "black spots" had been expropriated and that 105 000 people living in these areas had been forcibly relocated to black areas (Craib, 1990 cited by Baber, 1991: 53).

6.2 The current structure of agriculture in South Africa

Although all racially based legislation pertaining to land in South Africa has been repealed with the passing of the Abolition of Racially Based Land Measures Act of 1992, agriculture

in South Africa is still characterised by an extreme dualism. The rural economy in previously black areas (the small farm sector) is characterised by stagnating agricultural production, widespread resource degradation and poverty, increasing population pressure and landlessness, and extreme skewedness of distribution of assets and income amongst households (Baber and Nieuwoudt, 1992). Lenta (1981: 65) estimates that cereal production per capita in rural KwaZulu-Natal decreased at an average rate of 1.16 per cent per annum between the periods 1867-1872 and 1972-1977. Furthermore, estimates of relative yields indicate that output in the small farm sector is far below that attained on comparable land in historically white commercial areas (Lyne, 1989). By contrast, the large scale commercial farming sector is characterised by moderate increasing efficiency and levels of land conservation. Notwithstanding the drought experienced in the early 1980's, field crop, horticultural and animal production increased by 6.86, 3.80 and 0.89 per cent per annum respectively in the sector during the period 1980-1989 (Van Zyl and Van Rooyen, 1990 cited by Baber, 1991: 86).

This dualism is also apparent in the relative level of importance agriculture enjoys in the different sectors. It is estimated that over 80 per cent of household income in the small farm sector is derived from wage remittances and welfare benefits, with a high proportion of income being spent on food and household needs (Bembridge, 1987). Agricultural production is estimated to meet only 16 per cent of the *de facto* populations food requirements in these areas (Huntly *et al*, 1989 cited by Baber and Nieuwoudt, 1992). By contrast, South Africa currently enjoys an overall self-sufficiency in agricultural products after consumption and growth is taken into account (Baber, 1991: 86), reflecting the significant contribution of the commercial agricultural sector.

6.3 Public support and land distribution differentials

One reason for the relative poor performance of the small scale agricultural sector is that access to land, physical infrastructure (in the form of dams, roads and communication links) and institutional infrastructure (extension services, credit institutions and organised agricultural lobbies) differ in terms of quality and availability (Fenyés *et al*, 1988). According to Huntley *et al* (1989 cited by Baber and Nieuwoudt, 1992), the ratio of total financial aid and advisory services to commercial versus small farm sector was 197:1 for the period 1910-1936. Although this ratio improved to 2:1 in the 1980's, per capita state support remains extremely inequitable.

The distribution of land in South Africa is set out in Table 6.1. Following the 1936 Land Act and subsequent consolidations, the delimitation of land prior to the passing of the Abolition of Racially Based Land Measures Act assigned 16,3 per cent of South Africa's agricultural land for black use, and 83,7 per cent for white use. As a consequence, farm land area per capita of rural population is much more favourable in commercial sector than it is in the small farm sector. This extreme skewedness of the distribution of land is reflected by the fact that the amount of farm land per capita is on average approximately fifteen times as great in the commercial sector as it is in the small farm sector. Output per worker in commercial agriculture is more than twenty times that obtained in subsistence agriculture (Kassier and Groenewald, 1992).

Table 6.1: Farm land per capita of rural population - South Africa (1990)

| Region | Farm Land ¹⁾ (1 000 ha) | Rural Population (1 000) | Farm land/capita (ha) |
|----------------------------|---------------------------------------|-----------------------------|--------------------------|
| South Africa ²⁾ | 82 246 | 4 527 | 18,13 |
| Transkei | 4 185 | 2 638 | 1,59 |
| Bophuthatswana | 3 979 | 1 464 | 2,72 |
| Venda | 639 | 446 | 0,70 |
| Ciskei | 756 | 477 | 1,58 |
| KwaZulu | 3 277 | 2 645 | 1,24 |
| Lebowa | 2 057 | 1 718 | 1,20 |
| Gazankulu | 544 | 447 | 1,14 |
| KaNgwane | 354 | 338 | 1,05 |
| KwaNdebele | 214 | 282 | 0,76 |
| QwaQwa | 60 | 160 | 0,38 |
| Total | 98 311 | 15 182 | 6,48 ³⁾ |

1) Crop land, natural grazing, wood and forests

2) Excluding the former "homelands"

3) Average farm land per capita

Source: 1990 *Abstract of Agricultural Statistics*, cited by Kassier and Groenewald (1992).

Massive population growth in rural areas has further decreased land/population ratios to the point where individual land holding has become totally uneconomic in parts of the small farm sector. This extreme population pressure has inevitably led to massive overcrowding and landlessness in the small farm sector (Letsoalo, 1991: 101), and has reduced the potential of agricultural production to provide for household needs.

Access to land and infrastructure is explicitly addressed in the government's Reconstruction and Development Programme (ANC, 1994) and the *Green Paper on South African Land Policy* (Department of Land Affairs, 1996: 4). These, together with the likely change in

focus of state and research and extension into the small farm sector, should go some way to satisfy the demand for land and related services in the sector.

6.4 Property institution differentials

From the empirical results presented in Chapter Five, it is evident that a second reason for the poor performance of the South African small farm sector is likely to be the fact that the structure of property rights in previously black areas differs markedly from those in the white areas³. This divergent structure of property rights resulted because successive South African governments have, in accordance with the principal that whites possessed sovereignty over all land in the country, attempted to control and regulate the property rights allocated to blacks.

Following the 1913 and 1936 Land Acts, land in the small farm sector could be divided into four broad categories, namely Trust land, tribal (communal) land, private land and land held in quitrent from the state (Cross, 1991: 70). Trust land refers to land under tribal occupation outside the scheduled areas prior to 1936 (and now within the released areas). Trust land is registered in the name of the SADT. Tribal land refers to land occupied by a tribe in the scheduled areas and is registered in the name of the State President, acting as trustee for the tribe. Both tribal and Trust land are under the control of the SADT. Private land constitutes land purchased by individuals, tribes or other black associations in scheduled areas prior to 1913, in released areas and from the SADT after 1936. Quitrent tenure refers to a form of

³ Despite the passing of the Abolition of Racially Based Land Measures Act of 1992, the tenure institutions in the different sectors remain largely unchanged from those that evolved under prior legislation.

conditional individual tenure on land leased from the state for a nominal amount, subject to a number of state restrictions, with the threat of forfeiture (Cross, 1991: 82).

6.4.1 Property rights in the commercial farming sector

In the commercial sector, individuals possess private property rights to land, which is held mostly with individual freehold title. With exclusive private property rights, tenure is secure with the result that an active land market (both sale and rental) is prevalent in these areas. In the presence of an active land market, inefficient land use attracts an opportunity cost, ensuring efficient resource allocation (Nieuwoudt, 1990). Private property rights in white areas are attenuated by the Sub-division of Agricultural Land Act (Act 70 of 1970), which prohibits the subdivision of land into areas deemed to represent uneconomic farming units. In accordance with the 1913 and 1936 Land Acts, and the 1957 Group Areas Act, blacks were excluded from holding property rights in white areas.

6.4.2 Property rights in the small farm sector

Whites were by law precluded from all property rights in black areas. The *de facto* property institutions under which blacks possessed property rights in small farm sector was a product of the interplay between state attempts to control the access to and use of land, and attempts by indigenous land tenure forms to resist unwanted and exogenously imposed institutions. As a result, the majority of *de facto* property rights to land, other than the state tenures, are informal, differing substantially from what is written into law governing black areas following the Black Areas Land Regulations Proclamation R188 of 1969.

For the purpose of studying the land tenure implications of past legislation, the four main forms of land holdings in the small farm sector can be grouped into three categories, under varying degrees of state and popular control. Together, these three forms of land holding account for approximately 16.3 per cent of South Africa's agricultural land (CSS, 1992, cited by Kassier and Groenewald, 1992). First is traditional communal (or communitarian) tenure, which despite attempts of state intervention, is based on predominantly traditional indigenous tenure institutions. Second are state controlled leasehold tenures, including Trust tenure and tenure arrangements in the state initiated development areas (Project farms (Letsoalo, 1991: 106)) and last is a group of individualised forms of tenure relatively free from state intervention, including freehold and quitrent (Cross, 1991: 68).

6.4.2.1 Communal tenure

In principle, communal tenure is based on traditional institutions as filtered through Proclamation R188 of 1969, and refers to versions of tribal tenure administered by tribal authorities and their sub-ordinates, as found in KwaZulu-Natal and the former Transkei (Cross, 1991: 70). Land is legally held in trust by the chief for the benefit of that community, while the underlying title is vested in the state. Individuals, acting on behalf of the family or agnate group, are granted rights of exclusion to allocated land, including the right to occupy the land and the exclusive right to cultivate allotted arable land. As in communal area of Zimbabwe, land not allocated to a household reverts to communal grazing, as does allotted arable land that is not cultivated during winter months (Lyne and Nieuwoudt, 1991).

Access to and property rights in the land follow acceptance as a *bona fide* member of the community. In communal areas of KwaZulu-Natal, men born into a community usually obtain land by agreement from their fathers, or by negotiation with other relatives and neighbours. Outsiders wishing to gain access to land in a community have to find a local sponsor who will give them land or find land for them, or may in some cases apply directly to the chief who usually controls a small amount of abandoned or forfeited land. However, such land is becoming increasingly scarce as communities grow and individual holdings become smaller over time. The legitimate role of chiefs is thus to give legal sanction to locally arranged transactions and to publicly install new families (Cross, 1991: 73).

Individual rights in the communal area's differ from those under common law in two ways. Firstly, individual rights are informally recognised and sanctioned, often with no legal status. Secondly, property rights are 'communal' implying: (a) each married man has the right to be awarded a residential site and access to arable land (one man, one plot), and grazing rights follow a commonage system open to all households; (b) individual agents do not have the right to permanently alienate their land; and (c), the community is able to revoke land allocations following non-use over a designated period of time (Cross, 1991: 72).

Consequently, individual 'ownership' rights within a community are conditioned by group or secondary rights of other individuals in the community (Atwood, 1990). Insofar as communal tenure ensures the individual the ability to use land for a certain period and for a defined purpose, property rights are secure. However, these limited property rights do not guarantee that individuals can co-ordinate economic activity and reap the benefits of individual effort. Predictability, and hence tenure security, is further reduced since formally recognised land

law in South Africa (Roman-Dutch law) does not recognise the diverse system of land rights reflecting the diversity of land use patterns and values in indigenous tenure institutions (van der Walt, 1991: 34).

a) Tenure security in communal areas - arable land

Research in South Africa indicates that *de facto* land use in communal areas is paradoxical. In communal areas of KwaZulu-Natal, there is excess demand for additional land arising from intense population pressure, yet large tracts of land are left fallow. Results from empirical analysis in communal areas of KwaZulu-Natal show extremely low per hectare yields, indicating that cropland is under-utilised in these areas (Lyne and Nieuwoudt, 1991).

Although farmers have exclusive user-rights to arable land, individuals do not have the incentive to co-ordinate economic activity and exchange user-rights, and rental markets in rural South Africa are constrained despite the presence of potential tenants and lessors (Lyne and Roth, 1994). In a recent survey (1991) conducted in rural KwaZulu-Natal, it was found that half the households sampled wanted to rent in arable land left idle by neighbours, but that only five per cent did so. Of those who indicated that they would like to participate in a land rental market, almost 70 per cent indicated that transactions were too risky. This is because customary tenure in communal areas is perceived to be insecure and transactions are costly, because (a) there is a perception that transferring arable land may jeopardise existing property rights if interpreted by the tribal authority as openly demonstrating an indifferent attitude towards land use, and informal rental transactions are not legally enforceable (rights are not assured) and (b) the fact that the exclusivity of primary rights is in some instances undermined

by the secondary rights assigned to other users, resulting in increased transaction costs in locating the legitimate property right holder (the breadth of rights is inadequate) (Lyne and Roth, 1994). In the absence of an active land market, the opportunity cost of land is low or even zero in communal areas.

Tenure security is further reduced on arable land as individuals appear unable to enforce their legitimate rights of exclusion over their allotted arable lands. Research in KwaZulu-Natal (Thomson and Lyne, 1995) indicates that crop farmers are unable to enforce their property rights as they find it difficult to keep livestock belonging to other people out of their fields, and are often unsuccessful in extracting compensation from stock owners for crop damages caused by stray cattle. There is thus little demand for land as a productive asset because individuals are not assured of the benefits arising from individual effort.

b) Tenure security in communal areas - grazing land

Community members theoretically possess rights of inclusion to common grazing areas under communal tenure institutions. However, this individual right loses its meaning if the right to inclusion is not restricted to a distinct or finite group or community of individuals (Ciriancy-Wantrup and Bishop, 1975), or if the right to exclude others is not enforced. On grazing land, available evidence indicates that such binding restrictions on individual use and access to the commons, a necessary condition for efficient common property resource management, are not in effect (Lyne and Nieuwoudt, 1990). Consequently, the tenure institution on common grazing land can most accurately be described as open access.

Comparisons between communal and private grazing lands (Table 6.2) indicate that average stocking rates in communal areas of KwaZulu-Natal are almost double those in neighbouring commercial farms. High stocking rates have resulted in poor calving percentages and higher herd mortality rates. Grazing land in these subsistence areas is overutilized, leading to continued degradation of the natural resource base and comparatively low yields from animal production (Baber and Nieuwoudt, 1992).

Table 6.2: Comparison of cattle statistics in communal and commercial areas of KwaZulu-Natal (1987)

| | Communal ownership | Private ownership |
|----------------------------------|--------------------|-------------------|
| Grazing land (ha) | 2,2 million | 3,4 million |
| Herd size (1987) | 1,5 million | 1,2 million |
| Herd mortality | 7,4 % | 3,9 % |
| Calving rate | 32,0 % | 80,0 % |
| Slaughter and export rate (1987) | 5,0 % | 25,0 % |

Source: Lyne and Nieuwoudt, 1990.

6.4.2.2 State controlled tenure

Most land in the small farm sector in South Africa falls under the control of the SADT. Title to this land rests with the state and property rights are controlled by government officials, in conjunction with chiefs and headmen (who became paid employees of the government with the passing of the Bantu Authorities Act of 1951). In general, Trust land (that land under the control of the SADT) is more conditional and subject to more outside control than communal land (Cross, 1991: 78). Property rights are allocated on a 'one-man one-plot' basis, with the bundle of rights to these plots subject to a number of restrictions. Firstly, landholders are

legally permitted one field, and subdivision, leasing out and share-cropping is officially forbidden (Cross, 1991: 79) and secondly, property rights can be withdrawn if arable land is not utilised for a period of one or two years (Baber, 1991: 67).

Communities living on Trust land are thus effectively tenants of the state on highly conditional leases. Owing to government intervention and the disruption of the indigenous tenure institutions and egalitarian land ethic, tenure is perceived to be less secure than under traditional communal tenure (Cross, 1991: 80). The application of the 'one-man one-plot' principal, with its accompanying restrictions, effectively precludes the operation of a land market. Consequently, the opportunity cost of the land is viewed as zero, and efficient resource allocation via market transfers has been prevented.

Owing to increasing concerns at the environmental degradation that was taking place in black areas, the implementation of Betterment or rehabilitation was enabled in the form of Proclamation 31 of 1939, which centred on the need to 'combat the evil of over-stocking'. To prevent practices categorised as land abuse, the 'Betterment plan' provided that control over rural black land use should be taken away from the occupants and placed with the state agricultural apparatus (Cross, 1991: 70). All SADT land was subject to Betterment planning. Under Betterment legislation, land was delimited into separate areas for grazing, cultivation and residential use. In principle, all families are entitled to land, but by delimiting and freezing the number of sites available, Betterment has created a landless surplus of people (Cross, 1991: 70). According to Bembridge (1986), up to 70 per cent of land in the small farm sector was officially placed under betterment planning.

6.4.2.3 Individualised tenure

Legally, property rights on freehold land in the small farm sector mirror private property rights in commercial areas. Individuals have the right to the exclusive income stream flowing from a particular resource. This right includes the right to enter into contracts with other economic agents concerning these benefit streams, and the rental value of land represents the opportunity cost to the individual for not utilising the land. However, freehold land appears to be no more productive than trust or communal tenure (Cross, 1991: 91).

Freehold land in the small farm sector has moved to its highest economic use (Baber, 1991: 82). As a result of increasing population pressure and an increasing amount of landlessness, economic returns from 'farming with people' exceed returns from agricultural production, and in the absence of zoning regulations and the Subdivision of Agricultural Land Act, freehold land in the small farm sector is becoming increasingly residential. Food production thus remains a low-priority activity.

6.5 Land reform in South Africa - 1996

Over the better part of a century and through layers of statutory interventions into the common law of property, South Africa has been divided into a number of race zones. Within these race zones, people of different race have been assigned mutually exclusive and markedly different tenure institutions (Budlender and Latsky, 1991: 115).

As a consequence, land reform is identified in the Reconstruction and Development Programme as the central and driving force in a programme of rural development in South Africa (ANC, 1994: 19-20). The primary need for land reform is to redress the injustices of the past and to re-establish the legitimacy of the entire property rights structure in South Africa. Such legitimacy is required for any reform programme to be successful, since the effectiveness of an institution at defining property rights depends critically on those rights being upheld by the law (Bromley and Cochrane, 1994). This section briefly outlines land reform proposals and mechanisms described in the Government's *Green Paper on South African Land Policy* (Department of Land Affairs, 1996). The effect of proposed land reforms on economic incentives and agricultural productivity are discussed in Chapter Seven.

The Government's land reform proposal focuses on three main policies (Department of Land Affairs, 1996: 3):

- 1) The restitution of land rights lost in the past as a result of racially based policies. This is explicitly addressed by a Land Claims Court and Commission - established under the Restitution of Land Rights Act of 1994 - and is beyond the scope of this thesis.
- 2) The redistribution of land to provide the disadvantaged and poor with land for residential and productive purposes.
- 3) Land tenure reform to improve tenure security on all agricultural land (including land held in the traditional communal areas).

6.5.1 Land redistribution

Although the extent of the proposed land redistribution in South Africa is not yet quantifiable, it is envisaged that significant portions of commercial and state farm land will be transferred to the poor and emerging farmers over the next ten years (Department of Land Affairs, 1996: 26). Land from private individuals will be redistributed mainly through willing seller - willing buyer transactions, with expropriation been used as a mechanism of last resort. The state will thus not be a buyer or owner of land for redistribution, but will make available land acquisition grants to facilitate the policy of market driven land redistribution. Grants may also be used for the acquisition of state land. In this case, the value of the state land would be debited against the Grant for which the beneficiary had qualified.

The primary source of direct financial assistance to potential beneficiaries will be the Settlement/Land Acquisition Grant. This grant, set at a maximum of R15 000 per household, is to be used for land acquisition and infrastructural investments. The grants are not intended to fulfil all beneficiary needs. Rather, it is intended that grants should be used to encourage complementary contributions from government and private lending institutions. Households may apply for the grant individually or in a group. Given the limited size of the grant, there is clearly an incentive for households to organise into groups to finance larger, group owned, land purchases. Criteria for the selection of beneficiaries of the land redistribution policy proposed in the *Green Paper on South African Land policy* (Department of Land Affairs, 1996: 52) aim at alleviating poverty and assisting the poorest

of the poor. Households earning more than R1 500 per month are likely to be ineligible for state assistance in terms of the various land acquisition grants.

6.5.2 Land tenure reform

The goal of the government's land tenure reform programme is to extend registerable tenure rights to all South Africans, and to eliminate landholding systems based on permits (Trust tenure). Within the programme, it is intended that diverse tenure systems should enjoy equal levels of protection and recognition by the law, and will be recorded in a single registry. To achieve this, it is proposed that pre-existing formal and informal land rights be used as a basis to clarify and formalise property rights. The policy places emphasis on the requirements and land needs of the poorest South Africans. Group ownership and communal tenure are encouraged, as it is proposed that they can make an important contribution to land needs and poverty alleviation by 'providing low cost and secure access to land' (Department of Land Affairs, 1996: 45).

CHAPTER 7

POLICY IMPLICATIONS FOR LAND REFORM IN SOUTH AFRICA

Baber (1991: 91) identifies two distinct levels of rural land reform in South Africa. On a national level, land reform is concerned with the political demand from historically disadvantaged South Africans for a more equitable dispensation with respect to their access to rural land and infrastructure. A primary cause of the inequitable access is the existing distribution of rights to land in accordance with the Land Act of 1913, and the Development Trust and Land Act of 1936. In essence, these acts resulted in almost all land in the small farm sector being nationalised, becoming the property of the State or the SADT (van der Walt, 1991: 29). As a result, farmers in the small farm sector have been deprived of the opportunity to acquire ownership of land, giving rise to the inequitable distribution of productive assets between race groups and between sectors in agriculture (see Table 6.1). As a consequence, land reform at a national level is regarded as a *sine qua non* for a wider political settlement and is explicitly addressed in the RDP and the *Green Paper on South African Land Policy* (Department of Land Affairs, 1996).

At an equally important level, however, rural land reform concerns individual demands for tenure institutions at a local level. Certainty and stability of expectations determines institutional success (Runge, 1985). Consequently, for an institution to be efficient it must be well adapted to the specific needs and resource constraints facing a particular community. By defining and upholding property rights, different property institutions can be expected to provide different economic incentives to individuals within society. Due

consideration of this secondary market for land reform is essential if future land policies aimed at responding to the national political market for land reform are to avoid unexpected and counterproductive consequences, and was the focus of this study.

Evidence from Zimbabwean data indicates that tenure institutions characterised by exclusive and assured property rights significantly increase the probability of conservation and investments on agricultural land, and increased yields. At the same time, returns (yield) to investments in agricultural training and extension are likely to be greater in areas characterised by exclusive and assured property rights, as households have a greater incentive to invest time and capital in agriculture. It can thus be expected that any national land redistribution programme that takes land out of commercial production under formal private tenure and redistributes it under a land tenure system which does not facilitate economic interaction, or adequately internalise externalities, will reduce the level of agricultural production and resource conservation on that land.

Empirical results from Zimbabwe also suggest that communal land tenure systems in Southern Africa are a constraint on agricultural productivity. It is likely that the endogenous evolution of tenure institutions has been constrained by prohibitive transaction costs incurred in reaching collective agreement in large groups, and by resistance to change from households with a vested interest in maintaining the *status quo*. This result is critical to sustainable rural development in South Africa, since approximately 16 per cent of South Africa's agricultural land is characterised by some form of communal ownership.

This chapter critically analyses options for land reform in South Africa, including land reform policies proposed in the Government's *Green Paper on South African Land Policy* (Department of Land Affairs, 1996). The analysis is limited to an investigation of economic incentives under alternative tenure institutions resulting from likely land redistribution and tenure reforms in the South African small farm sector. The issues of land restitution and the financing of land reform, although critical to the success of a land reform programme in South Africa, are beyond the scope of this study and are only given limited attention.

7.1 The redistribution and resettlement of commercial and state land

The government's land redistribution proposals are set out in the *Green Paper on South African Land Policy* (Department of Land Affairs, 1996). Briefly, the proposals envisage that significant portions of commercial and state land will be transferred to poor and emerging farmers over the next ten years. Land from private individuals will be redistributed mainly through willing seller - willing buyer transactions, financially assisted by government land acquisition grants.

The reliance on market mechanisms to achieve land redistribution is applauded. However, the policy bias towards assisting the landless poor, rather than promoting the emergence of market-oriented small-scale farmers, is cause for concern (Eicher and Rukuni, 1996). This is corroborated by empirical evidence from this study which suggests that, in the absence of an efficient credit market, farmers without sufficient capital (or liquidity) are less likely to undertake the necessary long-term investments in agriculture to ensure sustainable land use. Furthermore, the potentially large size of groups to be resettled may result in tenure

institutions unable to internalise externalities and facilitate land market transactions (sale or rental) (according to Cousins (1996), groups of up to 300 families have applied for government financing in areas of KwaZulu-Natal).

7.1.1 Scenario one - Individual resettlement under formal private tenure

Since land acquired for resettlement will presumably be unoccupied, policy makers should have greater leeway in designing land tenure institutions that decrease uncertainty in exchange and ownership. To ensure productive and sustainable land use, government assistance for the purchase of commercial and state land for redistribution should be given to emerging small-scale farmers, with secure individual title enforced by the legal system. Provided land titles are legally recognised and enforceable, and registration procedures are simplified to ensure that title deeds are updated upon transfer or inheritance, resettled land can enter the land market and will be assigned an opportunity cost.

Problems characteristic of land titling elsewhere in Africa, notably the absence of legal support for and public recognition of registered title deeds (Barrows and Roth, 1990), are unlikely to arise since no conflicting secondary rights to the resettled commercial and state land exist.

7.1.2 Scenario two - Group resettlement

The subdivision of existing commercial and state land into the hands of private individuals will entail significant costs, both to the beneficiary and the State. Owing to prohibitive

physical costs associated with surveying and fencing land, and transaction costs incurred in negotiating and registering multiple land transactions, it is both likely and practical that groups of emerging farmers will become co-owners of freehold land following land redistribution. Furthermore, the mechanisms proposed by the government to achieve the stated objective of assisting the landless poor, rather than promoting small-scale commercial agriculture, provide individuals with the incentive to organise into large groups to access government financial assistance.

Once land is settled by groups of individuals, the following options for further tenure development exist:

1. The further subdivision of land into the hands of private individuals in the group. This is unlikely because of conflicting individual claims on the group owned resource and the high costs associated with the individual partitioning of land.

If no further sub-division of the land occurs, the group owned resource characterises a common property land tenure institution. Two further tenure developments are identified:

2. The group owned resource may be managed by a user group. Members of the group exercise their own management decisions within constraints established by the group as a whole.

3. Finally, non-user group management organisations may evolve. In this situation, members of the group surrender their use rights to an elected body, who manages the resource on behalf of the group.

As outlined in Section 2.2.2, user groups must be small otherwise transaction costs - the costs of negotiating and enforcing rules - tend to cancel the benefits of collective action (Olson, 1971: 54). In addition, the group must be well defined otherwise the benefits of collective action may accrue to non-members (free-riders).

In essence, user groups experience difficulties in satisfying the conditions necessary to ensure the efficient and sustainable use of agricultural land. Firstly, even small user groups will find it difficult to devise rules that distribute benefits of collective investments in the same proportions as members share costs. This decreases the likelihood of individual investments in fixed improvements because of the actions of free-riders. Secondly, user groups constrain the operation of the land market. Potential buyers or tenants wishing to secure exclusive rights to the land have to first find and then negotiate with all the land owners. The larger the group, the greater the transaction costs and the more the land market will be constrained. Finally, groups are not static and membership may become blurred if access to rights are transferred to multiple heirs. User groups may thus find it increasingly difficult to regulate access to the common resource and the benefits of collective action may accrue to non-members (free-riders).

In large groups, the common property tenure institution may revert to open access because the institutional rules do not assign exclusive property rights to individuals or groups (a

minimum requirement for an efficient common property institution), or because such rules are difficult to enforce. This is corroborated by evidence from the Zimbabwean Model A Resettlement Areas where groups of stock owners were unable to exercise exclusive control over villages' allocated grazing lands. Levels of investment in these areas were consistently lower than in neighbouring areas characterised by more exclusive grazing rights. Unless alternative institutions are provided to facilitate group decision making, this is the development pattern most likely to be followed in South Africa given the potentially large size of groups to be resettled (Moor and Nieuwoudt, 1996). By ignoring these considerations, land redistribution policies initiated in South Africa aimed at alleviating rural poverty may undermine the economic benefits of owning land through institutional failure, since under conditions of group ownership and inclusive property rights, profit maximisation is only attainable through collective action (Lyne, 1994).

This raises important questions regarding collective management institutions best suited to ensure economic efficiency and sustainability on resettled land. Where user groups are not successful, certain non-user group arrangements could satisfy the conditions necessary for the efficient and sustainable use of resettled agricultural land (see Section 2.2.2). A potential solution requires that all members of the group surrender their individual use rights to an elected management committee, having exclusive use rights to the resource and managing it on behalf of the community (as occurred on Maori land in New Zealand (Lyne, 1994)). Importantly, ownership of the land is still vested with the community or group. Members have simply traded their inclusive use rights for inclusive benefit rights emanating from decisions made by the management body. This arrangement differs from user groups in that decisions are taken by a small number of people (the management committee)

regardless of the group's size, facilitating good management practices and land market activity (Wynne and Lyne, 1995).

Such private institutions consist of groups constituted as private business organisations (for example, co-operatives and companies). Critical to the success of such institutions is the extent to which they curtail transaction costs and discourage free-riding. The constitution adopted by the management organisation must thus ensure that the management committee and community members are held accountable for their actions and that dealings are transparent. The constitution must further ensure that the cost of rule breaking is internalised to discourage free-riding. Different non-user group organisations are better at ensuring economic efficiency than others. Identifying non-user group management organisations suited to the management of group owned agricultural land is clearly an area that requires further research.

Importantly, collective action problems resulting in prohibitive transaction costs may constrain the endogenous evolution of non-user group management organisations following group resettlement. Pro-active state intervention is thus urged in South Africa. It is recommended that the government facilitate the evolution of private institutions by vigorously disseminating information about alternative business organisations (companies and trusts) and facilitate collective action by reducing transaction costs. Government should actively ensure accountability of the representative body by sharing administration and transaction costs incurred in drafting a transparent constitution and brokering settlements where distributional problems arise. In addition to this, attention needs to be given to

reducing costs and simplifying procedures surrounding land registration and transfer, to promote the evolution of a land market.

7.2 Tenure reform in communal areas

Approximately 51.7 per cent of South Africa's population reside in rural areas (DBSA, 1994 cited by Dushmanitch and Nieuwoudt, 1994). Moreover, communal areas (including all the land held by the former South African Development Trust) account for approximately 16 per cent of South Africa's agricultural land. Average farm size in communal areas of KwaZulu-Natal is estimated by Nieuwoudt and Vink (1989) to be 0.75 hectares, while most farms are less than two hectares in size. This is considered exceedingly small for maize production, the dominant crop grown in these areas. These factors have resulted in excess demand for agricultural land in communal areas, yet large tracts of land lie fallow and per hectare investments and yields remain low (Lyne and Nieuwoudt, 1991).

Evidence from this study suggests that a programme of land redistribution alone is unlikely to be sufficient to solve the problems of overcrowding and resource degradation experienced in communal areas (also see Roth, 1993). After more than a decade of land redistribution and reforms aimed at decreasing population pressures and increasing agricultural productivity in Communal Areas of Zimbabwe, levels of on-farm investment, input application and yields are still significantly lower than those on neighbouring small scale commercial farms. Empirical analysis of Zimbabwean data indicates that tenure

security is a significant limiting constraint on agricultural conservation and productivity in the communal areas.

This result suggests that tenure reforms increasing both the breadth (exclusivity) and assurance of property rights in communal areas of South Africa are required. This will facilitate the emergence of an active land market in communal areas, assigning an opportunity cost to the land. This in turn will provide individual economic agents with the necessary incentives and ability to invest in agriculture, and will ensure that land moves to its most valued use.

7.2.1 The market for formal private tenure in communal areas

The implementation of formal private tenure in communal areas of South Africa would entail taking property rights already recognised informally by the local community out of the realm of informal lineage and community ownership, making them fully legal by means of a registered individual title deed (Atwood, 1990: 659). Such a formally registered title would be unimpeachable, relatively easy to define, and would release the land from group or secondary rights. In theory, this would reduce transaction costs, including risk, surrounding land transfers. The expected returns to potential buyers would increase, leading to an outward shift in the demand for land and the emergence of an active land sale or rental market. This would assign an opportunity cost to agricultural land in communal areas.

However, from an institutional perspective, it is essential that property institutions are well adapted to the particular needs and resource constraints facing a community. This represents an objective criterion whereby the relative efficiency of different property institutions may be measured, and is concerned with the extent to which the institutions of a society are responsive to the values and choices of individual citizens (Buchanan, 1986: 99). The implication is that land reform policies must focus on communal area reforms that explicitly recognise the *status quo*, to avoid conceptualising a complete restructuring of the small farm sector from within a vacuum.

As a consequence of pervasive structural imbalances which have built up over the years in South Africa, together with a fundamental reorientation of household labour away from agricultural production in the small farm sector towards off-farm employment (Nieuwoudt *et al*, 1996), perceived returns to economic interaction in the small farm sector may not be sufficiently high to engender a very large demand for the information provided by formal private tenure. The disincentive to engage in agricultural production is compounded by high transaction costs under existing tenure institutions, with the result that the agrarian economy is likely to remain weak in the South African small farm sector in the future.

The poor state of animal production is also likely to mitigate against a great demand for formal private tenure. Existing circumstances in the communal areas virtually dictate that some form of communal grazing will continue to exist. The number of livestock owned by individual households is typically small, the vast majority comprise less than ten animals (Nieuwoudt *et al*, 1996). Individual producers consequently lack the incentive to provide

the capital for investments such as fencing and water facilities, as these fixed costs are spread over a small production.

The dangers of instituting land (title) registration in a situation where the property rights market indicates that this would not be the optimal tenure system are explained in Section 2.4. Briefly, title registration may replace customary tenure institutions in the South African small farm sector, leading to conflict between 'new' and customary rights (often associated with secondary rights assigned to community members). In addition to this, individuals have to cope with expensive and complicated legal procedures. Poorer households may thus be disadvantaged as transaction costs associated with formal private tenure vary little according to farm size.

7.2.2 Rental markets in communal areas

As a second-best solution, it is suggested that reforms facilitating an active land rental market characterised by secure property rights and contracts enforceable through a court of law (land registration is *not* required for this) are more likely stimulate increased agricultural investments and conservation than 'replacement' policies introducing land titling in communal areas (Lyne *et al*, 1996). The efficiency and equity advantages of a land rental market in communal areas are described in Section 3.1.1. Rental markets assign an opportunity cost to land, ensuring it moves to those individuals more willing and able to utilise it. At the same time, equity is enhanced as poorer household entering into rental transactions on land they are unable to utilise in the short term earn rental income, while their long term social security is not jeopardised. Since the requirements for an efficient

land rental market are almost the same as those for a land sale market - namely secure property rights and low transaction costs - the establishment of a rental market in communal areas can be viewed as a stepping stone towards the introduction of formal private tenure in these areas.

To achieve the equity and efficiency advantages of an efficient land rental market in communal areas of South Africa, endogenous institutional innovation towards more exclusive and assured individual land rights is required. However, strategies that ignore the problems of vested interest groups and collective action are consistent with a policy of 'doing nothing', and are likely to have undesirable consequences (see Section 2.3.1). Accordingly, 'adaptive' policies facilitating incremental changes towards more exclusive individual property rights, while still retaining the safeguards provided by communal tenure, are suggested (Lyne, 1994). Rather than by radical institutional change, this may best be achieved by improving the certainty of law in communal areas, establishing clear legal precedents to increase tenure assurance (Lyne and Roth, 1994). Crop farmers will thus be more assured of retaining the benefits from investments in crop production, leading to an outward shift in the demand for (rented) land. At the same time, perceived risks and transaction costs associated with rental transactions can be reduced by introducing rental contracts endorsed by tribal authorities.

However, it was established in Section 2.3.1 that endogenous institutional change will be resisted by those benefiting from the existing structure of property rights. Therefore, to alter the evolution of land tenure institutions in the communal areas from an unpredictable process to a more pragmatic one, losers have to be compensated. If tenure is secured at the

expense of households who rely on secondary use rights, acceptable compensation may involve alternative forms of social security, like adequate pension and unemployment benefits, or options to exchange secondary use rights for serviced residential sites held with secure property rights (Lyne *et al*, 1996). Where tribal authorities resist the evolution of a rental market it is essential that their co-operation is ensured, as the perceived risk of dispossession by the tribal authorities was identified as an important constraint on rental transactions in Section 6.4.2.1. In this situation, it may be necessary to offer incentives to tribal authorities. In KwaZulu-Natal, Thomson and Lyne (1993) found that chiefs willing to endorse rental contracts either benefited by entering into the rental market themselves, or raised tax revenue from the transactions.

The role of Government is thus to decrease transaction costs inhibiting endogenous institutional change in communal areas (Ault and Rutman, 1979: 177). Pro-active government intervention is required, including the provision of institutions facilitating collective action (disseminating objective information and sharing transaction costs) and a supportive legal and administrative environment for the evolutionary change in indigenous law, together with compensation of people whose welfare is threatened by an institutional change. Clearly, further research into institutional requirements reducing risks and transaction costs associated with land transfers in communal areas of South Africa is required.

✓ On grazing land in communal areas, the situation is somewhat different. Even though the community using the land may be well defined, rules governing access to grazing land are not enforced, with the result that grazing land is an open access resource. Negotiation costs

of reaching agreement between stock owners are infinite because the number of potential stock owners is infinite, preventing the transfer of land via either a sale or rental market. Stock owners do not have the incentive to limit stocking rates or to invest in improving pastures of herd quality as others (free riders) benefit from individual effort.

On this land, neither formal private tenure nor traditional communal tenure will influence the nature of animal production unless incentives are created for individuals to exercise their attendant rights of exclusion. This is unlikely to occur in the foreseeable future, given the limited area of grazing land available to communal area stock owners and small individual herd sizes, and prohibitive capital and transaction costs incurred with the 'privatisation' of grazing rights required for the emergence of a (rental) market for individual grazing rights. However, the cost of enforcing group rights of exclusion to a consolidated grazing area may be affordable. This implies that animal production and resource utilisation would be better served by instituting common property management institutions, similar to those proposed for groups of individuals resettled on free hold land.

The challenge facing grazing policy in communal areas is thus to revive, adopt and support endogenously sustainable common property institutions that control the access to and use of the grazing resource. Unless the net collective benefits of the proposed change are greater than the costs of enforcing group rights of exclusion (unlikely in areas where resource degradation is already severe), communities are not likely to initiate these changes themselves owing to collective action problems experienced by large groups (Olson, 1971: 48). Government therefore has a significant role to play in facilitating institutional innovation, either by increasing the size of the net collective benefit or reducing the cost of

enforcing the groups rights of exclusion. This is clearly an area that requires further research, since little empirical evidence exists to support economic theory in this regard.

7.3 The importance of the urban/rural link

Finally, although the question of urban land reform is beyond the scope of this thesis, it must be mentioned in so far as it would affect the structure of incentives operating in the small farm sector. In the light of rapid urbanisation and resultant insecure urban property rights, households moving to urban areas have the incentive to retain property rights to land in the small farm sector due to the benefit stream which this land provides. To ensure the continuation of these rural land rights, households have the incentive to assign people with a low opportunity cost of time (women, children and the aged) to agricultural production in the small farm sector, contributing to the low intensity of agricultural production in these areas. If both security of tenure and relatively inexpensive access to services and infrastructure were supplied in urban areas, the opportunity cost to urban dwellers of not transferring their rural land rights to more productive users would increase relative to the benefits derived from holding rural land as a source of social security, possibly to the point where it creates the incentive for them to relinquishing secondary rights to land in communal areas (Moor and Nieuwoudt, 1996). This would assist the emergence of a land market (sale or rental) and facilitate the movement of land into more intensive production.

Moreover, increased education, improved employment opportunities and better access to urban markets following urbanisation may significantly increase the opportunity cost of womens' time. This will result in a decrease in the number of children demanded, reducing

population growth and pressure in urban and rural areas (Dushmanitch and Nieuwoudt, 1994).

Policies increasing the choice set of rural residents by increasing their access to urban opportunities are thus likely to have both economic and social spin-offs for those who prefer to stay in rural environments. The implication is that policies creating a stable business environment and stimulating economic growth in urban areas, together with the provision of alternative forms of social security, may enhance rural development. Competing demands on Government's limited financial resources must be considered, and land reform must fall within a holistic approach aimed at increasing both urban and rural access to secure property rights and employment opportunities.

CONCLUSIONS

Data from an interview survey of 119 households in the Zimbabwean small farm sector were analysed to investigate the relationship between tenure security and agricultural productivity in small scale agriculture. The study area was stratified so as to maximise the variation on the tenure variables measured. Three geographically adjacent strata were identified, namely the Small Scale Commercial Sector (40 households), the Communal Area (39 households) and the Model A Resettlement Area (40 households).

Specifically, the analysis investigated the interaction between land tenure security and credit use, long-term on farm investments, complementary short-term input application and yield. The model was estimated as a simultaneous equation model using two-stage least squares (2SLS) regression analysis. Credit use, investments in long-term land improvements and levels of short-term input application were endogenous variables in the economic model. Unfortunately, credit use was too infrequent in the sample to warrant statistical analysis and was omitted from the final model. Other variables considered in the model were household characteristics, household head characteristics, farm characteristics and production characteristics for each household interviewed.

For the estimation of long-term investments in fixed improvements and complementary short-term input use, data from arable and grazing land were included in the same model. This was not possible in the equation estimating yield because of data limitations. By considering both arable and grazing land in the same model, a greater variation in the tenure variables observed was achieved. This also permitted the study of investment

behaviour of the same individual under two different tenure institutions (on grazing and arable land).

In the equation estimating an individual's investments in long-term on-farm improvements, the index measuring tenure security was significant at the 99 per cent confidence level ($t = 3.9$). The household's gross farm income (a proxy measure for farm size and liquidity) was also significant at the 99 per cent level ($t=3.4$). In the subsequent equation, investments in long-term land improvements were found to be a significant determinant of complementary short-term input application ($t=2.2$ which is significant at the 95 per cent confidence level).

Finally, 2SLS estimation of yield in the sample - using principal component regression analysis to rid the estimation of multicollinearity - revealed that tenure security has a positive and significant effect on recorded output ($t = 2.96$ which is significant at the 99 per cent level). Households who invested more in human capital also attained significantly higher yields than those without post-school training, *ceteris paribus* ($t = 2.91$, which is significant at the 99 per cent confidence level). Better educated or trained farmers are more able to assimilate information and are thus more likely to invest in yield enhancing management practices and technologies. The empirical result thus suggests that returns to investments in human capital and extension are likely to be enhanced by the provision of exclusive and assured property rights.

Empirical results thus support the hypothesis that a limited breadth, duration and assurance of property rights is a significant constraint on economic incentives and agricultural productivity in the sample. Households with more secure property rights invested more in

long- and short-term investments and attained higher yields in the area studied, *ceteris paribus*. Given similarities between the Zimbabwean and South African agricultural sectors, the implication for land reform in South Africa is that communal tenure institutions in the small farm sector are likely to be a constraint on economic incentives and agricultural productivity in the region. Furthermore, land redistribution without cautious consideration of individual economic incentives reduces the likelihood of on-farm investments and sustained agricultural production on resettled land.

It is thus necessary to initiate rural land reforms in South Africa at two distinct levels. At a national level it is necessary to address fundamental grievances regarding land access and rural infrastructure. The mechanisms outlined in the South African government's Reconstruction and Development Programme (RDP) and *Green Paper on South African Land Policy* go some way towards addressing these concerns. Reform is simultaneously required to land tenure institutions at the individual level, to ensure economic incentives necessary to maintain levels of agricultural production and resource conservation on South Africa's limited agricultural land. Reforms that do not take transaction costs and the needs of particular interest groups into consideration are unlikely to succeed at addressing the demands of those disadvantaged by past legislation, and at ensuring efficient and sustainable resource utilisation.

Where commercial and state land is acquired of redistribution and resettlement, preference should be given to emerging small-scale commercial farmers with secure title enforced by the legal system. Secure title can be pledged as collateral to access capital required to make the requisite investments in agriculture. However, practical considerations and political

objectives are likely to dictate that land acquired for redistribution will be resettled by large groups of individuals. Unless the costs (both physical and transaction costs) associated with land registration and the transfer of property rights are curtailed, the further sub-division of land resettled to groups into the hands of private individuals is unlikely. It is thus essential that group resettlement be accompanied by innovative tenure reforms which facilitate economic interaction and the internalisation of externalities. This is required given the high transaction costs associated with collective action in large groups, and free-rider incentives inherent in common property institutions. The establishment of private group management organisations, such as trusts or companies, is suggested in this regard. Such institutions have efficiency advantages in that decisions are made by a small management team, regardless of the size of the group.

In addition to the redistribution of commercial and state land, rural land reform in South Africa requires a restructuring of agricultural tenure institutions in communal areas. Land market activity in communal areas is constrained by insecure tenure and costly transactions (property rights lack breadth and assurance). However, perceived low returns to agricultural production in the small farm sector, together with resistance from those who stand to lose from an institutional change, are likely to constrain any endogenous shift towards more secure property rights. This does not suggest that formal private tenure be imposed on communities. Such a replacement policy could aggravate uncertainty in communal areas if 'new' rights conflict with those established under customary law.

Rather, adaptive tenure reforms allowing for proactive government assistance and incremental changes towards more secure property rights are proposed. A land rental

market can be viewed as a stepping stone towards private property rights. Rental transactions improve allocative efficiency by transferring land to households more willing and able to utilise it. At the same time, equity is enhanced as transactions are voluntary with lessors gaining rental income from land they do not require in the short-term. On allotted arable land in communal areas, the efficiency and equity advantages of a rental market may best be achieved by creating certainty of law regarding land rights, thereby decreasing uncertainty and transaction costs surrounding land transactions. The situation is different on grazing land in communal areas. Here the tenure institution represents an open access institution and the challenge facing policy makers is to revive, adopt and support endogenous sustainable common property management institutions that control the access to and use of the grazing resource, similar to those proposed for land resettled to large groups of individuals.

SUMMARY

From an institutional perspective, it is hypothesised that the evolution of permanent and enforceable land rights is closely related to increasing population density, advances in farming technology and the emergence of agricultural markets. However, evidence from several African countries suggests that the endogenous evolution of tenure institutions may be constrained by the actions of vested interest groups and prohibitive transaction costs. Within the context of sub-Saharan Africa's rapid population growth and declining agricultural productivity, this has resulted in growing debate about whether indigenous land tenure systems are a constraint on agricultural productivity and transformation in the region. Some argue that indigenous communal tenure institutions have arisen in response to the needs and resource constraints facing African communities, while others argue for the merits of individual ownership. Yet others contend that alternative, more binding, constraints result in land tenure having a limited impact on productivity and investment.

Of primary importance in this debate is the role of property institutions in manifesting economic incentives within society. Property institutions facilitate economic co-ordination amongst individuals within a society by helping them form expectations that can be reasonably held in their dealings with others. By establishing expectations about resource use in economic activity and about the partitioning of the income stream resulting from economic activity, different property institutions can be expected to provide different economic incentives to individuals within a society. It is hypothesised that the effectiveness of a particular property institution in manifesting economic incentives depends on the level of tenure security afforded by the institution.

The objective of this study was thus to empirically investigate the interaction between land tenure security and agricultural productivity in small scale agriculture characteristic of much of sub-Saharan Africa, and to derive implications for proposed land reforms in South Africa. Specifically, the study investigated the relationship between land tenure security and credit use, long-term on-farm investments, short-term complementary input use and yield.

- ✶ Data for the study were gathered by means of an interview survey of small scale farmers in Manicaland Province, Zimbabwe, in April and August of 1994. The Zimbabwean small farm sector was considered appropriate for the study as it allowed the investigation of the interaction between land tenure security and agricultural productivity (economic incentives) under a wide range of geographically adjacent tenure institutions. Furthermore, Zimbabwe has experienced more than a decade of land reform and redistribution following independence in 1980, which is likely yield important implications for proposed land reforms in South Africa. The study area was stratified to maximise the variation on the tenure variables measured. In total, 119 households were interviewed from the three strata identified, namely the Small Scale Commercial Sector, the traditional Communal Area and the Government initiated Model A Resettlement Area. Data for the study were gathered from both arable and grazing lands. Amongst the variables measured were household characteristics, household head characteristics (for example, the household head's age, experience and level of education), farm characteristics (including the farm's size and agricultural potential), production characteristics (including the extent of on-farm improvements, the level of input application and yield) and tenure characteristics.

Throughout the study, tenure security was defined as an individuals perceptions of his/her undisturbed rights to a piece of land on a continuous basis, as well as the ability to reap the benefits of labour and capital invested in the land, either in use or upon alienation. The level of tenure security afforded by a particular tenure institution is thus a function of three components, namely the breadth, duration and assurance of property rights. The breadth of rights defines the legal bundle of rights held over the land (use, transfer and exclusion rights). The duration refers to the length of time for which the bundle of rights is legally valid, while assurance defines the degree of certainty with which the legal definitions of breadth and duration are held. From an economic perspective, if one of these conditions is lacking, tenure is not secure. Information pertaining to each of these characteristics was gathered in the questionnaire.

The conceptual model to be estimated required four equations. Within the model, mutually dependent variables (endogenous variables) were correlated to the disturbance terms and were not independently distributed of them. Ordinary least squares (OLS) estimation under these conditions would have resulted in simultaneous equation bias, yielding biased and inconsistent parameter estimates. For this reason, the simultaneous equation system was estimated using two-stage least squares regression analysis (2SLS) . This technique purifies the stochastic explanatory variable of the influence of the stochastic disturbance term by creating a proxy or instrumental variable for the endogenous variable, and involves two successive applications of OLS. In the empirical model, dummy dependent variables were estimated using probit analysis.

In the empirical analysis, tenure security was estimated as an index capturing the perceived breadth, duration and assurance of an individual's property rights to both arable and grazing land. Credit use was too infrequent in the sample to warrant statistical analysis and was omitted from the final model. In the equations estimating long-term investments in fixed improvements and complementary short-term input use, data from arable and grazing land were pooled. This was not possible in the equation estimating yield because of data limitations.

Empirical results from the 2SLS regression analysis support the hypothesis that tenure security has a significant influence on economic incentives and agricultural productivity. Households with more exclusive and assured property rights invested more in on-farm improvements ($t=3.9$, significant at the 95 per cent confidence level) and applied greater levels of short-term inputs ($t=2.2$, significant at the 95 per cent confidence level) compared to those with less secure property rights, *ceteris paribus*. Households who invested more in on-farm improvements and who applied greater levels of inputs achieved significantly higher yields. Unfortunately, severe multicollinearity precluded the simultaneous estimation of the effect of long-term investments, input use and tenure security on yield. To overcome this, principal component regression analysis was used to purge the data of multicollinearity. Regressions on estimated principal components, excluding two minor principal axes, were calculated and transformed back into the original variables in the original scale. Although this technique resulted in loss in the model's ability to accurately reproduce the estimation data (a reduction in R^2), it increased the interpretability of the estimated coefficients. Results from this regression indicate that long-term investments,

short-term complementary input application and tenure security all have a positive and significant effect on yield in the sample (all significant at the 99 per cent confidence level).

Given similarities between the Zimbabwean and South African agricultural sectors, the implication for land reform in South Africa is that communal tenure institutions in the South African small farm sector are likely to be a constraint on economic incentives agricultural productivity in the region. Furthermore, land redistribution without cautious consideration of individual economic incentives reduces the likelihood of on-farm investments and sustained agricultural production on resettled land. The latter is particularly important in South Africa where groups of up to 300 people are likely to be resettled on land in terms of the Government's proposed land reform policy outlined in the Reconstruction and Development Programme (RDP) and *Green Paper on South African Land Policy*.

It is thus necessary to initiate rural land reforms in South Africa at two distinct levels. At a national level it is necessary to address fundamental grievances regarding land access and rural infrastructure. Reform is simultaneously required to land tenure institutions at the individual level, to ensure economic incentives necessary to maintain levels of agricultural production and resource conservation on South Africa's limited agricultural land. Reforms that do not take transaction costs and the needs of particular interest groups into consideration are unlikely to succeed at addressing the demands of those disadvantaged by past legislation, and at ensuring efficient and sustainable resource utilisation.

Where commercial and state land is acquired for redistribution and resettlement, preference should be given to emerging small-scale commercial farmers with secure title enforced by the legal system. Secure title can be pledged as collateral to access capital required to make the requisite investments in agriculture. However, practical considerations and political objectives are likely to dictate that land acquired for redistribution will be resettled by large groups of individuals. Unless the costs (both physical and transaction costs) associated with land registration and the transfer of property rights are curtailed, the further sub-division of land resettled to groups into the hands of private individuals is unlikely. It is thus essential that group resettlement be accompanied by innovative tenure reforms which facilitate economic interaction and the internalisation of externalities. This is required given the high transaction costs associated with collective action in large groups, and free-rider incentives inherent in common property institutions. The establishment of private group management organisations, such as trusts or companies, is suggested in this regard. Such institutions have efficiency advantages in that decisions are made by a small management team, regardless of the size of the group.

In addition to the redistribution of commercial and state land, rural land reform in South Africa requires a restructuring of agricultural tenure institutions in communal areas. Land market activity in communal areas is constrained by insecure tenure and costly transactions (property rights lack breadth and assurance). However, perceived low returns to agricultural production in the small farm sector, together with resistance from those who stand to lose from an institutional change, are likely to constrain any endogenous shift towards more secure property rights. This does not suggest that formal private tenure be

imposed on communities. Such a replacement policy could aggravate uncertainty in communal areas if 'new' rights conflict with those established under customary law.

Rather, adaptive tenure reforms allowing for proactive government assistance and incremental changes towards more secure property rights are proposed. A land rental market can be viewed as a stepping stone towards private property rights. Rental transactions improve allocative efficiency by transferring land to households more willing and able to utilise it. At the same time, equity is enhanced as transactions are voluntary with lessors gaining rental income from land they do not require in the short-term. On allotted arable land in communal areas, the efficiency and equity advantages of a rental market may best be achieved by creating certainty of law regarding land rights, thereby decreasing uncertainty and transaction costs surrounding land transactions. The situation is different on grazing land in communal areas. Here the tenure institution represents an open access institution and the challenge facing policy makers is to revive, adopt and support endogenous sustainable common property management institutions that control the access to and use of the grazing resource.

REFERENCES

- Adams, D.W. and Romero, A.A.P. (1981). Group landing to the rural poor in the Dominican Republic: A stunted innovation. *Canadian Journal of Agricultural Economics*, Vol 29(1): 217-224.
- ANC (1994). *Reconstruction and Development Programme: A policy framework*. Umanyano Publications.
- Arrow, K.J. (1985). The potentials and limits of the market in resource allocation. In *Issues in contemporary microeconomics and welfare*. Edited by Feiwel, G.K., 1985, The MacMillan Press Limited
- Ashworth, V.A. (1993). Towards sustainable smallholder agriculture. Draft copy, World Bank-Ministry of Lands, Agriculture and Water Development report. Harare, Zimbabwe.
- Atwood, D.A. (1990). Land registration in Africa: The impact on agricultural production. *World Development*, Vol 18(5): 659-671.
- Ault, D.E. and Rutman, G.L. (1979). The development of individual rights to property in tribal Africa. *The Journal of Law and Economics*, Vol 22(1): 163-182.
- Baber, R.A.A. (1991). A property rights approach to the land question in South Africa. Unpublished M.Sc (Agric) Thesis, Department of Agricultural Economics, University of Natal, Pietermaritzburg.
- Baber, R.A.A. and Nieuwoudt, W.L. (1992). Principals of justice and rural land reform. *The South African Journal of Economics*, Vol 60(2): 205-220.
- Bardhan, P. (1989). Alternative approaches to the theory of institutions in economic development. In *The economic Theory of Agrarian Institutions*. Oxford University Press, New York.
- Barnett, V. (1991). *Sample Survey Principals and Methods*. Edward Arnold, London.
- Barrows, R. and Roth, M. (1990). Land tenure and investment in African agriculture: Theory and evidence. *The Journal of Modern African Studies*, Vol 28(2): 265-297
- Barzel, Y. (1989). *Economic Analysis of Property Rights*. Cambridge University Press, Cambridge.

Beghin, J. and Fafchamps, M. (1995). Constitutions, institutions and political economy of farm policies: What empirical content? In *Agricultural Competitiveness: Market Forces and Policy Choice*, Proceedings of the XXII IAAE Conference. Edited by Peters, G.H. and D.D. Hedley, Dartmouth Publishing Company, USA.

Bembridge, T.J. (1987). An overview of agricultural and rural development problems in less developed areas of Southern Africa. *Development Southern Africa*, Vol 3(1): 20-36.

Bembridge, T.J. (1986). Human resource development and for increased agricultural production in less developed areas of South Africa. *Southern African Journal of Science*, Vol 83: 284-289.

Binswanger, H.P, Deninger, K. and Feder, G. (1992). Power, distortions and reform in agricultural land markets. In *Handbook of Development Economics*. Edited by Berman, J and Srinivason, T.N. World Bank, Washington

Blarel, B. (1994). Tenure security and agricultural productivity under land scarcity: The case of Rwanda. In *Searching for land tenure security in Africa*. Edited by Bruce, J.W. and Migot-Adholla, S.E.. Kendall Hunt Publishing Company, Iowa.

Bratton, M. (1990). Ten years after: Land redistribution in Zimbabwe, 1980-1990. Chapter 9 in *Beneath the surface of Zimbabwe's agricultural revolution*. University of Zimbabwe press, Zimbabwe.

Bromley, D.W. (1989). Property relations and economic development: The other land reform. *World Development*, Vol 6: 867-877.

Bromley, D.W. and Cochrane, J.A. (1994). Understanding the global commons. Working paper 13, The environmental and natural resources policy and training project. University of Wisconsin-Madison.

Bruce, J.W. and Migot-Adholla, S.E. (1994). *Searching for Land Tenure Security in Africa*. Kendall Hunt Publishing Company, Iowa.

Bruce, J.W., Migot-Adholla, S.E. and J. Atherton. (1994). The findings and their policy implications: Institutional Adaptation or Replacement? In *Searching for land tenure security in Africa*. Edited by Bruce, J.W. and Migot-Adholla, S.E.. Kendall Hunt Publishing Company, Iowa.

Buchanan, J.M. (1986). *Liberty, market and state. Political economy in the 1980's*. Wheatsheaf Books Ltd., Brighton.

Buchanan, J.M. (1991). *The economics and ethics of constitutional order*. Ann Arbor microfilms international: University of Michigan press, Michigan.

Buchanan, J.M. (1993). *Property as a guarantor of liberty*. The Shaftsbury Papers, 1. Edited by Rowley, C.K. Cambridge University Press, Cambridge.

Budlender, G. and Latsky, J. (1991). Unravelling rights to land in rural race zones. In *A harvest of discontent: The land question in South Africa*. Edited by M. De Klerk. Clyson Press, Cape Town.

Carter, M.R., Wiebe, K.D. and B. Blarel. (1994). Tenure security for whom? Differential effects of land policy in Kenya. In *Searching for land tenure security in Africa*. Edited by Bruce, J.W. and Migot-Adholla, S.E.. Kendall Hunt Publishing Company, Iowa.

Chatterjee, S. and Price, B. (1977). *Regression analysis by example*. Wiley series in probability and mathematical statistics. John Wiley and Sons, New York.

Ciriancy-Wantrup, S.V. and Bishop, R.C. (1975). "Common property" as a concept in natural resource policy. *Natural Resource Journal*, Vol 15: 713-727.

Cliffe, L. (1988). Zimbabwe's Agricultural 'success' and food security in Southern Africa. *Review of African Political Economy*, Vol 42: 4-25.

Coase, R.H. (1960) The problem of social cost. *Journal of Law and Economics*, Vol 3: 1-44.

Coase, R.H. (1988). *The firm, the market and the law*. University of Chicago Press, Chicago.

Cousins, T. (1996). Personal communication. Institution Building Unit Co-ordinator, Association for Rural Advancement.

Cross, C.R. (1991). Informal tenures against the state: Landholding systems in African Rural Areas. In *A harvest of discontent: The land question in South Africa*. Edited by M De Klerk, Clyson Press, Cape Town.

Dahlman, C.J. (1979). The problem of externality. *The Journal of Law and Economics*, Vol 22(1): 148.

Davies, D.H. (1990). Zimbabwe's experience in rural development. *Development Southern Africa*, Vol 7(Special edition): 467-482.

Davis, D. and Corder, H. (1991) Restructuring the rural economy: legal issues. In *A harvest of discontent: The land question in South Africa*. Edited by M De Klerk. Clyson Press, Cape Town.

Deininger, K. and Binswanger, H.P. (1992). Are large farms more efficient than small ones? Government intervention, large scale agriculture, and resettlement in Kenya, South Africa and Zimbabwe. World Bank, Washington.

Demsetz, H. (1967). Towards a theory of property rights. *American Economic Review*, Vol 57(2): 347-359.

Department of Land Affairs. (1996). *Green Paper on South African Land Policy*. February 1996, ISBN 0-621-17329-0.

Dushmanitch, C.D. and Nieuwoudt, W.L. (1994). The urban rural linkage in population growth and rural development in Southern Africa. Paper presented at the XXII IAAE conference, 22-29 August 1994, Harare, Zimbabwe.

Eicher, C.K. and Rukuni, M. (1996). Reflections on agrarian reform and capacity building in South Africa. Staff Paper No. 96-3. Department of Agricultural Economics, Michigan State University, Michigan.

Feder, G., Just, R.E. and Zilberman, D. (1982). *Adoption of Agricultural Innovation in Developing Countries: A Survey*. World Bank Staff Working Papers, Number 542, Washington, USA.

Feder, G. and Noronha, R. (1987). Land Rights Systems and Agricultural Development in Sub-Saharan Africa. *The World Bank Research Observer*, Vol 2(2): 134-170 July 1987.

Feder, G and Onchan, T. (1987). Land ownership security and farm investment in Thailand. *American Journal of Agricultural Economics*, Vol 69: 311-320.

Feder, G., Onchan, T., Chalamwong, Y. and C. Hongladarom. (1988). *Land Policies and Farm Productivity in Thailand*. John Hopkins University Press, London.

Feder, G. and Feeny, D. (1993). The theory of land tenure and property rights. In *The Economics of Rural Organisation: Theory, Practice and Policy*. Edited by Hoff, K., Braverman, A. and J. Stiglitz. Oxford University Press, Oxford.

Fenyés, T.I., van Zyl, L. and Vink, N. (1988). Structural imbalances in South African agriculture. *The South African Journal of Economics*, Vol 56(2): 181-195.

Furubotn, E.G. and Pejovich, S. (1972). Property rights and economic theory: A survey of modern literature. *Journal of Economic Literature*, Vol 10: 1137-1158.

Furubotn, E.G. and Richter, R. (1990). The new institutional economics: An assessment. In *The new institutional economics*. Edited by Furubotn, E.G. and Richter, R.. Texas University Press, Texas.

GENSTAT (1995). *Genstat 5.3.1 Procedure Library Manual*. Lawes Agricultural Trust, Rothamstead Experimental Station.

Gujarati, D.N. (1988). *Basic Econometrics*. (Second edition). McGraw-Hill Book Company, Singapore.

Gustafsson, A.B. (1987). Economy wide implications of resettlement in Zimbabwe. Unpublished Ph.D. Thesis, Stanford University.

Hardin, G. (1968). The tragedy of the commons. *Science*, Vol 162: 1243-1248.

Hayami, Y. and Ruttan, V.W. (1985). *Agricultural Development: An International Perspective*. The John Hopkins University Press, London.

Hayek, F.A. (1945). The use of knowledge in society. *American Economic Review*, Vol XXXV (4).

Hill, L. and Kau, P. (1973). Application of multivariate probit to a threshold model of grain dryer purchasing decisions. *American Journal of Agricultural Economics*, Vol 55(1): 19-27.

Hsiao, C. (1986). *Analysis of Panel Data*. Econometric Society Monographs, Cambridge University Press, Cambridge.

Jayne, T.S., Khatri, Y., Thirtle, C and T. Reardon. (1994). Determinants of productivity change using a profit function: Smallholder agriculture in Zimbabwe. *American Journal of Agricultural Economics*, Vol. 76 (3): 613-618.

Johnson, O.E.G. (1972). Economic analysis, the legal framework and land tenure systems. *Journal of Law and Economics*, Vol 15: 259-276.

Judge, G.G., Hill, R.C., Griffiths, W.E., Lutkepohl, H. and T-S. Lee. (1988). *Introduction to the theory and practices of econometrics*. John Wiley and Sons, Singapore.

Kassier, W.E. and Groenewald, J.A. (1992). The agricultural economy of South Africa. In *Agricultural restructuring in Southern Africa*. Proceedings of papers presented at the International Association of Agricultural Economists Symposium, 24-27 July, 1990, Namibia.

Kendall, M.G. (1957). *A Course in Multivariate Analysis*. Charles Griffin and Company Limited, London.

Kendrick, J.W. and Jones, C.E. (1953). Farm capital out-lays and stock. *Survey of Current Business*, Vol 33(8): 16-23.

Kerr, A.J. (1984). *The Law of Sale and Lease*. Butterworths, Durban.

Kille, G.S. and Lyne, M.C. (1993). Investment on freehold and trust farms: Theory with some evidence from KwaZulu. *Agrekon*, Vol 32(3): 101-109.

Lenta, G. (1981). Land shortages and land unused: The paradoxical patterns of KwaZulu. Occasional Paper No. 10, Economic Research Unit, Department of Economics, University of Natal, Durban.

Letsoalo, E. (1991). Land 'reforms'- state initiatives. In *A harvest of discontent: The land question in South Africa*. Edited by M De Klerk. Clyson Press, Cape Town.

Lyne, M.C. (1989). Distortions of incentives for farm households in KwaZulu. Unpublished Ph.D. Thesis, Department of Agricultural Economics, University of Natal, Pietermaritzburg.

Lyne, M.C. (1994). Ownership and control of Maori land: Some lessons for South Africa. Discussion paper, No.138, Agribusiness and Economics Research Unit, Lincoln University.

- Lyne, M.C. and Nieuwoudt, W.L. (1990). The real tragedy of the commons: Livestock production in KwaZulu. *The South African Journal of Economics*, Vol 58(1): 86-96.
- Lyne, M.C. and Nieuwoudt, W.L. (1991). Inefficient land use in KwaZulu: Causes and remedies. *Development Southern Africa*, Vol 8(2): 193-201.
- Lyne, M.C. and Roth, M. (1994). Land rental markets in sub-Saharan Africa: Efficiency, equity and institutional change. Unpublished paper, University of Wisconsin-Madison.
- Lyne, M.C., Thomson, D.N. and Ortmann, G.F. (1996). Advantages of a rental market for land in developing regions of Southern Africa and institutions necessary for its operation. *Agrekon*, Vol 35: 12-19.
- Mathambo, P. (1995). Personal communication. Regional AGRITEX extension official, Manicaland Province, Zimbabwe.
- Mehretu, A. (1994). Social poverty profile of communal areas. In *Zimbabwe's agricultural revolution*. Edited by M. Rukuni and C. Eicher. University of Zimbabwe publications, Zimbabwe.
- Migot-Adholla, S., Hazell, P., Blarel, B. and F. Place. (1991). Indigenous land rights systems in sub-Saharan Africa: A constraint on productivity? *The World Bank Economic Review*, Vol 5(1): 155-175.
- Moor, G.M. (1994). Institutional innovation in South African agriculture: Lessons from Zimbabwe. Unpublished M.Sc (Agric) Thesis, Department of Agricultural Economics, University of Natal, Pietermaritzburg.
- Moor, G.M. and Nieuwoudt, W.L. (1995). The interaction between land tenure security and agricultural productivity in Zimbabwe. *Agrekon*, Vol 34(4): 288-298.
- Moor, G.M. and Nieuwoudt, W.L. (1996). The prospects for improving institutional arrangements and land use in Southern Africa. *Development Southern Africa*, Vol 13(1) 67-77.
- Mufuka, K. (1991). The weak link in Zimbabwe's agricultural miracle: 1980-1990. *Development Southern Africa*, Vol 8(3): 293-304.

Muir, K. and Blackie, M.J. (1994). The commercialisation of agriculture. In *Zimbabwe's agricultural revolution*. Edited by M. Rukuni and C. Eicher. University of Zimbabwe publications.

Nieuwoudt, W.L. (1970). An economic analysis of the demand for resources and supply of output in South African agriculture. Unpublished Ph.D Thesis, Department of Agricultural Economics, University of Natal, Pietermaritzburg.

Nieuwoudt, W.L. (1972). A Principal Component analysis of inputs in a production function. *Journal of Agricultural Economics*, Vol 23: 277-283.

Nieuwoudt, W.L. (1987). Taxing agricultural land. *Agrekon*, Vol 26: 10-14.

Nieuwoudt, W.L. (1990). Efficiency of land use. *Agrekon*, Vol 29(4): 210-215.

Nieuwoudt, W.L., Moor, G.M. and R.A.A. Baber. (1996). Incentive distortions in Developing agriculture in South Africa and implications for tenure reform. Volume Two (Gender, Poverty and Food) of the IEA Tunis Congress. Edited by Y. Mundlak. MacMillan Press, London.

Nieuwoudt, W.L. and Vink, N. (1989). The effects of increased earnings from traditional agriculture in Southern Africa. *South African Journal of Economics*, Vol 57(3): 257- 269.

Olson, M. (1971). *The logic of collective action*. Harvard University press, Cambridge.

Palmer, R. (1990). "Land reform in Zimbabwe 1980 - 1990". *African Affairs*, Vol 28: 163-181.

Pasour, E.C. (1985). The public interest and rent seeking. *Public Choice*, Vol 47: 527-529.

Pasour, E.C. (1990). *Agriculture and the State*. The independent institutes, Holmes and Meier, London.

Place, F. and Hazell, P. (1993). Productivity effects of indigenous land tenure systems in sub-Saharan Africa. *American Journal of Agricultural Economics*, Vol 57(1): 10-19.

Place, F. and Roth, M. and Hazell, P. (1994). Land tenure security and agricultural performance in Africa: Overview of research methodology. In *Searching for land tenure security in Africa*. Edited by Bruce, J.W. and Migot-Adholla, S.E.. Kendall Hunt Publishing Company, Iowa.

Platteau, J-P. (1995). *The evolutionary theory of land rights as applied to sub-Saharan Africa: A critical assessment*. University of Notre-Dame Press

Roth, M. (1990). Analysis of agrarian structures and land use patterns. Background paper for the World Bank Agricultural Sector Memorandum, Johannesburg.

Roth, M. (1993). A critique of Zimbabwe's 1992 Land Act: Quasi-market versus non-market options for land reform. Unpublished paper, World Bank, Washington.

Roth, M., Barrows, R., Carter, M. and Kanel, D. (1989). Land ownership security and farm investment: Comment. *American Journal of Agricultural Economics*, Vol 71(1): 211-214.

Roth, M., Unruh, J. and R. Barrows. (1994). Land registration, tenure security, credit use, and investment in the Shebelle region of Somalia. In *Searching for land tenure security in Africa*. Edited by Bruce, J.W. and Migot-Adholla, S.E.. Kendall Hunt Publishing Company, Iowa.

Rukuni, M. (1990). The development of Zimbabwe's agriculture: 1980-1990. Working Paper AEE 7/90, University of Zimbabwe.

Runge, C.F. (1981). Common property externalities: Isolation, assurance, and resource depletion in a traditional grazing context. *American Journal of Agricultural Economics*, Vol 63: 595-606.

Runge, C.F. (1985). The innovation of rules and the structures of incentives in open access resources. *American Journal of Agricultural Economics*, Vol 67(1): 369-376.

Ruttan, V.W. (1978). Induced institutional change. In *Induced Innovation: Technology, Institutions and Development*: 327-357. Edited by Binswanger, H.P. and Ruttan, V.W.. The John Hopkins University Press Ltd., London.

South African Institute of Race Relations, (1975). *Survey of Race Relations in South Africa*. South African Institute of Race Relations, Johannesburg.

SPSS-X User Manual. (1975). *Statistical Packages for Social Sciences*.

SPSS Reference Guide. (1990). *SPSS Statistical Data Analysis*. ISBN 0-918469-62-7.

Thomson, D.N. (1996). A study of land rental markets and institutions in communal areas of rural KwaZulu-Natal. Unpublished Ph.D Thesis, Department of Agricultural Economics, University of Natal, Pietermaritzburg.

Thomson, D.N. and Lyne, M.C. (1993). Constraints to land rental in KwaZulu: Analysing the transaction costs. *Oxford Agrarian Studies*, Vol 21: 143-150.

Thomson, D.N. and Lyne, M.C. (1995). Is tenure secure in communal areas? Some empirical evidence from KwaZulu-Natal. *Agrecon*, Vol 34(4): 178-181.

Tweeton, L.G. (1962). An economic analysis of the resource structure of United States agriculture. Unpublished Ph.D Dissertation, Iowa State University of Science and Technology, Ames, Iowa.

Van den Brink, R., Bromley, D.W. and Cochrane, J.A. (1994). Property rights and productivity in Africa: Is there a connection? *Development Southern Africa*, Vol 11(2)

Van der Walt, A.J. (1991). The future of common law landownership. In *Land reform and the future of land ownership in South Africa*. Edited by A.J. Van der Walt. Juta and Co, Ltd. Johannesburg.

Van Reenen, T.H. (1962). *Land: Its ownership and occupation in South Africa*. Rusticca press. Cape Town.

Vink, N. and Louw, H. (1990). Agrarian reform in Zimbabwe- lessons for South Africa. *South Africa International*, Vol 21(2): 78-91.

Wade, R. (1987). The management of common property resources: collective action as an alternative to privatisation or state regulation. *Cambridge Journal of Economics*, Vol 11: 95-106.

Weiner, D. Moyo, S. Munslow, B and O'Keefe, P. (1985). Land use and Agricultural Productivity in Zimbabwe. *Journal of Modern African Studies*, Vol 23: 251-285.

Wynne, A.T. and Lyne, M.C. (1995). Communities, institutions and natural resources: An assessment of case-studies from KwaZulu-Natal. *Development Southern Africa*, Vol 12: 649-667.

Zimbabwe. (1986). First five year national development plan, 1986-1990, Vols.1 and 2, Government printer, Harare.

APPENDIX A.1 HOUSEHOLD QUESTIONNAIRE

Name : _____

Place : _____

Strata Number : _____

Respondent Number : _____

Natural Region : _____

Soil classification : _____

Note: The information recorded during this interview is strictly confidential. The respondent should be a male or female household head. Respondents are not required to answer questions if they do not wish to do so.

SECTION 1: Household characteristics**1.1 Household head**

1.1.1 Is the household head male or female? _____ (M / F)

1.1.2 How old is the household head? _____ (years)

1.1.3 How many years farming experience does the household head have? _____ (years)

1.1.4 Is the household head a full-time (F) or part-time (P) farmer?
(P: builder, taxi owner, works in town etc.) _____ (F / P)**1.2 Dependants**1.2.1 How many people live on the farm?
Adults _____ Children _____

1.2.2 How many family members work on the farm? _____

1.3 Off-farm income

1.3.1 How much money does the household receive from non-farm income sources? (from any of the family members)

Cash income _____ (Z\$/month)

Cash remitted _____ (Z\$/month)

Pension payment _____ (Z\$/month)

SECTION 2: Farm characteristics

- 2.1** What is the size of your land holding (**specify units**)? _____ (arable)
 _____ (grazing)
- 2.2** How far is your arable land from your house? _____ (km)
 _____ (minutes)
- 2.3** Does the household have more than one plot of arable land, in different areas? _____ (yes/no)
- 2.4** Do you have access to water on your farm? _____ (yes/no)
 Do you irrigate your arable land? _____ (yes/no)

2.5 Agricultural production: Crops

In a normal season (i.e. 1993/1994), how much of the following is produced?

| Crop | Area planted (ha) | Yield ¹⁾ | Quantity sold ¹⁾ | Gross income (Z\$) |
|------------------|-------------------|---------------------|-----------------------------|--------------------|
| Maize | | | | |
| Sorghum | | | | |
| Groundnuts | | | | |
| Rapoko | | | | |
| Cotton | | | | |
| Other: (specify) | | | | |
| | | | | |

¹⁾ Specify units

2.6 Agricultural production: Livestock

| Livestock | Number owned | Number sold during last year | Gross income (Z\$) |
|-----------|--------------|------------------------------|--------------------|
| Oxen | | | |
| Cows | | | |
| Bulls | | | |
| Goats | | | |
| Sheep | | | |
| Pigs | | | |

- 2.7** How many cattle died as a result of the 1992 drought? _____

2.8 Farming expenses

| Inputs | Used Y/N | Quantity used ¹⁾ | Total cost (Z\$) | Bought with credit (Y/N) |
|------------------------------|-------------|--------------------------------|---------------------|-----------------------------|
| | | 93/94 | 93/94 | |
| Purchased: Fertiliser | | | | |
| Manure | | | | |
| Maize seed | | | | |
| Other seed | | | | |
| Chemicals | | | | |
| Vet services | | | | |
| Hired: Contractor | | ***** | | |
| Tractor | | ***** | | |
| Draughts animals | | ***** | | |
| Farm equipment | | ***** | | |
| Farm labour | | ***** | | |

¹⁾ Specify units

2.9 Extension services

2.9.1 How many times in the last six months was a member of this household in contact with an extension official of:

| Institution | Contact ¹⁾ (Y/N) | Number of visits | |
|------------------|--------------------------------|------------------|------|
| | | TO | FROM |
| AGRITEX | | | |
| Co-operatives | | | |
| Other: (specify) | | | |
| | | | |

¹⁾ Does this household have any contact at all with the institution?

SECTION 3: On-Farm investments

3.1 Land use

3.1.1 What proportion of arable land was planted this season?

| Dryland % | | Irrigated % | |
|-------------|--|-------------|--|
| All (100 %) | | All (100 %) | |
| Most (75 %) | | Most (75 %) | |
| Half (50 %) | | Half (50 %) | |
| Some (25 %) | | Some (25 %) | |
| None | | None | |

3.1.2 Why is some arable land left unplanted?

3.2 Investments in land improvements (fixed)

What improvements have been made to the land by the **current operator**?

| Improvement | Yes/No | State of repair ¹⁾ |
|---------------------------------------|--------|-------------------------------|
| Fencing: Arable | | |
| Grazing | | |
| Improved pastures or grazing | | |
| Soil liming | | |
| Drainage / contours / erosion control | | |
| Irrigation | | |
| Tree crops ²⁾ | | |
| Farm buildings | | |
| Residential housing | | |
| Others: (specify) | | |

¹⁾ i.e. good (**G**), bad (**B**) or unusable (**U**).

²⁾ i.e. plantations planted for household firewood (do not include trees planted at house)

3.3 Investments in capital equipment and assets (movable)

Does the household own any of the following?

| Asset | Yes / No | Number owned | State of repair ¹⁾ |
|---------------------|----------|--------------|-------------------------------|
| Motor vehicles: Car | | | |
| Truck | | | |
| Motorbike | | | |
| Tractor | | | |
| Implements: Plough | | | |
| Trailer | | | |
| Planter | | | |
| Generator | | | |
| Water pump | | | |
| Other: (specify) | | | |

¹⁾ i.e. good (**G**), bad (**B**) or unusable (**U**).

SECTION 4: Credit availability

4.1 Has this household used credit in the past **two** years (1994/1995)? _____ (Y / N)
If **YES**, go to questions **4.2**. If **NO**, go to question **4.5**

4.2 What was the source of the credit used in the past two years?

| Source of credit | Used (Year) | Collateral required (Y/N) | Collateral used | |
|---------------------|----------------|------------------------------|-----------------|---------------------|
| | | | Land | Other ¹⁾ |
| Commercial bank | | | | |
| AFC | | | | |
| Farmer organisation | | | | |
| Co-operative (CMB) | | | | |
| Relative | | | | |
| Friend/neighbour | | | | |

¹⁾ Please specify (e.g. group loan)

4.3 What was the credit used for?

| Source of credit | Used for ¹⁾ | Amount borrowed (Z\$) |
|----------------------|------------------------|-----------------------|
| Commercial bank | | |
| AFC | | |
| Farmer organisations | | |
| Co-operative (CMB) | | |
| Relative | | |
| Friend/neighbour | | |

¹⁾ Production credit, purchase machinery, purchase land, finance land improvements, non-farm use (housing, education) etc.

4.4 After how long were you expected to repay the loan? (Tick where appropriate):]

1 year _____
2-5 years _____

4.5 If the household **does not** use credit, would it like to? _____ (yes/no)

If **YES**, what has prevented the household from using credit? (TICK where applicable)

- a) there is no credit available _____
- b) credit is too expensive _____
- c) you cannot use land as collateral for credit _____
- d) creditors will not accept land as collateral _____
- e) Credit is too Risky _____

SECTION 5: Tenure characteristics

5.1 How long has the land been farmed by this household? _____ (years)

5.2 How was the land acquired by this household? (TICK where appropriate)

- a) by inheritance _____
 - b) by purchase _____
 - c) long term lease (option to purchase) _____
 - d) government allocation (e.g. district council) _____
 - e) tribal allocation (e.g. chief) _____
 - e) other methods (specify) _____
-
-

5.3 Who owns this land?

Arable:

Grazing:

- a) Family _____
- b) Chief _____
- c) Government _____
- d) Other (specify) _____

5.3.1 If your family owns the land, does it possess a registered title deed to the land? _____ (yes/no)

If **yes**, in whose name is the title registered? (TICK where appropriate)

- a) present household head _____
- b) previous household head (ancestor) _____

5.4 Transfer rights

5.4.1 Can you specify the heir to this land? _____ (yes/no)

5.4.2 Are there rules that prevent you from renting out or lending surplus land to other individuals? _____ (yes/no)

5.4.3 Can you sell you land? **Arable:** _____ **Grazing:** _____

If **YES**, does the household require permission from others?

- a) permission not required _____
- b) family members _____
- c) tribal authority _____
- d) government official _____

5.5 Use rights

5.5.1 Do you share the farm with any other farmers? (either family members or other farmers)

Arable land _____ (yes/no)

Grazing land _____ (yes/no)

5.5.2 Is there a rule saying how many cattle you are allowed to own? _____ (yes/no)

If **YES**, what happens if you have too many cattle?

- Fined _____
- Cattle taken away _____
- Asked to reduce the herd size _____
- Nothing happens _____

5.5.3 Do cattle from neighbouring farms/other villages/other wards ever enter your/this villages/this ward's **grazing** land? _____ (yes/no)

If **YES**, what did you do with the stray cattle?

- Leave them _____
- Chase them _____
- Impound them _____
- Report owner to the authorities
(magistrate/tribal court/resettlement officer) _____

5.5.4 Have you ever fenced in your **grazing** land to protect it from stray cattle? _____ (yes/no)

If **NO**, why not? (tick where appropriate):

- Not allowed to fence off grazing land _____
- Community steals fence _____
- Fencing is too expensive _____
- No need for fencing _____

5.5.5 Are other households allowed to use your **arable** land for any part of the year (e.g. grazing livestock in winter)? _____(yes/no)

5.5.6 Can other households use your unutilized land (to graze cattle, collect wood and thatching grass etc.)? _____(yes/no)

5.5.7 Have cattle ever strayed into you **arable** lands after you have planted them? _____(yes/no)

If **YES**, what did you do with the stray cattle?

Leave them _____

Chase them _____

Impound them _____

Report owner to the authorities _____

(Magistrate/tribal court/Resettlement officer) _____

5.5.8 Have stray cattle ever destroyed your crops? _____(yes/no)

If **YES**, what happened? (tick where appropriate)

Stock owner fined in court _____

Settled out of court (with compensation) _____

Settled out of court (without compensation) _____

Took no action against stock owner _____

5.5.9 Have you ever fenced in your **arable** land to protect it from stray cattle? _____(yes/no)

If **NO**, why not? (tick where appropriate):

Not allowed to fence off arable land _____

Community steals fence _____

Fencing is too expensive _____

No need for fencing _____

5.6 Land disputes

5.6.1 Have you or your family ever had a dispute over land ownership or boundaries? _____(yes/no)

5.6.2 If **YES**, what was the dispute over? (TICK where appropriate)

a) boundary _____

b) ownership _____

c) grazing _____

d) inheritance _____

How are such disputes settled? (TICK where appropriate)

a) Resolved ourselves _____

b) Tribal authority _____

c) Magistrate _____

d) Government official _____

e) Other (specify) _____

Was the dispute between **FAMILY** members, or between family and **OTHER** households in the community? _____

- 5.6.3 Do you know of anyone in the last five years who has been dispossessed of their land as a result of a dispute? _____ (yes/no)

SECTION 6 Land Transactions

6.1 Rental transaction: Land Rented In

- 6.1.1 Does this household **rent in** additional land? _____ (yes/no)

If **YES**, go to question **6.1.2**. If **NO**, would this household consider renting in more land if it were able to? _____ (yes/no)

If the household would like to rent in more land, what has prevented the household from doing so?

- a) there is no land to rent _____
- b) the rent is too expensive _____
- c) tribal authorities do not allow the renting in of land _____
- d) the government does not allow the renting in of land _____
- e) other reasons (please specify) _____

- 6.1.2 If land is rented in, do you have a written contract? _____ (yes/no)

If **yes**, what is the length of the contract? _____ (years)

From who is the land rented? (TICK where appropriate)

- a) government _____
- b) relative _____
- c) other _____

- 6.1.3 Do you require family approval to rent in land? _____ (yes/no)

- 6.1.4 If land is rented in, have any improvements been made to the land?

- a) none _____
- b) fencing _____
- c) pastures _____
- d) others (specify) _____

Who provided the improvements? (TICK where appropriate)

- a) yourself _____
- b) landlord _____
- c) government _____

6.2 Rental transactions: land rented out

6.2.1 Does this household **rent out** land? _____ (yes/no)

If **YES**, go to question **6.2.2**. If **NO**, would this household consider renting out land if it were able to? _____ (yes/no)

If the household would like to rent out land, what has prevented the household from doing so?

- a) there is no one willing to rent in the land _____
 - b) there is no one willing to pay your price _____
 - c) tribal authorities do not allow the renting out of land _____
 - d) the government does not allow the renting out of land _____
 - e) other reasons (please specify) _____
-
-

6.2.2 If land is rented out, do you have a written contract? _____ (yes/no)

If **yes**, what is the length of the contract? _____ (years)

6.2.3 Can you remove the tenants from your land if they do not pay their rent or misuse the land? _____ (yes/no)

6.2.4 Do you require family approval to rent out land? _____ (yes/no)

6.2.5 If land is rented out, have any improvements been made to the land?

- a) none _____
- b) fencing _____
- c) pastures _____
- d) others (specify) _____

Who provided the improvements? (TICK where appropriate)

- a) yourself _____
- b) tenant _____
- c) government _____

6.3 Land sales

6.3.1 Has this household ever **bought** additional land? _____(yes/no)
If **NO**, would this household like to **buy** more land? _____(yes/no)

6.3.2 If this household **does** want to buy more land but has not, what has prevented it from doing so? (TICK where appropriate)

- a) there is no land to buy _____
- b) land is too expensive _____
- c) tribal authorities do not allow land to be bought _____
- d) government does not allow land to be bought _____

6.3.3 Has this household ever **sold** any land? _____(yes/no)

APPENDIX A.2 LIST OF VARIABLES

| | |
|--------|--|
| HHOLD | Respondent (household head) number within each stratum |
| STRATA | Stratum number: Small scale commercial sector = 1 Model A Resettlement Area = 2 Communal Area = 3 |
| NR | Natural Region: Natural Region 2: NR2 = 1 Natural Region 3: NR3 = 1 Natural Region 4: NR4 = 1 |
| SOIL | Lickert-type scale ranging from 1 to 5: 1 = Sandy soil (lowest potential soils) 2 = Sandy loam soil 3 = Sandy clay loam 4 = Sandy clay soil 5 = Clay soil (Highest potential) |
| P/F | Dummy variable scoring 1 if the household head is a full time farmer |
| SEX | Dummy variable scoring 1 if household head is a male |
| MF | Dummy variable scoring 1 if household head has a Master Farmer certificate |

| | |
|---------|---|
| EDU | Respondent's education in years of schooling |
| AGE | Respondent's age in years |
| EXP | Respondent's farming experience in years |
| ADULT | Number of adult family members living on the farm |
| CHILD | Number of children living on the farm |
| WORK | Number of family workers employed on the farm |
| LQD | Off-farm income (Cash income, wage remittances, pension payments) |
| DIST1 | Distance in kilometres between homestead and closest arable land |
| DIST2 | Distance in kilometres between homestead and furthestmost arable land |
| HECTARE | Total size of allotted arable holding (hectares) |
| SIZE | Total size of arable allotment planted in 1993/1994 season |
| MZHA | Hectares of maize planted in the 1993/1994 season |
| MZINC | Maize income from the 1993/1994 season (Z\$) |
| OTHA | Hectares of other crops planted in the 1993/1994 season |
| OTINC | Crop income (excluding maize) from the 1993/1994 season (Z\$) |
| CRINC | Total crop income for 1993/1994 season (Z\$) |
| HSL | Number of cows, oxen and bulls presently owned |
| HSS | Number of goats, sheep and pigs presently owned |
| HSDIE | Number of cows, oxen and bulls that died in the 1992 drought |
| HSTOT | Number of cows, oxen and bulls owned prior to the 1992 drought |

| | |
|---------|--|
| HSSELL | Number of cows, oxen and bulls sold in the last 12 months |
| HSINC | Income from livestock sales (Z\$) |
| GFI | Gross Farm Income (Z\$) = (CRINC + HSINC) |
| KGFERT | Total kilograms fert purchased for the 1993/1994 season |
| HIREA | Cost of hired animals (1993/1994) |
| HIREL | Cost of hired labour (1993/1994) |
| HIRE | Total cost of hired inputs (1993/1994) (includes hired machinery) |
| CREX | Total crop expenditure (1993/1994) |
| VET | Total expenditure on veterinary supplies (1993/1994) |
| EXT | Dummy variable scoring 1 if seen extension officer in the last six months |
| USE1 | Dummy variable scoring 1 if household used 100 % of allotted arable land |
| USE2 | Dummy variable scoring 1 if household used 75 % of allotted arable land |
| USE3 | Dummy variable scoring 1 if household used 50 % of allotted arable land |
| USE4 | Dummy variable scoring 1 if household used 25 % of allotted arable land |
| USE5 | Dummy variable scoring 1 if household used 0 % of allotted arable land |
| R1 - R4 | Reasons for not using all allotted arable land (dummy variable scoring 1 if the reason applies): |
| R1 | Drought |
| R2 | Lack of draught power |

| | |
|-----------|---|
| R3 | Manpower or input shortages |
| R4 | Crop rotation including fallow |
| TREE | Investments in tree crops |
| FENCEA | Investments in fencing on arable land |
| FENCEG | Investments in fencing on grazing land |
| INVA | Investments on arable land (conservation contours and/or lime) |
| INVG | Investments on grazing land (pastures and/or hay crops) |
| INVB | Investments in farm buildings and/or residential housing |
| INVM | Investments in movable assets (vehicles and machinery) |
| CR1 | Credit use (Z\$): Agricultural Finance Corporation (AFC) |
| CR2 | Credit use (Z\$): Commercial banks |
| CR3 | Credit use (Z\$): Non-institutional sources (family members etc.) |
| COL1 | Dummy variable scoring 1 if land used as collateral |
| COL2 | Dummy variable scoring 1 if movable assets used as collateral |
| CRST | Dummy variable scoring 1 if the loan was repayable after 1 year |
| CRMT | Dummy variable scoring 1 if the loan was repayable after 2-5 years |
| RC1 - RC4 | Reasons why land not used as collateral (Dummy variable scoring 1 if the reason applies): |
| RC1 | Collateral not required |
| RC2 | Land not accepted as collateral |
| RC3 | Land not available for collateral (i.e. no title) |

| | |
|---------|---|
| RC4 | Group loan |
| USE | Dummy variable scoring 1 if the household would like to use credit |
| C1 - C5 | Reasons why household does not use credit (Dummy variable scoring 1 if the reason applies): |
| C1 | Credit is not available |
| C2 | Credit is too expensive |
| C3 | Cannot use land as collateral |
| C4 | Land is not accepted as collateral |
| C5 | Repayment risk is too high |
| FARM | Number of years since the farm was acquired by the household |
| ACQ1-5 | Mode of acquisition (Dummy variable scoring 1 if mode applies): |
| ACQ1 | Inheritance |
| ACQ2 | Purchase |
| ACQ3 | Long term lease |
| ACQ4 | Government allocation |
| ACQ5 | Tribal allocation |
| OWN1A | Dummy variable, scoring 1 if the arable land is owned by the family |
| OWN2A | Dummy variable, scoring 1 if the arable land is owned by the Chief |
| OWN3A | Dummy variable, scoring 1 if the arable land is owned by the Government |
| OWN1G | Dummy variable, scoring 1 if the grazing land is owned by the family |

| | |
|--------|---|
| OWN2G | Dummy variable, scoring 1 if the grazing land is owned by the Chief |
| OWN3G | Dummy variable, scoring 1 if the grazing land is owned by the Government |
| TITLE | Dummy variable scoring 1 if the family has title deeds to the land |
| REG | Dummy variable scoring 1 if the title deed is registered in the current household head's name |
| HEIR | Dummy variable scoring 1 if the household is able to specify the heir to the land |
| SHAREA | Dummy variable scoring 1 if the household shares arable land with other farmers (family members or other households) |
| SHAREG | Dummy variable scoring 1 if the household shares grazing land with other farmers (family members or other households) |
| RI | Dummy variable scoring 1 if the household rents in additional land |
| RIC | Dummy variable scoring 1 if the household would like to rent in additional land |
| RIC1-6 | Reasons why households did not rent in additional land (dummy variable scoring 1 if the reason applies): |
| RIC1 | No land available to rent |
| RIC2 | rent is too expensive |
| RIC3 | Prohibited by tribal authority |
| RIC4 | Prohibited by government authority |
| RIC5 | Risk |
| RIC6 | Capital and input shortages |

| | |
|----------|---|
| RO | Dummy variable scoring 1 if the household rents out excess land |
| ROC | Dummy variable scoring 1 if the household would like to rent out excess land |
| ROC1-6 | Reasons why households did not rent out excess land (dummy variable scoring 1 if the reason applies): |
| ROC1 | No one willing to rent in land (no tenants available) |
| ROC2 | No one willing to pay the asking rental |
| ROC3 | Prohibited by tribal authority |
| ROC4 | Prohibited by government authority |
| ROC5 | Risk of damage to property leased out |
| ROC6 | Risk of dispossession |
| CONT | Dummy variable scoring 1 if rental transaction is accompanied by a written contract |
| ENF | Dummy variable scoring 1 if the contract is enforceable |
| BUY | Dummy variable scoring 1 if the household would like to buy more land |
| BUY1 - 4 | Reasons why more land has not been purchased (dummy variable scoring 1 if the reason applies): |
| BUY1 | There is no land to buy |
| BUY2 | Land is too expensive |
| BUY3 | Prohibited by tribal authority |
| BUY4 | Prohibited by government authority |

| | |
|-----------|---|
| SELLA | Dummy variable scoring 1 if the household is allowed to sell arable land |
| SELLG | Dummy variable scoring 1 if the household is allowed to sell grazing land |
| SELL1 | Dummy variable scoring 1 if no permission is required to sell land |
| SELL2 | Dummy variable scoring 1 if family permission is required to sell land |
| SELL3 | Dummy variable scoring 1 if the Chief's permission is required to sell land |
| SELL4 | Dummy variable scoring 1 if government permission is required to sell land |
| DISP | Dummy variable scoring 1 if the household recalled disputes surrounding use and ownership of the land |
| DISP1 - 4 | Nature of the dispute (dummy variable scoring 1 if the nature applies): |
| DISP1 | Boundary |
| DISP2 | Ownership |
| DISP3 | Grazing |
| DISP4 | Inheritance |
| RES1 - 4 | Settlement mechanism (dummy variable scoring 1 if the mechanism applies): |
| RES1 | Resolved privately |
| RES2 | Resolved by tribal authority |
| RES3 | Resolved in the courts (magistrate) |
| RES4 | Resolved by government authority |
| RES5 | Dispute remains unresolved |
| WHO | Dummy variable scoring 1 if the dispute was between family members and outsiders |

| | |
|--------|--|
| EVICT | Dummy variable scoring 1 if the household knows of anyone who has been dispossessed of their land as a result of a dispute |
| HSRULE | Dummy variable scoring 1 if the household is aware of the recommended stocking rate or any rule prescribing how many cattle they can own |
| HSR1-4 | Consequences of overstocking/breaking stocking rules (dummy variable scoring 1 if the consequence applies) |
| HSR1 | Household fined |
| HSR2 | Cattle impounded |
| HSR3 | Voluntarily reduce herd size |
| HSR4 | No action taken |
| EXCGR | Dummy variable scoring 1 if cattle from neighbouring farms/villages/wards stray into respondent's grazing land |
| EXC1-4 | Action taken by the household (dummy variable scoring 1 if the action applies) |
| EXC1 | Leave the cattle |
| EXC2 | Chase the cattle |
| EXC3 | Impound the cattle |
| EXC4 | Report the stockowner to the magistrate/resettlement officer/tribal authority |
| EXCAR | Dummy variable scoring 1 if the household does not have exclusive rights over arable land for the full duration of the year |
| USEAR | Dummy variable scoring 1 if the household does not have exclusive use rights over allotted arable land not under cultivation |

| | |
|--------|--|
| STRAY | Dummy variable scoring 1 if stray cattle ever entered into the household's arable land after it has been planted |
| ST1-4 | Action taken by the household (dummy variable scoring 1 if the action applies) |
| ST1 | Leave the cattle |
| ST2 | Chase the cattle |
| ST3 | Impound the cattle |
| ST4 | Report the stock owner to the magistrate/resettlement officer/tribal authority |
| DAMAGE | Dummy variable scoring 1 if stray cattle have destroyed the households crops |
| DAM1-5 | Action taken by the household (dummy variable scoring 1 if the action applies) |
| DAM1 | Stock owner fined in court |
| DAM2 | Settled out of court (with compensation) |
| DAM3 | Settled out of court (without compensation) |
| DAM4 | Took no action against stock owner |
| DAM5 | Stock owner fined, but has not paid yet |