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dissertation entitled

LINKS BETWEEN GENDERED DIVISION OF LABOR AND LAND USE IN OLOITOKITOK DIVISION, S.E KAJIADO DISTRICT, KENYA

presented by

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has been accepted towards fulfillment
of the requirements for the

Ph.D degree in Geography

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4-1-2004

Date

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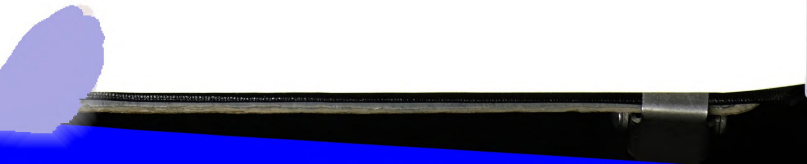


ABSTRACT

LINKS BETWEEN GENDERED DIVISION OF LABOR AND LAND USE IN OLOITOKITOK DIVISION, S.E KAJIADO DISTRICT, KENYA

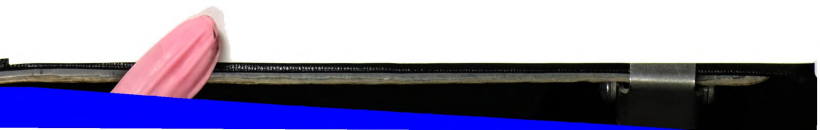
By

Elizabeth Edna Wangui

Pastoral production systems have been undergoing endogenously and exogenously driven change in recent years. One predominant change in pastoral production systems involves a shift from pure pastoralism to an integration of crop and livestock production. In this study, I explore the impact of one such livelihood and land use shift on gender roles and relations among the Ilkisongo Maasai of Oloitokitok Division in Southeast Kajiado District, Kenya.

My research uses the feminist political ecology theoretical frameworks to investigate how gender roles and relations are related to land use patterns, and how land use and gender roles and relations vary along the Mt. Kilimanjaro ecological gradient. I collected data using a variety of methods, and at various scales. The land use and land cover maps were from secondary sources and they had been analyzed from Landsat MSS, Landsat TM and SPOT imagery. Data on cropping patterns, labor allocation and intra-household labor negotiations were collected from men and women in household interviews, key informant interviews, group meetings and through participant observation.

Irrigated and rain-fed farming have expanded at the expense of grazing areas in the study area. Crops are increasingly grown for sale. Livestock kept and patterns of animal husbandry have also changed. In irrigated areas, men contribute most of the labor used in crop production. Women contribute most of the labor required for livestock production



in all the agro-ecological zones. Forces of change include structural adjustment pol the national land reform, ecological conditions and a variety of social and political factors. Patterns of labor negotiation display both cooperation and conflict within t households. I also found gendered patterns of landscape use in both crop and livest production in Oloitokitok Division.

In this study, I argue for the re-inclusion of men in gender analysis. I contribute the recent literature on masculinities by illustrating the role that men play in crop production in an agro-pastoral community. My findings also contribute to the litera on gender and pastoralism by arguing for the recognition of the importance of wom pastoral communities. By including both men and women and investigating their relations within the crop and livestock production process, I have made a contributi the feminist political ecology theoretical framework. I make a second contribution feminist political ecology through a discussion on the gendered landscapes of cropp grazing, conflict and marketing. My third contribution to feminist political ecology through the investigation of the processes of cooperation and conflict and how these change as livelihoods change. My results have important implications for policy in agriculture and natural resource management. Crop cultivation and livestock rearin need to be understood in the context of their gendered labor requirements. Both me women need to be engaged from the planning stages of agricultural development projects. Natural resource management projects need to be understood as land uses compete for land and labor with relatively more profitable land uses such as crop ar livestock production. In this study, I also explore the implications that the results h for other pastoral societies in Eastern Africa.

To my mother, Rebecca Ng'endo Tinga

ACKNOWLEDGEMENTS

This dissertation would not have been accomplished without the guidance and assistance of several people in the United States and in Kenya. I am most grateful advisor Dr. David J. Campbell. Since our first meeting in Naru Moru in 1997, Dr Campbell has provided me with excellent intellectual guidance and support. As m advisor, his door was always open and he always had time to discuss my ideas. H contacts in the field helped pave the way to a relatively smooth data collection exe Dr. Campbell always provided quick and helpful feedback to previous drafts of m dissertation. I cannot thank Dr. Campbell enough for his unwavering support thro my graduate studies at Michigan State University.

The members of my advisory committee, Drs Jennifer Olson, Anne Ferguson, Winkler, Robin Reid and David Lusch, provided useful and timely feedback to ea drafts of my dissertation. Dr. Jennifer Olson joined my committee in 2001 and sh provided priceless guidance in the initial stages of my data collection process. He comments on my initial survey tools helped me formulate a highly effective questionnaire. Dr. Anne Ferguson taught a seminar that informed my theoretical framework and continued to point out useful literature within the gender and development framework. Dr. Julie Winkler's graduate course sharpened my statis skills that will be useful in my career. Dr. Robin Reid facilitated my affiliation wi International Livestock Research Institute (ILRI).

Several professors at Michigan State University helped in the intellectual grow necessary to complete this dissertation. Dr. Antoinette WinklerPrins, Dr. David S and Dr. Alan Rudy offered challenging graduate seminars, which introduced me to

perspectives on human-environment issues. Dr. Catherine Yansa, together with Dr. WinklerPrins organized the 'women in geography' and the 'teaching in geography' forums of discussions that provided useful insights on teaching and research. Dr. Bryan Pijanowski kindly provided me with office space for my dissertation write up. Dr. Randy Schaetzl and Ms Sharon Ruggles helped me stay up to date with the academic and non-academic requirements of the degree program.

The Ministry of Education, Nairobi, District Commissioner's office, Kajiado and District Officer's office, Oloitokitok provided the formal and informal research clearance and support that was necessary before data collection could begin. I am grateful to the District Extension Commissioner, Oloitokitok Mr. S. Mwangi. His insights at the beginning of my research helped me design an appropriate sampling frame. I am indebted to the Chiefs and Sub-Chiefs of Oloitokitok Division, particularly Senior Chief Anthony Mepukori. Chief Mepukori was my initial contact in the Division and he helped introduce my project in the area. Kimana and Mbirikani group ranch officials supported my project and also helped introduce me to the members of their group ranches.

My research in Kenya could have been more difficult if I did not have the International Livestock Research Institute and Kenyatta University as home institutions. Both institutions helped me set up the formal paperwork for my research permit. Dr. Ishmail Mahiri gave valuable advice in this regard. My long term friend and lab 8 administration assistant Lucy Kirori helped with logistics at ILRI. Throughout the data collection and data entry, I relied heavily on Lucy's devotion to her work and high level of efficiency. Meshack Nyabenge helped me access some of the maps used in this dissertation. Hilary Kariuki helped with computer software and hardware issues. Kimani

Kariuki, Andrew Odero and Joseph Matere gave useful data entry and global positioning system (GPS) advice. Mohammed Baya, Tom Ouna, Fred Atieno, Jeff Worden, Andrew Muchiru, and Shauna BurnSilver were great officemates. To all of you I say *asanteni sana.*

Several people helped with the logistics of my move to and stay in Oloitokitok, as well as providing useful insights on the people and culture of the Division. Mwalimu Paul Ntheiya of Oloitokitok High School helped secure our 'field research station'. Mwalimu Raphael Selengei of Empiron Primary School provided insights on Empiron and helped publicize the research in Empiron.

My data collection was achieved through the assistance of seven extraordinary people. Justus visited all the homes in the study area collecting preliminary data. Richard Supeet, Timothy Saigilu, John Kaseenchi (Bishop), John Letiyon, Margaret Naiperian and Elizabeth Nasieku helped administer the survey tools. They were all very devoted to the research and they remained cheerful through many difficult times. They were willing to work odd and long hours when it was needed. In addition, they provided useful insights on the people and culture of the division. To all of you wonderful people *Ashe Naleng*! Data entry was done by Martin Mutua and Peter Mwangi. Thank you for your high quality work.

Friends and colleagues at Michigan State University helped my dissertation process in various ways. Bilal Butt provided useful information in the map making process. Marian Mitchell referred me to some useful references. Chris Oliver, Maki Hatanaka, Jamie Picardy, Xiomara Cordoba, Steve Bakiamoh, Kuria Githiora and Mary Mwiandi were instrumental in helping me balance between work and play. Tom Smucker

recommended my first social theory class and patiently answered all my *Wanjiku* questions. Tom challenged me intellectually and provided me with social and emotional support. I could never thank Tom enough.

I would like to thank my family for remaining supportive throughout my graduate studies. My mother, Rebecca Ng'endo Tinga, my sisters Caroline Wanjiku and Tracy Mwaka, my brother Ben Muya, and my cousin Mama Segeni - thank you for all your encouragement.

My dissertation research would not have got off the ground without grants from Rockefeller Foundation and the International Development Research Center. Additional research grants were provided by Land Use Change Impact and Dynamics (LUCID), the Graduate School at Michigan State University, and the Department of Geography at Michigan State University. I am most grateful to Ann Spalding, Marilyn Bria, and Robert Ngila for their support during the grant administration process.

In acknowledging support and assistance from so many people, the reader should note that any errors or shortcomings found herein are mine alone.

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KEY TO ABBREVIATIONS

WID - Women in Development

WAD – Women and Development

GAD – Gender and Development

FLS – Forward Looking Strategies

IMF – International Monetary Fund

SAP – Structural Adjustment Policies

WED – Women, Environment and Development

MSS – Multi-Spectral Scanner

TM – Thematic Mapper

ETM – Enhanced Thematic Mapper

UTM – Universal Transverse Mercator

LUCID – Land Use Change, Impact, and Dynamics

GPS – Geographic Positioning System

LH – Lower Highland

LM – Lower Midland

UM – Upper Midland

SARDEP – Semi Arid Rural Development Programme

NCPB – National Cereal and Produce Board

ECF – East Coast Fever

CLIMEX – Climate Change Experiment

TLU – Tropical Livestock Unit

Chapter 1: Introduction

In many parts of the world, pastoralists are changing their livelihoods and subsequently the way they use the land, as they become more incorporated into the global economy. In this study, I investigate the changing livelihoods of the Maasai agro-pastoralists of Oloitokitok Division, southern Kenya. The Maasai's changing livelihoods from pastoralists to agro-pastoralists have implication for land use and land cover in Oloitokitok Division. Using a feminist political ecology theoretical framework, I investigate what the changing patterns of land use in Oloitokitok mean for household labor demands. In this study I explore variations in land use patterns and processes along Mt. Kilimanjaro ecological gradient. I also explore how gender roles and relations vary along the ecological gradient and the processes behind the variation. This study has three broad objectives: to explore current and past land use patterns and identify the forces driving land use change; to explore current and past agricultural production systems and identify the social, ecological, political and economic contexts in which change has occurred; to investigate the gendered nature of changes in labor allocation patterns and how they are related to agricultural production systems and land use.

1.1 Global and Regional Land Use and Land Cover Change

Global ecological changes have in the last decade focused attention on land use and land cover change (Meyer & Turner, 1992; Turner et al., 1990; World Bank, 1992). Many studies in land use and land cover change have been done within the natural sciences and they stress the ecological and biological impacts of change. Land use and land cover change has been found to affect biodiversity worldwide (Ehrlich, 1988; Sala et al., 2000; Wilson, 1992), local and regional climate change (Chase, Pielke, Kittel, Baron,

& Stohlgren, 1999), and global climate change (Houghton, Hackler, & Lawrence, 1999). Land use and land cover change has been associated with ecosystem changes that limit the ability of ecosystems to satisfy human needs (Vitousek, Mooney, Lubchenco, & Melillo, 1997), and therefore increasing people's vulnerability to climatic, economic and social-political disturbances (Kasperson, Kasperson, & Turner, 1995).

While studies in the natural sciences contribute to a deeper understanding of particular aspects of global ecological change, a more comprehensive interdisciplinary approach that includes socio-economic dimensions would provide a more complete understanding of the central issues of change. The importance of linking the natural and the social sciences in the study of global ecological changes is widely recognized (Guyer & Lambin, 1993; Lambin & Guyer, 1994; Liverman, Moran, Rindfuss, & Stern, 1998; Ojima, Galvin, & Turner, 1994; Turner et al., 1995). The central issue in the linkage is understanding how local land use and land cover changes contribute to global changes, what socio-economic forces drive land use change, and how land use modifies global processes (Ojima et al., 1994).

Scientists of land use and land cover studies at a regional level have been more aggressive at applying an integrated approach. Within studies of people-environment relations, several integrated approaches have been conceptualized to investigate land use and land cover change (Blaikie, 1994; Blaikie & Brookfield, 1987; Campbell & Olson, 1991a; Campbell & Olson, 1991b; Peet & Watts, 1996b). Results from studies applying these approaches indicate that land use and land cover dynamics are complex (Campbell, Gichohi, Mwangi, & Chege, 2000; Campbell, Lusch, Smucker, & Wangui, 2003; Carney, 1996; Lambin et al., 2001; Schroeder, 1999). A comprehensive understanding of the

process of land use and land cover change requires an investigation that goes beyond analyzing landscape patterns of change to understanding underlying forces of land use and land cover change (Goeghegan et al., 1998). As summarized within the Kite framework (Campbell & Olson, 1991b), forces that drive land use and land cover change are an outcome of interactions of societal, environmental, economic and political forces that act across different spatial scales and over time. Blaikie's chain of explanation (Blaikie, 1994) and Vayda's progressive contextualization (Vayda, 1983) are further examples of approaches that explore the complex processes behind the land use and land cover patterns observed on the landscape. Understanding the power relations within and between different interest groups is central to the comprehensive study of land use and land cover processes.

1.2 Pastoral Production Systems and Land Use and Land Cover Change

Pastoral production systems all over the world are characterized by endogenously and exogenously driven change and can best be described as systems in transition. For example, nomadic pastoralists in South-western Iran have adapted to pressure from expanding human settlements and agrarian activity by modifying their land use and mobility patterns (Beck, 1998). In Niger, peanut production led to a neglect of subsistence production and a breakdown of existing social relations among the Fulani Pastoralists (Franke & Chasin, 1980). In North Africa, nomadic pastoralism was once the dominant form of land use (Steinmann, 1998), but it has steadily shifted towards more intensive agro-pastoralism in the second half of the 1900s (Bencherifa & Johnson, 1990). Crop-livestock integration is reported to occur more in lands historically used for

pastoralism, the arid and semi-arid areas, than it does in other agro-ecological zones in Africa (Coppock, 1993; McIntire, Bourzat, & Pingali, 1992; Mortimore & Turner, 1991).

Within East Africa, drought, disease and competing land uses have accelerated the evolution of pastoral production systems from a predominantly migratory mode until the late 1800s to a more sedentary mixed crop-livestock system today. Fratkin (1993) describes the transition in the production system of the Ariaal and Rendille pastoralists of Northern Kenya in the context of sendentarization and market integration. Waller (1993) describes changing interaction between Maasai and their neighbors with the creation of a colonial state during the late 1800s. Campbell (1999) discusses recent changes in land tenure in Kajiado District and how these have impacted on Maasai pastoral production systems, and specifically their responses to drought.

The dynamics of pastoral systems in transition have been summarized as land use intensification, economic diversification, institutional change and demographic transition (Mortimore, 1998). These categories have been shown to influence and impact on each other over time and space (Boserup, 1970; Turner, 1999; Winrock International, 1992). Transitions in pastoral production systems are an indication of changing people-environment relations. Transitions raise concern about ecological degradation (Reid, Wilson, Kruska, & Mulatu, 1997), and challenges scientists to address the complexities of local-scale land use systems. There is a need to capture specific dynamics of the transitions, and particularly understand gender relations within changing production relations.

1.3 Gender and Land Use and Land Cover Change

Historically, pastoral societies have organized production around gender and age specific roles that can broadly be categorized into household tasks, livestock tasks and manufacturing tasks that include house construction, leatherwork and ornamentation (Fratkin & Smith, 1994). The trend towards crop-livestock integration is associated with new activities, and it involves a reorganization of gender and age specific roles. Emerging gender divisions of labor are a direct consequence of struggles of men and women as they strive to support themselves and their families.

The relationships between gender and environmental change need to be contextualized as a two-way process. As Leach, Joekes and Green (1995 p.5) state:

> Gender relations have a powerful influence on how environments are used and managed and hence on patterns of ecological change over time. Yet environmental trends and shocks also impact on gender relations, whether directly – for example as ecological degradation alters the gender distribution of resources, or encourages particular coping strategies – or indirectly, in the political and ideological use of environmental issues to uphold or challenge particular relations or forms of subordination.

Understanding the two-way relationship between gender relations and environmental change is of great importance to Kenya and other African countries facing similar people-environment pressures. One crucial area in the consideration of gender and environmental change is the difference in tasks and responsibilities in agricultural production. This study investigates relations between new gender divisions of labor and

changing land use and land cover patterns along the Mt. Kilimanjaro ecological gradient in Kenya.

1.4 Relevance of the Study

In the context of Oloitokitok Division, pastoral production systems have been transformed into agro-pastoral production systems in the past 70 years. This has had implications for division level land use and land cover change and household level labor processes. Division level land use and land cover change processes and their root causes are well understood (Campbell et al., 2000; Campbell et al., 2003). Less understood are the implications of these division level processes on household labor dynamics. Investigating household labor dynamics not only gives insight on gender roles, but it also enables an understanding of power relations within the household and women's agency to negotiate for access and control over their labor.

Oloitokitok Division is a compelling case study of relations between land use and land cover change and gender division of labor for two reasons. First, Oloitokitok has not been affected by male out-migration that is a common characteristic of other rural areas in Kenya. Oloitokitok therefore presents an opportunity to investigate the role that men play in crop and livestock production in comparison with women. Since Boserup's characterization of the role of African women in farming (Boserup, 1970), there has been a general neglect of the role that men play in crop production in Africa. A focus on men and women's roles provides opportunities to investigate gender relations of production. This presents a deeper understanding of the role of human agency and the process of negotiating for access and control of the labor resource. Secondly, Oloitokitok Division lies on Mt. Kilimanjaro's ecological gradient. This presents a unique opportunity to

study a variety of production strategies in different agro-ecological zones within a relatively small geographic area.

1.5 Note on Terminology

Gender: From the mid 1980s, there was a shift from the use of the term 'women' to the use of the term 'gender' in development writing. This shift was an attempt by feminist scholars and practitioners to introduce the importance of power relations between men and women in defining gender inequalities. The term 'gender' incorporates the "the process by which individuals who are born into biological categories of male and female become the social categories of men and women through the acquisition of locally defined attributes of masculinity and femininity" (Marchand and Pappart 1995 p.14). By looking at 'gender' instead of 'women' the social construction of gender roles and relations are captured, and the gender division of labor is revealed as constructed rather than natural. Gender roles and relations are dynamic, historical, and are constructed through the actions of men and women in their interaction of local and translocal processes and structures (Hodgson & McCurdy, 2001). 'Gender' varies over time and space and it is mediated by class, race, and ethnicity.

Production: This term is economic based and it refers to the creation of a good or a service that is capable of satisfying human wants and needs. 'Production' as used in this document is rooted in Marxist theory. The process of production requires labor input. The application of labor in the production process results in an addition of value to the good or service produced. It is from this added value that profit may be obtained. 'Production' as used in this document refers to the application of labor to create a good for the market economy.

Reproduction: This refers to 'social reproduction', a concept that has its roots in feminist theory. Social reproduction is the process by which people and their labor are produced. 'Reproduction' as used in this document includes such activities as giving birth, care giving, and growing crops and tending livestock for home consumption.

Pastoralism: This term has been used to refer to a diverse group of production systems that rely on livestock (sheep, goats, cattle, camels), often mixed with varying degrees of cultivation, hunting, gathering, and wage labor (Spear & Waller, 1993). Most pastoralists herd their livestock in communally owned pasture (Fratkin, Galvin, & Roth, 1994). Each pastoral production system is the product of unique interaction of environmental, historical, socio-economic and political factors. In this study, I borrow from Hodgson (2000) and use the term to refer to an ideal way of life, thereby including agro-pastoralism in the category pastoralism. All pastoralists included in this study practice crop cultivation.

Scales of analysis and interpretation: Quantitative and qualitative data were collected, analyzed and interpreted at a variety of scales. In this section, I provide a brief definition of the scales used in this dissertation:

Household level – for the purpose of this study, I define a household as a group of people that eat from the same cooking pot on a regular basis. A household will in most cases include a husband, a wife and their children (adopted or by birth). There are also female headed households, where the husband is dead or away from the home on a permanent basis. Female headed households represent a relatively small fraction of the households in the study area.

Village level – a village is a collection of households. From my field data, a village could vary in size from about 30 households to about 150 households, depending on population density.

Location level – a location is an administrative unit defined by the government. The study area has four locations Kimana, Rombo, Mbirikani and Kuku. Kimana is the smallest in size covering an area of 370 km^2 while Mbirikani is the largest covering an area of 1397 km^2 (Survey of Kenya, 1973).

Division level – this is an administrative unit defined by the government. The entire study area lies in Oloitokitok Division. The Division level is therefore the scale that incorporates the entire study area.

National level – in the context of the study area, this refers to the Republic of Kenya.

International level – this scale incorporates areas outside of the Republic of Kenya. The international level of analysis could involve two or more interrelated countries.

1.6 Organization

Chapter two will explore theoretical frameworks for people-environment relations. Theoretical frameworks discussed include political ecology, feminist political ecology and feminist environmentalism. These are the frameworks on which this research draws for an understanding of relations between the gender division of labor and land use and land cover change. Chapter two also explores the literature on gender and pastoralism, and men and masculinities. The results of this study make a direct contribution to the literature on gender and pastoralism and men and masculinities. The chapter then defines the research problem in the context of the literature reviewed and ends with a list of the research questions to be investigated in this study. Chapter three is a description of the

methods used during data collection and data analysis. The chapter explores methodological challenges of positionality, representation, and finding the appropriate mix of methods that would answer the research questions. Chapter four gives an ecological, historical, political and cultural description of the study area. The chapter focuses on elements of the context of Oloitokitok Division that have implications for land use and land cover and gender relations. Chapter five describes the land use and land cover changes at division and farm levels. Two aspects of land use and land cover change, conversions and modifications, are described. Relations between land use and gender roles are explored in this chapter in the context of gendered landscapes. The chapter also investigates the global to local forces that drive the land use and land cover changes observed in Oloitokitok Division. Chapter six starts by presenting the historical division of labor. The chapter then discusses how and why this has changed by presenting the current pattern of gender roles in crop and livestock production and explaining forces driving observed changes. The last part of the chapter looks at some of the ways in which the intra-household gendered division of labor is negotiated within the context of the study area. Chapter seven presents the study's major findings and compares them with findings from other studies. In the comparison with similar studies, the chapter spells out the unique contribution that this research has made to the study of gender roles and relations in crop and livestock production. The chapter also explores the contribution that this research makes to regional political ecology, feminist political ecology, gender and development, and feminist environmentalism theoretical frameworks. Finally, the chapter examines the advantages of a multi-method and multi-scale approach to studies of land use and land cover change. The concluding chapter

highlights the important points in the dissertation and discusses the implications of the research findings for other studies on pastoral communities undergoing change. The final chapter also discusses the policy implications of the research findings. The chapter ends with a discussion on areas of future research in Oloitokitok Division.

Chapter 2: Literature Review

2.1 Early Approaches Linking Society and the Environment

The relationship between society and the environment is complex. Various conceptual frameworks have been formulated to explain the relationship. At one extreme is environmental determinism, which sees societies as social organisms that diversify and specialize under the influence of the external environment. Scholars faithful to this tradition include Herbert Spencer, Ellen Churchill Semple and Ellsworth Hurtington (Livingstone, 1992; Peet, 1998). At the other extreme, societies are seen to dominate and transform the environment. Whether the transformation is positive or negative remains a contentious issue. The following paragraphs explore these opposing views.

Neo-Malthusians follow the writings of Thomas Malthus and argue that there are finite limits to the ability of the earth's resources to support the demands of a large population (Ehrlich & Ehrlich, 1990; Hardin, 1968, 1974; Hardin, 1992; Homer-Dixon, 1999). Rapid population growth will therefore have a negative impact on the environment. In Kenya, population growth has been linked to migration into fragile ecosystems with subsequent serious environmental implications (Bilsborrow & Ogendo, 1992). In his early work, Malthus discussed positive and preventative checks (e.g. war, disease) that keep population in balance with the environment, and maintained that these checks would be borne by the lower classes. He therefore advocated for policies of 'benign neglect' of the lower classes (Harvey, 1974). Neo-Malthusians avoid examinations of the underlying dynamics of inequality, poverty and environmental change, and advocate for policies that control the population of the inhabitants of less developed countries, and the poor and recent migrants in more developed countries. The

works of Buchanan (1973) and Wisner et. al., (1982) have been part of the assault on neo-Malthusian arguments for its neglect of underlying dynamics of resource distribution in causing environmental degradation (Buchanan, 1973; Wisner, Weiner, & O'Keefe, 1982).

In direct opposition to the neo-Malthusians, Boserup's work concludes that population growth stimulates technological innovation, and is therefore necessary for progress (Boserup, 1981). This view is well illustrated with an example from Machakos, Kenya (Tiffen, Mortimore, & Gichuki, 1994). According to Tiffen et, al., the amount of soil erosion declined significantly at a time when the human population was increasing in the same area of Machakos District, Kenya. Boserup's viewpoint promotes the adoption of new technologies as a solution to environmental problems. Labor and capital are seen as important "substitutes" for natural resources, which have become "scarce" as a result of increasing population. In the case of Machakos, an increase in population provided the labor required in constructing labor intensive erosion control structures.

Cultural ecology presents a broader picture by focusing on the evolution of cultural systems through environmental adaptation (Bates & Fratkin, 1999; Bennett, 1976; Ellen, 1982). Cultural ecology became popular in the late 1960s (Watts, 1983). It applied ecological principles of equilibrium and homeostasis to social life. The focus on energy flows and systems analysis in cultural ecology limited its ability to view local communities as part of a wider political and economic system. By the early 1980s there was growing criticism of cultural ecology because of its apolitical and homeostatic approach to nature-society interactions (Bryant, 1998).

The early 1980s also marked the beginning of a "new ecology" that stressed disequilibria and instability of biophysical environments (Botkin, 1990; Hjort, 1982; Mooney & Godron, 1983; Vale, 1982; Zimmerer, 1994, 2000; Zimmerer & Young, 1998). The "new ecology" challenged conventional ecological wisdom that stressed equilibrium and homeostasis, and on which cultural ecology was based. Hjort, (1982), and Grossman, (1984) stressed the need to go beyond the study of isolated communities and recognize the economic and political contexts within which people make decisions, an approach that Vayda (1983) called "progressive contextualization". Cultural ecology also failed to recognize that societies are not uniform. Social differentiation based on age, class, gender, race, socio-economic status, etc affects access to and use of resources such as land and labor. This differentiation between groups is recognized within political ecology, a framework that evolved partly out of the critiques of cultural ecology in the late 1970s (Watts, 1983), and partly out of Marxism[1].

2.2 Political Ecology

The appeal of Marxism and results from studies on third world societies in transition produced a need for the investigation of linkages between integration into the world economy and local resource use and management (Blaikie, 1985; Grossman, 1984; Guha, 1983; Peet & Watts, 1996a, 1996b; Watts, 1983). Peet (1998), and Peet and Watts (1996a) outline other major environmental concerns of the 1970s, 1980s and 1990s that contributed to the development of political ecology. First, was the concern for the ecological state of the global environment. This was followed by the concern for population growth and a return to Malthusian arguments. There was also a concern for

[1] Cultural ecology continued to evolve parallel to political ecology after the 1980s.

the increasing polarity of world incomes, with the Brundtland Commission Report (19 linking poverty with ecological degradation (Rist, 1997). Political ecology therefore developed as an approach that linked the environment with development theory. Whil cultural ecology was stimulated by the study of isolated rural communities, political ecology recognized that 'isolated communities' were influenced by broader political a economic structures. Political ecology grew out of studies of agricultural communitie engaged in transitions involving market integration, rural diversification and intensification and a change of historical forms of resource use and management (Peet Watts, 1996a).

Early use of the term 'political ecology' can be found in the writings of scholars in the 1970s (Cockburn & Ridgeway, 1979; Wolf, 1972). The origin of the concept is however most closely associated with Blaikie and Brookfield (1987). In their investigation of linkages between land degradation and society, Blaikie and Brookfiel present land degradation as a social construct. They state that an environmental proce is defined as degradation based on some social criteria. Blaikie and Brookfield also present multiple perceptions of the concept by different land users and by different scientific disciplines. Further complicating the different perceptions of degradation ar conflicts over how land ought to be used (e.g. Campbell et al., 2000). Central to this early version of political ecology is the land manager. The land manager has the responsibility "to manage natural processes by limiting their degrading consequences both on-site and downstream[2]" (Blaikie & Brookfield p. 8). Land managers respond t social, political, and economic circumstances that bear no relation to the physical and

[2] Blaikie and Brookfield (1987) used the term "downstream" to refer to off-site locations that may be affected negatively by the actions of the land manager

chemical properties of the land they manage. New production strategies require
management strategies to maintain land quality. Blaikie and Brookfield also ide
three concepts of the margin and their interrelation: the economic, the ecological
political-economic. An example of political-economic marginalization would be
of proper infrastructure that would present low returns on labor. This would in t
motivate powerful members of a community to gain control of more favorable la
forcing the less powerful onto ecologically marginal land, where they are likely t
encounter economic marginalization due to the lower land potential. The three c
of marginalization are therefore self reinforcing.

The theory in political ecology continued to develop in people-environment s
the 1990s (Bryant, 1992; Bryant, 1998; Bryant & Bailey, 1997; Campbell, 1998;
Durham, 1995; Peet & Watts, 1996b). Political ecology examines the society an
environment interaction through an approach that includes interactive effects acr
different spatial and temporal scales (Blaikie & Brookfield, 1987). This perspect
adopts the view that societies are heterogeneous, and that political and economic
affect resource allocation and use. It places the people-environment discussion i
context of the wider political economy (Harvey, 1996) and local histories.

A considerable literature has developed to examine land issues within the pol
ecology framework (see examples in Peet & Watts, 1996b). Campbell and Olso
Framework (1991b) and Blaikie's Chain of Explanation (1994) are examples of
approaches that illustrate the political ecology approach. Political ecology has
emphasized linkages to national policy, interstate relations and global capitalism.
instance, the state has transformed pastoral lifestyles and land use and land cover

introducing boreholes in the arid and semiarid lands of Kenya and Botswana (Darkoh, 1996; Peters, 1984). Researchers working in the Sudan have explored the socio-ecological impact of state-sponsored dam and mechanized irrigation works (Horowitz & Salem-Murdock, 1987). Warfare, international aid and watershed management are important interstate relations that influence land use and land cover. Recurrent warfare and endemic personal and group insecurity have social and ecological implications (Bryant, 1992). Developed countries have facilitated socially and environmentally disruptive policies and practices in diverse settings in less developed countries (Braidotti, Charkiewicz, Hausler, & Wieringa, 1994; Rich, 1985). It has been illustrated that interstate relations associated with the Nile Basin resulted in hydro politics that have socio-economic and ecological implications (Waterbury, 1979). Links between global capitalism and environmental degradation in less developed countries have been extensively examined (Braidotti et al., 1994; O'Brien, 1985; Watts, 1983). The link between colonialism and capitalism and the impact of the two on the ecology and people of East Africa have also been examined (McCracken, 1987).

Several critiques have been leveled against political ecology. Peet and Watts (1996b) present three important weaknesses to political ecology approaches of the 1980s and early 1990s, which could still be broadly applied to political ecology today. Emphasis on poverty and the poor ignores the contributions of affluence and the rich to degradation (Hecht, 1993). Hecht's study of deforestation in the Brazilian Amazon provides an example of such a linkage. Secondly, political ecologists focus primarily on rural, agricultural third world countries, and neglect to apply the approach to other areas. Thirdly, political ecology has primarily focused on the land resource, ignoring other

equally important resources. Peet and Watts do not provide further information on the ignored resources. A look at the literature coming out of political ecology reveals that one ignored resource is human labor. A fourth major shortcoming of political ecology literature, not outlined in Peet and Watts, is that it does not give gender the prominence that it deserves. Political ecology draws attention to a land manager without investigating the identity of the land manager (Blaikie & Brookfield, 1987). Gender is a critical variable in shaping resource access and control. Gender interacts with class, caste, race, culture, and ethnicity to shape processes of ecological change, the struggle of men and women to sustain ecologically viable livelihoods, and the prospects of any community for progress (Agarwal, 1997a, 1997b, 2001).

2.3 Approaches Linking Women, Environment, and Development

A growing interest in women and environment relations emerged within the development discourse in the early 1970s (Braidotti et al., 1994). The interest was fuelled in part by the global oil crisis and the Sahel drought of 1968 to 1973. Geographers working in West Africa have explained how development planners drew attention to the use of fuel wood as a source of energy in developing countries and linked this to deforestation that was supposedly responsible for the Sahel drought (Mosley, 2002). Women's role in fuel wood gathering made them a target group to development projects that demanded more of the women's already over committed labor. Also significant was Boserup's (1970) study on women's roles in agriculture. Boserup documented the contribution of women in the productive sector of agricultural development in developing countries, thus bringing out the dimensions and importance of gender within the development process.

Four major theoretical approaches will be highlighted in this section. The section will focus on the major themes in each approach (many of which are a rubric of closely connected approaches), and how each theoretical approach was translated into practice within the development paradigm. Shortcomings of the approaches will also be described.

2.3.1 Women in Development (WID)

The term WID was first used in the early 1970s by the women's committee of the Washington, D.C chapter of Society for International Development as part of a strategy to bring women of developing countries to the attention of American policy makers (Braidotti et al., 1994; Rathgeber, 1990). Borrowing from the prevailing modernization theory[3], WID theorists argued that women, especially in the developing world, had been left out of the development process. This exclusion of women has been referred to as the "invisibility" of women in the development process (Young, 1993). Aligning itself with liberal feminism (Carson, 1962; de Beauvoir, 1952; Friedan, 1963), WID advocated for the inclusion of women in the development process.

Five variations of the WID approach that were closely related to the development paradigms of their time have been identified (Moser, 1989; Moser, 1993).

(1) "The welfare approach" – This was more widespread in the 1950s and 1960s (Braidotti et al., 1994). The approach disregarded women's productive roles (e.g. in agriculture) and focused on women's reproductive roles. Development for women was thus defined as an enhancement of their roles as mothers, wives and homemakers.

[3] Development is a linear process of economic growth

(2) "The equity approach" – This approach calls for equitable distribution of the benefits of development between men and women. The approach was informed by the Forward Looking Strategies (FLS) that came out of the United Nations Decade for Women (1976-1985). This approach was seen as originating from western feminists ideas and it faced severe criticism from men in developing countries and in developed countries as well.

(3) "The anti-poverty approach" – The demand for equity above was linked to economic self sufficiency and packaged as an anti-poverty approach. Women were seen as a valuable resource to be harnessed in the development process. T approach encouraged women to enter formal employment and to develop incom generating activities.

(4) "The efficiency approach" – The approach coincided with the International Monetary Fund (IMF) Structural Adjustment Policies (SAP) of the 1980s. It wa argued that the newly restructured development structures would be more effective and efficient through increased contribution of the women. This led to increased workloads for women.

(5) "The empowerment approach" – Although Moser identified this as a variation within WID, the approach is more in line with Gender and Development (GAD) approach that emerged in the early 1980s. The approach has its support in feminist scholars from developing countries and activists involved in grassroots organizations. In line with postmodernism, the approach supports the transformation of laws and social structures from the bottom up (Peet & Hartwick, 1999), to create structures that would empower women.

The WID school of thought brought recognition that women's roles and expe within the development process were different from those of men. WID legitimi institutionalized the focus on women's experiences as separate from men's. The approach was however not without its limits. Several studies have leveled critiq WID approaches (Leach, 1994; Mohanty, 1997; Peet & Hartwick, 1999; Rathgeb 1990). The general arguments in the critiques against WID stipulated that within WID framework, women from developing countries were presented as victims o development, a process that was seen as imbalanced along gender lines. WID's s link with modernization theory led to solutions that stressed economic growth in productive activities, ignoring the reproductive sphere. WID's activities increase labor demands on women in the productive sphere, without offering strategies fo reducing labor demands on women in the reproductive sphere. The end result wa increased demands and control over the labor of women.

WID approaches had only a partial analysis of gender roles and relations. Th a complete focus on women, ignoring men, their roles and the relations between women. Neither did the approach question the origin or nature of women's subo position within the development process. WID also overlooked contributions of and neo-Marxists theories of development that pointed to the importance of class and culture, and instead focused on 'women' as a single unproblematic unit of an

WID's solutions ignored local knowledge and expertise and instead promoted (usually technological) solutions from developed countries (Marchand & Parpart Rathgeber, 1990). One of the most profound critiques against WID comes from (Mueller, 1987). Mueller employed Foucault's (Foucault & Gordon, 1980) linka

between knowledge and power and concluded that WID programs shifted control developing country settings to the headquarters of development agencies in devel countries. Rather than liberate women in developing countries, WID maintains hierarchical divisions of the world market economy. It was in response to these c that an alternative approach (women and development) emerged.

2.3.2 Women and Development (WAD)

WID's main argument was for the inclusion of women in the development pro WAD took this as a point of departure and argued that women have always been a the development process, and it was their role in the process that had led to their subordination and oppression. WAD emerged in the late 1970s and aligned itself neo-Marxist feminists. WAD therefore drew more from dependency theory and n Marxist theories of development than from modernization.

The WAD school of thought drew linkages between the intensification of patr and the spread of capitalism (Figueroa, 1987; Mies, 1998). WAD argued that wo played important roles in economic development in their productive (formal) capa Their integration in the world market economy by core (developed) countries was process responsible for their subordination and oppression. The use of women in developing countries as sources of cheap labor in export processing zones have be discussed as examples of women's subordination and oppression by capitalism an patriarchy (Fontana, Joekes, & Masika, 1998; Mies, 1998). WAD perspectives recognized that poor men in developing countries were equally vulnerable to subordination and oppression within the world market economy. Henn (1986) an (1982, 1983, 1986) argue that gender relations become class relations as "patriarc

appropriate the surplus labor of women in African societies. Henn sees patriarchy as way through which capitalism indirectly obtains the benefits of women's surplus lab

As WAD addressed the structure of inequalities brought about by the "internatio division of labor" (Mies, 1998), the approach ignored gender relations within classes And although the approach theoretically recognized the importance of class, Rathgel (1990) notes that in practical project designs, WAD grouped women as a single cate with no regard for class, ethnic or race differences (see also Parpart 1995). Like WI WAD also focused on women's productive roles, ignoring their reproductive roles (c bearing and rearing). Intervention strategies coming out of WAD also failed to cons consequences on the time burdens of women. This shortcoming within WID and W has been attributed to their greater emphasis on quantitative methods, ignoring insigh obtained through qualitative analysis (Rathegeber 1990).

2.3.3 Gender and Development (GAD)

GAD emerged in the early 1980s and was closely aligned with socialist feminism Socialist feminism begins with the Marxist's notion of production for the satisfactio needs, and argues that reproductive needs (bearing and raising children) were as important as economic needs (Peet & Hartwick, 1999). Socialist feminists argued th women's oppression and subordination was historically specific and based on the so construction of production and reproduction (Merchant, 1996; Rathgeber, 1990). Th GAD approach radically questioned male and female roles, responsibilities and expectations as ascribed by different societies, and examined why women were systematically assigned inferior or secondary roles in the development process

[4] Women produce food for their husbands and sons, who then produce goods/services for capitalists.

(Rathegeber, 1990). Chondorow (1978) argued that ideas of masculinity and femininity were constructed in growing children as they related to their mothers. Boys were encouraged towards work outside the home, while girls were cultured into emotional work within or outside the home.

GAD rejected the idea within radical feminism that feminist knowledge is created directly from the particular experiences of women, which is different from men (Daly, 1978; Griffin, 1989). Instead, GAD welcomed the contributions of men who were committed to social justice and gender equity. By incorporating men and women's reproductive roles (non-commodity production) within the development process, GAD theorists rejected the public-private dichotomy that was used to undervalue the family responsibilities of women. GAD approaches enter the conjugal contract (private sphere) to analyze gender relations within the household (Marchand & Parpart, 1995). Unlike WID and WAD, GAD theorists see women as agents of change rather than victims of development. Although GAD recognized the importance of class distinctions, it stresses that patriarchy operates across class lines to oppress women. GAD therefore gave gender higher status than class in defining access to the vehicles of development.

One important critique on earlier GAD studies is that they have focused on women and paid less attention to men and masculinity (Chant & Gutmann, 2000; Cornwall, 1997; Greig, Kimmel, & Lang, 2000; Jackson, 1999; Jackson, 2000; Pineda, 2000). Several studies explore the reasons as to why men have been left out of GAD (Chant, 2000a; Chant & Gutmann, 2000; Levy, Taher, & Vouhe, 2000). Critiques of the exclusion of men from GAD state that GAD and feminist studies either present men as 'hazy background figures' (White, 1997), or focus on negative images such as

representations of men as lazy (Whitehead, 2000), or inconsiderate patriarchs appropriating the surplus labor of women in the production process (Folbre, 1983; Folbre, 1986; Henn, 1986). Critiques argue that gender equality and women's emancipation would only be achieved through an examination of the role that men play in women's disadvantaged positions, and an involvement of men in redressing gender inequalities (Greig et al., 2000). Out of this critique, a body of literature on men and masculinities has emerged within the GAD theoretical framework.

Within the GAD framework, masculinity (and femininity) is seen to be constructed as boys (and girls) are socialized into men (and women) through familial, religious, educational and other cultural institutions (Chodorow, 1978; Greig et al., 2000). The roles of 'men' in society are defined by "what it means to be male", or masculinity (Greig et al, 2000 p 5). Masculinity defines the place that men occupy in gender relations, the practices they engage in and the effects that those practices have on "bodily experience, personality and culture" (Connell 1995, p. 71). One dividend that men reap through masculinity is a position of power within gender relations, a fact that has been widely explored in feminist literature (Agarwal, 1988; Figueroa, 1987; Folbre, 1982; Goheen, 1996; Guyer, 1992; Leach, 1994; Mies, 1998; Talle, 1988/1994). A second dividend, explored within the masculinity discourse is material (Connell, 1995). Masculinity defines the role of men as providers of material needs for their families (Almeras, 2000; Bhasin, 1997; Greig et al., 2000; Silberschmidt, 2001; Varley & Blasco, 2000).

Some writers within the masculinity discourse have argued that the failure of men to provide the material needs for their families[5] have resulted in men's disempowerment

[5] Reasons given for men's failure include low income, unemployment, and women's increasing economic performance relative to men.

(Greig et al., 2000; Silberschmidt, 2001). The writers go on to argue that feelings of powerlessness among men lead men to domestic violence and sexual promiscuity. One assumption behind this argument is that powerful men are not violent or promiscuous. A second assumption is that before powerlessness sets in, men are not violent or promiscuous. From my experience, living and working in Africa, I find both assumptions incorrect. A stronger argument from the masculinity discourse is that for women's empowerment to be successful, it must be complemented by change for men, to accommodate women's empowerment (Chant, 2000a, 2000b; Chant & Gutmann, 2000; Rowlands, 1997; Townsend, Zapata, Rowlands, Alberti, & Mercado, 2000; White, 1997).

Within the masculinity discourse is a body of literature that argues for a focus on men's work, as a way to include men in GAD (Jackson, 2001). There is a general agreement that a lot is known about women's work, but relatively little is known about men's work (Jackson, 2000; O'Laughlin, 1998). Literature on gender division of labor has focused on women's work as separate from men's work (Carney, 1988; Guyer, 1981, 1990; Idowu & Guyer, 1993; Schroeder, 1999; Schroeder & Suryanata, 1996; Verma, 2001; Wangari, Thomas-Slayter, & Rocheleau, 1996). The general idea in these studies is that women are overworked in relation to men. This argument led Brown and Haddad (1996) to speculate that "if women suffer time-famines, then men must enjoy time-feasts" (reported in Jackson 2000, p10). This idea is explored further in Whitehead's analysis of the construction of the 'lazy man' in rural sub-Saharan Africa (Whitehead, 2000).

In addition to the general exclusion of men from GAD, Jackson (2000) argues that researchers have failed to explore gender relations with respect to work. The few existing studies that have gender relations with respect to work focus on separateness,

and contestations over the labor resource (Carney & Watts, 1990; Schroeder, 1999). The interdependent aspects of men and women's work in the production process have not been explored in literature.

This study points out one important shortcoming in the masculinity literature reviewed above. The masculinity literature does not engage in a discussion on the labor processes involved in pastoral production systems. Much of the time, the literature is silent on the type of production system in which its central argument is set (e.g. Jackson 2001, Greig et al 2000, Chant & Gutmann 2000). The argument of missing men would however only be valid in the context of crop production systems. The argument falls apart when one engages in the literature coming out of livestock production systems (e.g. Spencer 1993, Galaty 1993a). In this study, I will argue that in crop production systems, the role of men and masculinities are largely missing from the literature. However, in the context of livestock production systems, the trend has been to ignore the role that women play, and overstate the role that men play.

The common theme is GAD approaches is that they question the underlying assumptions of social, economic and political structures and advocate for a re-organization of existing power structures. In what seems like a direct contradiction, GAD also places emphasis on the role of the state (usually male dominated) in promoting women's emancipation. In practice, GAD has not met with a lot of success. GAD demands a level of structural change and power shifts that are difficult to implement. Rathgeber (1990) suggests that even socialist states that were committed to class reforms are less interested in reforming gender inequality.

2.3.4 Women, Environment and Development (WED)

There are many approaches that are lumped together under the WED rubric. Braidotti et al., (1994), and Peet and Warwick (1999) look at some of these approaches. This section will focus on three of these approaches, ecofeminism, feminist environmentalism and feminist political ecology. These approaches are the most relevant to the study on gender roles and land use change.

2.3.4.1 Ecofeminism.

There are various strands of thought within ecofeminism, most of which have developed in North America (Adams, 1993; Gaard, 1993; Mies & Shiva, 1993; Salleh, 1997; Shiva, 1988; Warren & Erkal, 1997). The broad argument within these strands is that women are closer to nature than are men. Men are associated with culture. Ecofeminist define nature as the ecological environment, and human biological needs and abilities. Nature is seen as inferior to culture and therefore women as inferior to men. Drawing from patriarchal thought, ecofeminists argue that the domination and oppression of women and nature by men has therefore gone hand in hand. In these arguments, it is seen as beneficial for women to end the domination of nature, as that would also lead to the deliverance of women. Feminists and environmentalists are therefore encouraged to work together.

Policy oriented literature that is based on ecofeminism has two dominant but contradictory images of women in developing countries. First, women in developing countries are portrayed as the first and most afflicted victims of environmental degradation. It is argued that this has been brought about by the close relation between women and nature. Women's roles and responsibilities such as fetching water, gathering

fuel wood and collecting fodder means that they are affected by environmental degradation sooner than men are. This argument is further supported by the observation that women make up the majority of the poorest segments of the population (Agarwal, 1986; Dankelman & Davidson, 1988). Second, it has been argued that women's closeness to nature makes them experts and educators in environmental knowledge (Rodda, 1991; Shiva, 1988). Women in developing countries are sometimes called barefoot ecologists (Davidson, 1989), and day-to-day environmental managers (Dankelman & Davidson, 1988). It is argued that women's connection to nature is spiritual and that their activities are in harmony with nature (Shiva, 1989).

These images of women are presented to convince gender blind policy makers of the importance of including women in environment and development projects. Within the development discourse, women are either referred to as "instruments" or "beneficiaries" of environmental projects (de Bruijn, van Halsema, & van den Homberg, 1997; Russo, Bremmer-Fox, Poats, & Graig, 1989), corresponding to the two images presented above. There is an underlying assumption about the interest, skills and availability of women to take part in such projects. Although based on particular case studies, these universal claims about women can be misleading when taken out of context. They do not present a complete picture of the complexity of the interactions between humans and their environments, or of the importance of class, ethnicity, and age in defining access and control of resources (Agarwal, 1992; Jackson, 1993b; Leach, Joekes, & Green, 1995; Sethi, 1989).

Some ecofeminists trace the connection between women and nature to female biology and the reproductive process (King, 1989; Ortner, 1974; Salleh, 1984; Shiva, 1988). Men

on the other hand, because of their inability to bear children, are forced to create artificially through cultural and technological means (Griffin, 1989; Ortner, 1974). Ecofeminists also attribute allocation of gender roles to the close link between women and nature. Women are therefore confined to a private (domestic) sphere because of their child bearing and child rearing activities. This notion has been discounted by anthropological studies that show variable definitions of male and female roles in different cultural groups (Leach, 1994; Moore, 1988). Ecofeminists have also been criticized for failing to acknowledge differences between members of the same sex based on their social positions (Moore, 1988).

Researchers in women studies discounted the biological links between women and nature as early as 1976 (Boserup, Chinnery-Hesse, & Farman-Farmaian, 1976). Boserup et, al.'s work on gender roles compared activities performed by men and women in Asia, Europe and Africa and concluded that the division of labor by sex was driven by culture rather than human physiology or anatomy. Boserup et, al.'s findings also supported Durkheim's theory of organic solidarity (Durkheim, 1984) by concluding that the division of labor between the sexes ensures survival of a society, especially within intermarrying groups. Boserup et, al.'s argument was that boys and girls were socialized into specializing in different but complimentary activities to ensure that all the activities necessary for family survival were performed.

2.3.4.2 Feminist environmentalism.

Feminist environmentalism was a response to ecofeminist arguments that conceptualized the women-nature link purely on ideological terms. Drawing examples from India, Agarwal supports ecofeminism's concepts of women as victims and women

as active agents in environmental degradation. But she argues that the women-nature link is not rooted in women's biology, and neither is it symbolic. Instead, Agarwal (1992) advocates for attention to the material circumstances that shape women and environment relationships. Agarwal states:

> I would like to suggest here that women's and men's relationship with nature needs to be understood as rooted in their material reality, in their specific forms of interaction with the environment. Hence, insofar as there is a gender and class (/caste/race)-based division of labor and distribution of property and power, gender and class (/caste/race) structure people's interactions with nature and so structure the effects of environmental change on people and their responses to it. And where knowledge about nature is experiential in its basis, the divisions of labor, property, and power which shape experience also shape the knowledge based on that experience (p. 126).

Researchers working in Africa have supported Agarwal's argument (Carney, 1988; Leach, 1994). Women and men perform different but complementary activities that together contribute to the survival of their household. In many African societies, women are more involved in drawing water, collecting firewood and growing food crops. This makes them more disadvantaged by degradation as there will be an increase on the demands for their labor. Agarwal argues that it is this material concern and not any spiritual or natural connection that gives women 'privileged environmental knowledge'.

2.3.4.3 Feminist political ecology.

The feminist political ecology approach is a branch of political ecology that seeks to address issues of gender, environment and development (Rocheleau, Thomas-Slayter, &

Wangari, 1996). The approach links the insights of feminist cultural ecology (Leach, 1994), political ecology (Blaikie & Brookefield, 1987), feminist geography (Townsend, 1995) and feminist political economy (Jackson, 1995). Feminist political ecology integrates feminist perspectives with political ecology and seeks to link local experience with global processes of economic and environmental change.

Feminist political ecology identifies three themes present in gender and environment case studies drawn from all over the world. The first theme "gendered knowledge" (Rocheleau et al., 1996, p. 4) is related to concerns for survival, and it explains the convergence of gender, science and environment. Women's multiple roles (production, reproduction, trade and consumption) provide them with a holistic and privileged perspective on the environment that leads to an acquisition of special environmental knowledge. It is this knowledge that propels them to organize and become politically involved in environmental protection (Agarwal, 1991; Maathai, 1988; Shiva, 1988). The second theme, "gendered environmental rights and responsibilities" (Rocheleau et al., p. 4) deals with resource access, control and management. Feminist political ecology recognizes that men and women have different rights and responsibilities within the production process and in determining the health of the biophysical environment. For example, in many African cultures, women have resource use rights while men have ownership rights. This situation can sometimes lead to insecurity of tenure and reluctance on the part of women to invest in long-term land improvement measures (Jackson, 1993a). Within this second theme is the gendered division of responsibilities and gendered power relations. The third theme "gendered environmental politics and grassroots activism" (Rocheleau et al., p. 5) focuses on

women's collective involvement in direct action for environmental change. Feminist political ecology examines the different forms and reasons underlying the surge in women's collective struggles over environmental issues. Rocheleau et al., (1996) provide the following summary of feminist political ecology:

> Incorporating a feminist analysis within political ecology illuminates the ways in which gender positions both men and women vis-à-vis institutions that determine access to land, [labor,] to other resources, and to the wider economy. An ecological approach allows us to see environmental management, resource use, and technological change as a dynamic, interactive process... An emphasis on "politics" recognizes the social and political contexts in which national and international governments and development agencies, operating at all levels, make policy. Linking gender and political ecology allows us to focus on the uneven distribution of resource access and control by gender... class and ethnicity (p. 300).

In a talk at Michigan State University, an additional theme within feminist political ecology termed "invisible political ecology" was examined (Rocheleau, 2002). Rocheleau discussed two aspects of invisible political ecology. First, invisible political ecology stresses the complexity of communities and the depth of their social networks. Rocheleau argues that nested within communities are invisible and changing sources of connection and solidarity between individual community members. These complex connections are invisible to researchers and development workers but they play an important role in group survival, especially in times of "uncertainty and surprise" (Rocheleau, 2001) p 86. A second aspect of invisibility that Rocheleau (2002) discusses involves the use of space (landscape space) by men and women. Rocheleau (2002)

captures this use of space in the metaphor 'gendered landscapes'. Her argument is that invisible gender relations within the household are represented as patterns that are visible on the landscape. In the interpretation of landscape patterns however, researchers most frequently focus on scales of investigation that fail to capture the gendered nature of the landscapes. In a separate but related discussion, earth observation science, on which many land use and land cover studies rely, has been criticized as utilizing a scale of analysis that obscures social relations that produce the landscape under observation (Litfin, 1997). Both Rocheleau and Litfin stress the importance of using scales of investigation that would capture not just the broad patterns on the landscape, but also the social relations of production. In the context of land use studies, this would involve an integration of research techniques that would capture the broad landscape patterns and the intra-household relations that produce the landscape patterns. In this study, I hope to make a direct contribution to the evolving theoretical framework of invisible political ecology, and in particular gendered landscapes.

Feminist political ecology has been used in Africa to understand "relations in production" and "relations of production" (Carney & Watts, 1990, p 217). Relations of production are critical in defining natural resource access and management (Campbell & The Women's Group of Xapuri, 1996; Rocheleau et al., 1996). For example, gender analysis has shown that security of tenure leads to higher investments in land, although people's ability to invest can be limited by a lack of resources vital to their survival (Mackenzie, 1995). Relations of production are important in defining strategies for survival in semi-arid environments (Wangari et al., 1996), the nature of gendered acquisition and use of knowledge (Fortmann, 1996) and the issue of land use conflicts in

areas adjacent to wildlife conservation areas (Rocheleau, Schofield-Leca, & Mbuthi, 1995). Relations in production explain labor processes and show that development intervention, environmental transformations and new markets puts new demands on labor and new values on resources, bringing about new gender conflicts.

2.3.4.4 Feminist political ecology and gender roles.

Within political ecology and feminist political ecology, analysis of gender roles and relations examines power relations within the household, and the struggles that evolve as men and women strive to redefine their roles in the context of changing production relations. Geographers working in The Gambia in West Africa examine how integration into the global economy and the spread of the green revolution redefined the meaning of land and gendered labor relations among contract rice farmers (Carney, 1988; Carney & Watts, 1990, 1991; Carney, 1992; Carney, 1994, 1996). The introduction of irrigated rice farming transformed property and labor relations between husbands and their wives. Struggles in rice production included women reaffirming claims to a portion of the surplus. When this was denied they refused to work on the household's farm, preferring to sell their labor in the market. Schroeder (1993, 1999) and Schroeder and Suryanata (1996) show how developers at different levels rely on the mobilization of unpaid female labor. In the Gambia, male landowners embraced tree growing once they were able to take advantage of unpaid female labor for the care of the trees. This brought about dual conflicts over labor and over space, as women destroyed or neglected the men's trees because they cast shadows over the women's vegetables limiting growth (Schroeder, 1993; Schroeder, 1999).

2.4 Gender in Pastoral Production Systems

The general theme in the literature on gender roles and relations in pastoral production systems is that pastoral production is dominated by the labor of men, and that women occupy a subordinate position with respect to men. Men own and control cattle, and they do most of the activities in livestock production (Fratkin & Smith, 1994; Schneider, 1979; Spencer, 1988). Women on the other hand engage in domestic roles (Evans-Pritchard, 1951; Fratkin & Smith, 1994; Spencer, 1965), which are subordinate to the livestock roles of men (Hodgson, 2000). Pastoralists are presented in the literature as male (Galaty, 1979; Spencer, 1988), and as patriarchs (Evans-Pritchard, 1951). Earlier attitudes towards pastoral women in the literature are well captured by Spencer's (Spencer, 1965) writings on the Samburu women of Northern Kenya:

> On the whole, I found women were quite ignorant of many aspects of the total society.. they were less inquisitive than the males... found it harder to comprehend my remarks and questions...had never been encouraged to show much initiative on their own...Samburu is essentially a man's society and from the male point of view women are inferior and politically uninfluential. Patriarchy is the norm. (p. 231).

Many researchers on pastoral communities have been male who might have had a problem accessing the perspective of pastoral women. For example, Spencer (1965) states that he found women to be unhelpful as key informants and consequently he left their perspective out of his research. Most pastoral research has therefore focused on men, male dominated activities and the male point of view, and undervalued the contribution that women made in pastoral production.

Two notable exceptions of the perspectives of earlier research on gender and past production exist (Driberg, 1932; Dupire, 1963). Both Driberg and Dupire criticized concept of gender hierarchy found in literature on pastoral production systems. Drib studied gender relations among pastoralists in East Africa and concluded that women roles were not inferior to men's roles. Dupire studied Fulani Wodaabe women in Ni and concluded that men and women had different but complimentary roles, none of which was considered superior to the other. Despite Driberg's and Dupire's works, t general theme in pastoralism literature continued to stress gender hierarchy and male domination (Schneider, 1979; Spencer, 1988).

Pleas for the inclusion of women in pastoralism research were made at a 1980 conference on the future of pastoral peoples held in Nairobi, Kenya (Broch-Due, Garfield, & Langton, 1980). However, it was not until the second half of the 1980s t research focused specifically on the position of women in pastoral societies. Studies reported the complexities of the roles and responsibilities of women in pastoral socie (Dahl, 1987; Oboler, 1985). Researchers also deconstructed the 'pastoralist woman' category and analyzed differences between women based on class (Oxby, 1987), wea status and degree of sedentarization (Ensminger, 1987), marital status (Little, 1987), (Baroin, 1987), and the extent of inclusion in the market economy (Talle, 1987). Un the earlier researchers (e.g. Galaty 1979, Schneider 1979, Spencer 1965), later researchers considered the significance of gender in pastoral production, the importa of analyzing historical processes of pastoral gender relations and the evolution of ge relations in the context of changing production relations (Hodgson, 2000, 2001; Kipu 1989; Talle, 1988/1994).

Studies continue to show evidence of female domination in a variety of social processes in pastoralist communities, negating the earlier assumptions of complete male domination. Among the Tuareg, women have ways of controlling access to urban market goods from their rural tents through indirectly controlling the activities of men (Rasmussen, 2002). Rasmussen explains that Tuareg women obtain control by using legal means (divorce) or other informal arrangements such as gossip, poetry, song verses and through social intermediaries. Among the Rendille of northern Kenya, sedentarization has presented new economic opportunities for women through the sale of agricultural produce, milk and labor (Fratkin & Smith, 1994; Nduma, Kristjanson, & McPeak, 2001). Similar patterns have been observed among several pastoral communities in southern Ethiopia and Northern Kenya (Little, Smith, Cellarius, Coppock, & Barrett, 2001). Women in pastoral communities use their clothing and adornment to support or undermine the clans to which they belong (Bianco, 2000) and to claim and advertise ethnic identity (Kratz & Pido, 2000). Somali women and women in North Eastern province in Kenya have been shown to play crucial roles in resolving conflicts (Elmi, Ibrahim, & Jenner, 2000). They have done this through the formation of women's peace groups as a response to violent war between different clans in the Somali community. Another domain through which pastoralist women exercise power concerns their technical knowledge, as demonstrated by examples from the Khoekhoe of Namibia (Smith & Webley, 2000). Talle (1988) and Kipury (1989) further demonstrate cultural roles that Maasai women play in male and female rituals.

The failure of many livestock development projects has been attributed to the neglect of the role of women in livestock production (Hodgson, 2000; Kettel, 1992). In response,

recent studies have focused on women's roles. In sub-Saharan Africa and the middle east, women have been documented to play an important role in poultry production (Gueye, 2000; Niamir-Fuller, 1994), in raising 'minor' animals such as sheep and goats (Fratkin & Smith, 1994; Niamir-Fuller, 1994; Turner, 1999), in the control of milk and milk products (Kipury, 1989; Mitzlaff, 1994; Niamir-Fuller, 1994; Steinmann, 1998; Talle, 1988/1994), and in disease control (Curry, Huss-Ashmore, Perry, & Mukhebi, 1996; Davis, 1996). Niamir-Fuller further argues that actual gender roles in livestock production systems differ from the ideal, with women being called upon to perform male duties a lot more than men are called upon to perform female duties. She states that male out-migration in Latin America and Asia, and the displacement of pastoral production systems in Africa results in increased workload for women in livestock production, a fact that is not well documented and not recognized by government officials and extension workers. She argues that service and input provision continues to bypass women in all three continents as their role continues to be underestimated.

Sedentarization of pastoral communities is an important trend in Africa and other parts of the world (Bencherifa & Johnson, 1990; Fratkin & Smith, 1995; McPeak & Little, 2003; Spear & Waller, 1993). This trend has been particularly significant in the past 50 years (McPeak & Little, 2003). Sedetarization has been attributed to different reasons in different parts of the world. For instance, pastoralists were forcibly settled by their governments following independence in Nigeria and the Sudan (Asad, Cunnison, & Hill, 1960; Awongbade, 1981). Forced sedentarization was in response to the dominant environmental discourse of the time that saw the pastoralist mode of production as inefficient and destructive of the environment (Blench & Marriage, 1998). More

recently, pastoralists have settled as a result of changing land use rights (Campbell, 1993; Niamir, 1991), and a proliferation of development assistance (McPeak & Little, 2003).

Sedentarization provides (or is a result of) opportunities that would previously not fit in with a nomadic lifestyle. Sedentarization is therefore associated with a change in the activities that households perform. McPeak and Little's (2003) work among six communities in Northern Kenya, found that pastoralists do not give up livestock production once they settle. Instead, pastoralists diversify into non-pastoral activities. Diversification can be towards town based activities (Fratkin, 1993; Fratkin & Smith, 1995; Republic of Kenya, 1980; Snow & Morris, 1984) or towards agricultural activities (Campbell, 2003; Steinmann, 1998). Either way, sedentarization means new gender roles and relations among pastoral communities (Niamir-Fuller, 1994).

2.5 Gender and Land Use in Oloitokitok Division

The literature reviewed above shows that a comprehensive understanding of land use dynamics should incorporate social, political, economic and ecological aspects of change. Case studies of people-environment interactions are needed for different cultures, ecological zones and economic settings around the world. Differences in labor and work routines need to be identified. Activities need to be situated in terms of property rights, access and control of labor. The implications of gender differences in property relations and the impact of land tenure reform need to be understood through micro-level research. The research also needs to be contextualized by macro-level analysis of broader processes and economic policies.

The dynamics of division level land use change in Oloitokitok Division are well understood[6]. Land use change in Oloitokitok has been studied by Campbell et, al., (2003) for the period between 1973 and 2000. Within this period, irrigated and rain-fed cropland expanded, while the area under forests and rangelands reduced. Campbell et, al., also investigate the underlying forces for the changes that they quantify. Using the Kite framework (Campbell & Olson, 1991b), they analyze economic, socio-cultural, environmental and political driving forces for land use change and their interactions across space and time.

Less understood is how land use changes observed on the landscape are related to gender relations and gender roles within the household. This requires an investigation of land use dynamics at the household level. It is at the household level that decisions that define the land use patterns observed on the landscape are made. Gender relations play an important role in these decisions. Husbands and their wives might have different ideas about what crops should be grown, and where on the farm they should be planted. Some of their decisions might be influenced by the level of availability, and competition for household labor. Land use decisions might also be shaped by access to labor from outside the household. Labor allocation is usually defined along age and gender lines, with children, men and women performing different roles. It is the broad objective of this research to understand the gendered nature of labor allocation in agricultural production and the implications of gendered division of labor for landscape patterns at local scales.

From the literature reviewed in sections 2.1 to 2.4, there are five broad ideas that have direct relevance to the study area:

[6] Land use and cover dynamics at division and household level will be covered in chapter five.

1. The literature reveals the gendered nature of labor organization and labor-time allocation. The broad argument to support the division of labor between men and women has been tied to survival at different levels of social organization (household, community).
2. Literature on gender roles in crop production systems has focused on the role of women, while literature on gender roles in livestock production has emphasized the role of men over the role of women.
3. The division of labor has been recognized as a domestic dimension of power relations within the household. This draws attention to the importance of understanding the negotiations for labor that occur within the household.
4. Focus on intra-household negotiations has been on gendered conflict and contestation. Not enough attention has been given to the role of interdependence and cooperation for household material survival.
5. Invisible to many researchers who carry out their investigation of land use and land cover change at divisional scales of analysis is the gendered nature of landscape patterns. This is a direct consequence of failing to integrate different scales of analysis in their study.

Looking at the gender division of labor therefore helps us understand (1) how land use change affects gender roles (2) power relations within the household and how the household functions (3) women's agency to negotiate for change and for the benefits of their labor, and (4) the imprint of gendered relations on the landscape, as gendered landscapes.

Of the theoretical frameworks reviewed in sections 2.1 to 2.3, I most closely identify with the two interrelated approaches of feminist political ecology and feminist environmentalism. For the most part this study is informed by feminist political ecology theoretical frameworks. I also borrow from feminist environmentalism, particularly the explicit emphasis that feminist environmentalism makes on material concerns. In the Oloitokitok study area, people's material concerns have been instrumental in shaping their interaction with the environment. Two major landscape level changes in land use have occurred partly as a response to market opportunities emerging at local, national and international levels. The first change involves an evolution from a predominantly pastoral production system to an agro-pastoral production system. Livestock markets are less developed than crop markets and consequently livestock herders have fewer income generating options than do crop farmers. This fact has combined with land tenure systems that favor crop farming over livestock herding. As the people of Oloitokitok struggle to provide for their families, they have diversified their food and income base by taking up crop farming. The second major land use change has been a shift from subsistence farming to cash crop farming. Crops were first grown for cash to benefit emerging local markets when the District Office was set up in Oloitokitok town in 1930s (Campbell et al., 2000). Cash cropping has expanded to serve demands in Nairobi, Mombasa and Europe. Based on the central argument in feminist environmentalism, we would expect that in Oloitokitok Division, emerging gender roles are deeply rooted in a household's struggle for survival. We would therefore expect that acts of cooperation or conflict over gender roles would be nested within the context of the survival of the household as a whole.

Feminist political ecology recognizes the importance of looking beyond the local to understand forces of change at local levels. For example, population in-migration at regional scales, changes from communal to private land tenure advocated by the national government and local level land use changes are some of the factors that drive changes in gender roles and responsibilities in Oloitokitok Division. Feminist political ecology also recognizes the importance of understanding intra-household power relations and how they define access and control of resources. Land, labor, livestock, cash crops and education opportunities are some of the resources that are unequally controlled by men and women in the study area. A holistic understanding of labor relations, an important focus of this study, will be better understood from an analysis of intra-household power relations between husbands and their wives.

The concept of gendered landscapes within feminist political ecology is of particular importance in this study. In this study, I hope to contribute to this evolving theoretical framework by investigating gender relations of production at the household level and gendered use of the land at field level. In this study, I will use division level data to provide the broader context of change and investigate drivers of change at regional, national and international levels.

2.7 Research Questions

Broadly, I seek to understand how changes in land use have influenced (and been influenced by) the evolution of gender relations in crop and livestock production along the Mt. Kilimanjaro ecological gradient. I am interested in looking at how ethnicity and agro-ecological zonation influence labor allocation in different agricultural activities. I recognize that differences in wealth and education influence gender relations in

agricultural production. Wealth and education will however not be addressed through a quantitative analysis in this document as the current structure of my database does not allow for such an analysis in the time available. Wealth and education will be discussed here based on qualitative information and in more detail in a follow-up document within the next year. I am also interested in examining forces that drive changing land use and land cover patterns and the gender division of labor. In keeping with feminist political ecology, I will explore local forces, regional/national forces and international forces that drive change in Oloitokitok Division. The following are my specific research questions:

Changes in land use and land cover

1. What is the current land use and land cover of Oloitokitok Division?
2. How has land use and land cover changed since 1930?
3. What are the current cropping patterns?
4. How has the choice of crops grown changed in the past five years?
5. What are the current livestock production patterns?
6. How have livestock production patterns changed in the past ten years?
7. What are the current drivers of land use change?

Changes in labor allocation patterns and relation to land use

8. What is the historical division of labor in crop and livestock production?
9. How has the division of labor changed since 1930?
10. How does time allocation in crop and livestock production differ between men and women?
11. How does the division of labor differ by ethnicity and by agro-ecological zones?
12. Why has the division of labor changed?

13. How is the gender division of labor mediated within the household, in the context of changing land use systems?

Chapter 3: Research Methods

As revealed in the research questions, I was interested in going beyond a description of gender division of labor and land use and cover change in this study. I also sought to understand the processes behind current gender division of labor and land use and cover change patterns and what the relations between gender division of labor and land use and cover change were. A comprehensive exploration of the research questions requires the use of pluralistic methods of data collection that would capture both quantitative and qualitative aspects of the research. There is also a need for people involved in the field research process (the researcher and research assistants) to be constantly engaged in a self-reflective process in order to understand what biases they involuntarily introduce in the data they collect. In this chapter, I start with an exploration of the challenges I faced in designing a comprehensive data collection process. I also evaluate what data were needed to explore the research questions, and how the data were collected and analyzed, in this chapter.

3.1 Methodological Challenges

I faced complex challenges in designing an appropriate methodology[7] to capture the dynamics of the gender division of labor and its linkage to land use and land cover change. Methodological challenges that I faced in this research are common in many studies based on the feminist political ecology theoretical framework, and also on the broader political ecology theoretical framework. Scholars within these theoretical frameworks are interested in reasons for and meanings of social processes, in addition to

[7] A distinction is made between method, "a techniques for gathering evidence", and methodology, "a theory and analysis of how research should proceed", Harding (1987, page 2)

their descriptions. I discuss methodological challenges here because they indicate the problems encountered during data collection, and the biases that may have been introduced into the data collected. I faced three important methodological challenges that are captured best by the following questions: (1) What position(s) or role(s) did I have in the communities that I worked with and how did that influence the research process? (2) How was representation achieved? (3) What was the best research method to utilize in order to accurately capture the dynamics and linkages between the gendered division of labor and land use?

3.1.1 Positionality

The importance of a discussion on a researcher's positionality in the field comes from the realization that the 'field' in fieldwork is not just a physical landscape. It is also a social landscape of interconnected gender, age, class, and ethnic fields (Nast, 1994). Scientists in the field are positioned simultaneously in a number of these fields, and are always negotiating differences based on gender, age, class, ethnicity and so on. These factors (gender, age, etc) intersect to produce unique relations between the researcher and the researched. Because of this uniqueness, the first person will be used in the discussion on positionality and its meaning for the research process.

Gender, ethnicity and level of education were some of the most important aspects that had a bearing on my data collection process. These aspects accelerated and hindered the data collection process at different places. In the government offices, I played up my level of education and my status as a graduate student. This identified some commonality with government officials, most of who were graduates. This served as an important entry point for the research interaction. My gender was however a hindrance

in the interaction process as it limited the spaces within which the interaction could take place with government officials, most of who were male. I was culturally confined to formal interaction in the government offices, as non formal interaction in social places would have been frowned upon. This meant that my research only got the formal perspective of the government officials, and never attained the rapport necessary for participant observation[8].

Gender was important in defining the spaces that research participants allowed me to share with them in their homes. Some women participants welcomed me to join them in their kitchens. Men do not usually enter the kitchen and women therefore felt more comfortable holding discussions on sensitive issues there. In group meetings involving just women, I felt like an insider. The women and I shared our knowledge and experiences of rural life in different parts of Kenya and what that meant for the demands on the labor of women. We shared experiences on the struggles of women and men to put food on the table. Some of the older women referred to themselves as my 'aunts' and went on to give me advice on how and when to negotiate for property and labor rights within a marriage. My gender therefore enabled me to get close to the women's experiences beyond what I had expected.

My position as a researcher allowed me into certain domestic spaces that would usually be out of bounds for a woman. On many occasions I sat with groups of men outside their animal sheds, or in their living rooms, and actively or passively participated in discussions on forces surrounding changing gender roles and land use. Several times I

[8] Government officials are forbidden to criticize government policies. I was therefore unable to obtain information on their personal perspectives on agricultural policies.

was referred to as *Mzungu* (meaning a person of European descent) in these situations. This marked me as an outsider, a stranger who was not bound by local cultural norms that define gendered spaces. Although this gave me access to men's spaces, it also played up my outsider status and therefore may have limited the depth of qualitative information that I was able to get from the men.

Although ethnicity was important, it was not my ethnicity rather the ethnicity of my field research assistants that may have introduced bias in the research process. Ethnicity intersected with land ownership conflicts to play an important part in the interaction between my Maasai research assistants and some Kikuyu participants of the household survey. Ethnic dynamics during my research process can only be understood if their particular historical context is taken into consideration.

Ethnic boundaries and ethnic identities were fluid in the study area in pre-colonial times (Spencer, 1993). They became reconstructed, at the national level, by the colonial administration and later by the independent Kenya government, to help create and maintain certain power structures in both administrations. Land in the highlands of the study area was adjudicated and subdivided among local Maasai people in the mid to late 1960s. Soon after the title deeds were issued, the Maasai sold their land to Kikuyu buyers on a willing buyer willing seller basis. Unknown to the Maasai, some Kikuyu buyers obtained larger tracts of land than they paid for. One Kikuyu man admitted to me that his family had paid for ten acres from a Maasai seller, but obtained fifteen acres. This happened because many Maasai sellers were unable to comprehend the meaning of area units used in the title deeds. Maasai at the time calculated wealth by livestock units and not land area. The Kikuyu on the other hand understood area units and took

advantage of the sellers' lack of area understanding. From about the late 1990s, a few educated sons of the original Maasai land sellers have tried to obtain compensation from the present owners, for the land that they felt their fathers were cheated out of. This is the scenario in which my research assistants and I entered into in one of the villages that we worked in.

We encountered a few Kikuyu who were unwilling to take part in the survey because they were uncomfortable answering any questions asked by young educated Maasai research assistants. My Kikuyu ethnicity did not reassure them. From a village population of 55% Kikuyu household heads, we sampled 50% Kikuyu household heads. This under representation is most probably a direct consequence of their unwillingness to take part in the household interviews, which led to their continual replacement by people from other ethnic groups. The village where we encountered the problem is one among six villages surveyed in the rain-fed zone. When the entire rain-fed zone is taken into consideration, the proportion of Kikuyu farmers interviewed was found to be the same as the proportion of Kikuyu farmers in the sample population (32%).

Although the multiple positions of a researcher are described individually in the preceding paragraphs, they will usually act in combination to put the researcher in a constant state of 'betweenness' with respect to the research participants. The concept of betweenness has been used by a number of scientists (England, 1994; Katz, 1994; Kobayashi, 1994; Moss, 1995), and it implies that scientists are never complete 'outsiders' or 'insiders' when carrying out fieldwork (Nast, 1994). Harraway has coined the term 'mobile positioning' to refer to these multiple and constantly changing positions of the scientists (Haraway, 1991). She argues that each of these positions give a scientist

'the privilege of the partial perspective'. Only after a scientist combines these partial or 'situated perspectives' can 'strong objectivity' exist. The notion of situated perspectives is a challenge to "scientists to revalue the subjective, then stretch and combine it into something that can be verified and validated through a variety of methods" (Rocheleau 1995, p 459). These situated perspectives require the researcher to position themselves within the matrix of social relations in their research context. During a research process scientists should be aware of their multiple positionalities and the bias that these might introduce to the research process.

3.1.2 Representation

The second major methodological challenge was on representation. It was important that the data collected reflect the views and characteristics of the diverse population of the study area. This was especially important when key informants and focus group discussants were selected. However, it was not always the desire of this research to randomly select key informants and some of the focus group discussants. In certain instances, very particular information was required and it was more worthwhile to get the information from people that would have it. For example, government officials, particular elders, and long-term farmers who were interviewed as key informants were not randomly selected. I felt that representation was well achieved during the household survey where respondents were selected based on a stratified random sampling technique.

3.1.3 Selection of Methods

The third methodological challenge was on identifying research methods that would adequately answer the research questions. Over the past two decades, feminist scholars have argued about the best research methods to capture women and gender issues

(Harding, 1987; McLafferty, 1995; Moss, 1995; Peet, 1998; Stanley & Wise, 1993). Within feminist political ecology, scholars have turned towards triangulation, which is a deliberate combination of empiricism and critical theory (Rocheleau, 1995a). Triangulation involves the combination of qualitative, quantitative and visual research methods. Each of qualitative and quantitative methods are better suited to answer certain questions and less appropriate for others. Both methods inform each other and produce insights and understanding that cannot be achieved by either method alone. Visual research methods qualify quantitative and qualitative research. One way that qualification can occur is through participant observation of the object and participants of the research.

In this study, research questions concerning how land is used and how labor-time is allocated between different family members required an empirical approach to data collection and analysis. Research questions concerning why land use and labor-time allocation have changed required qualitative data collection and analysis. To understand the dynamics and linkages between the two processes required conceptualization that borrowed from critical theory. The study therefore chose to combine the complementarities of a household survey, focus group discussions, key informant interviews and participant observation to collect the qualitative and quantitative data necessary to answer the research questions. Table 3.1 below summarized the data collection methods required to answer the research questions raised in chapter 2.

Table 3.1

Research Questions and Data Collection Methods

Research Question	Data needs	Data sources (Methods)
Division level land use	Current maps of land use	Land use maps from secondary sources, field observation.
Land use change	Older land use maps Past vegetation of currently cropped area When conversion to cropping occurred Information on past land use	Land use maps from secondary sources, key informant interviews, focus group discussions, household interviews.
Cropping patterns	Data on types and acreage of crops grown	Household interviews, participant observation.
Change in cropping patterns	Data on change in type and acreage of crops grown Data on past cropping patterns	Household interviews, key informant interviews, focus group discussions, secondary sources
Livestock production patterns	Data on types of livestock kept and livestock production methods	Household interviews, field observation, focus group discussions

Change in livestock production	Data on change in livestock types kept, and change in livestock production methods	Household interviews, key informant interviews, focus group discussions
Forces driving land use change	Data on local, national and international forces driving land use change	Household interviews, key informant interviews, focus group discussions, secondary sources
Historical division of labor	Data on past labor organization	Key informant interviews, focus group discussions, secondary sources
Change in division of labor	Data on current labor organization	Key informant interviews, focus group discussions, household interviews
Variation in division of labor by gender	Data on current labor allocation by men Data on current labor allocation by women	Household interviews, key informant interviews, focus group discussions, participant observation
Variation in division of labor by agro-ecological zone	Data on current labor allocation patterns in different agro-ecological zones	Household interviews, key informant interviews, focus group discussions, participant observation

Forces driving change in division of labor	Data on household, local, national and international forces driving change in the division of labor	Household interviews, key informant interviews, focus group discussions, participant observation
Intra-household negotiation for labor	Data on how labor allocation patterns are negotiated	Participant observation, key informant interviews, focus group discussions

3.2 Data Needs and Sources

3.2.1 Land use and land cover data

In order to meet the objectives of this research, data were needed on land use and land cover change at the division level. This would provide the study with broad trends in land use and land cover conversions, which are the cumulated results of individual decisions made at the household level. Data were also needed on land use change at the household level. These data would be more specific than the division level data, and would involve current crop acreage. Collecting land use data at the household level was important because this is the level at which the study sought to understand labor-time allocation and land use linkages. Data were also needed on forces driving the land use and land cover changes observed at both the division and household levels.

Data on land use and land cover at the division level were obtained from secondary sources (Campbell, 2003; Campbell et al., 2003). Campbell et al. analyzed land use and land cover of Oloitokitok Division between 1973 and 2000 using Landsat MSS, Landsat

TM, SPOT and Landsat ETM+. For each year, Campbell et al. georeferenced the satellite images to the UTM Zone 37 South grid. They created false color composites, which they contrast-stretched and then visually interpreted. Resulting maps were in vector formats, drawn by heads-up digitizing of rain fed agriculture, irrigated agriculture, forest and rangeland. To minimize error introduced by using imaging platforms with different resolutions, Campbell et al. used a combination of spatial resampling during the interpretation process and visual reevaluation of boundaries in the completed interpretation. A more detailed description of their methodology can be found in Campbell et al.

Data on land use at the household level were obtained in a household survey. Data on both crop farming and livestock herding were collected. Data on crop farming that were collected included types of crops grown, their acreage, how the acreage had changed within the past five[9] years, and the reasons for the change in crop acreage. Data on livestock herding included the size and composition of the herd and how these had changed in the past ten[10] years, grazing patterns and how these had changed in the past ten years. Data on forces driving land use were obtained from focus group discussions, key informant interviews, and secondary sources.

3.2.2 Data on Gendered Division of Labor

Data were also needed on the different agricultural activities required for the crops grown and the livestock kept. In this study, I was interested in categorizing who did the different activities and how much labor-time went into each activity. I was also

[9] This allowed us to incorporate change encountered by relatively recent farmers
[10] This allowed us to collect data that showed a trend, and not merely the impact of recent drought

interested in the historical division of labor and forces that had contributed to bring about change in the division of labor.

There are important difficulties associated with the collection of gendered labor data in crop and livestock production. Researchers have found it challenging to measure the work of women, a task that usually leads to under enumeration that is related to the invisibility of women in the cash cropping, land owning and wage earning economy (Brydon & Chant, 1989; Safilios-Rothschild, 1994). Another challenge is in the seasonal nature of agricultural activities. This creates flexible and sporadic work patterns associated with changing crop and livestock demands. Men and women tend to be employed in agriculture only on a temporary basis. In this study, I needed to develop a method that would include both subsistence and commercial agricultural labor, enumerate unpaid labor, including the labor of children, and capture the seasonal dynamics of labor allocation. I also needed a method that would collect data on the labor of women directly from the women and not from the male heads of the households who may have cultural reasons to discount the value of women's work.

I collected data on agricultural labor using a household survey. In each household, the husband and the wife were interviewed on their labor contributions to agriculture. In order to capture subsistence and commercial labor as well as unpaid labor, I collected labor-time data for each individual. This was the amount of time spent on a particular activity for a particular crop type or animal found on the farm. Data on other people from within or outside the household who contributed to the agricultural production in the household were also collected. These included data on labor networks, hired labor,

children and other relatives. In each case, data on their gender and relation to the household head were collected.

It has been argued that the best way to capture seasonal labor dynamics would be to plan repeated visits to household survey participants in order to record what people did during the different seasons (Colfer, 1994; Wollenberg, 1994). Repeated contacts allow the researcher to build a rapport with the respondents and refine the interviewing strategies. Repeated interviewing is particularly useful when the amount of data being collected is small, and likely to take just a few minutes of the respondents time. I found this method problematic for two reasons. First, the time and money available for the study would not cover a complete calendar year, meaning that certain activities would be missed if we used this method. Secondly, I collected data other than labor as part of a larger project focusing on the East Africa region (the LUCID project). It was most appropriate therefore to administer the survey tool when respondents were likely to be least busy with farm related activities. I chose the dry season for data collection and relied on respondent recall for labor-time allocation data. In order to improve the recall of the respondents, I used the decomposition method (Jobe & Mingay, 1989). In this method, Jobe and Mingay recommend that an interviewer ask about the most recent event, in order to avoid receiving answers that represent the typical rather than the actual. Using this method, I asked questions about the most recent growing season and used probe questions to help respondents recall as was necessary.

In order to understand the dynamics of the division of labor, respondents were asked about the changes they had experienced in time allocation, when those changes occurred and the reason they attributed to the changes. Data on the historical division of labor and

forces that drove the evolution of the division of labor to current conditions were collected from key informants, focus group discussants and secondary sources. Data on how labor allocation was negotiated in the context of changing land use patterns was obtained through participant observation and key informant interviews.

3.3 Data Collection Methods

3.3.1 Household Survey

The household survey involved the face-to-face administration of a structured questionnaire. Face-to-face interviews had several advantages in the context of the study area. Many respondents were expected to be illiterate and would be unable to provide information except through verbal communication. Face-to-face interviews also gave respondents an opportunity to ask questions about the research so that they would feel comfortable about sharing information on their livelihoods. When respondents did not answer a question fully, the interviewer had the opportunity to probe the respondent, or reword the question to make sure that it was understood. Face-to-face interviews also had certain costs to them. They were very intrusive as they required visiting people in their personal spaces and asking them personal questions, primarily for the benefit of the academy. Household interviews were also very costly in terms of time and money. Each interview took about an hour and a half to administer. This did not include the time used for polite talk as was culturally expected in the study area. There was also a lot of time used trying to locate respondents that had been selected for the survey. Many times this involved repeated visits to a respondent's home.

3.3.1.1 Sampling design.

The household interviews involved the administration of a structured questionnaire in 351 households selected based on a stratified random sample design. Stratification was based on agro-ecological zonation. The stratified random sample design is based on the principles of probability theory, meaning that the sample is representative of the larger population and statistically reliable inferences can therefore be made.

The population from which the sample would be drawn was all crop farmers in the study area. This included farmers who cultivated crops but did not keep livestock and farmers who cultivated crops and kept livestock (farmer-herders). A list of the study population did not exist and I therefore had to go through the time consuming process of constructing a sampling frame. The sampling frame was constructed by physically visiting all the households in the study area and compiling a list of all of them. In this exercise, I enlisted the use of local guides in all the villages that these data were collected. I noted the location of a group of households using a GPS (Geographic Positioning System). This would make it easier to later find the households selected for the survey. Five households (0.3% of the total number of households) did not want to be included in the survey and they were not included in the sampling frame. The study therefore had a target population that differed slightly from the sampled population, introducing a sampling bias in the research. The sampling bias came about because our target population represented 99.7% of the population, instead of the ideal 100%. Table 3.2 shows the sampled population in each agro-ecological zone of the study area.

Table 3.2

Total number of farming households in the sampled population

Agro-ecological Zone	Sampled Population (no of households)	Number of Households included in the survey
Rain-fed Zone	458	173
Mixed Zone	242	85
Irrigated Zone	639	94
Total	1339	352

Determining the sample size that a researcher needs to take is a complex process involving many issues. Bernard (1995) recommends the use of Krejcie and Morgan's formula (after Krejcie and Morgan 1970, quoted in Bernard 1995):

$$Sample\ Size = \frac{\chi^2 NP(1-P)}{C^2(N-1) + \chi^2 P(1-P)} \qquad 1.$$

where χ^2 is the chi-square value for 1 degree of freedom at some desired probability level; N is the population size; P is the population parameter of a variable (usually set to 0.5); and C is the confidence interval chosen .

Using this formula, the recommended sample size in the study area at 90% confidence level was 171 in the rain-fed zone, 128 in the mixed zone and 191 in the irrigated zone. Unfortunately the time and money available for the research did not allow for such a large sample to be taken. In such situations, Bernard recommends focusing on making the sample representative of the study population (Bernard, 1995). The sample size selected in each agro-ecological zone was the largest that I could interview given the time and financial resources at my disposal. The sample size in the rain-fed zone was as

recommended. Using the Krejcie and Morgan's formula and recommendations in Burt and Barber (1996), I calculated what the lower than recommended sample sizes in the mixed and irrigated zone would mean for my study. A sample size of 85 in the mixed zone gave a 7.2% confidence interval at 90% confidence level. This means that if I conducted the same survey 100 times, 90 out of 100 administrations should yield results within ±7.2% of the current number. A sample size of 94 in the irrigated zone gave a 7.9% confidence interval at 90% confidence level. This means that if I conducted the same survey 100 times, 90 out of 100 administrations should yield results within ±7.9% of the current number.

During the sampling design process, I was initially interested in collecting data in four agro-ecological zones, the upper rain-fed zone (86 households), the lower rain-fed zone (87 households), the mixed zone (85 households) and the irrigated zone (94 households). Field experience and preliminary data analysis revealed both rain-fed zones to be very similar and I therefore decided to collapse them into one rain-fed zone. This explains why the rain-fed zone has a relatively large number of households included in the survey.

The sample design selected for this study was the stratified random sample. A stratified random sample is obtained by forming classes, or strata, in the population and then selecting a simple random sample from each (Burt & Barber, 1996). Stratification was based on agro-ecological zonation. It was necessary to stratify in order to decrease the probability of obtaining an unrepresentative sample. Stratification reduced sampling error by defining homogeneous strata based on agro-ecological zonation. Each member of the sampled population appeared in one and only one strata. In each strata, each

household was assigned a number. I made sure that each household in the sampled population had an equal chance of being included in the survey by using a random number generator to select the households to be surveyed. To replace households whose members declined to be included in the survey, I excluded the selected households from the sample population and ran a second stratified random sample design on the remaining households. This avoided the biases introduced by conveniently replacing respondents by their next door neighbors. Smith found that conveniently replacing respondents homogenizes the sample making it less representative of the variations in the population under study (Smith, 1989).

The objective of the study was to do a gendered comparison; I therefore interviewed the husband and one wife in each household. In cases where a man had multiple wives, the woman that was resident in the household selected for the study was interviewed. I also carried out interviews with widows where the sampling design picked them. Table 3.3 summarizes the number of people interviewed in each agro-ecological zone.

Table 3.3

Number of respondents in the household survey in each agro-ecological zone

Agro-ecological Zone	Husbands	Wives	Widows	Total
Rain-fed Zone	136	138	34	308
Mixed Zone	72	71	13	156
Irrigated Zone	81	83	11	175
Total	289	292	58	639

3.3.1.2 Training field research assistants.

The study relied heavily on field research assistants during the household survey. This was necessitated by my language and time constraints. Although many people in the study area could understand Kiswahili, which I am fluent in, they preferred to communicate in their local Maasai language, which I was not fluent in. This necessitated the hiring of Maasai speaking field research assistants to administer the questionnaires. In this study, I needed to interview a large number of people within the period allocated for the field research. This could only be realized using several field research assistants. I hired six assistants to administer the questionnaire. They were selected based on education (high school education was a requirement), knowledge of local languages (Kiswahili and Maasai) and culture, and experience as field research assistants. I tried to have gender balance, but ended up with four men and two women based on their competence as field research assistants. The field assistants were well respected members of their communities, and this helped in the overall acceptance of the study and of me in these communities.

Using multiple interviewers has one important disadvantage. They increase problems associated with interviewer bias in the research process. I spent two weeks carefully training the field research assistants so as to minimize the bias they introduced to the interview process. The first part of the training involved general issues that would create and enhance good relations between all the people involved in the research process. The second part involved a detailed discussion of each research question to make sure that everybody understood what information was required. I used the translation and back translation technique recommended by Bernard (1995) to make sure that all the questions

were understood. The field assistants were divided into two groups and one grou asked to translate the questions into Maasai. The other group was asked to transla questionnaires back into English. I cross checked the meaning of the result with t original questionnaire. The group went through the process several times until I v satisfied that the content of the questionnaire had been fully understood by everyo that an accurate copy of the questionnaire had been produced in the Maasai langua The Maasai language questionnaire was used when the interviews were held in M minimize translation errors and biases. The third part of the training involved gett assistants to work as a team. This required them to learn how to use the same prol clarifications when this was necessary. The fourth and last part of the training inv checking and enhancing their interaction with respondents. This was achieved thr role playing exercises among the field research assistants. The exercise prepared t inexperienced field research assistants for the reality of the field and exposed them issues they would not have anticipated, making them better prepared for the interv process. The field assistants were closely monitored throughout the data collectio exercise and their questionnaires checked daily to ensure that high data quality wa maintained throughout the research process.

3.3.1.3 Pretesting the questionnaire.

Although I had done sufficient ethnography of the study area in order to write culturally relevant questions, it was still necessary to pretest the questionnaire. Pr helps a researcher identify important issues they may have overlooked, such as po wording. As is recommended by Bernard (1995), I pretested the questionnaire in the households that the study would be conducted in. The survey team therefore

conducted interviews in 35 households. None of these households would be involv the actual survey. All the field assistants were involved in the pretest, as this was a important training opportunity for them, especially those that did not have experien with field methods before. The questionnaire was pretested in all the agro-ecologic zones that would be used in the actual survey and interviewed the husband and his of the selected household. The survey team visited respondents in their homes, just they would in the actual survey. After the pretest was complete, the survey team ca together and discussed ways to improve the survey exercise. The final questionnair used in the survey are attached as appendices 1 and 2.

3.3.2 Key Informant Interviews

Key informant interviews were continuously held during the length of the study. interviews were concentrated at the beginning of the research, as they helped me to design an efficient survey tool and focus group discussions. This approach has been before by Tremblay in 1957 (reported in Bernard 1995). The success of key inform interviews depends on the quality of the informants. Good informants understand w information the researcher is looking for, and they are able to communicate the information to the researcher (Kumar, 1989). Key informants were selected primari based on their competence and knowledge of the subject matter. Gender, age, educa and ethnicity were a secondary consideration to ensure information obtained was representative of the community. Key informants included local teachers, chiefs, gr ranch officials, agricultural extension workers, local elders (junior and senior elders) other inhabitants of the study area. The interviews were semi-structured, and the co varied depending on the field of expertise of the key informant. Key informants we

asked questions on gender roles, land use, property rights, how these had changed an why they had changed.

3.3.3 Focus Group Discussions

Focus group discussions have been recognized as an important data collection too especially where there are serious time constraints. They enable an outsider to quick understand the range of perspectives in a community (Slocum, Wichhart, Rocheleau, Thomas-Slayter, 1995), and at the same time give respondents an opportunity to learn from each other. Focus group discussions were led by a facilitator (myself) and each 10 to 15 people invited to attend as recommended by Slocum et al. (1995). Between and 10 people attended each focus group discussions.

To meet the objectives of the study, a total of 15 focus group discussions were he Five of these were held in the rain-fed zone (LH3/UM3 and UM4 agro-ecological zo 5 in the mixed rain-fed and irrigated zone (LH5/UM5) and 5 in the irrigated zone (LM Each of the 5 meetings held in each zone discussed a different topic: (1) a discussion gender division of labor by men only, (2) a discussion on gendered division of labor women only (3) a discussion on patterns and processes of land use and land cover in past seventy years by both men and women (4) a discussion on property rights and th impact on gender roles and land use by men only (5) a discussion on property rights a their impact on gender roles and land use by women. Single gender focus group discussions on gender division of labor and property rights were preferred as women the cultural context of the study area were uncomfortable divulging this information i the presence of men. This was not expected in the discussion on forces driving land change and we therefore held mixed gender meetings for those.

The people invited to attend the meetings were carefully selected so that ethnicity, age, level of education and gender (in the case of the discussion group on forces driving land use change) were well represented. Care was taken to select people based on their competence and knowledge of the issues under discussion. A decision on who to invite was arrived at after consultations with local extension officers, and other local residents, and it incorporated the researcher's own knowledge of the people of the study area since it was done towards the end of the study. I was not overly concerned about representation in the focus group discussions as this had already been achieved in the household survey. All the meetings were tape recorded and later transcribed and translated into English.

3.3.4 Participant Observation

Participant observation involves collecting information in the field through observation, natural conversations and unstructured interviews. Effective participant observation occurs when a researcher establishes rapport with members of a community so that they do not act differently when the researcher is present. This does not mean that the observer hides his or her identity as a researcher. Participant observation was used as an active method of data collection throughout the duration of the study. At the initial stages, participant observation helped the researcher understand important aspects of the study area that aided in the construction of the survey tool and in putting together an effective team of research assistants. In later stages of the field work, participant observation helped validate the information collected through other methods and added meaning to the data. Participant observation happened at bus stops, in people's homes on

their farms and in other public places. I was continuously collecting data using participant observation.

3.4 Methods of Data Analysis

3.4.1 Gender Division of Labor

Data collected during the household survey were entered into ACCESS and analyzed in SPSS and EXCEL packages. Hours spent on different crop and livestock activities per person per season were calculated. To capture gender differences, a comparison was made between the time spent on different activities by husbands and their wives. A matched pair two tailed t-test (90% confidence limit) was used to test for significance in the difference. Comparisons between Maasai and Non Maasai ethnic groups were made, to see how ethnicity plays out in defining gender roles. In this case I used an independent two tailed t-test to test for significance (90% confidence limit). The t-tests assumes that both sampling distributions of husbands and wives are normal, with a difference of 0 in their means. The independent t-test was preceded by the Levene's test for equality of variance. From the results of the Levene test, the independent t-test was run with the correct assumptions regarding the equality of variance. In all cases comparisons between different agro-ecological zones were made to capture variation along the ecological gradient[11]

3.4.2 Cropping Patterns

Cropping patterns were analyzed for the two major production systems: irrigated agriculture and rain-fed agriculture. For each production system, the area under each

crop was calculated. This provided the data necessary to quantify the current croppi patterns in the study area. To understand how these patterns had changed, the total number of households that reported a change for each crop was calculated. Also analyzed were the reasons that farmers gave for changing their crop patterns. The reasons given were contextualized at broader scales by integrating the information collected in focus group discussions with information from secondary sources.

3.5 Conclusion

The research questions explored in this study required data collection and analys multiple scales. Data on land use and land cover changes were required at division a household levels. Data on patterns of labor allocation in crop and livestock producti were best collected at individual level. Information on the processes of the observed patterns in land use, land cover and labor allocation required historical data. A comprehensive understanding of forces driving changes in land use, land cover and l allocation required investigation at household, community, regional, national and glo scales.

The use of pluralistic methods of data collection and analysis was instrumental in meeting the data and information needs in this study. The household survey provide quantitative data on land and labor patterns and processes, and enabled statistical comparisons to be made by gender, ethnicity and agro-ecological zone. The household survey however did not provide information on the location of the division with resp to the national center of power, or on intra-household gender relations of production

[11] It should be noted here that even though I analyzed my data based on gender, ethnicity and ecology understand that none of these factors act in isolation. The differences that I observe are as a result of combination of all three factors (among others) and their historical and geographical interactions.

survey also did not provide information on international forces that influence labor demands and land use change. Information on power relations and resource allocation at national level, and intra-household power relations and the control of labor was acquired from key informant interviews, group discussions, participant observation and analysis of secondary sources. Exploring gendered differences in labor patterns from quantitative data collected at individual level was also found to be very useful. This was more so in livestock production where people's perception of gendered division of labor expressed during group meetings differed from what was measured in the household survey.

Some images in this dissertation are presented in color. These are figures 4.4, 5.1, 5.2, 5.3 and 5.4.

Chapter 4: Oloitokitok in Context

This chapter sets the context within which the research questions will be e
As explained in chapter two, this research is strongly influenced by feminist p
ecology theoretical frameworks. The description of the study area will therefo
the ecology, history, political-economy and cultural organization of the people
study area. Discussions will focus on international, and national contexts with
local land-use and labor processes occur. Power relations will be explored at
First, between the local region and the national center of government, and seco
between men and women in the local communities.

4.1 Ecological Context

The study is located in Oloitokitok Division of Kajiado District, Kenya (F
The study area covers four group ranches, Mbirikani, Kuku, Kimana and Rom
4.2). Oloitokitok Division lies on the Mt. Kilimanjaro ecological gradient, an
seven agro-ecological zones, LH2, LH3, UM3, UM4, LM5, UM5 and LM6. A
ecological zones (in the tropics) are defined by moisture supply and are differ
soil types, in order to provide a framework for the ecological land use potentia
area. The letter part of the agro-ecological zone names represents "temperatu
defined by the temperature limits of the main crops in Kenya. The number is
zone" and it represents a combination of precipitation and evaporative deman
atmosphere, taking into consideration the length and intensity of arid periods
Schmidt, 1983). Table 4.1 summarizes the ecological land use potential of th
ecological zones of Oloitokitok Division. Table 4.2 summarizes the rainfall a
each agro-ecological zone.

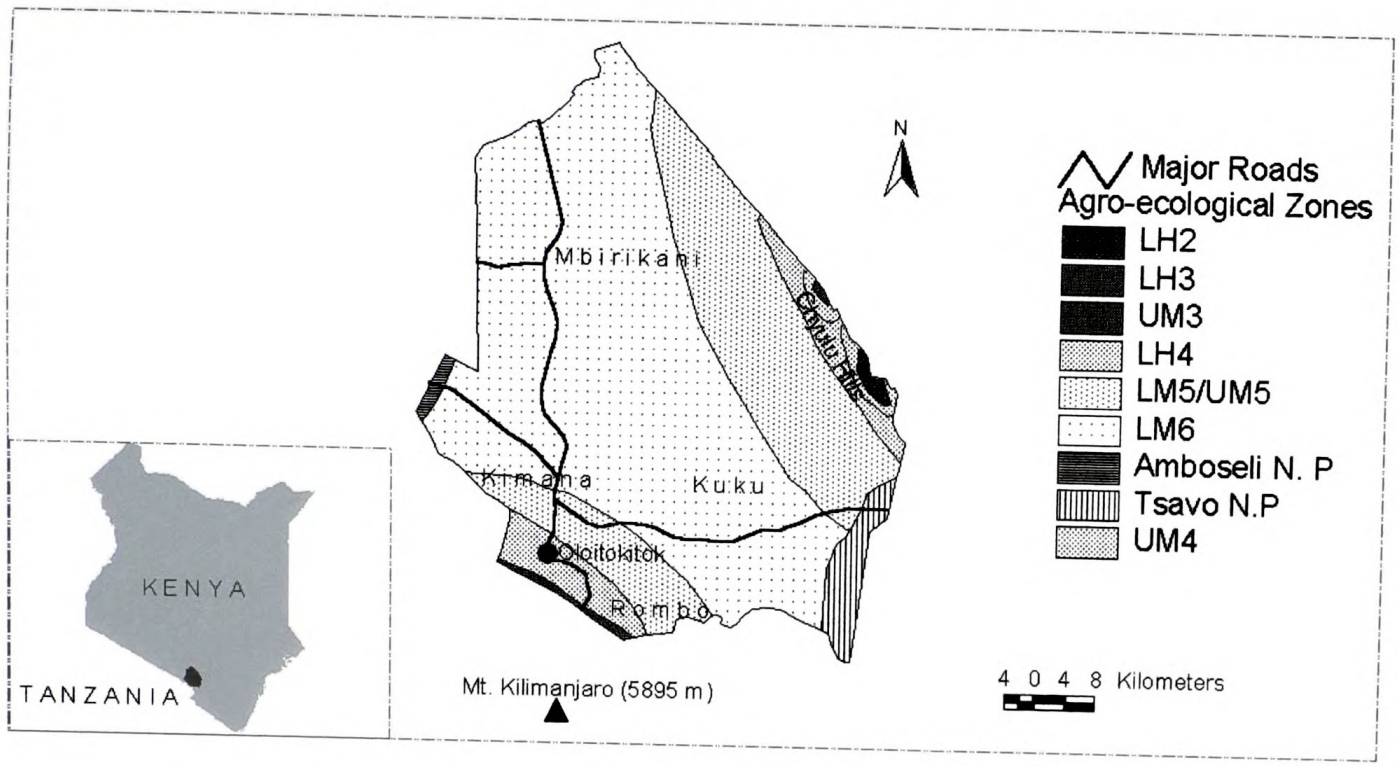

Figure 4.1 Map of Oloitokitok Division

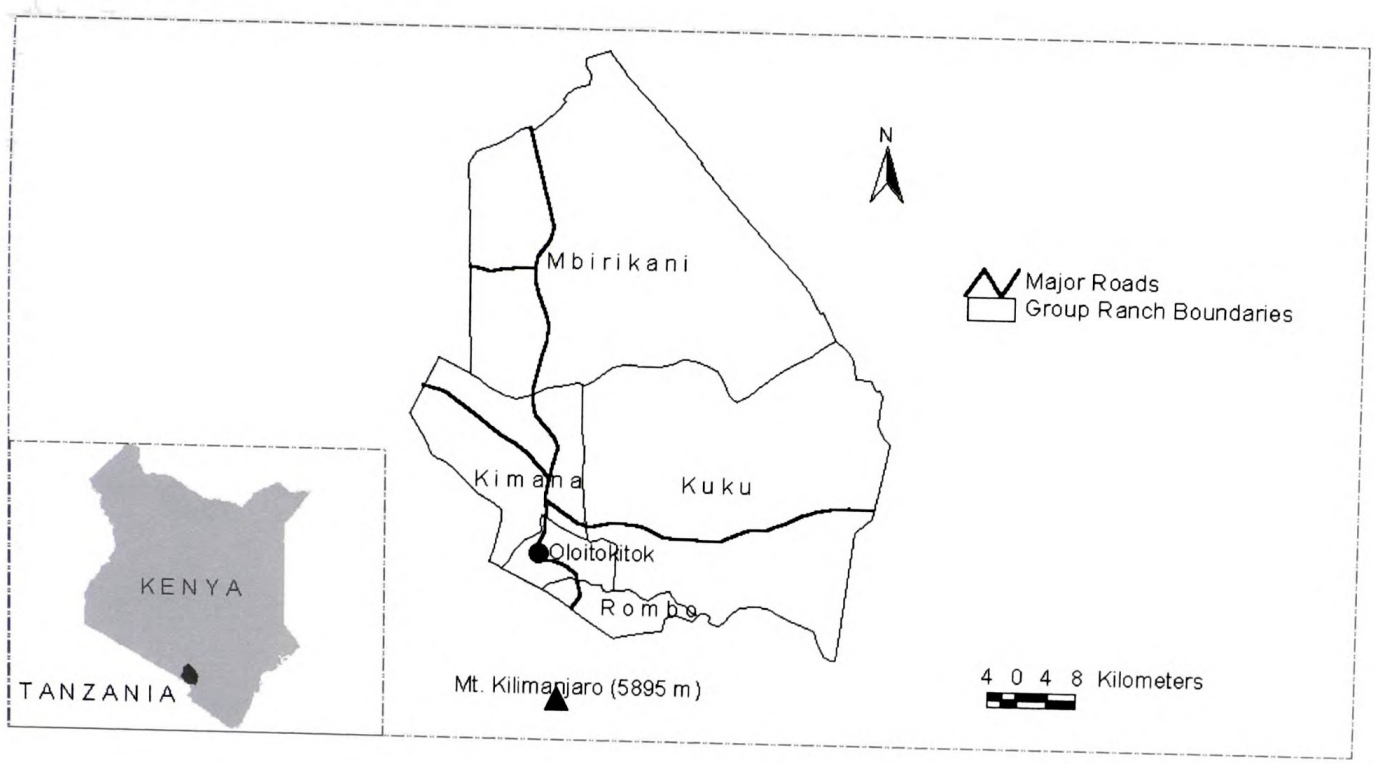

Figure 4.2 Group Ranches in Oloitokitok Division

Table 4.1

Characteristics of Agro-Ecological Zones in Oloitokitok Division

Agro-Ecological Zone	Rainfall/ Evaporation Ratio (%)[1]	Description[2]	Ecological Potential[2]	Actual Land-Use and land cover
LH2	65-80	Sub-humid lower highland zone. Annual mean temperature 15-18 C. Mean min temp 8-11 C	Wheat/maize, pyrethrum zone	Forest, maize, beans, stall-fed livestock
LH3	50-65	Semi-humid lower highland zone. Annual mean temp 15-18 C. Mean min temp 8-11 C	Wheat/maize, barley zone	
UM3	50-65	Semi-humid upper midland zone. Annual mean temp18-21 C. Mean min temp 11-14 C	Marginal coffee zone	

UM4	40-50	Transitional upper midland zone. Annual mean temp 18-21 C. Mean min temp 11-14 C	Sunflower/maize zone	Maize, beans, Stall- fed livestock
UM5	25-40	Semi-arid upper midland zone. Annual mean temp 18-21 C. Mean min temp 11-14 C	Livestock-sorghum zone	Maize, beans, horticulture
LM5	25-40	Semi-arid lower midland zone. Annual mean temp 21-24 C. Mean min temp > 14 C	Livestock-millet zone	stall-fed livestock, ranching
LM6	15-25	Arid lower midland zone. Annual mean temp 21-24 C. Mean min temp > 14 C	Ranching zone	Maize, horticulture, ranching

[1]Compiled from Sombroek et al. (1982)

[2]Compiled from Jaetzold & Schmidt (1983)

Table 4.2

Rainfall Distribution and Reliability

Agro-Ecological Zone	Average Annual Rainfall (mm)	60% Rainfall Reliability[1]	
		First Season	Second Sea
LH2	1000-1100	250-350	450-500
LH3, UM3	800-1000	200-300	320-450
UM4	650-900	160-200	250-380
UM5, LM5	400-720	140-180	130-260
LM6	300-450	100-150	100-150

[1]Amount surpassed in 6 out of 10 years

Source: Jaetzold and Schmidt (1983)

Rainfall amounts and distribution over time are important determinants of the ecological potential of an area. Figure 4.3 shows the spatial distribution of rainfall i study area. In Oloitokitok Division, rainfall follows a bimodal pattern, with 30% fa between March and May (the first rains), and 45% falling between October and December (the second rains) (SARDEP, 2001). Annual rainfall amounts are relativ low and highly variable (see Table 4.2), with the drier areas in the division (UM5, L and LM6) suffering from recurrent droughts[1] (Campbell, 1999; Jaetzold & Schmidt, 1983). The division has suffered nine major droughts since the early 1930s: 1933-3 1943-46, 1948-49, 1952-53, 1960-61, 1972-76, 1983-84, 1994-95, (Campbell, 1999 2000-2001.

[1] Below average rainfall amounts as perceived by local residents of Oloitokitok

In the tropics, moisture availability rather than temperature is the more important factor limiting crop growth (Jaetzold & Schmidt, 1983; Pratt & Gwynne, 1977). Not surprisingly, the actual land use pattern in Oloitokitok is very strongly defined by rainfall patterns. Most of LH2 falls under the jurisdiction of the forest department and is not available for crop farming. LH3, UM3, and UM4 have enough moisture available to support rain-fed farming. In periods of good rainfall, UM5 and LM5 also receive enough moisture to support rain-fed agriculture. UM5 and LM5 are also important for irrigated agriculture where springs or rivers are present. LM6 is too arid to support rain-fed farming. Crop farming in this zone is only possible through river or spring irrigation. The physical description of the study area will be done based on these broad actual land use patterns rather than by the potential land use zones defined by agro-ecological zones.

4.1.1 The Rain-Fed Zone

The physiography of this zone consists of the volcanic ridges and uplands of Mt. Kilimanjaro, with an altitude ranging from about 1400 to about 1950m. The zone receives an average annual rainfall of 700-1000mm (Jaetzold & Schmidt, 1983). The soils in this zone have developed on Tertiary basic igneous rock. They are predominantly nito-chromic and eutric cambisols. Figure 4.4 shows the soils in the study area. They are well drained, shallow to very deep and have moderate to high fertility (Sombroek, Braun, & van der Pouw, 1982). The ground water level is moderately deep to very deep (70-250m) (SARDEP, 2001). The area is also drained by several permanent rivers, and it is the source of the water flowing in the Nolturesh pipeline that serves other divisions in Kajiado District and parts of Machakos District.

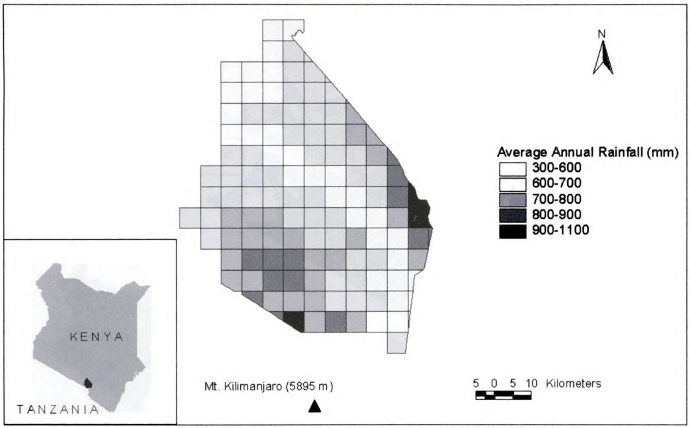

Figure 4.3 Rainfall Distribution in Oloitokitok Division

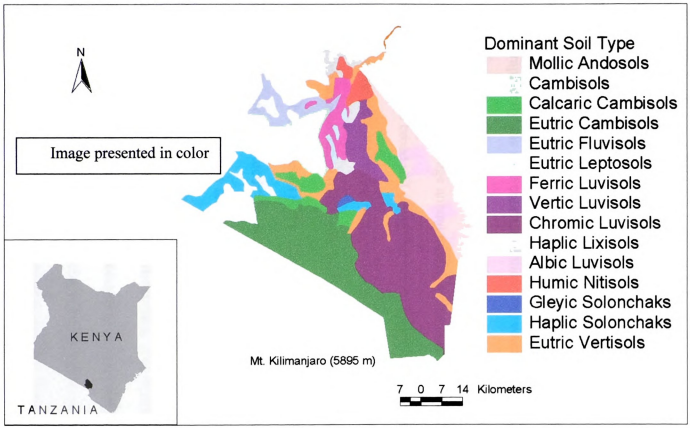

Figure 4.4 Soils of Oloitokitok Division

In broad terms, the vegetation of the study area is closely related to agro-ecological zonation. Human land use also contributes to define the vegetation associations observed in the study area. Apart from a small forested area at the Kenya-Tanzania border, the non-farmed areas of the rain-fed zone are covered by woodland with *Chloris roxburghiana, Themeda triandra* and *Commiphora africanus* vegetation associations (Republic of Kenya, 1990).

4.1.2 The Mixed Rain-Fed and Irrigated Zone (The Mixed Zone)

Physiographically this zone consists of the lower volcanic ridges and uplands of Mt. Kilimanjaro. The zone rises from about 970m to about 1700m above sea level. The mixed zone receives an average annual rainfall of between 400 and 720mm (Jaetzold & Schmidt, 1983). Two broad soil categories can be found in the mixed zone. On higher elevated areas the soils are similar to the soils found in the rain-fed zone. Lower elevations have an association of chromic luvisols and verto-luvic phaeozems, soils that have developed on basic igneous rocks. Luvisols are well drained, deep to very deep while phaeozems are imperfectly drained deep to very deep saline and sodic clays. Both soil types have moderate to low fertility (Sombroek et al., 1982). Surface streams originating in the rain-fed zone drain the mixed zone. In addition, the zone is served by several springs where ground water reaches the surface. The mixed zone is dominated by bushed grasslands, with wooded grasslands occurring in areas where ground water is available. The dominant vegetation association in this mosaic consists of *Pennisetum mazianun, Lintonia nuntans* and *Commihpora africanus* (Republic of Kenya, 1990).

4.1.3 The Irrigated Zone

Piedmont plains dominate the plains in this zone, with lacustrine plains close to Lake Amboseli. The altitude ranges from 910 to 1310m. The rainfall received in this zone is between 300 and 400mm per annum and not sufficient for rain-fed agriculture (Jaetzold & Schmidt, 1983). The major soil types in the mixed zone extend into the irrigated zone. In addition, there are orthic solonchaks and orthic solonetz soils that have developed on the lacustrine plains and gleyic solonchaks on the swamps. They are a complex of moderately well drained to very poorly drained soils. Their depth ranges from shallow to very deep. They are strongly calcareous, strongly saline and strongly sodic, and usually found in swampy areas. They have moderate to low fertility. The irrigated zone also has pellic vertisols of variable fertility on bottomlands. These are imperfectly drained, very deep, slightly to moderately saline, moderately sodic and in many places calcareous. On the piedmont plains are calcic cambisols that developed from tertiary or quaternary volcanic rocks. They have moderate to high fertility, are well drained, moderately deep to very deep with slightly saline and sodic deeper subsoil (Sombroek et al., 1982). Surface streams provide irrigation water in the zone. The irrigated zone has vegetation associations similar to those found in the mixed zone in areas where ground water is available. On the drier areas there are grassland vegetation communities. Important grassland species are *Digitaria macroblephara, Sporobolus fibriatus* and the invader species *Ipomea kituensis,* which can be found on degraded pasture (Republic of Kenya, 1990).

4.2 History

The study area has historically been inhabited by the Maasai ethnic group. Maa people have undergone a lot of change in the past 150 years. Before the arrival of t British, the Maasai inhabited a large area stretching from the north of Lake Turkana (currently Southern Ethiopia) to central Tanzania (Galaty, 1993a). Livestock playe important role in the life of the Maasai. Livestock provided food and a livelihood, i a source of power and prestige related to wealth. During the wet seasons, pasture a water resources were widely available and the Maasai livestock were dispersed on t valley floor. In the dry season, livestock congregated on the swamp margins and th watered highlands east of the rift valley where water and pasture were available. Th Maasai used force to maintain access to pasture and water resources (Waller, 1979). Compared to neighboring communities, the Maasai had a large, well organized milit the *murran*, armed with better weaponry and tactics for defense and attack (Sutton, 1993).

Huntingford (1953) estimates that by the 1870s, the Maasai were at the height of political and territorial powers. They numbered about 500,000 (Kjekshus, 1977). In 1880s and 1890s, a rinderpest outbreak that swept through most of East and Souther Africa (Lovemore, 1997) combined with contagious bovine pleuro-pneumonia and reduced Maasai livestock numbers by 80% (Huntingford, 1953). At about this time human cholera and smallpox reduced the numbers of the Maasai considerably. Thes diseases coincided with the period of European colonization of Africa and additiona Maasai died fighting British occupation of their territory. It is estimated that by the 1900s only about 40,000 Maasai survived (Kjekshus, 1977).

During colonial rule, the British alienated land for their farmland and settlement using a series of treaties (Britain, 1934; Low, 1965). In 1904 the British government created two native reserves in which they confined the Maasai. The Northern Reserve comprised of Laikipia and Samburu and the Southern Reserve stretched from the Ewaso Ngiro River to Mau Narok (roughly present day Kajiado and Narok Districts). By 1911, the Northern Reserve was taken for European farmland and most of its resident Africans were moved to the Southern Reserve (Cranworth, 1919). In 1912, an agreement was made that required the Maasai to stay within the reserve, an area of about 38,000 square kilometers (Lindsay, 1987). These confinements resulted in the loss of important grazing lands for the Maasai, land which had been particularly valuable in periods of extended drought. Confining the Maasai to reserves also cut them off from their trading partners (Campbell, 1981; Campbell, 1986; Campbell & Olson, 1991a).

In the early part of the twentieth century, the Maasai concentrated on rebuilding their herds, and by the early 1930s the Kajiado District Commissioner reported that the Maasai had more cattle than at any other time during colonial rule (Kenya, 1932). This report coincided with global environmental concerns that had their origin in the United States of America. The Maasai were accused of overgrazing and soil erosion, and policies were designed to encourage reduced herd sizes. To the Maasai however, the livestock were their livelihood, their measure of wealth, and their medium of exchange. In this context, It was rational for the Maasai to maximize their herds.

Before colonial rule, the Maasai had close associations with their neighbors, especially the Kikuyu, with whom they had trade associations (Thompson, 1887). Sometimes during periods of extreme drought when the Maasai lost much of their cattle,

they took up crop farming among the Kikuyu (Waller, 1993). Maasai and Kikuyu identity was fluid and could be changed through intermarriage or raids and return ra (Galaty, 1993b). The Maasai also interacted and traded with the Borana people of Northern Kenya for hardy breeding stock.

The official colonial policy was to exclude aliens from the Maasai Reserves and remove Kikuyu who were in the Reserve (Kenya, 1927). This was problematic bec some Kikuyu were already in the reserve when it was created and they were regarde assimilated Maasai or "adoptees" (Waller, 1993). They were a product of long term association between the Maasai and Kikuyu through intermarriages and trade. Som been recent migrants driven by land pressure in the Kikuyu Reserves and a demand labor and cultivating wives in the Maasai reserves (Waller, 1993). Some Maasai we beginning to establish semi-permanent homes and crop farming. They married Kiku women who knew how to cultivate crops. Some Kikuyu who came into the Maasai reserve at about the same time were however neither adoptees, nor were they seekin be assimilated (Kanogo, 1987). They obtained share-cropper, tenant, or squatter stat (Waller, 1993).

After independence, a combination of forces drove the transitions in Oloitokitok Division. The first was an increase in the population of the division. The populatio the division increased from 6,168 in 1948 to 95,430 in 1999 (Kenya, 1950; Republic Kenya, 1964, 1970, 1981, 1994, 2001a). This is a 1,447% change, three times highe than the national average of 446% during the same time period. Population increase were more a result of migrations into the division than natural increase. Forty seven cent of the respondents in my research are migrants who were born outside the divisi

Although most of the non Maasai living in the study area today are of Kikuyu origin, there are also people from the Kamba, Luo, Luhyia ethnic groups as well as people of Tanzanian origin. Table 4.3 below shows the trend in ethnic composition in Kajiado District between 1962 and 1989[13].

Table 4.3

Ethnic composition in Kajiado District between 1962 and 1989

Ethnic Group	1962		1969		1989	
	Number	% of total	Number	% of total	Number	% of total
Maasai	53,219	79	58,961	69	146,268	57
Kikuyu	6,233	9	16,258	19	61,446	24
Kamba	3,975	5	4,321	5	20,755	8
Luo	1,023	2	1,612	2	8,084	3
Luhyia	1,269	2	1,166	1	5,416	2
Others	1831	3	3,585	4	16,710	6
Total	67,550	100	85,903	100	258,679	100

Source: Republic of Kenya (1964, 1970, 1994).

The earlier migrations of non-Maasai continued and were accelerated by changes in land tenure. Land tenure was in the process of being transformed from communal to individual ownership. The trend was to subdivide the land into individual ranches and farms. The first individual ranch was allocated in Kajiado District in 1956 (Ayuko, 1981). In Oloitokitok Division, most Individual Ranches were allocated in the rain-fed

[13] The Government of Kenya has not yet released ethnic data from the 1999 Kenya Population Census.

zone in the later 1960s. The Maasai further subdivided and sold these ranches and farms on a willing seller willing buyer basis. The buyers were in most cases migrants from the Kikuyu community, who had heard of land availability from their kin who had settled in the division earlier. Sale of land resulted in a redistribution of dry season resources which increased the vulnerability of Maasai herders in periods of prolonged drought.

Because individual ranches could not support everyone, group ranches were established by an Act of Parliament (Group Representative Act of 1968) and group ranches were demarcated in the drier zones (the mixed zone and the irrigated zone). Kajiado District has a total of 27 group ranches. Fifteen of them were established in Livestock Development Phase 1 (1969 to 1974) and the rest in Livestock Development Phase 2 (1975 to 1981) (Olang, 1982). More recently, there has been a push, coming from the sons of those who had initially obtained membership of the group ranches to subdivide the ranches into individual units (Campbell, 1993). Some of the challenges that accompany the group ranch subdivision process in Kajiado District have been explained in detail (Ntiati, 2002; ole Simel, 1999).

Another important occurrence in Oloitokitok Division was the introduction of protected areas during British colonial rule. This was part of a rising environmental concern at the global level, that saw the establishment of national parks and game reserves in the United States of America and Africa by 1908 (Western & Wright, 1994). Global environmental concern combined with the rise of preservationism as a paradigm for conservation. This translated into the establishment of a Game Reserve in Southern Kenya, between Nairobi and the border with German East Africa (present day Tanzania) in 1899. The reserve was gazetted in 1906 (Lindsay, 1987). In 1933, the convention on

wildlife preservation in British colonies was signed, following which a number of National Parks were established. After the passing of the National Parks Ordinance in 1945, the large Southern Game Reserve was abolished in favor of three smaller National Reserves, one of which was the Amboseli National Reserve. This reserve covered an area of approximately 3260 km^2 surrounding the Amboseli basin (Lindsay, 1987), and further alienated dry season pasture for the Maasai.

After independence, a series of negotiations between the government, conservationists and resident pastoralists was set in place, culminating in the establishment of Amboseli National Park (488 km^2) which was gazetted in 1974 (Western, 1982). At the time, there were plans to provide Maasai pastoralists compensation and alternative watering options for their livestock. Today however, many of them feel disillusioned as many promises that came out of the lengthy negotiations did not benefit local communities. There are continuing conflicts between the local communities and wildlife over crop damage and transmission of disease from wild animals to domestic animals (Campbell et al., 2000; Western, 1982).

4.3 Political Economy

In this section, I will contextualize local opportunities and constraints within the broader political-economic processes of Kenya. This is critical in understanding the complexity of the issues that men and women of Oloitokitok have to deal with while defining their farming and herding labor and livelihood strategies. This section will begin with a short general review of Kenya's economy, and then go on to (1) describe the political location of Oloitokitok within Kenya, and explain how this has influenced resource allocation and access to global economic linkages within the division; (2)

describe the impact that structural adjustment policies have had on the livelihoods of the men and women of Oloitokitok Division.

Agriculture and tourism are the two most important foreign exchange earners in Kenya. Of the 1.6 million tourists who visited Kenya's parks and game reserves in 2000, 6% visited the Amboseli National Park, to the east of Oloitokitok Division (Republic of Kenya, 2001b). Local institutions benefit from contributions made by the Kenya Wildlife Service from the park fees paid by the tourists. Tea, horticultural produce and coffee form the three most important agricultural exports from Kenya. The irrigated zone of the study area is a source of onions, tomatoes, and Indian vegetables that are grown for sale in the domestic markets and for export to European countries. In Oloitokitok Division, agriculture and livestock are the two most important sources of income. However, farmers and herders experience decreasing returns on their labor investments in crop farming and livestock herding. There are many reasons for this, two of which stand out and will be explored at length here. These reasons relate to the weak political-economic position of Oloitokitok division within the state, and the negative impact of structural adjustment policies on Oloitokitok division.

Kenya's ethno regional balance of political power has led to an unequal distribution of resources among its diverse ethnic groupings. This has in turn played a significant role in the availability of political and economic structures that support rural development in many parts of the country, one of which is Oloitokitok Division. During colonial rule in Kenya, all ethnic groups faced challenges such as alienation from land, forced labor, and crop and livestock production and trade restrictions (Kenya, 1927; Verma, 2001). After independence, Kenyatta's government favored the Kikuyu people in certain areas of

Central Province in terms of political and economic resources. Pastoral communities, among them the Maasai were perceived by the government as too far from the center of power to deserve much attention. Therefore, Oloitokitok Division did not win much government investment in it's livestock or agricultural sectors. In the early 1980s, Moi's government increased the level of investment in his home province, the Rift Valley Province, in which Oloitokitok lies. The investments were directed towards Moi's Baringo home district, and little was allocated to Oloitokitok Division. The popular perception among Kenyans and development workers is that Moi's agricultural policies favor his own ethno region and close political allies, at the expense of other areas and people of Kenya.

Oloitokitok Division is one of the many disadvantaged areas in terms of access to state resources, financial and legal protection, finance capital, public positions, land, and education (Haugerud, 1995). As a consequence, the division has a poorly developed infrastructure which has reduced the benefits of crop and livestock production. For instance, there is one major road in the division running north-south and connecting to the Nairobi-Mombasa Road. None of the roads (main and feeder) are tarmaced and many become impassable during the rainy season. The roads fall into frequent disrepair making it more expensive and more time consuming to move goods and services to and from the division. This has limited the accessibility that farmers and herders have to crop and livestock markets outside the division. In 2001 as this study was going on, transport costs were so high that many farmers had to leave their agricultural produce to rot on their farms as transport costs exceeded the price of produce at the point of sale. The high transport costs has also contributed to the high cost of production inputs required in

farming and herding. Currently, the division is dominated by linear settlement patterns as residents build their homes in areas that take advantage of the few roads that there are.

A large fraction of farmers in Oloitokitok grow horticultural produce, which is one of the most important foreign exchange earners for Kenya (Republic of Kenya, 2001b, 2001c). Unfortunately the farmers have not benefited much from global economic linkages that would open up markets outside Kenya. In Kenya, only a small number of individuals who have access to Kenya's political machinery are involved in foreign trade. In a few cases, farmers in Oloitokitok enter in contract arrangements with middlemen who have access to markets in Europe. As has been observed elsewhere in Africa (Little & Watts, 1994), it is the middlemen who obtain most of the economic benefits in such arrangements.

The World Bank and International Monetary Fund (IMF) Structural Adjustment Policies (SAPs) have brought about drastic changes in the Kenya government and in many cases negatively affected the people of Kenya. SAPs were negotiated between the Bretton Woods Institutions and the Government of Kenya to enable Kenya to recover from an unfavorable balance of payment, so that Kenya can service its external debt. The unfavorable balance of payment had been brought about by the oil crisis of the 1970s combined with decreasing terms of trade for Kenya's primary commodity exports, inflation, droughts and declining exports (Bigsten & Ndung'u, 1992). The SAPs included decontrol of price structures, including food and agricultural input subsidies; introduction of user fees for public services such as health and education; and currency devaluation (Mackenzie, 1993a; Mackenzie, 1993b). The impact of SAPs has had important consequences for household survival in Kenya.

Devaluation of the Kenya currency lowered the purchasing power of individuals, especially with respect to imported products. Devaluation has increased the cost of agricultural inputs such as chemical fertilizers, seeds, livestock drugs and farm implements, and at the same time financial subsidies for the inputs have been eliminated. This has placed an increased burden of crop and livestock production on individual farmers. Their real incomes have been eroded, and they have to work longer hours to meet the needs of their families. Although SAPs advocate for increased credit to help farmers obtain agricultural inputs, this has not benefited the farmers of Oloitokitok Division. Access to credit is only achieved by farmers who own title deeds to their land. Of the 639 farmers who were interviewed in this study, only 23% had title deeds.

Shifting the cost of social services has added to the burden that parents have in meeting the health and education needs of their families. In the past, Kenya prided itself in having one of the most successful education systems in Africa (Gitobu & Kamau, 1994). The Kenya government heavily invested in education and had a goal to provide formal education to all by the year 2000. SAPs defined education investments as unsustainable and designed cost-sharing measures. The government provides salaries for the teachers, but parents have to pay for buildings, furniture, and all other school related expenses. This has increased the amount of school fees that parents pay. Nevertheless, parents place great value on education as they see it as the way to ensure a secure future for their children. Education is one of the most important expenses for households in Oloitokitok Division. Recently, the number of elementary (pre-primary and primary) schools has increased from 106 in 1997 to 153 in 2000 (SARDEP, 2001). The number of males and females from Kajiado District, under the age of 25 in school increased by 77%

between the 1989 and 1999 population censuses (Republic of Kenya, 1994, 2001a). Health costs are also jointly shared by the government and the general public. More and more, people are shifting away from herbal medicines to medicines available through formal health centers. Oloitokitok has 24 health provision centers, a number higher than the district average of 19 per division (SARDEP, 2001). Education and health expenses have further eroded the real incomes of the people in the division, and further put stress on their labor demands as they strive to find non traditional sources of income to meet their increased reliance on cash.

4.4 Gender and Culture

Gender roles are defined and negotiated within the context of a society's culture. Culture defines the accepted farming and herding activities for different members of a society, as well as accepted avenues and limits of the negotiation process. Scholars in Sub-Saharan Africa have demonstrated that struggles over labor and other resources are simultaneously struggles over cultural meanings, and that these struggles occur through cultural processes (Carney, 1988; Carney & Watts, 1990, 1991; Schroeder, 1999). Culture is therefore continually and actively created and recreated, and interpreted by women and men (Gupta & Ferguson, 1997).

Throughout this dissertation, I will look at specific aspects of culture and society that are important in the definition of gender roles and the organization of the labor process. In this section, I will discuss male and female social organizations and their implication for power relations between men and women. Two systems of social organization common in the study will be discussed. The age-set system, which is more widespread

among the Maasai, and the Patrilineal descent system which is common in all the ethnic groups in the study area.

The age-set system was more widespread in pre-colonial Africa and it was practiced by many ethnic communities on the continent. The system has however been more closely associated with the Maasai (who comprised 70% of the respondents[14]) than with other ethnic groups. Kipury (1989) attributes this to the persistence of the age-set system among the Maasai to the present time, despite colonial and post-colonial attempts to abolish it.

The age-set system puts men into groups (*olporror*) that are generated at circumcision. Circumcision ceremonies are held once every seven years at adolescence. It follows then that an age-set (*ilajijik*) is generated once every seven years. Members of an age-set go through progressive stages in their life cycle together. Progress from one stage to the next is marked by a rite of passage. At circumcision, boys become juniors (*ilmurran*). After about 7 years, member of the age-set celebrate the *eunoto* ritual and become junior elders (*ilpayiani*). About 15-20 years later, at a meat eating ceremony (*olgesher*), junior elders progress to become senior elders. Eventually senior elders retire into old age (*iltasati*). Although each ceremony of the rite of passage is organized at local level (e.g. at sub-location level), they are all nationally coordinated. Several researchers provide detailed descriptions of the Maasai age-set system (Jacobs, 1965; Spencer, 1988; Spencer, 1993; Talle, 1988/1994).

Girls are automatically transformed into adults at circumcision. Although women do not go through age-set progressions during their life cycle, they belong to an age-set through marriage. Women also participate in the age-set progression system at two

levels. First, women play a critical role during the men's rites of passage. Examples of women's roles in men's rituals include the shaving of a candidate's hair, and feeding a candidate certain foods. Kipury (1989) explores the symbolism behind these seemingly simple acts. Second, women are involved in parallel rituals close to the dates of the men's age-set progression rituals (Kipury, 1989). Parallel women's rituals include the women's blessing ritual that is performed close to the *eunoto*. Kipury argues that the women's blessing has the function of "uniting the male and female "principles" to complete the symbols of reproduction." (Kipuri 1989 p101). A second women's ritual is the *olkishoruto*, a hastily formed group of angry women who set out to discipline sex offenders. The women descend on the man (and sometimes woman) early in the morning before he leaves his house, beat him, slaughter his livestock and destroy his fence[15] (fence repair is a man's responsibility). Spencer (1988) calls this a 'ritual of rebellion' following Gluckman (1950) (quoted in Spencer 1988). Talle (1994) describes other less significant informal gatherings of women under a tree, and ritual delegations that plan large formal male meetings.

The patrilineal system of descent, common in all ethnic groups in Oloitokitok Division, recognizes levels of descent constructed through moieties, clans and sub-clans. The highest level of territorial unity is formed by sharing a common, distant and in most cases mythical descendant. It is at this level that natural resources were controlled. A family unit comprising of a man, his wife or wives and their unmarried children formed the smallest unit of production. Division of labor was organized along age-set and gender lines, while resource access was organized along the patrilineage.

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[14] Ethnicity data was not released after the 1999 population census.

Many scholars identify the male dominance of the age-set system and patrilineal systems of descent with female subordination and powerlessness (Folbre, 1986; Henn 1986; Legesse, 1973; Llewelyn-Davies, 1978; Spencer, 1988). In the study area, mal dominated ideologies can be seen in the activities that accompany changing gender ro This has been observed elsewhere in sub-Saharan Africa (Carney & Watts, 1991; Schroeder, 1999). For example, age-sets define culturally accepted social relations ar set limits on people's dietary, accommodation and sexual habits. The age-set system has implications on the division of labor in pastoral production, with the pre-circumci boys being herders, the *ilmurran* being warriors, and elders having more flexible role community and household levels.

However, within these male dominated systems of social organizations are cultura boundaries within which women can maneuver. Within these boundaries are rituals where roles are reversed and women dominate an event (for example and women's rit described earlier in this section). Although men publicly announce and legitimize ma decisions, there are instances when such decisions are first negotiated within the dom arena. This fact has also been observed by Talle (1988).

Women in Oloitokitok, regardless of their ethnic background, reproduce the ideol of male dominance and seemingly reinforce unequal power relations between themse and the men. They show respect and are silent while among elders in public. But wit the seemingly rigid rules of conduct, there exists room for negotiation. This is not un to the study area. Women in many parts of Africa have been found to have power an

[15] A broken fence needs to be repaired immediately to protect the livestock from wildlife attacks. The of repairing fences is usually done by men.

agency in their struggles to make room to maneuver within the seemingly unequal gender power relations (Schroeder, 1999; Verma, 2001).

Women in the study area are expected to give in to male authority to avoid punishment through physical violence, and being ostracized by their groups. In the public eye, women show deference to men, and by doing so create their space for maneuverability. Outright contestation and overt resistance would create intense scrutiny and social sanctioning. Through 'invisible' decisions, women are able to push boundaries and pursue their own interests while at the same time reproducing the structures of male dominance that exist in public. Women are therefore in some position to influence and control the labor allocation process.

4.5 Conclusion

This chapter has explored the complexities and diversities inherent in the study area. Settlement and land-use patterns are closely related to the area's ecology. Historical interactions between different communities in the study area have influenced the current ethnic composition. The national land reform process accelerated immigration into the division and the expansion of crop cultivation onto grazing areas. At the same time, the establishment of protected areas limited the wet season grazing lands for Maasai livestock. The distant location of the division within Kenya's political system led to minimum infrastructure investment. This created a development handicap that was further aggravated by the introduction of the SAPs. At the local level, Maasai pastoralists adjusted by diversifying their income by experimenting with crop-livestock interactions. A process that had implications for gender relations and gender roles within the household and for land use and land cover change.

Chapter 5: Land Use and Land Cover Change

Oloitokitok Division has experienced significant land use changes since Kenya's independence in 1963. These can be broadly classified as land use and land cover conversions and land use and land cover modifications. Conversions occur when land use and land cover changes from one type to another. Examples include changes from forest to cropland. Modifications are temporary changes in the structure of an extant cover (Lambin et al., 2001). Modifications occur when changes happen within the same broad land use and land cover category. Examples include changes from food crops to cash crops, both of which fall broadly within the cropland category. Conversions are better documented and easier to monitor at landscape levels, and they have been studied from remotely sensed imagery (Campbell, 2003; Campbell et al., 2003; Meyer & Turner, 1992). Land use and land cover modifications occur at finer scales and are more difficult to document, especially when the classification categories of land use and land cover are broad. For example forest thinning, intensification of cultivation, and overgrazing would not register as land use and land cover change if only conversion is considered.

This chapter will explore the patterns and processes of land use and land cover change in the study area. The chapter will address the research questions dealing with changes in land use, land cover, cropping patterns and choice of crops grown. The first part of the chapter utilizes the complementarities of household surveys and remote sensing to analyze the patterns of division level land use and land cover conversions. Remote sensing will provide data on the area of different land uses and land covers in 1973, 1984, 1994 and 2000. The household survey will provide data for periods not covered by the remotely sensed data. Land use and land cover modification patterns will

be explored based on key informant interviews and on survey data collected at the household level. The gendered nature of use and control of space will be investigated based on data collected at household level, and visits made to several irrigated plots. T last part of the chapter will explore the research question on land use change drivers. This will involve a discussion of forces acting at international, national and local level to influence the patterns of land use and land cover described.

5.1 Land Use and Land Cover Change Patterns at the Landscape Level

Farming initially started in the study area in the early 1930s (Kenya, 1932). The stratified random sample drawn for the study included farmers who have owned cropl in Oloitokitok Division since 1940. Data analyses from the household survey reveal t initial land acquisition for crop farming occurred almost exclusively from forests (Tab 5.1). Of the 25 ha of land acquired by farmers in our sample between 1940 and 1950, 98% came from the forest in the upper slopes, close to the Kenya-Tanzania border. T proportion reduced to 92% between 1951 and 1960, when farmers began to acquire la from the rangelands.[16] In the following decade, 1961-1970, farmers were buying land that had already been cleared for cultivation (13%), thus reducing the proportion farm acquired from previously unbroken forests and rangeland. The demand for land was however very high compared to previous decades, with the largest amount of forest (2 ha) being acquired during this decade. The total land that was acquired during this decade was also the highest by that time.

[16] There is a good chance that a bit of this 'rangeland' was actually forest – they are in the UM4 zone. the same, farmers called it 'rangeland'.

Table 5.1

Quantity of land acquired by farmers from different land uses and land covers between 1931 and 2000.

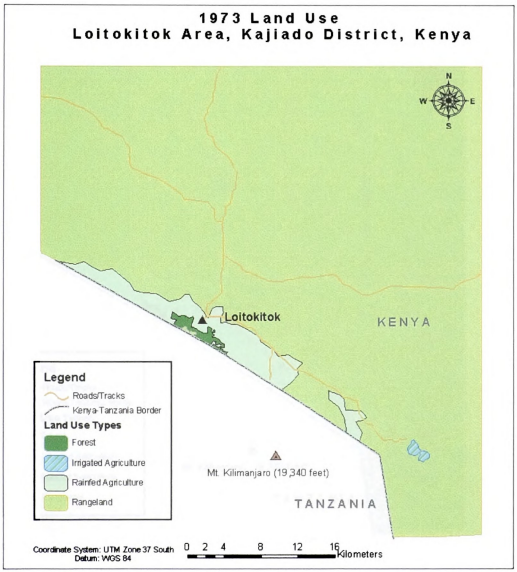
Time	Swamp		Forest		Rangeland		Cropland		Total	
Period	Ha	%	Ha	%	Ha	%	Ha	%	Ha	%
1931-1940	0	0	0	0	0	0	0.4	100	0.4	100
1941-1950	0	0	24.3	100	0	0	0	0	24.3	100
1951-1960	0	0	106.3	92	8.7	8	0	0	115.0	100
1961-1970	0	0	200.9	80	18.0	7	32.6	13	251.5	100
1971-1980	16.2	7	109.3	48	73.2	32	27.8	12	226.6	100
1981-1990	8.1	2	125.3	37	58.3	17	143.9	43	335.6	100
1991-2000	14.3	3	63.6	13	118.7	24	292.9	60	489.6	100

This rapid rate of land acquisition is a consequence of changing land tenure arrangements following Kenya's independence[17] in 1963. Post independence land reform triggered an influx of migrants from other regions of Kenya into Oloitokitok Division. Most of the migrants settled on the upper slopes, close to the Kenya-Tanzania border.

Farmers did not start acquiring swamps for cultivation until the 1970s. The period between 1971 and 1980 had markedly different patterns of land acquisition from previous years. Forests accounted for less than half of all land acquired by farmers. Significant focus had shifted towards the swamps (7%), and the rangelands (32%). This was as a result of a rapid expansion of irrigated agriculture. Between 1981 and 1990, forests ceased to be the most significant single category from which land was acquired. Farmers now acquired land that was already cleared for cropping. Of the 357 ha of land acquired by farmers during this period, 43% was already cropland. This pattern continued into the 1991-2000 decade, with 60% of newly acquired land coming from cropland (sharecroppers, renters).

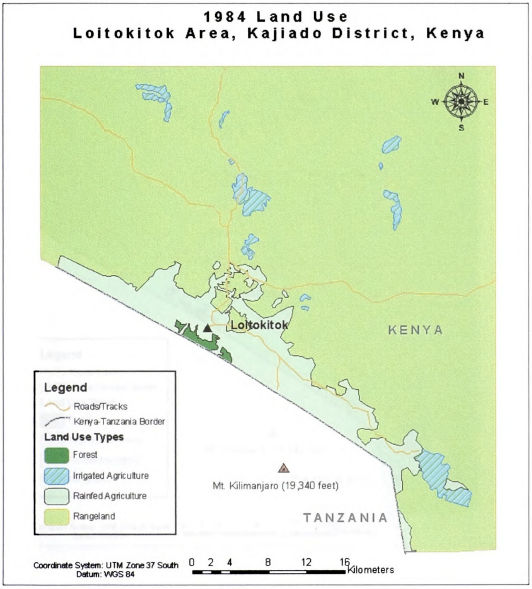
Campbell et al. (2003) provide a detailed analysis of land use patterns and processes between 1973 and 2000. Land use and land cover maps from their study are presented in figures 5.1, 5.2, 5.3 and 5.4. Table 5.2 summarizes their results.

[17] The process of land tenure change following Kenya's independence is discussed in more detail in section 5.3.2 of this chapter.



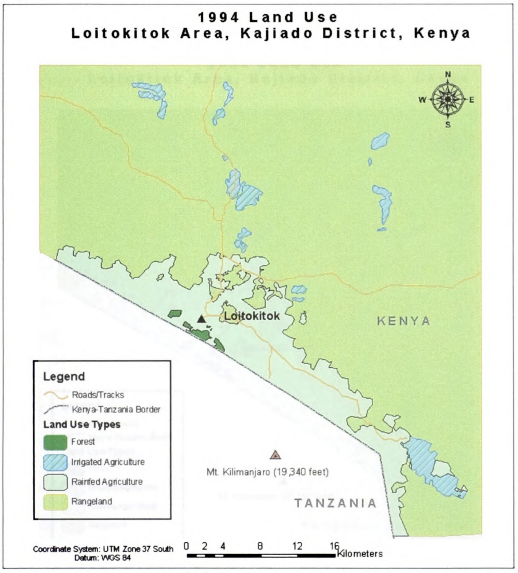
Note: Image presented in color

Figure 5.1 1973 Land Use and Cover Map (Source: Campbell et al., 2003)



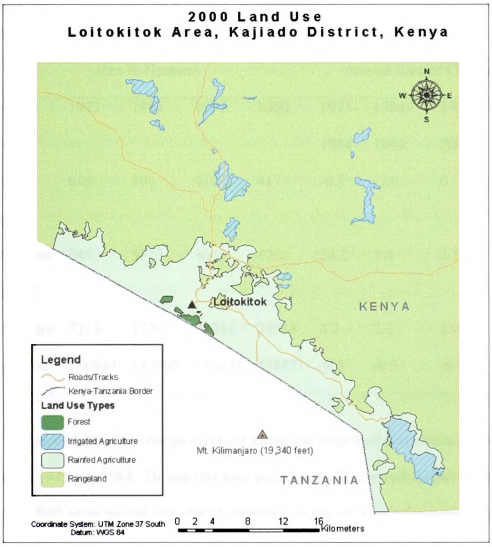
Note: Image presented in color

Figure 5.2 1984 Land Use and Cover Map (Source: Campbell et al., 2003)



Note: Image presented in color

Figure 5.3 1994 Land Use and Cover Map (Source: Campbell et al., 2003)



Note: Image presented in color

Figure 5.4 2000 Land Use and Cover Map (Source: Campbell et al., 2003)

Table 5.2

Land use and land cover change in Oloitokitok Division between 1973 and 2000 (modified from Campbell et al., 2003)

	Area in Hectares				Annual Rate of Change[18]			
Land use or cover	1973	1984	1994	2000	1973-1984	1984-1994	1994-2000	1973-2000
Forest	646	596	417	417	-0.7	-3.6	0	-1.6
Irrigated Agriculture	245	3513	4045	4768	24.2	1.4	2.7	11.0
Rain-fed Agriculture	7213	17762	22034	24911	8.2	2.2	2.0	4.6
Rangeland	160847	147095	142474	138871	-0.8	-0.3	-0.4	-0.5

The most significant change involved forest and rangeland conversion to cropland between 1973 and 1984. During this time period, rain-fed agriculture increased more than twofold, at an annual rate of 8.2% (Table 5.2). In 1973, rain-fed agriculture could only be seen on the upper slopes (LH2, LH3 and UM3) close to the border with Tanzania (Figure 5.1). By 1984, it had expanded down slope into areas that were previously rangeland (Figure 5.2). Campbell et al., (2003) note that the expansion pattern of rain-fed agriculture occurs in a roughly concentric pattern that they closely associate with rainfall distribution and proximity to the Oloitokitok-Emali main road. This is the main road connecting the study area to Nairobi and Mombasa, the two largest cities in the country.

[18] Annual rates of change are calculated based on Harper's relative growth rate formula (Harper, 1977)

The slopes have a rainfall-evaporation ratio of between 40% and 80% (Jaetzold & Schmidt, 1983), which is enough to support rain-fed agriculture.

The most rapid change between 1973 and 1984 occurred in the irrigated agriculture category. During this time period, the area under irrigated agriculture increased fourteen fold at an annual rate of 24.2%. In 1973, there was very little irrigation in the study area. Most of this was located south-east of Rombo town. During meetings with key informants, elders said that a few farmers had been practicing irrigation in the Kimana-Tikondo and Isinet areas in 1973. However, these small, dispersed farms could not be picked out from the Landsat MSS (Multispectral Scanner) imagery used by Campbell et al. (2003). At 80m, the spatial resolution of the MSS was too coarse to pick out small farms. By 1984, rangeland adjacent to rivers, springs and swamps in Isinet, Kimana-Tikondo, Namelok, Empiron and Inkisanjani had been converted to irrigated agriculture.

Between 1984 and 1994, expansion of both rain-fed and irrigated agriculture continued, but at much slower rates. The annual rate of rain-fed expansion was 2.2%, while that of irrigated agriculture was 1.4%. Rain-fed agriculture continued the down slope expansion onto the rangelands (see Figure 5.3). By 1994, rain-fed agriculture had expanded into the rangeland in LM5 and UM5 agro-ecological zones, where the rainfall-evaporation ratio is as low as 25%. In this zone, farmers only get a good harvest during years of good rainfall. Crops fail once in every three years (Campbell, 2003). Also notable was the expansion of rain-fed agriculture into the forest close to the Kenya-Tanzania border. Forests were replaced by rain-fed agriculture at an annual rate of 3.6%. Areas opened up for irrigation in the previous decade continued to expand on to the rangeland, but at much lower rates.

By 2000, most of the land that received enough rainfall to support agriculture had already been cleared for rain-fed farming (see Figure 5.4). Between 1994 and 2000, the annual rate of rangeland clearance for rain-fed farming was 2%. Conversion patterns changed from the down slope movement to an "infilling" of previously unconverted rangeland (Campbell et al., 2003). At 2.7%, the annual rate of expansion of irrigated agriculture was higher between 1994 and 2000, than it had been between 1984 and 1994.

5.2 Land use and land cover modifications within the major cover/use categories[19]

During the household interview, farmers reported how they had changed the area under different crops in the previous five years (between 1996 and 2001). These results are shown in Table 5.3 and discussed below.

Tomatoes and onions combined, dominate the irrigated landscape, especially on farms adjacent to the main Oloitokitok-Emali road. This is the only road through which produce from the area is taken to outside markets. Locating close to this road increases farmers' access to the means of transport for their produce. During the rains, transporters are unable to reach farms that are further away from the main Oloitokitok-Emali road due to poor road conditions. In wet weather, farmers cultivating further from the road are forced to take their produce closer to the road either on donkey carts or on their backs.

[19] This study is only interested in land use modification patterns of irrigated and rain-fed agriculture. Modification patterns of forests and rangelands are the focus of a team of ecologists working on a related project currently in progress. Their results were not available at the time of writing this dissertation.

Table 5.3

Cropping patterns in the rain-fed and irrigated areas between 1996 and 2001

	Rain-fed Agriculture				Irrigated Agriculture			
Main crop	Area (ha)	Total households	Households reporting increase	Households reporting decrease	Area (ha)	Total households	Households reporting increase	Households reporting decrease
Maize	390.8	224	42	45	54.2	94	26	22
	75.6%	63.6%	18.8%	20.1%	38.6%	26.7%	27.7%	23.4%
Beans	26.8	16	6	5	5.3	13	5	2
	5.2%	4.5%	37.5%	31.3%	3.7%	3.7%	38.5%	15.4%
Tomatoes	3.9	10	3	1	34.7	74	18	23
	0.8%	2.8%	30%	10.0%	24.7%	21.0%	24.3%	31.1%
Onions	1.6	7	2	0	31.4	74	16	26
	0.3%	2.0%	28.6%	0.0%	22.3%	21.0%	21.6%	35.1%

Fruits	62.0	29	5	1	6.0	8	3	0
	12.0%	8.2%	17.2%	3.4%	4.2%	2.3%	37.5%	0.0%
Cabbage	0.2	1	1	0	3.1	10	2	5
	0.0%	0.3%	100%	0.0%	2.2%	2.8%	20.0%	50.0%
Root crops	17.4	20	4	1	2.5	5	1	1
	3.4%	5.7%	20.0%	5.0%	1.8%	1.4%	20.0%	20.0%
Sukuma	0.6	3	1	0	2.1	10	4	2
wiki	0.1%	0.9%	33.3%	0.00%	1.5%	2.8%	40.0%	20.0%
Peas	0.3	4	2	0	0	0	0	0
	0.1%	1.1%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pepper	0.0	0	0	0	1.3	5	3	0
	0.0%	0.0%	0.0%	0.0%	0.9%	1.4%	60.0%	0.0%

This limits how far from the road farmers plant onions and tomatoes. Farmers said that these are the two most important cash crops in the area. Of the farmers that reported a change in the area under both onions and tomatoes, most said that the area had decreased (see Table 5.3). Other crops grown in the irrigated zone include maize, beans, fruits, *sukuma-wiki* and pepper. Of the farmers that reported a change in the area under these crops, most farmers reported an increase. Maize covers the largest amount of cropland in the irrigated zone(see Table 5.3). Maize is usually intercropped with beans, and 30% of all the farmers interviewed in the irrigated zone grow either one or both of these crops.

Maize intercropped with beans dominate the rain-fed zone. About 59% of the total cropped rain-fed area in our survey is under maize intercropped with beans. The maize crop had a different five year trend in the rain-fed zone. Of the farmers that reported a change, most said that they had decreased the area under maize (see Table 5.3). For all the other crops, most farmers that reported a change said that they were growing more of each crop in 2001 than in 1996.

5.3 Gendered Landscapes

The use and control of space was found to be highly gendered in both the rain-fed and irrigated areas. Space organization by gender on the farms was more obvious and more widely done on the irrigated areas than on the rain-fed areas. In the rain-fed areas, men in wealthier households with relatively larger pieces of land allocate a small part of the farm to their wives for their own use. The size of land allocated to women varies depending on the total amount of land that the family owns. The largest piece of land that I found allocated to women was 2 acres. Women decide what crops to grow on their portion of the farm and how to dispose of the harvest. Women plant a variety of root

crops (sweet potatoes, cassava, yams, arrow roots, and potatoes), peas (green peas, black peas, brown peas), nuts (macadamia, ground nuts) and a variety of soy beans. The harvest is consumed in the household with surpluses being sold by the women at the local weekly markets within the division. Women have complete control of the money they get from the sale of such produce. Most times they spend the money on school related expenses for their children.

In the irrigated areas, the farms are relatively smaller than they are in the rain-fed zone. Availability of irrigation water also places physical limits on the amount of land that a family can farm. The importance of cash crop farming for income generation places the use value of irrigated land at higher rates than the use value of rain-fed land. All these factors combine to define a gendered landscape that is very different from the gendered landscape in the rain-fed areas. The control and use of space by women therefore differs between the rain-fed and irrigated areas.

In the irrigated areas, men do not allocate women a portion of the family farm. Women instead use the raised earth mounds that separate irrigated basins for their crops (see Figure 5.5). The raised earth mounds receive the least amount of water during an irrigation episode, and crops grown on the mounds are the most likely to suffer from water stress on the farm. Crops grown on the mound include maize, beans and sukuma wiki. These are grown principally for household consumption and very rarely is the harvest sold.

Note: Image presented in color

Figure 5.5 Gendered landscapes in irrigated areas: Onions in the irrigation basins and beans on earth mounds.

Differences between the nature of gendered landscapes in the rain-fed and irrigated areas have important implications for their quantification. In the rain-fed zone, it is possible for farmers to estimate the total farm area allocated to women for their use. This is because each woman's plot lies on one part of the farm. In the irrigated areas, each woman's mounds are spread out all over the farm. It is more difficult for farmers to estimate their size, and consequently the area under women's control. This study relied on visits to individual irrigated plots to be able to estimate the mound area used for women's crops. The proportion of land allocated to women varied between one-eighth to one-sixteenth of the irrigated plots.

5.4 Land use and cover change and livestock production

The types of livestock kept and methods of grazing practiced have implications for land use and land cover change and vice versa. As cropping has expanded on the rain-fed highlands and the swampy lowlands, dry season grazing areas have been lost. This has necessitated a change in herding strategies that is reflected in the types of livestock kept and the grazing strategies adopted.

Table 5.4 shows the types of livestock kept in the study area and changes that have occurred in the past 10 years. The table shows a clear pattern of spatial differentiation in the breeds of cattle kept. The majority of the local breeds (Maasai, non-Maasai and local crossbreeds) are kept in the drier lowlands (mixed and irrigated zones) while exotic cattle and exotic crossbreeds are kept predominantly in the wetter highlands (rain-fed zone). There are large numbers of goats and sheep in all the zones, with numbers being slightly higher in the irrigated zone. Fifty-eight percent of the poultry is kept in the rain-fed zone.

Livestock numbers in the study area show a general falling trend between 1991 and 2001 in all the zones (see Table 5.5). More respondents reported a reduction in their herds than those that reported an increase. The only exceptions are increases in local non-Maasai cattle breeds in the rain-fed zone, exotic cattle breeds in both the rain-fed and mixed zones and poultry in both the rain-fed and irrigated zones.

Grazing strategies in the study area also changed significantly between 1991 and 2001[20] (see Figure 5.6). In 1991, grazing livestock close to the boma was the dominant grazing strategy in the wetter highlands, while migratory grazing strategies were preferred in the drier lowlands. In the rain-fed zone, zero-grazing was also becoming important, though not as important as grazing close to the boma. By 2001, zero-grazing had increased in all the zones, but most notably in the rain-fed zone. Eighty-one percent of all zero-grazing in the study area is practiced in the rain-fed zone. The importance of migratory grazing patterns have greatly reduced in the irrigated and mixed zones.

[20] Grazing strategies were evolving prior to 1991. This discussion focuses on the 1991-2001 time period as it is the period covered during the household survey.

Table 5.4

Livestock kept in each agro-ecological zone

Breed[21]	Rain-fed Zone				Mixed Zone				Irrigated Zone			
	Num-ber	Total house-holds	House-holds reporting increase	House-holds reporting decrease	Num-ber	Total house-holds	House-holds reporting increase	House-hold reporting decrease	Num-ber	Total house-holds	House-holds reporting increase	House-holds reporting decrease
Cattle[22]												
Local Maasai		60	33%	63%	787	70	21%	73%	1151	72	26%	69%
Local Non Maasai	91	9	56%	33%	16	3	33%	67%	274	14	43%	50%

[21] This analysis only distinguishes between livestock breeds as they affect grazing strategies and labor requirements

[22] A distinction is made between 'local crossbreed' and 'exotic crossbreed'. Local crossbreeds are all crossbreeds between Maasai and Non-Maasai local breeds. Exotic crossbreeds are all crossbreeds between local breeds and exotic breeds

Local												
Cross-												
breed	97	7	0%	86%	28	2	50%	50%	150	4	25%	75%
Exotic												
Cross-												
breed	43	13	31%	69%	105	2	0%	100%	13	2	50%	50%
Exotic	97	33	52%	42%	8	6	33%	17%	3	2	0%	100%
Goats	1175	91	39%	56%	1137	84	21%	62%	1325	81	23%	73%
Sheep	725	61	30%	64%	689	58	17%	72%	834	55	27%	69%
Poultry	1137	87	31%	28%	377	30	27%	30%	462	40	30%	18%
Donkeys	77	17	29%	53%	29	10	20%	40%	54	15	20%	53%
Pigs	5	3	0%	0%	0	0	0%	0%	0	0	0%	0%

Table 5.5

Forces driving land use and land cover change in Oloitokitok Division

	Environmental	Social-Cultural	Political	Economic
Global	Biodiversity conservation		Colonization	Structural adjustment policies Access to market
National/ Regional	National parks Drought Livestock disease	Changing meaning of land Land reform Land shortage in central Kenya	Water availability Loss of dry season grazing lands Limited livestock markets Distance from center of government	Price reform Privatization of crop marketing Privatization of input supplies Reduced government expenditure in public sectors Access to national markets Removal of restrictions on grain movement

Local	Water availability Wildlife conflict Rainfall amounts Changing soil properties	Changing meaning of livestock Population inmigration Land sales Information transfer between adjacent communities Sedentarization	Poor road conditions Limited livestock markets	Increased need for cash for health and education Local markets Wide availability of agricultural inputs

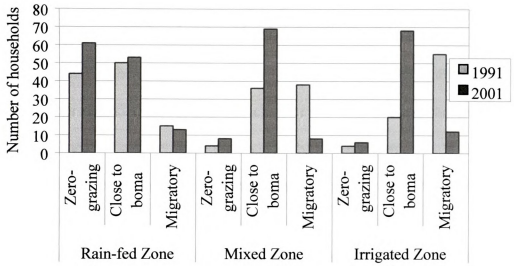


Figure 5.6 Changes in grazing methods in different agro-ecological zones

Residents have instead switched to grazing close to bomas, which is now the dominant grazing pattern in the drier lowlands. The strategy employed in migratory grazing techniques has also changed since 1991. In 1991, people who practiced migratory grazing moved the homestead and the livestock. As farmland has expanded and land available for dry season grazing has reduced, people have responded by establishing two homesteads, one in the highlands or swamps where crop farming is practiced (the crop boma), and another in the lowland areas that are too dry for crop farming (the livestock boma)[23]. The livestock spend the dry season in the wetter crop boma feeding on crop residue on the farms (mixed and rain-fed zones) or on swamp grass (irrigated zone). During the rainy season when pasture is widely available and the farms are put under

[23] This study did not cover the areas that were too dry for crop farming (where many of the livestock bomas are found)

crop, the livestock are moved back to the livestock boma. During periods of extended drought, livestock is also taken to the wetter Chyulu hills east of the study area

5.5 Land use and land cover change drivers

Forces that drive land use and cover change are many and varied. Table 5.5 is a list of driving forces identified during the research. The list is divided into the four major categories outlined in Campbell and Olson's (1991b) Kite framework.

Although these forces are listed independently of each other, it is important to recognize the importance of interactions between them. In this section, I will focus on four broad driving forces in the context of Oloitokitok Division: (1) Structural Adjustment Policies (SAPs), (2) National land reform, (3) Wildlife conflict and (4) Ecological changes. Within these broad categories, I will discuss the specific driving forces identified in table 5.5 and their interactions. These interactions occur at different scales and over time and space (Campbell & Olson, 1991b). For example soil fertility decline (discussed in section 5.4.4) is as a result of an intersection of SAPs and land reforms, while the reduction of irrigation water availability (discussed in sections 5.3.4 and 5.3.1) is a result of an intersection of ecological forces and national policies. Local land use decisions are influenced by forces originating internationally, nationally and locally. SAPs originate internationally but they affect land use decisions through national economic policies and local land use decisions. Land reforms can be linked back to colonial alienation of land and post independence tenurial arrangements. Some of the ecological forces discussed are part of global climate change whose local impacts is a function of different local contexts.

5.5.1 Structural Adjustment Policies (SAPs)

At the international level, the most significant forces influencing land use and land cover change decisions made in Oloitokitok Division are related to agriculture. The World Bank has had an interest in Kenya's agriculture since independence. In the 1960s and 1970s, aid to Kenya (and other developing countries) was tied to agricultural 'modernization' through the adoption of 'off-the-shelf' technologies made in, and for, developed countries (Gibbon, 1992; Winter-Nelson, 1995). In the 1960s, delivery of modernization technologies was focused on large scale producers, and it was usually accompanied by mechanization and where necessary irrigation. Focus shifted towards small scale producers and rural integrated development after McNamara's recommendation in Nairobi (McNamara, 1973). During both 'modernization' phases of the 1960s and 1970s, the World Bank emphasized the role of the state through agricultural marketing boards and crop development projects (Richardson, 1996; Winter-Nelson, 1995).

The 1980s saw a major shift in the approach used by the World Bank to develop agriculture in developing countries. This was in response to increasing deficits in the balance of payments of many developing countries that had set in, in the early 1970s. The oil crisis in 1973, frequent droughts in the 1970s and 1980s, falling coffee prices in the 1980s all contributed to the unfavorable balance of payment in the Kenyan context (Ikiara, Jama, & Amadi, 1993). The World Bank and International Monetary Fund (IMF) made the adoption of SAPs mandatory for Kenya, and other developing countries that wanted to continue receiving loans and aid.

SAPs differed from earlier World Bank approaches in that they were based on neo-classical economic theory (Gibbon, 1991; Ikiara et al., 1993; Mosley, Harrigan, & Toye, 1991; World Bank, 1981, 1989). The Berg Report (World Bank, 1981) recommended price reform and privatization of crop marketing and input supplies. Agricultural subsidies and price controls on inputs were essentially removed. Eight years after the Berg Report, the World Bank published a more elaborate definition of the role of the state in agriculture, stressing reduced participation in marketing and increased provision of infrastructure (World Bank, 1989). As discussed in chapter 4, the World Bank and IMF policies also recommended reduced government expenditure in public sectors outside agriculture. For instance, SAPs require governments to pass on health and education expenses to the general public in a cost-sharing exercise (Ikiara et al., 1993; Nzomo, 1992).

Three aspects of SAPs have had a direct consequence on land use and land cover change in Oloitokitok Division. These are market liberalization, elimination of agricultural input subsidies, and reduction of government spending in the public sector. These three interact with each other to influence the decisions that farmers make regarding what crops to grow and when to discontinue growing them. The three act at varying scales to influence farmer land use decisions. For example, market liberalization and lack of all weather roads affect farmers' ability to sell their produce at national and international markets, while reduced government spending in education and health creates a need for alternative sources of income for farmers at local levels. The impact that market liberalization, elimination of agricultural input subsidies, and reduction of

government spending in the public sector have on land use and land cover varies with time, promoting conversion at one time and modification at a later time.

One aspect of market liberalization that could have encouraged the expansion of horticultural growth nationally was import liberalization. Before SAPs were implemented, the government placed restrictions on the import of agricultural inputs (Fontaine, 1992). For example, there were only seven fertilizer importers, who therefore had the power to influence domestic supply (Lele, Christiansen, & Kadiresan, 1989). The alleviation of controls resulted in widespread availability of fertilizer and other agricultural inputs on which onions and tomato production depends. Shops specializing in agricultural inputs can be found in all the trading centers in the study area. Availability of inputs may have therefore contributed to the conversion of rangeland to irrigated agriculture.

Market liberalization has also had an impact on the production of maize. Maize is the most important food crop in Oloitokitok and also the crop with the largest acreage. Before SAPs, maize marketing, pricing and distribution was solely controlled by the National Cereal and Produce Board (NCPB). SAPs proposed to restructure the NCPB in two phases. The first phase entailed a removal of restrictions on inter-district movement of maize (and other cereals). The longer-term goal entailed relegating the role of the NCPB to buyer and seller of last resort. The full impact of the removal of the movement and price restriction on maize was felt in Oloitokitok from 1998 to 1999. Maize farmers in Oloitokitok had more avenues through which to dispose of their crop, and they sold their crop for the best price they could find. Farmers said that they were able to sell a 90 kg bag of maize for between Kshs 1530 and 1820 (between US$ 20 to 25) in 1998 and

1999. Most of these sales were made to truck buyers who drove to the division from Nairobi. The NCPB was offering farmers Kshs 450 (US$ 6) per 90kg bag of maize during this time. Not surprising, farmers preferred to sell their produce to the truck buyers. The good price encouraged an expansion of maize farming in the irrigated zone in 1999 to 2001. Unfortunately the NCPB, did not offer to buy maize in 2000 and 2001. As a consequence, farmers were exploited by the truck buyers who recognized that farmers had no choice but to sell their crop to them. At this time, a 90 kg bag of maize sold for as low as Kshs 300 (US$ 4). During group discussions, farmers expressed frustration at NCPB's decision not to buy maize from them, and said they would consider growing alternative crops that would yield higher returns to their labor.

> "At first we were happy when we found other people (other than NCPB) to buy our maize. But now NCPB has stopped buying our maize completely. We have no choice but to sell it to the lorry people, and the lorry people know that. They are offering very low prices for our maize. Very low. It is better when NCPB used to buy our maize because the lorries are offering prices much lower than NCPB offered. It is better to grow potatoes."

Elimination of agricultural input subsidies from the government have increased the production costs for farmers. High production costs, combined with poor road conditions in the division and consequent high transport costs to reduce the competitiveness of products grown in Oloitokitok in outside markets. Campbell (1999) found that Nairobi was an important market outlet for agricultural produce from Oloitokitok Division in 1996. Farmers said that by 1998, the importance of Nairobi as an outlet for their produce had greatly reduced and Mombasa became the key market outlet for Oloitokitok produce.

Farmers found that their produce did not compete well with produce from Western and Central Kenya in the Nairobi market due to the higher transport costs for Oloitokitok Division.

> "You know we do not take our tomatoes and onions to Nairobi because the price there is not very good. There is tomatoes and onions coming from Kikuyuni and other places and it is cheaper. We take ours to Mombasa... Transport to Mombasa is very expensive for us. We do not have our own vehicles and we have to hire vehicles to take our tomatoes and onions to Mombasa. The drivers charge a lot of money. A lot of money. Two hundred and fifty shillings per box. Even sometimes the transport is so much and the price so low that after the driver sells your tomatoes and onions in Mombasa, he comes back with the letter. The letter tells you that the price of your tomatoes and onions was not enough to cover the transport costs and that you owe him money... The transport is a lot because the road is so bad. After a year the car is kaput, and so they must charge us a lot of money."

Thirty-five per cent of the farmers that reported a reduction in onions and tomatoes attributed the change to a lack of profitability for both crops. Farmers said that input costs have increased while market prices have decreased.

> "The lowest we ever sold our tomatoes was Ksh 300 (US$ 4) per box. That did not happen often and it only happened when the supply was very high. We usually did not fall below Ksh 400 (US$ 5.3) per box. When prices were good, we sold one box at Ksh 2500 (US$ 33.3). During the el-nino (1998) one box of tomatoes was selling for Ksh 2800 (US$ 37.3). Nowadays we even sell one box for as low as Kshs 70 (US$ 0.9) to 100 (US$ 1.3). Onions used to sell for Ksh 800 (US$ 10.6) per net in

1999 and tomatoes for Ksh 2900 (US$ 38.6) per box. Now onions sell for Ksh 70 (US$ 0.9) to 150 (US$ 2) per net."

High production costs of onions and tomatoes and low sale prices led farmers in the irrigated areas to experiment with maize and pepper as cash crops. Both crops have low input requirements in comparison to onions and tomatoes. During group meetings, farmers said that maize is especially seen as an attractive alternative cash crop because it can be dried and stored for later sale or household consumption if market prices are too low.

Market liberalization created opportunities for the expansion of the horticultural industry in Kenya. By the early 1990s, horticulture had emerged as a major component of agricultural production in Kenya. It ranked third in land-use, occupying 11% of the arable land (Ikiara et al., 1993). The largest horticultural farms belong to large corporations owned by people close to the ruling elite. One such farm is reputed to be the largest rose farm in the world and it is located in Kajiado District. About 1990, the owners of the farm used their national political power and proximity to the State's machinery to divert a large amount of water from the Nolturesh River in Oloitokitok Division for use at the rose farm.

This diversion has created water shortages in the division. Areas downstream of the diversion point were particularly hard hit, leading to migrations within the division. A large number of farmers moved from Lang'ata, downstream of the diversion (and outside the study area) to the previously unoccupied Ilchalayi Swamp on the eastern side of the study area. Water shortages created by the diversion of the Nolturesh River have had an impact on the amount of land that people can irrigate. Twenty percent of the farmers

who had reduced the area under onions and tomatoes said they no longer had access to irrigation water to support their initial crop acreage.

Reduced government spending on health and education directly increased people's financial needs, necessitating a diversification of income earning options. Lack of school fees is one of the main reasons why children of school going age in the division are unable to attend school. Farmers struggle to educate their children as they see education as a gateway to a more comfortable life in future. Seventy one percent of the study's respondents cited education as one of their top three expenses. A resident of the rain-fed zone explained:

> "When I was young and in secondary school (about 1980), my school fees was about Ksh 800 (worth about US$ 50 in 1980) for the first term of form one. Now we pay Ksh 22,000 (US$ 293.3) for form one first term in the same government school... I would like my children to get a good education. Education does not rust. Education is unlike farming which is surrounded by uncertainty. Education has no rain failure. I would like my children to get a good education and move away from farming."

Many herders in Oloitokitok Division took up crop farming as an income diversifying strategy. To substitute their incomes further, the people of Oloitokitok sell their livestock when a sudden need for cash arises. They explained that most livestock is sold in December and January, when the largest sums of school fees are required. Fifty seven percent of the survey respondents mentioned the sale of livestock as an important explanation for their reducing livestock herds.

5.5.2 National Land Reform

The meaning and value accrued to land changed significantly in the twentieth century in Kenya. Kitching (1980) examines how different communities used land non-exclusively before colonialism. Land was neither a measure nor a store of wealth as it did not have exchange value. Land was relatively more abundant and people did not accumulate land they did not use. Land was therefore not exclusively owned, rather it was shared. This concept changed significantly during colonial rule. One characteristic of Britain's colonial occupation of Kenya was the excision of the best land for white settlers. Much of this land was found in central Kenya and the central parts of the present Rift Valley province. The settlers used land exclusively, and defined Africans who shared the land as 'tenants' or 'squatters'. It was during the colonial period that Kikuyu and Maasai communities (among others) lost most of their territory. Africans who had earlier used the land were either confined to native reserves, or allowed to remain on the now white owned farms in exchange for their labor.

The main objective of the land reform was to correct the imbalances of land ownership between the Africans and the white settlers. Land reform happened in two broad phases, pre-independence and post-independence. Pre-independence land reforms concentrated on the native reserves, while the post-independence plan concentrated on land initially held by white settlers as crown lands (Bruce & Migot-Adholla, 1994). In a bid to accelerate development in the native reserves, the Assistant Director of Agriculture, R.J.M. Swynnerton provided an economic policy report in 1954 that later came to be known as 'The Swynnerton Plan' (Kenya, 1954). The plan's main objective was to consolidate and register land held by Africans, starting in the Kikuyu Reserves. In

the context of colonial Kenya[24] (Bates, 1989; Kanogo, 1987; Sorrenson, 1967; Throup, 1988), the plan had an aim to create an African rural elite as a first defense against the native revolt against their British colonial masters. The plan's second objective was consequently a relaxation of restrictions on the production of export crops by Africans.

After independence, the new Kenyatta government embarked on a land reform program that involved redistribution of land formerly occupied by the white settlers. Post independence land reform was therefore more concerned with high potential land as this was the land that had been excised for white settlers. This focus on high potential land happened at the expense of rangeland development, and it translated into a deliberate focus on crop production at the expense of livestock production. In the 1960s and 1970s land of high agricultural potential was redistributed from extensive large scale farmers (white settlers) to intensive smallholders. Land redistribution was accompanied by further removal of restrictions on the production of high value crops by African farmers, and continued acquisition of private property rights by African farmers. By 1974, the land reform program which had involved about 2 million ha of land formerly owned by white settlers had been completed (Ikiara et al., 1993). This posed a serious constraint to agricultural production in central Kenya, by creating a shortage of medium to high potential land in the former white highlands. The shortage drove people from central Kenya to seek land for smallholder agricultural production elsewhere in the country.

Oloitokitok Division was part of the Maasai native reserve, and had historically not been part of the land excised for white settlers. Land reform in the division involved the transformation of communal tenure to individual tenure, with the creation of individual and group ranches. This process is explained in more detail in chapter 4, section 4.2.

[24] The revolt against the British colonial masters was in its initial stages

Individual ranches were located in the rain-fed zone, while group ranches were located in the drier rangeland. Maasai herders who were initially allocated individual ranches, subdivided them and put them up for sale.

At national level, the land reform process simultaneously created a demand for agricultural land in central Kenya, and a supply of agricultural land in Oloitokitok Division. This resulted in a migration of Kikuyu farmers into Oloitokitok Division to buy land for cultivation. Before the post independence land reform process, in 1962, the population of Kikuyu farmers in Kajiado District was 6,233 (9% of the total) (Republic of Kenya, 1964). By 1979, the number had risen to 33,630 (23% of the total) (Republic of Kenya, 1981). Although Kikuyu farmers had always existed in Oloitokitok Division, it was the large post independence influx following the land reform process that had a significant impact on land use.

Migrant Kikuyu farmers settled in the rain-fed zone and were responsible for the rapid expansion of farming in the rain-fed zone in the 1970s (Campbell, 1981). Subsequently, migrant farmers from other parts of the country have migrated into Oloitokitok Division as tenant farmers and contributed to agricultural expansion in both the rain-fed and irrigated zones. This trend was also observed by Campbell (2003) during his 1996 fieldwork. During this study (2001), 43% of farmers who reported an increase in crop area in the rain-fed zone, and 34% of farmers who reported an increase in the irrigated zone were new farmers who had not been farming in 1996. Maasai herders said that they have also learned farming from the migrant farmers and started doing it.

Both pre- and post-independence land reforms indicate contempt for customary land tenure. The official policy seeks to replace customary communal tenure with a system of private tenure similar to the "English freehold" (Okoth-Ogendo, 1999). During the reform process, land ownership was based on permanent occupation of a piece of land. This idea favored cultivators over pastoralists, as cultivators usually occupy land for longer periods of time than pastoralists. Pastoralists divide their ecosystems into dry season and wet season grazing areas, using each area for short periods of time during any one year. This temporary occupation put pastoralists at a disadvantage in the initial phases of the post independence land reform process.

A difference in the value attached to land between pastoralists and cultivators further marginalized pastoralists in the land reform process. On the occasion that pastoralists obtained land during the land reform process, as happened in Oloitokitok Division, they quickly sold the land and moved to other areas (Campbell, 1981). The land reform process therefore had the indirect impact of preserving the most ecologically favorable land for cultivators, leaving the arid and semi-arid land for pastoralists. The impact of pastoral production marginalization is seen on the landscape as the loss of rangelands, which are usually used for grazing, to crop farming. Farmers in all the zones cited a loss of grazing areas to crop farming as an important reason behind the shift towards zero-grazing and grazing close to the boma. Another consequence of the land reform process in the study area has been a rise in the number of permanent settlements, especially in areas close to the Oloitokitok-Emali road and its feeder roads. Farmers in the mixed and irrigated zones cited increasing settlement as one of the main reasons behind the reduction and modification of migratory grazing patterns.

5.5.3 Wildlife Conflict

Wildlife, through tourism, is an important source of foreign exchange for Kenya. The study area lies in between Amboseli National Park and Tsavo West National Park. In 2000, Amboseli National Park received 93,524 visitors and Tsavo West National Park received 78,615 visitors (Republic of Kenya, 2001b). The cropped areas of Oloitokitok Division lie directly in the migration corridors and dispersal areas of wildlife. Farmers in the area sometimes suffer heavy losses when wild animals destroy their crops. The stakes have risen in the past decades as farmers intensify cultivation along swamps in the irrigated zone.

Conflict with wild animals has forced farmers to reevaluate the crops they grow on their farms. Twenty-four per cent of the farmers who practice irrigation cited conflict with wild animals as an important influence on their decision to decrease their onion and tomato farmland. Most of the farms affected are in Isinet, Kalesirwa and Inkisanjani areas, all of which lie outside the electric game fence. Wild animals, especially elephants, eat and trample crops leading to heavy financial loses especially in the cases of high input crops such as onions and tomatoes. Fourteen per cent of farmers in the rain-fed zone who have reduced the area under maize cited increasing problems with wildlife, particularly elephants. Conflict between wildlife and farmers in the study area is well documented for the period between 1977 and 1996 (Campbell et al., 2000; Campbell et al., 1999). During my fieldwork, group discussants said that men were more involved in protecting their crops from wildlife than the women were. They explained that wild animals usually come on the farms at night. Night duties outside the home are usually done by men and consequently the job of guarding crops against wildlife is done mostly

by men. Women said that they usually help out when their husbands have traveled outside the home. Despite the game fence built in 1998, small ungulates and elephants continue to present a problem to farmers. Farmers said that some ungulates are small enough to fit in between adjacent electric wires on the fence. Elephants on the other hand are large enough to damage the fence, opening the way for other animals to gain access to the protected farmland on the other side of the fence. In general, however, farmers said that incidences of farmer-wildlife conflict have decreased since the game fence was erected in 1998.

> "The gazelles are just like goats. Very clever. You know with most animals once you chase them away they leave. But the gazelle will keep an eye on you and once you stop chasing it and turn around to go back, it also turns around and follows you back. The gazelle knows how to crawl through the fence without getting electrocuted, so they are still a problem. But not as much as they were before... The elephant is very clever. It knows which wires will electrocute it, but the wood will not. You know what it does? You know what it does? It stands on its hind legs. Puts its front legs on the wooden part of the fence and pushes it to the ground. And then the power gets lost (gets disconnected) because the fence is damaged."

5.5.4 Ecological Conditions

Local ecological conditions define the limits for crop and livestock production and also place physical constraints on crop and livestock production intensity. The current location of crop farms is defined and limited by soil moisture availability during the growing season. Rainfall amounts and reliability define the down slope extent of rain-fed farming. In the irrigated areas, farmers reported a severe reduction of water for

irrigation. This reduction can be partly attributed to an increase in the number of users inside and outside the division. The reduction might also be related to the continuing loss of the Mt. Kilimanjaro ice cap (Tenenbaum, 2001), and reducing rainfall amounts that key informants talked about in the Mt. Kilimanjaro highlands. I was unable to confirm the information on reducing rainfall amounts from meteorological statistics due to data paucity. Snowmelt from the Mt. Kilimajaro ice cap, and rainfall at Mt. Kilimajaro's higher elevation is thought to be the source of the springs and rivers that feed irrigated farming in Oloitokitok Division. It has been estimated that Mt. Kilimanjaro has lost one-third of its ice cap since 1989 as a consequence of climatic processes occurring at global scale (Tenenbaum, 2001).

During key informant and group interviews, farmers in the division complained about reducing rainfall amounts and reliability that have become more severe in the past ten years. Since farming started in the study area, nine major droughts have occurred (1933-35, 1943-46, 1948-49, 1952-53, 1960-61, 1972-76, 1983-84, 1994-95 (Campbell, 1999), and 2000-01). Recurrent droughts and falling rainfall amounts contribute to reduced amounts of irrigation water reported by farmers. Drought has also influenced livestock production in the study area. Thirty four per cent of the respondents cited drought as an important reason for their reduced livestock numbers (see Table 5.6).

The number of livestock in the study area has decreased in the past ten years (see Table 5.4). Drought and disease are the two most important conditions cited for reduced livestock numbers in the Division (Table 5.6). Many of the diseases cited are endemic in parts of East Africa, and their occurrence is defined by ecological conditions.

Table 5.6

Reasons for changing livestock numbers

	Number of households that gave reason			
	Rain-fed Zone	Mixed Zone	Irrigated Zone	Total
Disease				
Red intestine	15	24	51	90
Interfluke lung	55	53	55	163
Foot and mouth	35	27	51	113
East coast fever	62	61	61	184
Trypanosomosis	37	19	52	108
Anthrax	12	33	26	71
Lumb skin	25	24	42	91
Malignant cattle fever	14	10	37	61
Other	10	0	0	10
Selling	96	35	67	198
Drought	35	27	56	118
Livestock used in ceremony	30	13	59	102
Livestock gave birth	43	13	7	63
Respondent bought more livestock	30	11	9	50
Respondent received livestock as gift	8	6	9	23
Livestock eaten by wild animals	3	0	0	3

For example, East Coast Fever (ECF) is caused by the blood parasite *Theileria parva* and transmitted by the brown ear tick, *Rhipicephalus appendiculatus*. Climate, vegetation cover and host availability have been found to be important in defining the geographic distribution of *Rhipicephalus appendiculatus* (CLIMEX, 2003). Trypanosomosis is caused by different species of the trypanosome parasite, which is transmitted by the tsetse fly. The geographic distribution and extent of tsetse fly habitats have been linked to rainfall and vegetation cover (Catley & Irungu, 2000), as well as human induced land use and land cover changes (Bourn, Reid, Rogers, Snow, & Wint, 2001).

5.5 Conclusion

In this chapter I have described the land use and land cover changes that have happened at both division and farm levels since 1930. At the division level, forests and rangelands have been converted to two broad forms of crop farming. On the highlands where rainfall amounts are relatively higher and more reliable, rain-fed crop farming has developed. Maize and beans are the two major crops grown in the rain-fed zone. These crops are grown both for household consumption and for sale. On the lowlands close to rivers and swamps, irrigated farming has developed. The main crops grown by irrigation are tomatoes, onions, maize and beans. Tomatoes and onions are grown specifically for cash while maize and beans are grown both as cash and food crops.

The chapter also describes the gendered nature of land use and control in irrigated and rain-fed areas. In the rain-fed areas, women in wealthier households are allocated a portion of the farm for their use. In the irrigated areas where competition for irrigation water places physical limits to the extent of irrigated land, women use raised earth mounds separating irrigated basins for their crops. In both the rain-fed and irrigated

areas, women have complete control of the produce that they harvest from the limited space that they control on the farms.

In addition to changes in crop production, this chapter has also discussed changes in livestock production. Livestock production has evolved from a predominantly migratory herding economy to a predominantly sedentary herding economy. Specific methods of farming differ between the rain-fed and irrigated areas. In the irrigated areas, most people practice zero-grazing and some graze their livestock close to their homes. In the irrigated areas most people graze their livestock close to their homes. Changes in the types of livestock kept have also been discussed. In the rain-fed zone, people are increasing the number of exotic and local non Maasai livestock breeds that they keep. In the mixed zone exotic livestock are also becoming more popular than they were previously. The general trend in the irrigated zone has been a loss of livestock due to drought and disease.

Throughout this chapter, we see the role of human agency in land use and land cover change. In response to increasing cash needs, the Maasai people who had been previously pastroralists who shunned crop cultivation voluntarily started growing cash crops. Another aspect of human agency discussed in the chapter is that of owning bomas in more than one agro-ecological zone. As explained in the chapter, the Maasai did this to ensure that they maintained access to different agro-ecological zones in the context of land privatization. A third aspect of human agency is that of negotiation for irrigation water use. When a farmer does not have the financial input or labor to plant and maintain an irrigated cash crop, they sell their water use rights to a second farmer. This means that the proportion of land under irrigation at divisional level is very closely related to the

amount of water available for irrigation. The proportion of land under irrigation is less likely to be influenced by individual farmers financial and labor constraints. A fourth aspect of human agency is demonstrated by the way people respond to the threat of wildlife on their irrigated cropland. People construct sheds on their farms during periods of wildlife conflict. One member of the household sleeps in the shed and guards the farm against attack by wildlife.

The changes in herding and cropping strategies reported in this chapter have important implications for labor demands in the study area. Crop farming is a more labor intensive exercise than migratory livestock herding that was predominant in the past. The different pattern of land use along the Mt. Kilimanjaro ecological gradient is expected to translate to different labor patterns. Crops grown and method of farming used (irrigated or rain-fed) also have different labor demands. Constructing and maintaining irrigation structures make irrigation a more labor intensive method of production than rain-fed farming. The type of livestock kept also influences the animal husbandry technique, and this has a direct consequence on the demand for labor. Exotic breeds and cross breeds are zero-grazed, and this has higher labor requirements than range grazing. Grazing close to the homestead also increases the number of days in the year when the livestock are in the care of women[25].

The general reduction in livestock numbers and the general increase in crop farming, especially cash crop farming, is expected to have important implications for men and women's labor allocation. In agricultural production systems, men tend towards controlling cash generating crops, livestock or both, and women tend towards controlling

[25] Many times women remained behind when men migrated with the livestock in search of water and pasture.

food crops, livestock or both. As cash crop farming becomes an important income generating activity, the work of livestock is expected to be relegated to the women, as men use more and more of their time in cash crop farming.

Chapter 6: Gendered Division of Labor and its Relation to Land Use

This chapter explores research questions seeking to understand the historical gender division of labor in the study area and how this has changed across different agro-ecological zones. The relationship between gender division of labor and land use in the historical and current contexts are discussed. Analyses are separated between crop production and livestock production and gendered time allocation differences for different crops, cropping activities and livestock activities are presented. The chapter further explores local, national and international factors that have driven changes in the way labor is organized in the study area. Later in the chapter, intra-household gender power relations are explored in the context of negotiations involved in the control of women's labor.

6.1 Historical Division of Labor and its Relation to Land Use

I will use 1930s as a starting period for the discussion on the historical division of labor between men and women. This does not imply that prior to the 1930s the labor roles were static. I am aware that societies are not static, and intra-household gender roles evolve as part of changes in the wider society. I choose the 1930s as the point of entry because this is the period of initial crop cultivation in the study area (Campbell, 1986). The 1930s fall within the period after colonial occupation and before significant amounts of crop cultivation. In the SE Kajiado context, this period can be thought of as a period of labor under-utilization, especially among men. This is because it is essentially male labor-time that was modified by colonial policies that limited or banned hunting, raiding and fighting (Kitching, 1980).

The study area lies in Maasai country and, from field observation and information obtained from key informants, is principally occupied by the Ilkisongo Maasai. The area is also occupied by non-Maasai people from agricultural communities of Kenya and Tanzania. As explained in chapter 4, non-Maasai are recent migrants who have brought with them their agricultural skills, techniques and labor organization. This section will focus on the Maasai historical division of labor and not on the historical division of labor in non-Maasai communities for three reasons. First, it is the Maasai who have undergone the more recent change in livelihood patterns that have affected their labor organization. The non-Maasai communities in the study area practiced mixed crop-livestock agricultural farming before they migrated into Oloitokitok Division. They have not undergone recent changes in their labor organization to the same extent as the Maasai have. Secondly, it is the Maasai who are historically and geographically tied to the study area. Land use and land cover changes described in chapter 5 have occurred in areas that were historically used by the Maasai. Thirdly, the Maasai make up the single largest ethnic group in the division.

In the mid 20th century, the Maasai followed a nomadic herding political economy that was confined in the Southern Maasai Reserve. Activities involved in nomadic herding were clearly defined by gender and age-set roles (Spencer, 1993; Talle, 1988/1994). Land was communally used for grazing. Key informants said that the area was more vegetated than it is today. The highland forest was more extensive than it is today and in the lowlands, tree density was higher than it is now. This might be because the land was used less intensively as fewer people were physically confined to the lowlands on a permanent basis. Herders mainly used the lowlands for livestock grazing,

leaving the better watered highlands reserved for grazing during the long dry seasons. Key informants said that tsetse flies and ticks also contributed in keeping herders away from the lower highlands (agro-ecological zone 5) except in periods of prolonged dry seasons.

The daily work of tending livestock was assigned to uncircumcised shepherd boys (*ilaiyok*). They were joined by the circumcised young males (*ilmurran*) when going to water places (Mitzlaff, 1994). During the rainy season, livestock were grazed and watered close to the bomas, and in some cases very little supervision was required. Herders told us that sometimes all they did was "open the animal sheds in the morning and count the livestock in the evening". Old and young males had plenty of leisure time during the rainy season. Their work increased during the dry season when they walked longer distances to their dry season water sources and pastures. Mitzlaff explains that during these times, tending of livestock was transferred from the *ilaiyok* to the *ilmurran*. In periods of prolonged drought, the *ilmurran* would migrate with the livestock for a period of up to several months to the well watered highlands such as the Chyulu Hills and the Nguruman escarpment. The *ilmurran* also built and repaired the thorn fences of the livestock shed.

The elders did not engage in manual work, unless they were very poor (Mitzlaff, 1994). Elders were responsible for managing issues of public interest. They officiated disputes (marriage, criminal, etc) and made resolutions. Their role in day to day activities was mostly leadership and supervisory. For example, adult men attended milking, mostly to ensure that women did not over milk the cattle (on average women milked two teats for human consumption and left two teats for the calves to suckle)

(Talle, 1988/1994). An elder was also responsible for the management of his herd, including his wife's (or wive's) and children's livestock (Mitzlaff, 1994).

The life of female members of the community was concentrated around their bomas. They were responsible for house construction, cleanliness, food preparation and sharing, reproduction and care giving. Livestock related activities included milking, looking after the young and sick animals (Hodgson, 2001) and sweeping the animal sheds. Upon marriage, a woman was assigned a number of milk cows and small stock which she was not allowed to sell or slaughter, but could give as a gift (Mitzlaff, 1994). Women were in charge of handling and management of milk and milk products (sour milk, butter fat), a fact that gave them a key role in the household (Dahl, 1979; Hodgson, 2001; Talle, 1988/1994). Livestock allotted to a house were milked by the woman of the house and her older daughters. The cows were milked twice a day, before grazing in the morning and after grazing in the evening. After milking, the woman kept the milk inside her house where it was further prepared or consumed. Milk management gave the woman substantial decision making power within the household. She was free to dispose of the milk as she wished. She could exchange it for cash or labor or use it to build goodwill and reputation with her female friends and relatives (Talle, 1988/1994). This was not unique to the Maasai, rather it was true in other pastoral communities as well (Dahl, 1979). Their role as milk managers put women in charge of the young livestock. When apportioning the milk, a woman had to make sure that the young animals received sufficient for their nutritional needs. Women milked a proportion of the milk from an animal and then brought its young to suckle the rest. Women therefore brought the young to their mothers twice a day, allowed them to suckle and then took them away

from their mothers after they suckled (Mitzlaff, 1994). Older girls helped their mothers in milking and feeding the young animals. Livestock activities took more of the women's time during the rainy season than during the dry season because livestock produced more milk during the rains. The livestock were also more susceptible to disease attack (shoats especially) then, and their sheds had to be cleaned out more frequently to keep them as dry as possible. Livestock were also at the boma more often during the rains and less often during the dry season. During the dry season, the livestock would migrate to the hills and the swamps where there was pasture.

Important activities related to cleanliness and food preparation were gathering firewood and fetching water. These were done by women and girls. Women in focus group discussions said that this was not very difficult at the time as water was more easily available from the rivers and good quality firewood was more widely accessible. The women and girls also made calabashes for milk storage, prepared snuff, worked the skins of slaughtered animals and made leather clothing for their families and decorated these with beads. The Maasai were first introduced to glass beads at the turn of the century (Talle, 1988/1994) and ever since they have spent time making bead and leather work. They decorate milk calabashes, clothes and make colorful ornaments such as bracelets, belts, necklaces and earrings. Ornaments are given as gifts to other women and men, usually to cement a good relationship. Women were also responsible for house construction and maintenance. This was especially difficult during the rainy season because the women had to ensure that the house did not leak (Mitzlaff, 1994), and this took considerable time and effort.

6.2 Changes in land use and implications for the traditional division of labor in crop and livestock production

As noted earlier, initial cultivation started around the 1930s (Campbell, 1986). It was however after the second world war that the amount of cultivation in the Oloitokitok area begun to increase (Campbell, 1981). At this time, cultivation was practiced by non-Maasai government officers posted at the Oloitokitok office. After the declaration of the State on Emergency in 1952, most non-Maasai returned to their native homes and the area under cultivation reduced (Campbell & Migot-Adholla, 1981). Non-Maasai returned to Oloitokitok and surrounding areas after independence, with the vast majority moving in between 1966 and 1976 (Campbell, 1981).

By 1976 therefore, crop farming was almost exclusively practiced by non-Maasai agriculturalists who had settled in the area from other parts of the country. The Maasai in the area were still almost exclusively involved in livestock herding, and most of their land was utilized for pasture. Conversion of the forest and rangeland to cropland, and further modification of the cropland (discussed in Chapter 5) was a reflection of two main local processes: (1) immigration into the area by agriculturalists who bought farmland from the Maasai, land which the Maasai had previously used as pasture, and (2) changing livelihood patterns among the Maasai, from pure pastoralists to agro-pastoralists. It is this second process that is the concern of this study.

In this chapter, I describe how labor organization and labor-time allocation changed for husbands and their wives to incorporate the new activities defined by the new land uses. Comparisons are also made between the Maasai[26] (who are relatively recent

[26] Respondents were grouped by ethnicity based on self identification

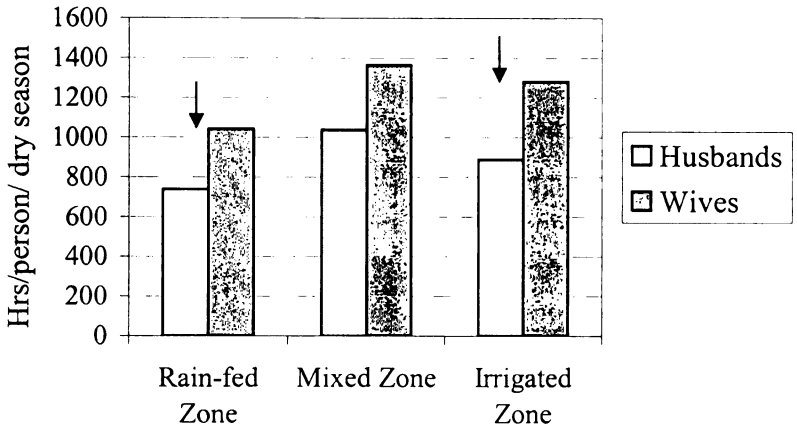
cultivators) and the non-Maasai, (who are historically cultivators) to assess the extent to which their time allocation differs.

6.2.1 General Patterns

People in the study area still spend more time on livestock related duties than they do on crop related duties (Figure 6.1 and 6.2 respectively) in all the agro-ecological zones. Differences in the general patterns of cropping time allocation between the Maasai and non Maasai reflect the groups' historical preferences. Although many Maasai have actively taken up crop farming, they still do not allocate as much of their labor to crop production as non Maasai people do (Figure 6.3). Non Maasai spend significantly more time than Maasai do on crop production in the rain-fed zone ($p=0.009$) and the irrigated zone ($p=0.047$).

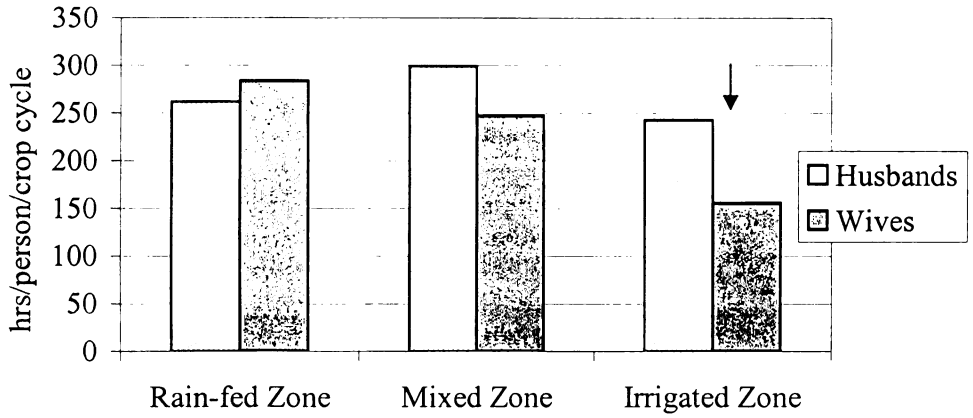
Evidence of Maasai's historical preference for herding, and non Maasai preference for cropping is not visible from an examination of time allocation in livestock production (Figure 6.4). The difference between the time spent by Maasai and non Maasai is only significant in the irrigated zone ($p=0.036$), with Maasai spending more time than non Maasai. However, non Maasai spend more time in livestock production in the rain-fed zone and the mixed zone than the Maasai do. This is a reflection of differences in livestock production systems, and will be described in greater detail in section 6.2.5.

The historical division of labor that placed the responsibility of livestock production in the hands of the male members of the community has changed. In all the agro-ecological zones, the wives are spending more labor-time on livestock production than their husbands (Figure 6.1). These differences between husbands and their wives are however only significant in the rain-fed zone ($p=0.077$) and the irrigated zone ($p=0.064$).



Note: Arrows indicate where differences are significant

Figure 6.1 Comparison of time spent on livestock production by gender and agro-ecological zone[27]

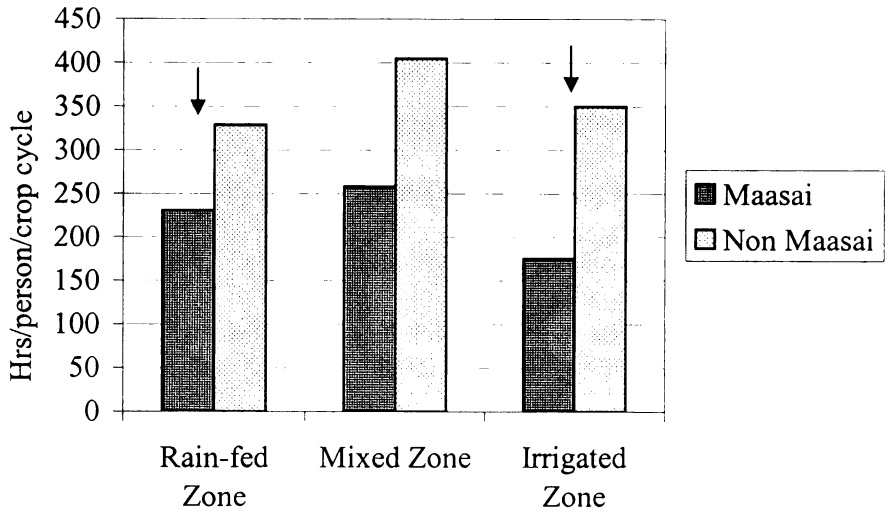


Note: Arrow indicates where differences are significant

Figure 6.2 Comparison of time spent on crop production by gender and agro-ecological zone[28]

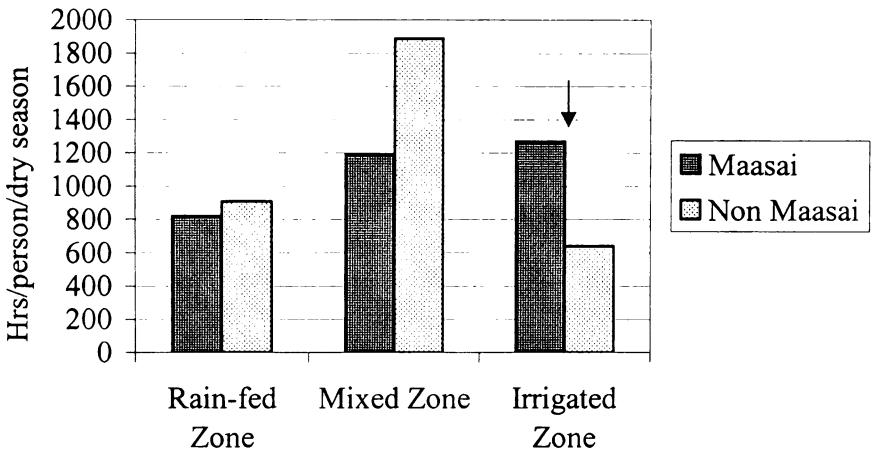
[27] Data on time allocation in livestock production represents hours spent by each individual during the long dry season (4 months)

[28] Data on time allocation in crop production represents hours spent by each individual during one cropping cycle



Note: Arrows indicate where differences are significant

Figure 6.3 Comparison of time spent on crop farming by ethnicity



Note: Arrow indicates where differences are significant

Figure 6.4 Comparison of time spent on livestock farming by ethnicity

Gender differences in labor-time allocation in crop production show a strong link to the dominant land use patterns. In the rain-fed zone where cropping has been going on for much longer, women are doing more of the crop production activities. In zones where irrigation is practiced (the mixed zone and the irrigated zone) men are doing more of the crop production activities, with the difference being significant in the irrigated zone ($p=0.034$) (Figure 6.2). These differences are a reflection of the different cropping strategies specific to the zones, and they will be described in greater detail in section 6.2.3 and 6.2.4.

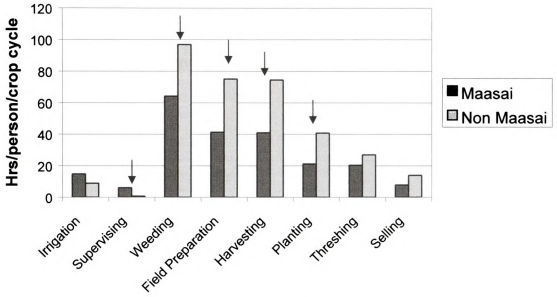
The domination of crop production by husbands in the irrigated zone is related to the perceived difficulty of the tasks involved in irrigated farming. Tasks such as construction of irrigation structures during field preparation, irrigation and maintaining irrigation structures are thus performed by the husbands. The domination of crop production by the husbands is also linked to how long a family has been farming. Crop cultivation in the irrigated zone is more recent than it is in the other zones. People are still in relatively early stages of integrating crop and livestock farming, and therefore they still have very clearly defined gender roles. People that have taken up farming in the last two years said that farming activities are too hard for women, and that is why they are predominantly done my men. People who had been farming for longer periods said that as farm related jobs multiply and their urgency increases with increasing crop cultivation, husbands find that they cannot perform all the activities without the help of their wives, and the gender roles become blurred. This study found a positive correlation between the number of hours wives spent on crop production and the length of time a family had been farming ($p=0.01$). No significant correlation was found between the number of hours men spent

on crop production and the length of time the family had been farming. Kitching (1980) reported a similar trend of men taking up farming before women in pre-colonial Kenya.

6.2.2 Differences between Maasai and Non Maasai in Crop Labor Allocation

The ethnicity of the Maasai has been described as 'fluid' or 'mutable' (Sobania, 1991; Waller, 1985). Historically, the Maasai have had fluid identity boundaries with their neighbors, the Arusha, and Torobo and the Kikuyu. (Galaty, 1993b) describes the complex social processes of "inclusion, exclusion and boundary shifting in Maasai identity" (p. 174). Intermarriages, bilingualism, migration and recent economic diversity all contribute to make the Maasai identity complex. The author carried out analysis based on ethnicity using the identity that the respondents ascribed themselves. A husband and his wife can have different ethnic identities, as can a parent and his or her child. Analysis based on ethnicity is further compounded by the fact that ethnicity on its own does not provide a complete explanation of the differences observed in crop and livestock farming. Rather, ethnicity intersects with ecology, economics and politics to define what people grow, how they grow it, and where they grow it.

In general, non Maasai spend significantly more time than Maasai in most crop farming activities (Figure 6.5). Maasai spend significantly more time than non Maasai only in supervising ($p=0.038$). This is because the Maasai use more hired labor that require supervision than non Maasai do. Hiring of labor comes out of necessity for the Maasai, who dominate the irrigated areas and grow principally cash crops. Most activities in the irrigated zone need to be done all at once, and cannot be completed using family labor.

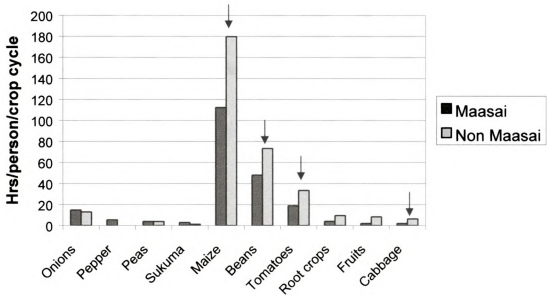


Note: Arrows indicate where differences are significant.

Figure 6.5 Crop farming by ethnicity

This fact is compounded by the fact that although more and more Maasai women in the irrigated areas (mixed zone and irrigated zone) are involved in crop farming, the numbers are still small and most of the family labor still comes from the men (see Figure 6.3). For example, farmers prefer to transport their produce to market in one trip to minimize indirect transport expenses such as bribes to policemen and accommodation at the selling point. This requires that harvesting is done quickly to minimize spoilage, and thus labor is hired for the exercise. Non Maasai spend significantly more time on weeding ($p=0.021$), field preparation ($p=0.001$), harvesting ($p=0.000$), and planting ($p=0.000$). This is because non Maasai on average cultivate larger fields and use less hired labor than the Maasai do. Non Maasai spend significantly more time on maize ($p=0.000$), beans ($p=0.021$), tomatoes ($p=0.025$) and fruits ($p=0.048$) (Figure 6.6). Maize and beans are low input crops that also do not sell for a lot of money. For this reason, maize and beans

are grown mostly for food, with some extra being sold in good years. Maize and beans are grown on the rain-fed areas where the fields are much larger, and that is why they take up more time than other crops do.

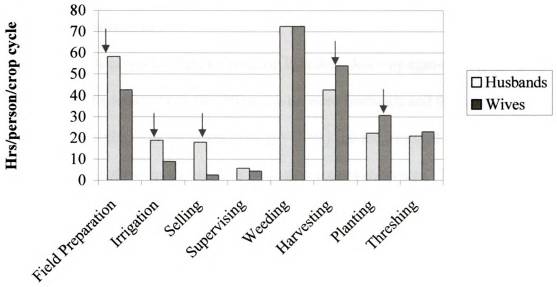


Note: Arrows indicate where differences are significant.

Figure 6.6 Time spent on crops by Maasai and non Maasai

6.2.3 Gender division of labor by cropping activities

Labor allocation between husbands and their wives for different cropping activities differs as shown in figure 6.7. Activities such as field preparation, irrigation, selling and supervising are mostly done by men, while harvesting, planting and threshing are mostly done by women. This pattern of gender roles has been documented in other areas of Africa (Burton & White, 1984; Guyer, 1988a; Kitching, 1980; Netting, 1993). However, results from weeding showed almost equal labor allocation between husbands and their wives.



Note: Arrows indicate where differences are significant

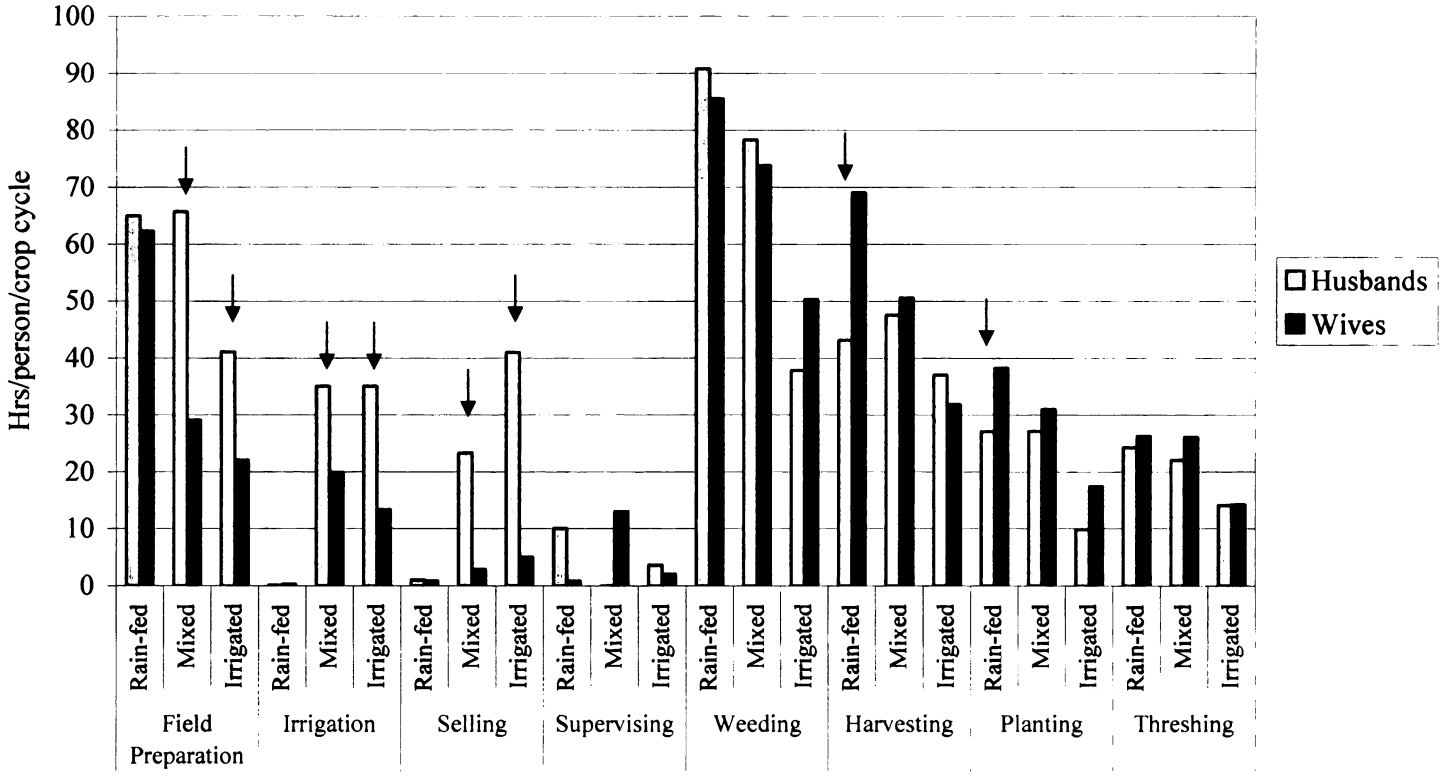
Figure 6.7 Gender roles in crop production

This is contrary to what other studies have found in other areas (Burton & White, 1984; Guyer, 1988a; Kitching, 1980; Netting, 1993), where women have been found to dominate weeding. Guyer (1988a) did field research in West Africa and concluded that women's work is dominated by the "symbolism of bending". Meaning that women tend to be more involved in activities that necessitate bending, such as field preparation, planting and weeding. This fact does not hold true in our study area. For example, time allocation for field preparation was significantly higher for husbands than it was for their wives ($p=0.004$) even though this involves the "symbolism of bending". Preparing a fallow or previously uncultivated field for cultivation involves first burning to clear small bushes and grasses, followed by slashing to clear the remnants of small trees and finally plowing using a hoe or ox-plow. These activities are locally perceived to be male, as they are considered to be very physically demanding. Although tractors are sometimes

used in field preparation, these are rare as they can only be afforded by the wealthier members of the community.

When labor allocation for field preparation is broken down by agro-ecological zone (Figure 6.8), results indicate that the difference between husbands and their wives becomes more prominent in the mixed zone ($p=0.001$) and the irrigated zone ($p=0.027$). Field preparation in these zones involves more than it does elsewhere. This is because in these zones, fields have to be leveled for basin irrigation (the predominant irrigation type in the study area). In addition to the burning, slashing and plowing, the fields need to be divided into irrigation plots separated by a soil mound. The plots between the mounds have to be leveled to control water flow in the entire field. This is a time consuming activity that is perceived as too difficult for women. Men principally do it, with their wives helping out occasionally.

The difference in labor-time allocation between husbands and their wives in irrigation was found to be significant ($p=0.000$) with men spending more time on irrigation (Figure 6.7). Irrigation is principally done in mixed and irrigated agro-ecological zones (Figure 6.8), where annual rainfall totals, distribution and reliability cannot support rain-fed farming. In both zones, the difference in labor-time allocation between husbands and their wives was found to be significant ($p=0.037$ in the mixed zone and $p=0.003$ in the irrigated zone). This is a consequence of the way irrigation is organized in the study area. In many villages irrigation follows a strict timetable to ensure that water is equally distributed among the farmers.



Note: Arrows indicate where differences are significant

Figure 6.8 Crop production activities conducted by husbands and their wives in different agro-ecological zones

Water rights are sometimes negotiated and exchanged between farmers. For example where one farmer does not have enough money to cultivate his farm, he can transfer his irrigation time to another farmer usually in exchange for cash. Preparing an irrigation timetable requires constant consultation between interest parties and is usually done in formal meetings. Formal meetings fall within a (public) domain where women in these zones are often excluded. So starting in the planning stages, matters concerning irrigation fall into the hands of the husbands.

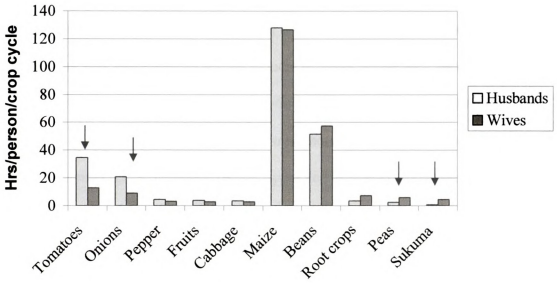
The irrigation activity itself has certain aspects that make it to be perceived as a male activity. First, conflicts erupt when farmers do not respect each others' irrigation time. Kenya is in general considered to have serious problems of water availability at the national level (Postel, 1993 quoted in Rathgeber, 1996). Locally, water availability is compounded by changes driven by investments of the ruling elite, with a large amount of Kilimanjaro waters being deviated through the Nolturesh pipeline to areas outside Oloitokitok Division for flower cultivation. Despite this reduction in the amount of water available for irrigation , the area under irrigation has continued to increase in recent years (Campbell et al., 2003). Consequently, the trend has been towards longer periods of rotation (the length of time between 2 irrigation periods) for each farmer. For example, in Empiron area, a key informant told us that ten years ago, every farmer used to get 7 hours of irrigation time every week, but now they get 3 hours every two weeks. Tomatoes require irrigation every 7-10 days (Krugmann, 1996), so unless a farmer acquires extra irrigation hours, his crop is likely to suffer water stress. Farmers narrated how sometimes they divert or tinker water from the main canal to their farms during someone else's irrigation time. This has been reported elsewhere in Oloitokitok Division

(Krugmann, 1996; Rathgeber, 1996), and it is known to happen more to farmers towards the end of the irrigation furrow. Farmers reported that they stole water-time to save their crop and salvage their investment. Perceptions of potential irrigation related conflicts within the community have contributed in defining irrigation as a predominantly male activity, because conflict resolution is principally a male responsibility (Mitzlaff, 1994; Talle, 1988/1994).

Secondly, high demands for irrigation water has meant that irrigation has to take place round the clock. Some families sometimes have to irrigate their fields at night. Women's responsibilities over children and food distribution (Talle, 1988/1994) means that they cannot take part in the night duty. Women are also culturally exempt from night duties that involve leaving the homestead because of safety concerns. The danger of wild animals is high in most of the irrigated zone. During group meetings, people said that wild animals usually wander into the bomas at night. The threat of wild animal attack is perceived to be higher for women than it is for men, because women do not carry any weapons. Men of the other hand will usually carry locally made weapons, which they were trained to use during their *murran* years. Thirdly, the types of crops grown using irrigation are commercial crops, a fact that makes irrigation the responsibility of men. This fact will be explored further in section 6.2.4.

Selling of crop produce is significantly done more by men than by their wives ($p=0.001$). This is shown in figure 6.7. Figure 6.8 shows that most selling takes place in the mixed zone (significantly different between men and their wives with $p=0.001$) and the irrigated zone (significant difference between men and their wives with $p=0.019$). It is in these zones where the main cash crops, tomatoes and onions are predominantly

grown (Figure 6.9). These crops, together with pepper are grown for markets in Nairobi, Mombasa and even overseas (Campbell et al., 2000).



Note: Arrows indicate significant differences

Figure 6.9 Time spent on different crops by husbands and their wives

Several reasons combine to put selling in the domain of husbands. Selling usually involves long journeys to Mombasa that involve several days absence from the household. Selling also requires negotiations over prices and transport costs and conditions with transporters. In a Kenyan context, farmers and traders involved in transporting goods over long distances frequently encounter police road blocks on their respective routes. Although it is illegal, the policemen frequently demand money from the farmers or traders. Failure to pay up could lead to unnecessary delays before the goods reach the market. These situations sometimes require lengthy and delicate negotiations, which could be costly where perishable goods are involved. Male key informants and group meeting participants (in single gender meetings) told me that men negotiate better than women and that women are easily deceived by male buyers who

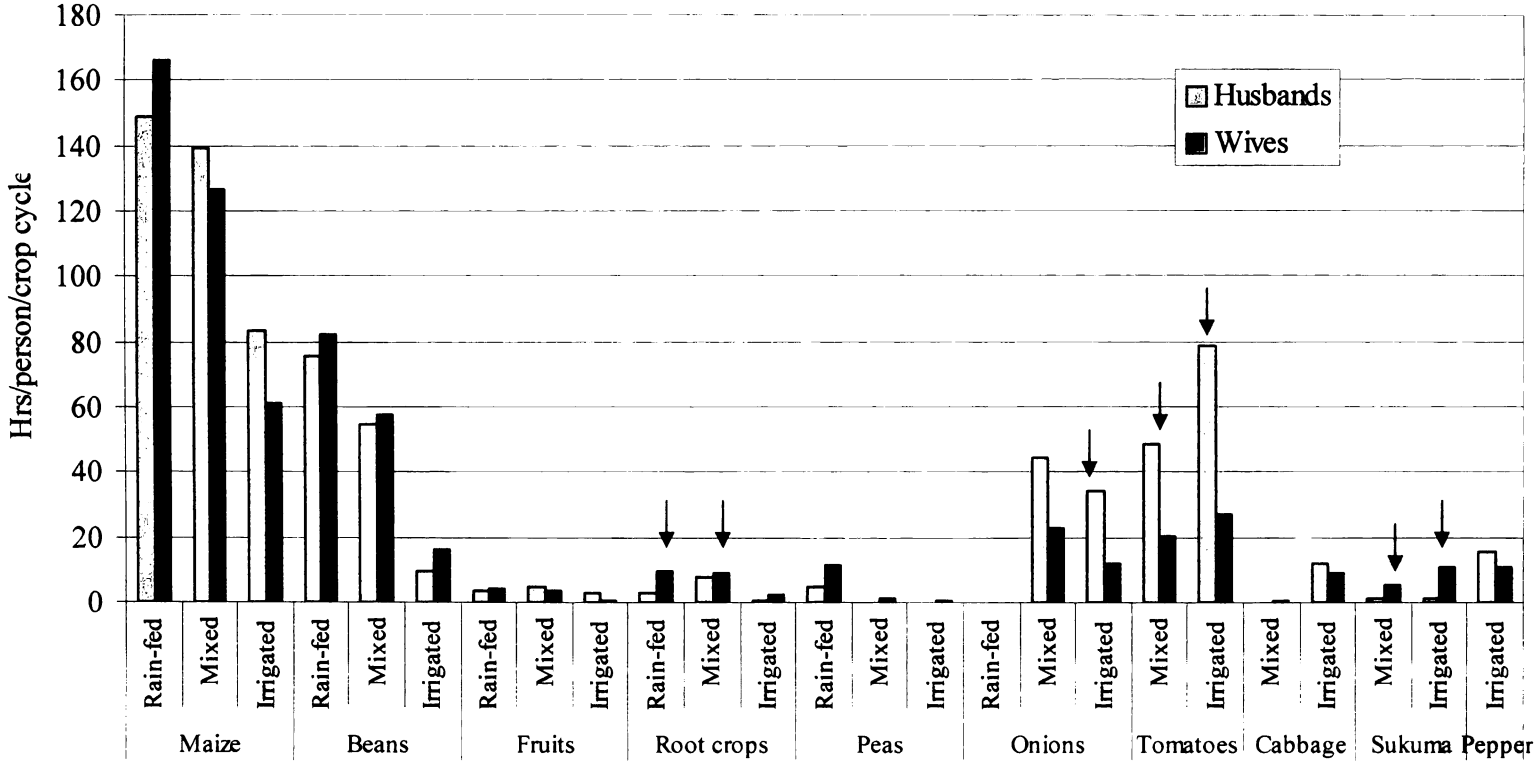
offer women lower prices for their produce and by male transporters who charge women higher transport costs. The women however argued against this explanation and instead said that men prefer to be in charge of the sale of farm produce because that automatically puts the fruits of everybody's labor into their (husbands) control. Women further argued that they participate in selling in local markets, where they successfully haggle and negotiate for good prices for their produce. History would favor the women's explanation over the men's. Women dominated trade between the Maasai and the Kikuyu in pre-colonial times (Muriuki, 1971). Spear and Waller (1993) document that Maasai women traveled longer distances than men did in pre-colonial Kenya for trade reasons. During this period, produce was exchanged with produce (barter trade), and this involved considerable negotiation. At the time, men only dominated livestock trade. Livestock was the measure of wealth (Kitching, 1980) and arguably the equivalent of contemporary money. History therefore reveals a pattern of male control over exchange value, which is still present today.

Harvesting and planting are the two activities where women do significantly more work than men (Figure 6.7) ($p=0.041$ for harvesting and $p=0.002$ for planting). Figure 6.8 shows that women spend more time harvesting than men do in all the agro-ecological zones, except for the irrigated zone. However, this difference is only significant in the rain-fed zone ($p=0.017$). Figure 6.8 also shows that women spend more time planting than men do in all the agro-ecological zones. Like harvesting, planting is only significantly different between men and their wives in the rain-fed zone ($p=0.009$). Both activities 'symbolize bending' (Guyer, 1988a) and therefore it is no surprise that it is dominated by women. Both male and female key informants and group discussants

reported that women are more involved in planting and harvesting because "they can bend better" and because "they are very patient", qualities that they said were beneficial in both activities.

6.2.4 Gender division of labor for different crops

Figure 6.9 shows the time spent on different crops by men and their wives in the study area. This is broken down by agro-ecological zone in figure 6.10. Labor allocation was found to be significantly higher for men than for women in tomato ($p=0.005$) and onion ($p=0.003$) cultivation. Labor allocation for women exceeded that of men significantly in peas ($p=0.042$) and sukuma ($p=0.002$) cultivation. When we looked at labor allocation across different agro-ecological zones, we found men to spend significantly more time in tomato cultivation in both zones where tomatoes were grown, i.e. the mixed zone ($p=0.004$) and the irrigated zone ($p=0.044$), and in onion cultivation in the irrigated zone ($p=0.003$). Women were found to spend significantly more time than men in root crops in the rain-fed zone ($p=0.003$) and the mixed zone ($p=0.088$) and in sukuma in the mixed zone ($p=0.038$) and the irrigated zone ($p=0.013$). No significant difference was found between time spent by men and their wives in cultivation of the other crops. These results are not surprising and support theses put forward by Schroeder (1993), Guyer (1988) and others: women spend more time than men in growing food crops while the opposite is true for cash crops. Tomatoes and onions are the only two crops that were widely grown specifically for cash, while sukuma, peas and root crops were grown specifically for food. Any surplus in the food crops was shared between friends and kin or sold by women at local markets.



Note: Arrows indicate where differences are significant

Figure 6.10 Labor-time allocation for different crops in different agro-ecological zones.

Other crops, e.g. maize and beans, met both the cash and food needs of the families. Maize and beans were usually sold on the farm to buyers from Nairobi and Mombasa. This usually happened when there was surplus production and people had enough in store for food.

6.2.5 Gender division of labor in livestock production

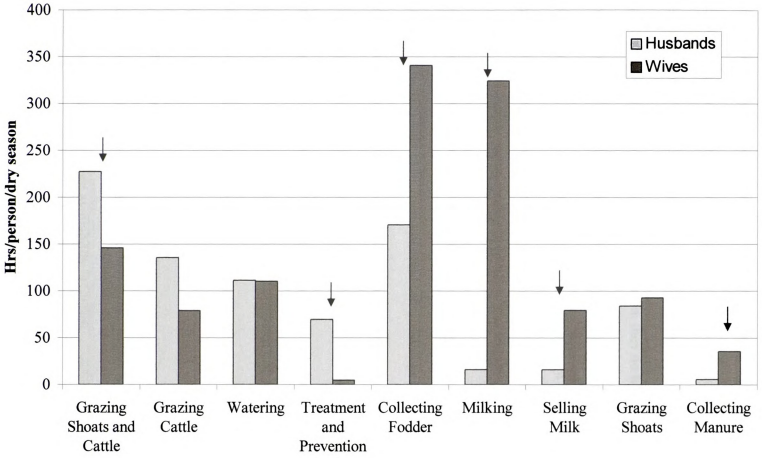
Livestock production is historically the main activity of the Maasai. Maasai communities living in areas north of the study site (outside the study area) are still engaged in pastoral production strategies that do not include crop farming. Within the study area, people are engaged in agro-pastoral production strategies that integrate crop farming with livestock keeping. In the drier areas of our study site (the irrigated and mixed zones), local livestock breeds are kept and herding strategies primarily involve grazing close to the homestead. This means that each morning, livestock are taken out to graze close enough to the homestead that they can be brought back to the homestead each evening. In the rain-fed zone, exotic livestock breeds and exotic crossbreeds are kept, and herding strategies primarily involve zero-grazing. Current herding strategies are a shift from what they were in the past. Farmers reported keeping more exotic breeds than they did ten years before the survey in the rain-fed and mixed zones, and practicing more zero-grazing. Farmers also reported practicing less migratory grazing methods and moving more towards grazing close to the homestead. Farmers in the irrigated zone reported a general reduction in their herd sizes from what they were ten years before the survey. Changes in herding strategies and forces behind the changes were discussed in more detail in chapter 5.

Male and female key informants and group discussants agree that women are now more involved in livestock production than they have been in the past. However, there was a general consensus that husbands still spend more labor-time on livestock activities than their wives do. This perception was however not supported by data. This may be because men and women have not recognized that women are spending a lot more time taking care of the livestock as a result of changing herding strategies. Figure 6.1 shows that wives are doing more livestock related activities than their husbands in all the agro-ecological zones. This difference is significant at $\alpha=0.1$ in the rain-fed zone ($p=0.077$) and the irrigated zone ($p=0.064$). The difference in labor-time between men and women may be related to the changing role of livestock as a measure of wealth in the study area. In pre-colonial times, pastoralist societies accorded more value to livestock than to land and crops. During this period, land 'ownership' had a different meaning from what it does today. One could use the land they owned, but they could not transfer ownership to another person. Land only had use value and there was no land shortage. Livestock on the other hand, had both use and exchange value, and therefore were considered more valuable than land. Colonial policies changed land distribution and tenure, and added an exchange value to land. In addition, growing cash crops, which themselves have use and exchange values, added to the use and exchange value of land. Ultimately, land and cash crops became more valuable than livestock. Men tend to devote more of their labor-time to activities that generate goods with relatively higher exchange values (Guyer, 1988b; Schroeder, 1999). In pre-colonial times, men dominated livestock activities because livestock had higher exchange value. As the value of land rose, and cash cropping

increased in importance in the study area, men took up cash-cropping activities, and passed on livestock activities to women.

Major livestock activities in the study area and the labor-time spent on them are shown on figure 6.11. Husbands dominate grazing of herds that contain cattle, watering the herds and activities involving treatment and prevention of diseases. Of these activities, grazing mixed cattle and shoats (shoats = sheep and goats) herds and treatment and disease prevention varies significantly between husbands and their wives ($p=0.085$ and 0.000 respectively). Wives dominate fodder and manure collection, milking and selling milk and grazing herds of small stock. Except for grazing of shoats, all these activities are significantly different between men and their wives at $p=0.000$.

The way livestock feeding labor is organized is a reflection of herd composition; grazing method (zero-grazing versus range grazing); distance to pasture; and labor availability in the household. Herd composition defines the interest that male members of the community have in the herd and therefore the amount of labor that they will invest in grazing. Cattle are the most valuable livestock to the Maasai (Saibull & Carr, 1981) and have always been a source of pride and prestige for families. Even though the importance of livestock in the study area has decreased, people's wealth status is still partly related to the size of their herds. Many times in the evenings, elders can be seen in cattle enclaves enjoying the site and smell of cattle as they return home from grazing. It is not surprising that husbands participate more in grazing when there is cattle in the herd, leaving their wives to take part more in grazing of small stock herds.



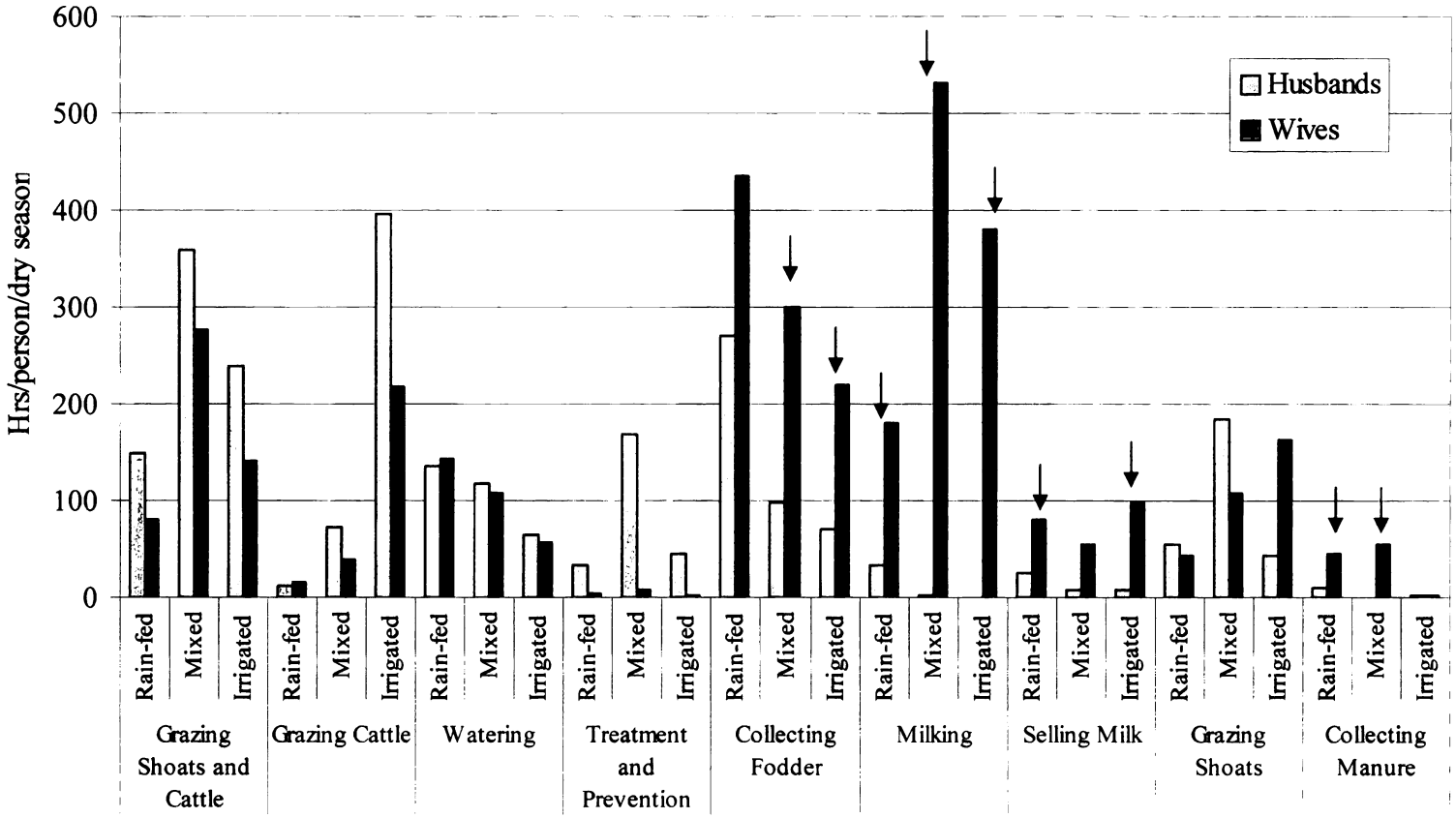
Note: Arrows indicate where differences are significant

Figure 6.11 Gender roles in livestock production

Zero-grazing is more prominent in the rain-fed zone where there is a larger proportion of exotic cattle breeds. Exotic breeds are preferred in many well watered areas of Kenya because they have a higher milk yield than local breeds. Unfortunately they also have a lower tolerance for endemic diseases. Exotic cattle breeds require high quality fodder and plenty of water all year through. For this reason, they do not do well in the drier zones. Contact with indigenous livestock increase the chances for disease transmission to the exotic cattle. This can happen when pests (e.g. ticks), that carry diseases for which indigenous cattle have more tolerance, are passed on to the exotic cattle. Farmers stall feed their cattle to lower the chances of disease transmission. Stall fed animals have minimal interaction with other livestock that could carry infectious diseases. Stall fed animals are also relatively safer from ticks and other insect pests that are found in bushes.

Zero-grazing involves fodder collection, which usually comes from the forest and agro-forest areas in the rain-fed zone. Fodder collection is done predominantly by women (Figure 6.12). Husbands will usually help their wives when the amounts required are large and cannot be done by one person. The women transport fodder on their backs or use donkeys and men transport fodder on bicycles or wheelbarrows (and sometimes donkey carts).

In the drier zones (mixed and irrigated zones) most of the grazing involves taking the livestock over short or long distances. In these areas, fodder is mostly collected during the dry season, when the pasture availability is limited. Fodder collection is dominated by the wives and is significant in the mixed zone ($p=0.005$) and the irrigated zone ($p=0.007$). .



Note: Arrows indicate where differences are significant.

Figure 6.12 Livestock production activities conducted by husbands and their wives in different agro-ecological zones

The pods of *Acacia tortilis* are one of the most important sources of fodder for shoats in the dry season. The seeds are collected by women using a long stick with a curved knife attached to the end. The work of the women is to harvest the pods and sometimes transport them short distances to their households. Most times they harvest the pods and the sheep and goats eat them as they fall to the ground.

Organization of grazing labor is also tied to distance to pasture. Key informants said that women are more involved in grazing during the rainy seasons and normal dry seasons. During these periods, livestock are grazed relatively closer to the homesteads. The mean distance traveled by herders in the irrigated zone was 9.84 km in the dry season and 8.63 km in the wet season (BurnSilver et al 2003). In periods of extended drought, the livestock is taken to the better watered Chyulu Hills until moisture conditions at home become more favorable. This is a much longer grazing orbit that could necessitate up to several months absence from the home. Because women have other responsibilities related to child care and home management, this longer grazing trips are done exclusively by men.

The amount of labor available in the household influences how grazing labor is organized by gender. In the past, grazing was predominantly done by the younger unmarried males in the household. As more and more of this age group has enrolled in school, the household labor pool has shrunk. The labor void thus created has been filled more by the wives than by the husbands (husbands have moved on to crop production).

Treatment and prevention of diseases usually involves administration of unpleasant tasting drugs or injections (or both) to livestock. This task cannot be performed by one person as it requires several people to hold the animal still as one person administers the

treatment. Women told us that they do not like to hold down the animals and will only do this in the absence of male members of the family. Administration of drugs is therefore done almost exclusively by the husbands

Gender roles have not changed in certain livestock activities. Two of these activities are milking and selling milk (Figures 6.11 and 6.12). Milking is significantly dominated by women in all the agro-ecological zones ($p=0.000$ in all zones except for the rain-fed zone where $p=0.031$). Cattle are milked twice a day, in the morning before they go out to graze and in the evening after grazing.

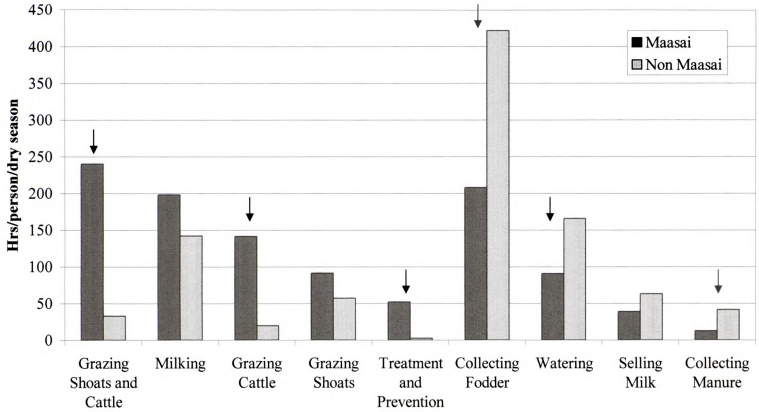
Selling of milk is significantly dominated by women in two agro-ecological zones ($p=0.045$ in the rain-fed zone, and $p=0.000$ in the irrigated zone). Maasai women sell milk when the product is relatively abundant. The amount of milk sold and the price varies with season. During the rainy season, there is an abundant supply of milk, and women are more ready to sell. However the demand for milk is also lower during the rainy season and therefore the price is low. During the dry season when the cows produce less milk, the demand for milk is higher and the price is also higher. In 2001 in Oloitokitok town, the price of milk during the dry season was Ksh 30 (US$ 0.4) per bottle (1 liter) and half that during the rainy season. In places further away from the town centers, the prices are more variable and considerably lower. Other livestock products (e.g. ghee, sour milk, hides etc) are not sold in large quantities because their supply is limited. Ghee is sometimes sold to teachers, government officials and local businessmen living in the local towns. Considering the lower price of livestock products in relation to the price of consumer goods (e.g. sugar), and the rising inflation rate, the amount of money that women receive from the sale of livestock products is quite modest. The

women in the study referred to the modest amount of cash received from the sale of livestock products as 'money for tobacco' (tobacco is very cheap).

Men are sometimes involved in the sale of milk. This usually happens in non-Maasai households where cultural linkages of milk to women are absent or weak. In the study, 72% of the men that sold milk were Kikuyu. The remaining 28% of men that sold milk were Maasai. In these situations, the families involved had a large herd of cattle and milk sales were commercialized. The women in such cases lose control of the milk money. This tendency has been reported in Maasai communities in Tanzania (Ndagala, 1982) and Kipsigis smallholders in Kenya (Talle, 1988/1994). Selling of hides, usually in the domain of women can also fall into men's hands. Key informants told us that in periods of prolonged drought, herders lose large numbers of their livestock and there is an abundance of hides and skins. These fetch a good price and men usually take over the sales. Key informants told me that the reason men take over the sale of milk and hides when there is a lot of money involved is that women cannot handle business deals or large amounts of money.

Manure is usually collected as women clean the livestock sheds. The manure is then stored in a heap outside the livestock shed, and later spread on farms. Farmers who apply manure on their farms said they did this at the beginning of the cropping season before field preparation. Manure application is more important in the rain-fed and mixed zones than it is in the irrigated zone. This is illustrated in the time spent collecting manure in the three zones (Figure 6.12). Women spend more time than men in all the zones, but the difference is only significant in the rain-fed and mixed zones. This is not surprising since historically collecting manure was done by women as they cleaned out the animal sheds.

Differences in time spent on livestock production by the Maasai and non Maasai are shown on figure 6.13. There are significant differences between the time spent on grazing by Maasai and non Maasai, depending on the composition of the animals in the herd. The Maasai spent significantly more time grazing when cattle are included in the herd ($p=0.000$ for grazing cattle, and $p=0.000$ for grazing cattle and shoats). This is as a consequence of differences in animal husbandry techniques between the Maasai and non-Maasai, a difference that is partly driven by ecology, and partly by historical livelihoods. The Maasai keep most of their cattle in the irrigated zone. From an ecological perspective, this is an efficient method of land use as the zone is too dry for crop farming, except for the irrigated areas. One way that the rangeland can be converted to products useful for human consumption is through livestock rearing. Historically, the Maasai have reared livestock in the rangeland using time consuming animal husbandry techniques. Cattle grazing was not just a method of production, it was also a way of life. Cattle grazing in the livestock zone (the irrigated zone) is a time consuming exercise that involves herding cattle over large areas. Grazing orbits can be up to 9.84 km during the dry season and 8.63 km during the wet season (BurnSilver, Boone, & Galvin, 2003). The non-Maasai on the other hand keep most of their cattle in the rain-fed zone. Due to competition from crop farming, animal husbandry techniques differ in the rain-fed zone. High yielding cattle breeds are zero-grazed. Fodder is collected and water is fetched and brought to the animal stall. Non-Maasai spend significantly more time collecting fodder ($p=0.003$) and watering their animals ($p=0.035$) than the Maasai do.



Note: Arrows indicate where differences are significant

Figure 6.13 Time spent on livestock production by Maasai and non-Maasai

Historically, the Maasai have treated their livestock with herbal medicine when they fell ill. More and more they use alternative medicine, but they still treat their livestock themselves. The non-Maasai usually keep exotic breeds, and use professional veterinary services more when their cattle fall sick. The Maasai therefore spend significantly more time on treatment and prevention than do the non-Maasai ($p=0.000$). Collection of manure is done more by non-Maasai than by the Maasai ($p=0.028$). A reflection of the agro-pastoral techniques used in different zones. People in the rain-fed zone (where most of the non Maasai live) use manure in their fields more than people in the other zones (dominated by Maasai). Consequently they spend more time collecting manure. A second reason for this is that more manure collects in stalls in zero-grazing systems than in systems where the animals are let out of the sheds during the day. Therefore there is a lot more manure to clear in zero-grazed stalls.

6.2.6 Summary of Gendered Division of Labor in Crop and Livestock Production

Table 6.1 is a summary of the discussion in section 6.2. The major differences in time allocation between husbands and their wives in livestock production has changed from what it used to be in the past. Women spend more time on livestock related duties than men do in all the agro-ecological zones of the study area. Currently, both men and women are engaged in grazing livestock, an activity that was dominated by male members of the community. Women are also still involved in milking, milk distribution, and collecting manure (part of cleaning out the animal shed).

Table 6.1

Summary of the Gendered Division of Labor in Crop and Livestock Production

	Wives		Husbands	
	Past	Present	Past	Present
Livestock				
Rain-fed Zone	No livestock keeping in zone	Grazing, watering, collecting fodder, milking, selling milk, collecting manure	No livestock keeping in zone	Grazing, watering, collecting fodder, treatment and disease prevention*
Mixed Zone	Milking, milk distribution, looking after young livestock, looking after sick livestock, cleaning shed	Grazing, watering, collecting fodder, milking, selling milk*,collecting manure	Grazing, watering, building and repairing animal shed, attend milking	Grazing, watering, treatment and disease prevention*
Irrigated Zone	Same as mixed zone	Grazing, watering, collecting fodder, milking, selling milk	Same as mixed zone	Grazing, watering treatment and disease prevention*

Crop				
Rain-fed Zone	No crop farming	Activities: field preparation, weeding, harvesting, planting, threshing Crops: maize, beans, root crops, fruits, peas*	No crop farming	Activities: field preparation, weeding, threshing, supervising* Crops: maize, beans, fruits
Mixed Zone	No crop farming	Activities: weeding, harvesting, planting, threshing, supervising* Crops: maize, beans, root crops, onions, sukuma-wiki, fruits	No crop farming	Activities: field preparation, irrigation, selling, weeding, harvesting, planting, threshing. Crops: maize, beans, tomatoes, onions, fruits

Irrigated Zone	No crop farming	Activities: weeding, harvesting, planting, threshing, supervising Crops: maize, beans, cabbage, sukuma-wiki, pepper	No crop farming	Activities: field preparation, irrigation, selling, weeding, harvesting, planting, threshing, supervising Crops: maize, beans, onions, tomatoes, cabbage, pepper

Note: * indicates where differences between husbands and their wives were found not to be significant, but over 90% of the labor came from either the husbands or the wives.

The only new livestock activity that men have taken up is treatment and disease prevention which has now acquired financial implications. Variations along the ecological gradient reflect the differences in livestock herding strategies practiced in areas of different rainfall potentials.

In crop production, there are different patterns of gender division of labor, that are a clear reflection of dominant cropping patterns in different agro-ecological zones. In the rain-fed zone, women do all the activities that men do, and at the same time do significantly more of the harvesting and planting. Men on the other hand do significantly more supervising. Both men and women spend time on maize and beans, the two dominant crops in the zone. At the same time, women spend more time on a variety of root crops and peas, which are grown to substitute the family diet or for sale at the local market. In the mixed and irrigated zones, men spend more time than women do in crop production. This is a reflection of the crops grown and methods of farming. Men spend more time than women do preparing the fields for planting, irrigating the fields, and selling the farm produce. Men spend much of this time on onions and tomatoes, the two major cash crops in both zones. Like in the rain-fed zone, women spend more time than men do on crops grown to substitute the family diet and for occasional sale at the local markets, root crops and sukuma wiki.

6.3 Why the gendered division of labor in crop and livestock production is changing

Table 6.2 is a list of forces identified during the research as important drivers of change in gender division of labor.

Table 6.2

Forces Driving Changes in the Gender Division of Labor

	Environmental	Social-Cultural	Political	Economic
International				-SAPs -Market liberalization
National or Regional		-Population pressure in the Kenya highlands -Land reform -Out-migration from Central Kenya -Historical social ties between Maasais and Kikuyus	-Less government investment in the district -Government promotion of the concept of the developed individual (*maendeleo*)	- Increased cost of education and health -Historical economic ties between Maasai and Kikuyu

Local	-Expansion of area under crop -Reduced availability of grazing land -Reduced livestock numbers	-Reduced importance of livestock for food and cash -Population increase -Changes in herding strategies -Conversion from traditional religion to Christianity -Changing house structure -Higher school attendance by boys than by girls -Sedentarization -Changing settlement patterns from a few large to many, smaller homesteads -In migration of farming communities -Intercultural marriages -Interaction with farming communities	-Poor road infrastructure -Increased school enrollment	-Increased need to earn cash -Increases in food costs -Increased cash crop farming -Shift towards labor intensive irrigated crops - Changes in type of livestock kept -Increased engagement with paid labor by both men and women -Increased reliance on family labor for poorer farmers

The list is presented here based on Campbell and Olson's (1991b) Kite framework. Although these forces are listed independently of each other, they interact with each other over space and over time. In this section, I will therefore focus on four major forces: (1) land use change (2) social factors (3) national government policies and (4) structural adjustment policies. I will discuss interactions of the forces listed in table 6.2 within the context of these four broad forces.

6.3.1 Land use change

Cropped area has expanded at the expense of grazing land. Households have taken up new land uses, such as crop farming, and this has brought new activities that have influenced work and how work is shared in the study area. One reason for this shift in land use has been the decline in the importance of livestock as a food and economic resource, and consequently a need to find alternative sources of food and income. Herds are too few to satisfy either the nutritional or the economic requirements of family members. The vegetarian component of the diet is very important, especially during the dry season. This fact has been observed in other pastoral areas as well (Talle, 1988/1994).

Pastoral communities have the choice of growing their own foodstuffs or relying on purchased products. Fifty-one per cent of the households in our study indicated that their expenses on food had increased in the past 10 years. Fifty-four percent told us that food was one of the three most important expenses in their households. Reliance on purchased food products is a general trend in pastoral communities in East Africa (Hjort, 1982). One explanation for this is linked to number of tropical livestock units per capita. Pratt and Gwynne (1977) recommend a minimum of over 5 TLU per capita to meet food

requirements. The reason for this is that there would be enough milk to become an important part of the diet. The sampled population in this study has a 2.3 TLU per capita, meaning that livestock alone cannot meet the food requirements of the population. This is one reason that families purchase foodstuffs to help meet their requirements. Talle (1988) found that consumption of purchased foodstuffs was higher during the dry season when milk yield is considerably low (an eighth of the rainy season amounts). As much as possible, households will try to grow what food they can, and spend money only on commodities that they cannot grow (e.g. sugar, cooking fat).

In addition to the expansion of cropped areas, there has also been land use intensification. Intensification has involved a change in the types of crops grown and methods of farming used. As illustrated in chapter 5, people have expanded crop production in to dry areas, where they practice irrigation. Farmers have also changed the types of crops grown, and moved towards more labor intensive cash crops.

Intensification has been directly related to increasing population density and a consequent need to raise production per unit area (Boserup, 1981). Population in the study area has been increasing both from in-migration and natural increase. The population of Oloitokitok Division increased more than fifteen fold between 1948 and 1999 (Kenya, 1950; Republic of Kenya, 2001a). One way that communities increase production is by increasing the labor input in the production process (Netting, 1993). In the study area, intensification has increased labor demands and affected gender roles in crop production. This has happened through changes in the types of crops grown and changes in the methods of farming.

During group interviews, farmers explained that maize, beans and potatoes, the initial crops grown in the rain-fed area, are less labor intensive than tomatoes, onions, cabbages, *sukuma-wiki* and peas. Farmers estimated that one crop of maize, which is in the field for seven months, only requires half the time (per ha) that one crop of tomatoes or onions, which are on the field for about 3-4 months require. Tomatoes, onions, pepper and cabbages can be grown all year long as they are grown principally using irrigation. The labor for these four crops comes mostly from men (Figure 6.9).

The methods of farming in the study area have expanded to include both rain-fed and irrigated techniques since the 1970s (see chapter five). Irrigation is more labor intensive than rain-fed farming. This is because the irrigation process involves activities that are not required in rain-fed farming. These activities include construction and maintenance of irrigation structures and watering the field. As explained in section 6.2.2, these activities are usually done by men. Crop intensification, which has mostly happened in the irrigated and mixed zones, has resulted in increased labor demands, most of which have fallen in the hands of men.

Intensification in livestock keeping has also affected the amount of work done and gender roles in livestock production. The number of livestock kept has reduced and the types of breeds have changed as people respond to the reduction in grazing areas (among other changes). Over the past ten years, there has been a general trend towards smaller herd sizes in the study area. This trend was aggravated by the recent drought in 2000. Cattle owned by the Maasai in Oloitokitok Division reduced from 40,705 to 14,857, goats reduced from 25,769 to 14,407 and sheep from 35,007 to 19,800 between 1999 and 2000 as a result of drought (SARDEP, 2001). In the irrigated zone and mixed zone, people

prefer to keep larger breeds (e.g. the ndama) that will fetch more money and sell faster in the market than the traditional zebu. In the rain-fed zone, and parts of the mixed zone, people stall feed grade cattle which have higher labor requirements than the traditional zebu. It has been found that once the herd size dropped below a certain limit, Maasai men became less interested in the management of their animals, leaving a great deal of responsibility to their wives (Talle, 1988/1994). This study speculates that reducing herd sizes has contributed to transferring livestock care from husbands to their wives.

6.3.2 The role of the national government

The concept of development (*maendeleo)* has been promoted by Kenya's national and local government officials since independence. A developed individual is perceived by local communities as one who has had a formal education, practices a religion other than African Traditional Religion (ATR), wears non-ethnic dress and lives in a brick house. This meaning of development has influenced the way people have made their choices, especially since a lack of *maendeleo* is interpreted as backwardness *(ushamba).* Development has had an impact on changing gender roles through changes in school enrolment, religion and house construction. The impact of school enrolment will be discussed in this section, while that of religion and house construction will be discussed in section 6.3.4 (social forces).

Increased school enrolment has had an impact on gender roles in crop and livestock production. Fifty years ago, there were no schools in the study area and children stayed home and helped their parents. Schools have since been built and people have developed a high value for formal education and have started to send their children to school. Schools are seen as one way to equip children with skills that will enable them to be

successful adults, and consequently provide economic and social status to the family. Formal schooling has removed from the household an important labor resource, and placed an extra workload on parents. Although on average Kajiado District has fewer people aged between 5 and 24 in formal education institutions than the national average, the national pattern of higher attendance by males is maintained. Thirty-eight per cent of the females in the district aged 5 to 24 attend formal schooling (national average is 55%) and 45% of the males attend formal schooling (national average is 60%) (Republic of Kenya, 2001a). This is because parents are deliberately enrolling their sons in formal schools more than their daughters. Parents view their children's education as an economic investment and they perceive a son's education as more beneficial to them than a girl's education. They argue that a girl grows up and leaves home to get married and only benefits the family into which she marries, while a boy will not leave home. Parents also argue that investing in a girl's education was risky as girls stood a higher chance of dropping out of school than boys did, due to pregnancy, early marriages, or both. Girls are also an important source of wealth (bride price) especially for poor families, who prefer to obtain an income by marrying off their young daughters, rather than spend money on them through school fees. Hodgson (2001) observed a similar pattern in school enrolment among the Maasai in Tanzania. Key informants said that this fact has increased the amount of work assigned to the girls, as they have taken up the activities that were initially performed by their brothers. Key informants told us that most of what school going children used to do has also been passed on to the mothers.

6.3.3 Structural Adjustment Policies

Kenya's national economy has not performed well since the 1980s (Republic of Kenya, 1991, 2001b). The changes in the economy have contributed to increasing poverty in the country (Gitobu & Kamau, 1994; Ikiara et al., 1993). As explained in chapter 5, The World Bank's structural adjustment policies have increased the cost of education and health. These changes in the economy have combined with people's increasing needs to improve their economic performance. The growing need for cash and the lack of cash resources has been found to encourage poor pastoral families to settle close to trading centers and small towns where job opportunities, or market and cropping facilities are better (Anderson & Broch-Due, 1999; Barth, 1964; Talle, 1988/1994). In the context of Oloitokitok, the people have diversified their economic base by settling close to transport networks and taking up new activities, and intensifying some of their older activities. In addition to activities already discussed, people have also taken up small businesses and engaged more in waged labor. Furthermore, for those dependent on purchased foodstuffs, the distance to shops and markets further encourages settling close to transport networks. Both men and women have taken up these new activities.

Another product of World Bank's structural adjustment policies has been market liberalization (Fontaine, 1992; Ikiara et al., 1993). For a country to be able to compete favorably in the global arena, it needs to minimize the cost of production as much as possible. One way to do this is to build and maintain a good infrastructure. The study area is unfortunately very badly served in this respect, and a large part of the cost of production goes into transport costs that have been inflated by the poor status of the roads. Market liberalization has introduced competition from Tanzanian farmers, who

have lower production costs due to their more superior infrastructure. Kenyan farmers from Oloitokitok cannot afford to sell their produce as low as the Tanzanians do. In 2001, many farmers left their tomatoes to rot on their farms due to this stiff competition. One way that people try to lower their production costs in the study area is by relying solely on family labor and avoiding reliance on hired labor. Respondents complained that they are usually over committed in crop and livestock production as well as other domestic activities.

Although both men and women have been affected by SAPs, the impact has been greater on the women than it has been on the men. Men have had to take up new activities related to the new land uses, but they have also passed some of their previous activities to women. Women on the other hand, have taken up new activities related to the new land uses, and at the same time taken up some of the work that was previously done by men. As explained earlier in this chapter, this is especially evident in livestock production. In addition women are still the principal providers of domestic labor. Although some men said that they have taken up a few domestic activities, they agree that these activities are few and do not compensate for the time that women are investing in previously male activities. With the increased time demands on women, they have had fewer opportunities to engage in waged labor than men have. As explained earlier in this section, SAPs have led to higher education costs, which have in turn led to a reduction in the number of girls attending formal schooling. This further reduces the opportunities that females have to engage in formal employment, and to enjoy the economic security that comes with it.

6.3.4 Social forces

National development strategies can have societal implications that influence how labor is organized within the household. One such strategy has been the land reform process explained in section 5.4.2. In Oloitokitok Division, the land reform process necessitated a re-organization of Maasai residential units (Kipury, 1989). As explained in chapter 5, the land reform process encouraged sedentarization of the Maasai pastoral communities. In addition their homesteads became smaller, more permanent, and extended family units became more dispersed. At the time of this fieldwork in 2001, the division had many nuclear family settlements. Re-organization into smaller units has reduced the number of people per unit of production, and therefore either increased labor-time allocation for each person or for certain categories of people or both. Examples of activities that can be affected by homestead re-organization include livestock grazing and watering, and child care. During group meetings, respondents felt that homestead re-organization, although important, was on its own not a critical driver for changes in the division of labor.

Changes in house structure has also had an impact on the gender division of labor. Traditional Maasai houses (*enkaji*) were relatively smaller than those constructed more recently. The walls and roof were made by women from a mixture of mud and wattle. The *enkaji* could optionally have been grass thatched. Those who can afford it now construct houses with concrete or wood walls and corrugated iron roofing (*mabati*). Changes in house structure are a visible indication of increasing permanence of residence and affluence in a family. Modern houses are a symbol of economic and social standing that a man has achieved. They are usually constructed by the more educated male

members of the community with stable incomes. They are found more in privately owned land than on the group ranches[29]. The *enkaji* was constructed and maintained by the women of the house. In contrast, the modern houses are built principally by the man. Men collect and put up the poles which support the house. The women do the plastering and thatching. In cases where a family builds a concrete or wooded structure, the work is done by paid craftsmen. Changing house structures have also meant that women are relieved of the constant task of repairing houses during the rainy season.

An unlikely driver of changes in gender roles has been religion. Fifty years ago, people practiced Maasai traditional religion to a great extent. Today, many Christian churches have local parishes and a large following, especially among the younger generation. Key informants told us that Christianity has changed the way that society perceives women by lifting their social status. Religious leaders condemn wife beating practices and encourage men to treat women as equals. One result of this has been an expansion of women's economic opportunities as husbands now allow them to travel further and work more independently than they did before. This has also increased the economic responsibility that women have, and the time they spend on livestock and crop duties.

A common explanation by key informants for changing gender roles is influence from non-Maasai communities, most notably the Kikuyu farmers. The Maasai were livestock herders who frowned upon crop farming, thinking it a lowly activity for them. Indeed, only the poor Maasai who had lost all their livestock practiced farming (Anderson & Broch-Due, 1999). Interaction with other communities and the introduction of a

[29] Group ranch members told me that they did not want to invest in constructing permanent dwelling units, because they might have to relocate their homes after the group ranches are subdivided.

monetary economy contributed to change these attitudes. One way that interaction with other communities occurred was by marriage. Galaty (1993b) gives an account of how Kikuyu women married by Maasai men learned to intersperse cultivation with the annual movements of cattle in order to be able to continue farming (the Kikuyu livelihood). Interaction also occurred through *osotua* (friendship bond) (Sobania, 1991). This came out of close economic (trade) and social (raids) ties between Kikuyu and Maasai (up to 1890).

More recently, interaction has come out of migrations of Non Maasai ethnic groups into Maasailand (Campbell, 1993; Campbell & Olson, 1991a; Waller, 1993). Continued interaction and intermarriages with other communities transferred farming skills to Maasai communities. The Maasai in the study area no longer consider livestock to be the single measure of wealth. Wealth is increasingly measured on monetary terms. The Maasai reported that they have learned from interaction with other communities that there is wealth (money) in crop farming too. This has changed their attitude towards crop cultivation and created an interest in cropping. Since the 1970s, the Maasai have taken up crop-livestock farming as a livelihood system and not as a temporary activity during periods of extended drought.

Interactions with the Kikuyu and other farming communities (e.g. the Kamba and Chaggah) has impacted on the role that Maasai women play in crop production. During key informant and group meetings, Maasai women who have been farming for relatively longer periods explained that initially their husbands thought that women were too weak to farm. The husbands changed their attitude when they continuously witnessed women from other farming communities doing the activities that they perceived to be too hard for

women. Similar patterns of women's exclusion from what is perceived to be hard physical work have been reported among the Tuareg (Rasmussen, 2002). Unlike in Oloitokitok, proximity to farming communities whose women are engaged in what is perceived to be hard physical work has not influenced work patterns among the Tuareg.

6.4 Labor negotiation within the household

The nature of gender relations can best be understood through the use of a more detailed unit of analysis than is provided by the household (Guyer & Peters, 1987). Households constitute many actors with different preferences. One way that gender relations manifest themselves is through the division of labor within the household. Evidence from several geographic locations reveal gender inequalities in the way labor is allocated (Agarwal, 1997a; Steinmann, 1998). The labor allocation patterns described in previous sections can be seen largely as socially constructed and not biologically determined. Labor allocation patterns are closely tied to ideologies and meanings that individuals and groups attach to 'maleness' and 'femaleness'. The evolution and continuing transformation of the production regime, and consequently the labor process in Oloitokitok has resulted in dynamic and highly contested meanings.

The household is a site of cooperation and conflict between husbands and their wives as they strive to ensure survival for the entire household. Men and women will cooperate if cooperation benefits the household. Conflict will arise where cooperation is seen to benefit certain members of the household more than others. The forms of contestations that arise from the conflicts can be limited by social norms (Agarwal, 1997a). Some women may opt for forms of contestations that will not define them as social outcasts, while others could be more radical in their approach. The nature that cooperation or

conflict takes is closely related to power relations within the household, especially regarding to who participates in decision making. The power that an individual has to negotiate for control of their labor is related to their economic power, as defined by their economic assets, and to their age.

In the Oloitokitok context, economic assets of women are mainly in the form of exchange entitlements, and endowments such as labor power and a limited amount of the crop and livestock harvest. Men's economic power primarily stems from sale of crop and livestock produce. In poorer households that do not have enough land or cannot afford farm inputs, men obtain economic power by selling their labor in the agricultural market. A person's age sets certain limits to a person's ability to negotiate despite their economic power. The Maasai division of labor is organized around age sets (Spencer, 1988; Spencer, 1993) and social norms therefore limit negotiation capacity of individuals. Elders are the ultimate decision makers regardless of their economic power. An elder has the power to temporarily redistribute milking rights among his wives or the wives of his progeny, with implications for women's milking time and access to milk. Among women, age combines with education to increase an individual's ability to negotiate. Key informants said that young educated women will have more control over their labor than older uneducated women. This is because educated women have access to wage employment and a stable income that contributes to household survival.

In the Oloitokitok study area, cooperation more than conflict is the dominant result of negotiation. In single gender focus group discussions, both men and women said that they had so much to do to ensure survival of their households that "everybody does everything". In the rain-fed zone where farming has been going on for a longer time,

men explained how they take up previously female dominated activities such as weeding. They said that failure to help the women would result in a loss of part of the crop, further increasing the problems that the household has to deal with. In the irrigated areas where crop farming is more recent, women explained how they have to provide their labor to grow cash crops, as the sale of the crops provides an income that benefits the entire household.

Cooperation breaks down when individuals fail to see the benefits of their labor. Key informants and single gender focus group discussions indicated that this usually happens when men fail to meet financial needs of the family, and instead use the fruits of the family labor for selfish gains. Women complained that many men increase their alcohol consumption after the sale of farm produce (crops and livestock). When this is done in excess, the family's food, health and school fees needs are jeopardized. Women engage in implicit forms of contestations over their labor. They withhold their labor from the family farm and instead hire it out. Women said that this gives them the ability to provide for education, food and clothing needs for themselves and their children. Women's entry into wage labor increases their economic power and therefore their ability to negotiate within the household. The women of Oloitokitok study area said that their husbands were more willing to let them decide what they did with their time when the husbands had seen financial benefits of their wives labor in the household.

An extreme form of contestation involves complete withdrawal of the women's labor from all the household's activities. Women leave their husband's household and return to their pre-marital home ('running away'). This usually happens when other forms of negotiation fail. Women said that they arranged their 'running away' so that it coincided

with the beginning of the crop cycle. This also coincides with the end of the dry season when the granaries are either empty or almost so. Key informants said that women who choose to 'run away' are those whose husbands continuously sold most of the harvest leaving little food for home consumption, and used the money on themselves and not on the needs of the households. 'Running away' when the granaries are empty and female labor is required on the farm forces the husbands to the negotiating table fast. He has no time to install a replacement (another wife) and find food for the children, and he has no money to hire labor to work on the farm. 'Running away' is a powerful form of contestation as it exposes a husband's wrong doing to the elders, with who he has to negotiate before his wife is allowed to return to her matrimonial home. 'Running away' is a socially accepted form of contestation for women and there is no fear of stigmatization associated with it. For this reason, it continues to be used, more so by women who are powerless to use more radical forms of contestations. Participant observation and key informant interviews revealed that women who ran away did not have much control over their labor and therefore could not achieve any form of financial independence through wages.

I noted more cases of extreme forms of contestations among the Maasai women who lived in the rain-fed zone. Maasai women in the rain-fed zone are more engaged in crop farming than the Maasai women in the irrigated zone. The women are at a stage where labor allocation by gender is at its most dynamic, and therefore also at a stage where a lot of negotiation takes place. This is probably the reason why running away was most common within this group.

Although there were more incidences of cooperation than incidences of conflict in the study area, I noted from participant observation that gender relations were still unequal. Three issues stick out in this respect. First, women had to rely on the goodwill of their husbands and did not always have equal say on how earnings from their labor were used. As one woman in the study area explained:

> You know about men. Sometimes he takes the money and you do not know what he has done with it. You know men do not like to ask you how the money should be used. The amount that he brings to you to use for yourself and the children is very small. And he does not always ask you how much you need. But there is no point in fighting and quarrelling all the time. If you do that you will never stop fighting and quarrelling. If he has not taken all the money, if he has remembered to use a little bit on you, there is no need to quarrel all the time.

Secondly, women would fail to contest and appear to cooperate even when men did not use the family's earnings for the benefit of the entire family. Women only contested in extreme situations, as this is what was culturally accepted. Thirdly, culturally accepted ways of disciplining errant wives was more violent and more frequently administered than culturally accepted ways of disciplining errant husbands. Consequently, women avoid errant situations more than men do. This explains why women contested only in extreme situations and persevered moderate situations (women's contestations are culturally acceptable during extreme situations). The women wanted to avoid situations where they would be treated as errant wives at all costs.

6.5 Conclusion

This chapter has examined how land use and gendered division of labor influence each other in different agro-ecological zones. Differences in the way land is used influences labor demands and labor-time allocation by gender. In the rain-fed zone there is intensive animal production strategies with farmers moving towards the more labor intensive zero-grazing strategies. In the drier lowlands, farmers are also moving away from the less intensive migratory grazing strategies to grazing close to their homesteads. This change has implication for women's labor requirements. Crop production in the rain-fed and irrigated areas show differences at divisional level. The lowlands are the focus for cash crop farming in Oloitokitok Division while the highlands focus on crops that can be used either for food or for cash. Cash crop farming in the lowlands is controlled by men and consequently men's labor in crop production in the lowlands is used more than women's labor. Overall, both men and women have more work to do today than they did in the past.

Forces driving changing gender roles occur at international, national and local levels. The forces can be environmental, social, political or economic. In this chapter, I have explored how forces of change interact across time and space. Within the forces of change discussed, two aspects of human agency can be seen. The first involves the deliberate transfer of livestock care from husbands to their wives in response to the changing role and value of both livestock and land in the production process. The use and exchange value of livestock has decreased. At the same time, land which previously had only use value, has now acquired exchange value. As explained elsewhere in this chapter, it is men's desire to control the means of exchange that have focused their

attention away from the livestock and on to the land. Secondly, human agency is seen in the negotiation that goes on between men and women for labor control. We see human agency in the forms of cooperation and conflict. Although gender relations are unequal, women have culturally accepted avenues to negotiate for control and access of their labor in extreme cases of labor appropriation.

Chapter 7: Discussion

This chapter highlights the main discussion points of my research. I start the chapter with an examination of the gendered nature of crop and livestock production. Specifically I highlight the role that men play in crop production and the role that women play in livestock production. In my discussions, I draw comparisons between my findings and the findings of other researchers working in the area of gender roles and relations in crop and livestock production. I also examine the contribution that my study has made to feminist political ecology and regional political ecology. I highlight some of the aspects that political ecology would have expected of my research that I did not deliver and explain why this was so. I also compare the results of my study with other studies utilizing feminist political ecology in Kenya, and in pastoral communities in other parts of the world. The last part of this chapter examines the advantages of mixing methods in gendered research, and the benefits of multiple scales of analysis.

7.1 The Role of Men in Crop Production

This study contributes to the literature on the role of men in crop production. As stated in chapter 2, the role of men in crop production has been neglected in recent literature. The exclusion of men may be partially responsible for the persistence of the colonial constructions of the 'lazy man' in sub-Saharan Africa. It is essential to bring men back into the picture so as to get a more holistic understanding of gender relations in crop production. In Oloitokitok Division men spend significantly more time than women do on crop production in the irrigated zone. The time spent by men and women in crop production in the mixed zone and the rain-fed zone was not found to differ significantly.

These results differ from the results obtained in other geographic locations. For example, Boserup's monumental study (Boserup, 1970) analyzed the sexual division of labor in several countries and concluded that in areas of intensive, irrigation-based cultivation, both men and women share equally in agricultural tasks. In intensive irrigation-based cultivation in Oloitokitok Division, men participated in agricultural tasks more than women did. This difference from Boserup's findings can be explained by two factors. First, the activities involved in the irrigation process are perceived by the men to be too difficult for women, and the men therefore chose to perform them. Secondly, crops grown on irrigated lowlands are mostly grown for cash. The tendency in Oloitokitok Division is for men to control property that have high use and exchange value. As livestock has declined in exchange value, men have relegated livestock care to women, and men have then focused on cash cropping which has a higher exchange value.

In Oloitokitok Division, there is also a tendency for women to become increasingly involved in crop farming the longer a family continues to practice cultivation. During initial years that a family cultivates, men do most of the work. With time, men realize that they cannot manage all cropping activities without the inclusion of women. Many farmers in the irrigated areas are relatively recent farmers and this could partially explain why more of the cropping labor comes from men than from women.

Boserup (1970) also concluded that in areas of dense population where plows and other simple technologies are used, men do most of the work. This was found not to be the case in Oloitokitok Division. On the highland areas where population densities are high and farmers use simple technologies, there were no significant differences between the time that men and women spent on crop production. This can be explained by the

fact that unlike in many densely populated rural areas, Oloitokitok Division has had minimal male out-migration. Male labor is therefore still available for utilization in agricultural production[30].

My study also differs from Boserup (1970) in that Boserup describes differences in gender roles over a large geographical area. While this has the advantage of providing broad generalizations, it does not allow for an analysis of the unique contexts and processes that were behind the patterns of difference that Boserup observed. In this study, I focused on a much smaller region and I was therefore able to link the differences that I observed in gender roles to the Oloitokitok context and the forces behind the changing roles.

From the literature reviewed in chapter two, cropping activities are usually organized along gender lines. My results indicate that men do significantly more of the field preparation, irrigation and selling of farm produce. Women do significantly more of the harvesting and the planting. Both men and women contribute equally to weeding activities. These results differ from literature (Burton & White, 1984; Guyer, 1992; Guyer, 1988b; Guyer, 1990; Idowu & Guyer, 1991) with respect to weeding and field preparation. Guyer carried out extensive studies on gender roles in western Africa and concluded that women's activities are dominated by the symbolism of bending. She found that women contributed more labor to weeding and field preparation than the men did. Guyer's findings are supported by Burton and White, and Iduwo and Guyer.

The difference between my results and Guyer's (1988b, 1990) are explained by the different contexts in which the studies were carried out. There is a lower rate of male

[30] It is not clear from Boserup (1970) what the level of male outmigration was in the areas where she collected her data.

outmigration in Oloitikitok than in the areas where Guyer worked. This means that there are more men present to provide their labor in Oloitokitok. Guyer has done her studies in communities that were traditionally crop farmers. The Beti of Cameroun and that Yoruba of Nigeria have also been linked to the urban and global economy and to western religion for much longer periods of time than the Maasai have. The Beti for example grow cocoa for the international market and other foods for Cameroun's urbanites. The difference between Guyer's findings and mine could also be explained by differences in agricultural practices. In Oloitokitok, field preparation involves breaking new land for cultivation, or preparing irrigation furrows or both. These activities are perceived to be hard work in much of the study area and are therefore mainly performed by the men.

I see my results as similar to the results of Guyer (1988b, 1990, 1992) in a general way. In both studies, we see a broad shift from traditional livelihood patterns. Guyer's work exemplifies income diversification strategies, achieved through a shift away from farming to new activities in rural areas, urban areas or both. Men move away from farming and into the new activities, leaving women to dominate farming activities. This pattern in similar to the one I observed in my study area. In Oloitokitok, there is a shift in livelihoods from pastoral to agro-pastoral as a way to diversify people's income. As in Guyer's studies in West Africa, men are the first to take up the new activities, leaving the traditional livelihood in the hands of the women. This partly explains why in the irrigated areas of Oloitokitok (where the transition is most dynamic) men do more of the cropping activities while women do more of the livestock activities.

7.2 The Role of Women in Livestock Production

This study focused on Maasai agro-pastoralists of Oloitokitok Division. The results of this study contribute to literature on gender roles and gender relations in pastoral production systems. As discussed in chapter 2, mainstream literature on gender and pastoralism has elevated the roles of men and ignored or downplayed the role played by women. There is however a growing number of researchers who recognize the importance of women in pastoral systems of production. In sub-Saharan Africa and the middle east, women have been documented to play an important role in poultry production (Gueye, 2000; Niamir-Fuller, 1994), in raising 'minor' animals such as sheep and goats (Fratkin & Smith, 1994; Niamir-Fuller, 1994; Turner, 1999), and in the control of milk and milk products (Kipury, 1989; Mitzlaff, 1994; Niamir-Fuller, 1994; Steinmann, 1998; Talle, 1988/1994).

Niamir-Fuller (1994) gives an overview of women's role in livestock production systems in Latin America, Asia and Africa and argues that their role is undervalued. She draws examples from transhumant systems, agropastoral systems, intensive crop-livestock intergrated systems and peri-urban systems. She offers a description of women's activities in these systems and argues that the role that women play is changing. She discusses male out-migration, sedentarization, privatization of communal land, shift towards off-farm employment and integration into the market economy as important forces driving the changing gender roles in livestock production. She concludes her study by advocating for research into the role of women and the recognition of women's roles in livestock development projects.

Niamir-Fuller's (1994) study was different from mine in that she gave a generalization of livestock production systems in the developing world. My study on the other hand focused on Oloitokitok Division. She was able to compare across different livestock production systems and make generalizations across her sites. My study concentrated on one agro-pastoral production system and covered a greater detail in the processes behind the change than she did. My study also made a quantitative comparison between men and women and their time allocation strategies in livestock production. All the forces of change that Niamir-Fuller identified were true in my study area, except for male out-migration. Her study advocates for studies that quantify women's role in livestock production and that is what my study did.

Turner's (1999) research investigated the reasons behind the declining importance of cattle and a corresponding increase in the importance of sheep and goats in livestock production systems in Niger. He argued that the main driving force was related to intra-household gender relations and not to desertification as earlier postulated. In Turner's study area, men historically owned and cared for cattle while women owned and cared for sheep and goats. Turner presents three reasons behind the shift towards sheep and goats in Niger. First, male dominated out-migration led to a decline in the number of cattle owners and consequently a decline in the number of cattle. Women controlled livestock wealth increased from 44% in 1984 to 59% in 1994 in Turner's study area. Secondly, the gendered nature of roles and responsibilities for different types of livestock also contributed to the shift towards smaller stock in Niger. Culturally, women who water and herd their cattle are frowned upon. A cattle owning woman has to rely on her husband to water and herd her cattle. Women whose husbands have emigrated will

therefore prefer to invest in sheep and goats. Thirdly, men's livestock was the first to be sold during periods of drought or financial need. When there was a need to sell livestock to provide for the family's needs, women invoked Islamic law that advocates for men to provide for their families. This ensured that cattle would be sold before the sheep and goats were sold.

Turner (1999) noted that changes in livestock production were related to the obligation that men and women have to provide subsistence for their families. This observation is similar to what was observed in Oloitokitok Division. Despite have different goals, the men and women of Oloitokitok had a strong desire to clothe, feed and educate their children. This was an important factor in income diversification strategies that they sought. As explained in the previous paragraph, Turner's study found a link between religion (Islam) and changing livestock production systems. Invoking Islamic law meant that there were more sheep and goats, and consequently more livestock related work for women. A similar link between religion (Christianity) and changes in livestock production systems was observed in Oloitokitok. As explained in section 6.3.4, Christianity elevated the status of women and led to increased economic responsibility and increased time spent in livestock production in Oloitokitok. In both Niger and Oloitokitok, we see a shift away from livestock related activities to other activities. In Niger, men migrate to other regions in search of alternative sources of income. In Oloitokitok, men shift towards cash crop production.

Turner's (1999) study differed from mine in that gender roles and responsibilities were not his objective of study, rather gendered livestock ownership was. He worked in an area where male out-migration was high, and where women were allowed to own

some livestock. This is in sharp contrast to Oloitokitok where only men can own livestock and where male out-migration is negligible.

The results of my study agree with the findings in the literature cited above, and go two steps further. First, my results indicate that women also contribute a significant amount of their labor-time to cattle rearing in addition to the sheep and goats. Secondly, my results indicate that in all the agro-ecological zones, women contributed more of the livestock labor than men do. During my research, I did not come across another study that has attempted to quantify the labor-time used in all the activities of livestock production. The results that women are doing more in the context of the study area are therefore a major contribution to the literature on gender and pastoral production systems. It is my hope that these results will motivate researchers working on other parts of the world, especially in areas where pastoral systems are in transition, to do quantitative studies on the gender roles in pastoral production systems.

The results obtained from the quantitative data was particularly important as it demonstrated the gap between what is practiced and what is believed to be practiced by the people of Oloitokitok. During group meetings and key informant interviews, both men and women agreed that women were now more involved in livestock production than they had been in the past. However, both men and women said that men still spent more time in livestock related activities than the women do, a fact that was not supported by either the quantitative data, or the researcher's participant observation. It is my hope that this discrepancy between the actual and the perceived will motivate researchers to collect both quantitative and qualitative data during their investigations on gender roles.

The transfer of livestock duties to the women can be explained in three ways. First, dominant grazing patterns have over the years changed from predominantly range grazing to increasingly zero grazing. Secondly, there has been a shift towards keeping larger cross breeds and exotic breeds of cattle that require different husbandry techniques than the traditional Maasai and local cattle. These two reasons are related and they have influenced the shift in roles in the rain-fed and mixed zones. It is as a result of changing cattle breeds that the grazing patterns have changed. Exotic cattle breeds and cross breeds require zero-grazing animal husdandry techniques. Zero grazing increases the amount of labor required for fodder and manure collection, activities which are predominantly done by women. Zero-grazed cattle are kept mostly for milk, which is usually the women's domain. This is partially why women spend more time than men do taking care of cattle that are zero-grazed. A third reason that might explain the shift of livestock duties to women relates to male control of exchange value. In the past, livestock was used as currency, and men spent more of their labor on livestock. The introduction of a monetary economy has shifted men's attention from the livestock as currency to actual cash. Men are therefore engaged more in cash crop production, leaving livestock in the care of women.

Current grazing patterns and their gendered nature can also be seen as a gendered use of space that has not changed over the years. Women are involved in livestock activities that keep them close to the home as they were in the past. Current livestock feeding strategies ensure that livestock remains closer to the homestead than in the past, and therefore within the space of women. Women's increased participation could therefore

be due to the increased presence of livestock in their space. This idea is explored further in section 7.3 below.

7.3 Contribution to Feminist Political Ecology

In broad terms, my study makes three important contributions to feminist political ecology. First, my study focuses on both men and women and compares their involvement in production with respect to each other. Much of the literature coming out of the feminist political ecology theoretical framework only looks at women. For example, Campbell with the women of Xapuri (1996) looks at how women have organized themselves in the defense of rubber tapers in Brazil; Wangari et, al. (1996) in her study on gendered use of resource use, access and control in semi-arid regions of Kenya only focuses on the rights of women; and Fortmann (1996), in her investigation of gendered knowledge also focuses on women's knowledge and does not give credit to men's knowledge. My research therefore brings to feminist political ecology one of the few studies to focus on both men and women. Secondly, my study investigates both cooperation and conflict in gender relations of production. Most of the studies within feminist political ecology focus more on the conflict and do not examine some of the areas of cooperation that exist between men and women (e.g. Carney & Watts 1990, Schroeder 1999). Thirdly, my study investigates the process of change and how it relates to the process of conflict or cooperation. I did not find another study that looks at the evolution from cooperation to conflict and back to cooperation in the context of changing land use patterns (and increasing involvement of women in cropping activities). Results from my qualitative data show higher levels of cooperation in communities that were not undergoing rapid change (new farmers and people who had been farming for fairly long

periods). The highest incidences of conflict were found in communities where farming had been practiced long enough for the men to realize they needed labor input from women, but not long enough for the negotiation on labor access and control to be settled.

The rest of this section will focus on more specific contributions that my study makes to feminist political ecology. I will start with a discussion on power relations within the household, then go on to discuss issues of conflict and cooperation within the household, and finally discuss the gendered nature of landscape use in Oloitokitok Division. The last part of this section will discuss the impact of wealth status, stage in life cycle and level of education on gender roles and relations.

One important argument from the regional political ecology literature discussed in chapter two is the importance of understanding power relations of production and how resource access and control (including the labor resource) are tied to power struggles at household to national levels. As discussed in chapter 2, feminist political ecology recognizes the importance of investigating power relations within the household, their gendered nature, and the meaning for gendered resource access and control. This study found that the household is both a site of contestation as men and women struggle for the control of women's labor, and a site of cooperation as men and women struggle to provide for their families. I will first discuss the household as a site of cooperation.

Reinforcing arguments from feminist environmentalism and in particular supporting Boserup (1976) findings and Durkheim (1984) theory of organic solidarity, this study found that the ultimate concern when labor-time allocation decisions are made within the home, is household survival. This is not to suggest that all individuals in a household have one common shared goal. Husbands and wives are separate individuals with

different priorities. But in most households in Oloitokitok Division, both parents share the objective of feeding their children, providing them with a good education and providing for their healthcare needs. It is this goal to provide these basic needs that promotes cooperation between husbands and their wives. Unlike the findings of Carney (1988, 1996), Carney and Watts (1990, 1991) and Schroeder (1999), this study finds the household to be more a site of cooperation and interdependence than it is a site of conflict.

Associated with cooperation is the idea of role blurring that was found to occur in Oloitokitok Division. This study demonstrates that role blurring occurred more in households that have been farming for longer periods of time than in households that had only recently taken up farming. Three reasons explain the role blurring process. First, there is a strong desire for both men and women to provide the basic needs of their children. Farmers explained that 'everybody does everything' as providing for the needs of the children was a common goal in most households. Secondly, role blurring has occurred out of necessity as diversification and intensification has led to new activities and higher labor demands for both men and women. Although men initially take up the new farming activities, they quickly realize that the labor requirements are very high and they cannot cope without the help of their wives. Thirdly and perhaps most importantly, there has been a change in people's attitude towards what is culturally accepted as a man's or a woman's activity. Proximity to different cultures and subsequent exposure to different gender roles has contributed to the shift. People's attitudes have also changed in response to the influences of Western religious beliefs. The few men who did domestic chores that were traditionally women's roles also practiced Western religion.

Conflicts that occur over the control of the female labor are not about the labor, but more about resources produced by the female labor. When resources generated from household female labor are used for the benefit of the entire household, no conflict arises. Conflict arises when men, who control resource distribution in the households, use resources generated by the household's collective labor for their own personal gain. Women continue to contribute their labor to cash crop and livestock production, even though men control the money earned from these activities, because labor contribution gives the women an edge in the process of negotiating for the allocation of resources by men in the household. Women who do not contribute their labor in the production of resources that are later converted to cash are culturally not expected to contest the use or distribution of the resource or cash. When women choose to contest resource allocation by men, the methods they choose show sophistication in their timing, cultural acceptability and involvement of opinions and support beyond the household. The overall objective of female contestation is closely tied to their material concerns for household survival. This is in keeping with the central theme of feminist environmentalism.

A relatively new concept within feminist political ecology theoretical framework that was discussed in chapter two is the idea of gendered landscapes. This is an important concept in understanding how men and women share different parts of the landscape. This study analyzed the gendered nature of landscapes at different times and at different scales of analysis, and found four kinds of gendered landscapes in Oloitokitok Division: gendered landscapes of grazing, gendered landscapes of cropping, gendered landscapes of marketing and gendered landscapes of conflict.

Gendered landscapes of grazing are identifiable through a historical analysis of grazing patterns at the landscape level. In the 1930s, range grazing was the dominant activity in almost all Oloitokitok households involved in the study. Group discussants and key informants said that grazing orbits were longer than they are today. They attributed this partly to the greater access to the rangeland that pastoral Maasai had in the past. Range grazing was predominantly done by the men. During this time, women took care of the sick and young livestock that were left at the homestead when the rest of the livestock went to graze on the range. Among the agro-pastoral Maasai, range grazing is slowly being replaced by zero-grazing, and grazing close to the homestead. These methods of grazing are primarily confined to areas within or close to the homestead. Over time, the dominant locality of the livestock has been transferred from the range to areas closer or within the domestic locale, and consequently from the care of the men to the care of the women. An analysis of the historical patterns of grazing therefore reveals patterns of gendered use of the landscape that have not changed very much, despite major shifts in animal husbandry techniques, and types of livestock kept.

Gendered landscapes of cropping are perhaps the easiest to identify in Oloitokitok Division. These are identifiable at two different scales of analysis. First, gendered landscapes of cropping can be identified through an investigation of how husbands and their wives share space at the field level. Husbands put the crops in their direct control on ecologically more favorable areas of the field, leaving less favorable areas for the crops that women control. Secondly, gendered landscapes of cropping are also identifiable at divisional level. Irrigated fields on the lowlands are used for the cultivation of cash crops controlled by men, while the rain-fed areas on the highlands are

used for the crops that both men and women control. This use of the landscape is partly related to the conflict and confrontation that Oloitokitok residents have come to associate with irrigation. As explained in chapter 6, irrigation water use conflicts sometimes leads to public verbal and physical confrontation. It is more culturally acceptable for men to display such public acts of confrontation than it is for women. This partially explains why irrigated farming has a higher male involvement than rain-fed farming.

Gendered landscapes of marketing crop and livestock produce were also identified in Oloitokitok Division. While men travel as far as Mombasa to sell crop produce, women only travel to markets within the division to sell their crops. Crops sold by men are usually grown specifically for cash, while crops sold by women constitute the surplus of the food crops they produce. Like crop marketing patterns, livestock marketing patterns also show variation in the distances that men and women travel, and in the types of livestock sold. Men primarily sell cattle, sheep and goats at livestock markets within the division. Women on the other hand can only sell poultry, as these are the only livestock that they have complete control over. Poultry sales are rare, and they primarily happen within the homestead. Poultry buyers are usually formally employed persons who visit the homesteads in an official capacity. Most transactions involve the sale of one bird.

As explained earlier in this chapter, conflict and cooperation between men and women occurs within the production process. Conflict between husbands and their wives will initially occur at the household level, and sometimes escalate outside the household to involve extended members of the family. Conflict between men also occurs in the production process. As explained in chapter 6, arguments over irrigation water are common, and they have in many instances only been resolved at community level

meetings. Cross gender conflicts are in most cases family affairs that rarely escalate to community level. Conflicts therefore display a gendered pattern, remaining with the family where women are involved and occurring at community level where only men are involved.

The feminist political ecology theoretical framework expects a discussion that goes beyond analyzing 'women' and 'men' as single undifferentiated categories. Feminist political ecology finds the categories 'women' and 'men' problematic as they fail to consider differences within these categories that are based on age, education, and wealth status. During the time frame of this study, my data structure did not allow me to manipulate my variables in order to quantitatively investigate differences based on wealth status, education and age. I will do these analyses in the near future. The following discussion is therefore based on interpretation of qualitative data collected during my field study. I will discuss how education and age affect adoption of cash crop farming, and how wealth influences gender roles in crop production.

During my fieldwork, I observed that the initial adopters of irrigated farming were in many instances the more educated members of the community. There are very few people with college degrees and diplomas in the study area. Most of the educated people have either a primary school or a high school education. Educated people, especially those with a high school education, have had a relatively higher chance of interacting with other communities in the school setting. They are also the most likely to have traveled outside the division and therefore the most likely to engage in activities that involve long distance travel, such as selling of cash crops. Educated people are also the ones who are likely to have alternative sources of income that can be used to finance

initial cash crop production. Education, therefore increases a resident's chance of engaging in crop farming, especially cash crop farming.

I would expect age and the stage in life cycle to work hand in hand to influence a person's chances of adopting cash crop farming. Senior elders are the least likely to take up new activities. For the most part, they reject new forms of dress, new gods and new livelihoods such as crop farming. In addition, the physical exertion involved in the construction of irrigation structures would perhaps deter the senior elders from cash crop farming. On the other hand, the recently married junior elders are the most likely to engage in cash crop farming. For one, they are more likely to have had a formal education (and the cross cultural interaction that comes with it) than the senior elders. Secondly, junior elders are just entering family life and have to think of how to finance their adult responsibilities. Senior elders in comparison have many of their children grown up (and able to help their parents) and consequently fewer responsibilities. I would therefore expect to find fewer people engaged in crop farming with increasing age.

The wealth status of a family influences how much they rely on family labor and consequently how much the labor of women is used. Wealthier households can afford to use hired labor in crop and livestock production. Wealthy households therefore use less family labor and engage more in supervising hired labor. In wealthy households, everybody's labor is used less than in poorer households. In wealthy households, women's time is freed up for other domestic activities as men do most of the supervising. Men and women from poor households are also more likely to sell their labor in the market for wages. These households are therefore more likely to have higher time

pressures as they struggle to provide the labor required on their farms and at the same time earn wages by providing labor to households other than their own.

This study focused on Maasai and non-Maasai people who were farmers. The study did not include Maasai people who are pure pastoralists as they live outside the study area. The results of this study showed differences between Maasai and non-Maasai in their labor allocation patterns. As explained in section 6.2.2, intermarriage, multilingualism, migration and livelihood change all contribute to make the Maasai identity complex. I carried out my analysis based on the ethnic identities that the respondents ascribed to themselves. I found that ethnicity intersects with ecology and social history to influence gender roles and relations in both crop and livestock production. The Maasai keep most of their livestock in the irrigated zone. This is because the irrigated zone forms part of the land that the Maasai have historically used to graze the livestock. The ecology of the irrigated zone is more suited to range grazing than it is to zero grazing. Consequently, Maasai communities are more engaged in activities associated with range grazing than the non-Maasai communities are.

The non-Maasai live and keep most of their livestock in the rain-fed zone. Their social history defines them as crop farmers, who kept a few livestock to substitute their diets. Land in the rain-fed zone is therefore primarily used for crop farming. Livestock kept in this zone is usually zero-grazed. Zero-grazing is practiced in the rain-fed zone because the ecology of the zone support this more intensive form of land use. Non-Maasai therefore spend more time on activities associated with zero-grazing than the Maasai do.

The non-Maasai are relatively recent migrants into Oloitokitok Division. Many of them are of Kikuyu and Kamba origin, who have migrated out of high population density areas in Central and Eastern Provinces of Kenya. Most of these migrants are from crop farming communities that were facing land pressure in their places of origin. The main attraction to Oloitokitok was arable land availability that came with post independence land reforms. The recent migrants therefore settled in the rain-fed zone and took up crop farming as the primary activity. This history explains why non-Maasai today spend more time in crop farming than the Maasai do.

One important outcome of the land reform process in Oloitokitok has been the presence of relatively larger individually owned farms in the rain-fed zone, and the relatively smaller units allocated to group ranch members in the irrigated zone. The specific historical process that led to this tenurial arrangements and parcel sizes has been well explained in section 5.5.2. This arrangement partially explains why Maasai spend less time on crop farming than non-Maasai do. The non-Maasai have larger parcels of land which therefore require more labor to cultivate.

Differences in ecological potential between the rain-fed and irrigated zones dictate the farming techniques practiced in these zones. This in turn has influenced the labor allocation differences that we see between Maasai and non-Maasai. The nature of irrigated farming and marketing necessitates one time harvesting arrangements so that the perishable produce can be transported to markets in Mombasa in a cost effective way. This means that during harvesting, irrigated farming relies heavily on hired labor so that everything is harvested in one go. This reliance on hired labor is less necessary in the rain-fed zone, where the main crops grown are maize and beans. Maize and beans are

less perishable than the onions and tomatoes grown in the irrigated zone, and do not require one time harvesting. Maize and beans can also store better and do not require rapid one time transportation to market. The higher reliance on hired labor in the irrigated zone partially explains why Maasai spend less time than the non-Maasai do on crop farming.

7.4 Feminist Political Ecology in Kenya

Several studies conducted in Kenya use the feminist political ecology theoretical framework (Asamba & Thomas-Slayter, 1995; Oduor-Noah & Thomas-Slayter, 1995; Rocheleau, Jama, & Wamalwa-Muragori, 1995; D. Rocheleau et al., 1995; Wangari et al., 1996; Wanjama, Thomas-Slayter, & Mbuthi, 1995). There are several notable differences between these studies and my study. First, all of these studies have been done in places where male outmigration is high and there is a significant absence of men in the study areas. Rocheleau et, al., (1995) study in Kathama reports that two-thirds of the households are headed or managed by women. Similarly Wanjama et, al., and Asamba and Thomas-Slayter report high male outmigration from central and eastern Kenya into the capital city of Nairobi. In this context, the results of my study will provide an important contribution to feminist political ecology as I provide a gendered analysis in an area where both men and women are present in equal proportions.

Secondly, much of the focus by these studies has been on women. This is partly because they are based in areas where women are the significant majority as a result of the high male outmigration. My study on the other hand gives equal attention to both men and women and their gendered relations.

Thirdly, on the few occasions that gender division of labor is addressed, the studies focus on a rural-urban division of roles. Rocheleau et, al., (1995b) and Asamba and Thomas-Slayter (1995) discuss gender roles in Eastern Kenya. Due to the high male outmigration, they describe a division of labor that is not about contemporary tasks, but more about a rural-urban division. Men are engaged in production in urban centers while women are engaged in production in rural areas. My study is able to capitalize on the presence of men and investigate specific task allocations and the negotiations behind the allocations.

Fourthly, neither Rocheleau et, al. nor Asamba and Thomas-Slayter focus explicitly on gender roles and relations. Rocheleau et, al.'s study is more about gendered environmental knowledge and specifically about women's knowledge of their ecological environment. They document the challenges faced by agroforestry programs due to their exclusion of the local ecological knowledge that women have on fuelwood species and the assumptions that they make about the time budgets of women. Asamba and Thomas-Slayter examine resource ownership and control in societies transitioning from an economy dominated by cattle to one dominated by coffee. Their focus is on land and livestock resources and they only give minimal attention to labor. My study differs from both Rocheleau et, al. and Asamba and Thomas-Slayter in that they do not explicitly address labor as a central resource in the process of production. Their discussions on the gender relations of production is therefore focused on cooperation and conflict over land resources and not over the labor resource.

The fifth notable difference between my study and other studies utilizing the feminist political ecology framework in Kenya regards the forces that have been identified as

driving change. Asamba and Thomas-Slayter (1995), Wanjama et, al. (1995), Oduor-Noah and Thomas-Slayter (1995) all describe forces of change that are very similar to some of the forces that I describe. Examples include structural adjustment policies and market liberalization, changing tenure relations and their impact on access to grazing land and the importance of a woman's education and economic status in determining her power to influence decisions made at the household level. However none of the studies that examine forces of change identified changing house structure, the impact of religion and the changing meaning of livestock as forces of change. In this respect therefore my study is unique and it adds to the list of possible forces that can influence change in a region.

Rocheleau et, al. (1995b), Asamba and Thomas-Slayter (1995), and Wanjama et, al. (1995) all report increased demands on the labor of women. These results are similar to what I found in Oloitokitok Division. In Oloitokitok however there were also increased demands on men's labor. Asamba and Thomas-Slayter specify that women are assuming new responsibilities such as managing coffee cooperatives and managing cattle, responsibilities that were earlier done by men. In both cases this has happened in response to the high rate of male outmigration and the ensuing shortage of male labor in local areas. Similar patterns can be observed in the irrigated zone of Oloitokitok Division, though they are not linked to male outmigration. Women are taking up new activities in livestock production as their husbands become more engaged in crop farming. Wanjama et, al. report increasing flexibility in the division of labor with both men and women taking up responsibilities as the need arises. These results are similar to

what I observed in the rain-fed zone, where respondents reported gender role blurring with 'everyone doing everything'.

Wanjama et, al. (1995) study in Gikarangu documents a shifting focus of men's interest from coffee to bananas in response to depressed coffee prices in the world market. Before the slump in world prices for coffee, men were more interested in coffee, and bananas were an important source of income only for the women. Men started competing with women for the banana market once they recognized the value of bananas as a local cash crop that was not affected by the whims of the world market. This shift in men's focus from coffee to bananas is driven by the same desire as the shift from livestock to cash crops in Oloitokitok Division. Men chose what to spend their time and effort on depending on its meaning in cash terms. Men's desire to control the means of exchange causes the observed shifts in both Gikarangu and Oloitokitok.

7.5 A Note on Methodology

This study demonstrates the importance of multiple scales of analysis in understanding issues relating to gender and linking those issues to the landscape. The study relied on an integration of data collected at divisional level, household level and individual level. Each scale of analysis revealed information and relation patterns that were obscured at other scales. The secondary data derived from remote sensing was useful in providing information on broad patterns of land use and land cover conversion. The study could however not get information on land use modification patterns and specifically changing cropping and grazing patterns at the divisional level of analysis. The study relied on data collected at the household level to get to information on land use modification patterns. The study relied on data collected at individual level to get

information on the use of farm space at household level and its gendered nature. Gendered landscapes are invisible at the dominant scale of analysis used in land use and land cover change studies (for example Campbell et al. 2003, Campbell 2003, Meyer & Turner 1992, Ojima et al. 1994, Turner et al. 1990). Gendered landscapes occur at the spatial scale of the farm and they can only be recognized through detailed field studies that treat gender as a critical variable.

At the community level division of labor seems to be related to stereotypical differences that community members say can be found between men and women. For example, farmers referred to the muscular strength of men in relation to male domination of irrigation. Farmers also referred to men's bravery and superior expertise in negotiation and conflict resolution in relation to the domination of sale of farm produce in far away places. But analysis of data collected from men and women at individual levels revealed male domination of irrigation and the sale of crop produce to be linked to the control of the means of exchange. Irrigation is the main income generating activity for most farmers in the Oloitokitok Division. Control of the technology and the sale of the produce put the control over the main means of exchange in the study area in the hands of men. Analysis at individual level also revealed the preference that women have of particular food crops and how this contributes to the gendered landscapes observed at farm level.

The success of multiple scales of analysis is closely tied to the use of multiple methods of data collection and analysis. Much of the literature on land use relies on the collection of quantitative data from remotely sensed imagery (Meyer & Turner, 1992; Ojima et al., 1994; Turner et al., 1990). The methodology in this study was built of

careful triangulation of quantitative, qualitative and participant observation. This flexible combination of methods revealed the gendered structure of labor allocation in the households and their linkages to land use on the farms. The quantitative data yielded important numbers on labor allocation patterns and allowed the study to test whether differences between men and women were significant. Quantitative data allowed the study to test for differences between what was actually happening and what people's perceptions of labor allocation patterns were. The study found that in livestock production, both men and women underestimated the amount of time that women spend on livestock production. Men and women were asked to make a quick comparison on their labor-time allocation in livestock production, they all said that although women are doing more than they used to in the past, men were still doing more. The quantitative data collected at individual level revealed the opposite to be true. Qualitative data and participant observation were both vital in understanding the complex relationships between men and women in the production process.

7.6 Conclusion

In this chapter, I have discussed my results in the context of previous studies and identified the contribution that my study makes to the literature on masculinities, feminist political ecology and regional political ecology. I have argued for the inclusion of men in gender studies as this presents a more holistic understanding of gender relations in the crop production process. I have also argued for the recognition of the role of women in livestock production. In this chapter, I have discussed the use of both quantitative and qualitative data at various scales in land use change studies. Each scale of analysis presents only a partial understanding of the patterns and processes of land use change.

Combining different scales of analyses presents a more complete picture of both patterns and processes of change.

Chapter 8 Conclusion

In this concluding chapter, I will start with a summary of my results in gender and land use change. I will then analyze the usefulness of my theoretical framework and research methods in achieving my goals. I will discuss the implications of my results in a thematic and a geographic way. Thematically, I will discuss the usefulness of my results for natural resource management and agricultural policies. Geographically, I will discuss the implications of my results for other pastoral areas in Kenya. In this chapter, I will also discuss what the impact of some of the processes that I observed going on in the field are, even though they were not part of my research questions. In this respect I will discuss the impact of group ranch subdivision and the impact of the construction of a highway linking the study area to the Nairobi-Mombasa road. I will conclude the chapter with a discussion on future research directions in Oloitokitok Division.

8.1 Summary of Results

In this study, I have explored the linkages between gender division of labor and land use change within the feminist political ecology theoretical framework. I have also borrowed from the closely related feminist environmentalism theoretical framework. My results show a shift in land use patterns in the study area towards diversification and intensification. While previously there was only maize, beans and potatoes in the rain-fed zone, there is now a variety of peas, vegetables and fruits in addition. Previous farming in the rain-fed zone was subsistence, but there is now significant cash crop production as well. Previous land use patterns in the irrigated zone were focused on livestock production, but we now have a mixed agro-pastoral production system. The

types of cattle breeds kept have shifted towards cross-breeds and exotic breeds which have higher meat and milk yields.

Diversification and intensification of land use has had a gendered impact on roles and relations within the households. In general, everyone has had to do a lot more than they did in the past, to support the new activities associated with diversification and intensification. As a result of diversification and intensification, people are doing more of what they did in the past and also taking up new activities. In the rain-fed areas women spend more of their labor-time on crop farming than men did, but this difference was not statistically significant. However in both the mixed zones and the irrigated zones, men did significantly more than the women did in crop production. Women did more work than men did in livestock production in all the agro-ecological zones.

My findings reinforce the central arguments within both feminist political ecology and feminist environmentalism theoretical frameworks. I found that local changes in land use and gender roles are influenced by an interaction of social, ecological, economic and political forces, acting at a variety of scales from local to global. SAPs, the national land reform and ecological forces influence land use decisions made by farmers in Oloitokitok Division. However, I found that land use change alone was not enough to explain the changing gender roles and relations that are observed in the division. Social forces such as interaction with other communities, the changing value of formal education, conversion to Christianity, the changing structure of dwelling units, and the changing meaning of livestock have all contributed to change the roles that women and men have in the households.

Feminist environmentalism and feminist political ecology framework demonstrate the importance of treating gender as a critical variable in studies on resource control and access. My results reveal the differences in labor-time allocation between men and women and contribute to information on linkages between gender roles and crop and livestock production. My study shows how power relations within the household are negotiated as women make an effort to control the fruits of their labor within unequal gender relations. Women demonstrated skill in the negotiation process, contesting in a manner and at a time that would yield results fastest. Women also carefully selected when to cooperate and when to contest in a manner that minimized conflict with the cultural norms of the society. Women understood that in their context, challenging cultural norms in a dramatic way would not yield desired results.

8.2 Implications for Policy

The results of this study have important implications for agricultural development programs in pastoral communities. Livestock development program officers need to recognize the gendered nature of labor allocation and even more importantly, the significance of women's labor in livestock production. The failure of livestock development projects have been attributed to the neglect of the role of women in livestock production (Hodgson, 2000; Kettel, 1992). Livestock development programs need to be formulated with the importance of women's roles in mind. For example, since women are increasingly engaged in activities associated with cross-bred and exotic cattle (e.g. watering, collecting fodder, collecting manure), development programs that advocate for a shift towards cross-bred and exotic livestock will increase their chances of success if women's opinions are incorporated from the beginning. This is likely to be a

challenge because in many pastoral societies, men own the livestock and subsequently make decisions regarding livestock. Livestock development officers need to actively seek out and engage women in the spaces that women feel comfortable to express their opinions. The popular format of general community meetings does not always provide the appropriate setting for women's voices to be heard. Usually women do not attend general community meetings, and when they do, they remain silent. Women's only meetings would be more appropriate than general community meeting. During such meetings, women's time demands and availability for participation in development projects should be addressed.

The argument presented above in connection to livestock development programs applies to crop development programs as well. Studies in the Gambia have shown how failure to include women's opinions can lead to failure of crop development projects (Schroeder, 1999; Carney & Watts, 1990, 1991). Programs designed to rely on women's labor should incorporate women's opinions from the planning stages. As in the case of livestock, men own the land and subsequently are more involved in decisions on agricultural development. Agricultural project leaders need to recognize that land and labor are two separate and equally important resources in agricultural production. Negotiations between local people and agricultural development officers should therefore engage both land and labor resources. For example, irrigation project officers should understand labor allocation between men and women and make informed decisions on who to involve and when to involve them. My results show that women's contribution to crop production was related to how long a family had been farming. Agricultural officers

need to understand such nuances when they design their projects to increase their chances of success.

The results of this study also have important implications for natural resource management. There are many natural resource management projects that rely on local labor availability for their success. Examples range from wildlife community conservation efforts (Western and Wright, 1994) to village forestry programs (Maathai, 1988). It is important for those involved in formulating such projects to recognize that both men and women's labor is already highly committed to crop and livestock production. The need for food and money to meet health and education needs is a large factor influencing decisions on where labor is allocated. Natural resource managers relying on local labor inputs need to recognize this fact while formulating their projects. Natural resource management needs to be understood as a land use competing for land and labor with such land uses as crop and livestock production, and subsequently designed so as to provide short term economic gains (in addition to long term ecological gains) to land and labor investment.

8.3 Implication for Pastoral Societies

The broad patterns of change that my study and Campbell et, al. (2003) documented in Oloitokitok Division are part of a larger process of change affecting pastoral communities in other parts of Kenya. As communes become fragmented and privatized, access to grazing land is reduced and pastoralists move to diversify their incomes by taking up new activities (Little et, al., 2001). This has inevitably led to sedentarization of pastoral communities. In Oloitokitok Division, pastoralists have responded to reduced grazing land by taking up cropping activities and modifying their grazing patterns to fit

their more sedentary lifestyles. These changes in lifestyles towards sedentarization are similar to what Fratkin and Smith (1994) and Nduma, Kristjanson and McPeak (2001) found among the Rendile of northern Kenya. Among the Rendile, sedentarization presented new economic opportunities for women, through the sale of agricultural produce, milk and labor in neighboring towns. Thompson and Homewood carried out a study among Maasai communities adjacent to the Maasai Mara National Reserve found that sedentarization had led to income diversification towards farming, wildlife tourism and large scale cereal cultivation (Thompson & Homewood, 2002). Similar patterns were found in pastoral communities in southern Ethiopia (Little et, al., 2001). I would expect that sedentarization among pastoral communities will continue to be an important factor driving livelihood changes.

8.4 Impact of Group Ranch Subdivision

Land tenure in Oloitokitok Division is currently under negotiation in some areas (e.g. Mbirikani Group Ranch) and currently under change in other areas (e.g. Kimana Group Ranch). Ntiati presents a well informed summary of these changes (Ntiati, 2002). According to Ntiati, group ranches in Oloitokitok Division are likely to be subdivided into smaller individual ranches. At the time of my fieldwork, subdivision had already started in Kimana Group Ranch, and the subdivision discussion had already started in Mbirikani Group Ranch. It seems inevitable that in the near future, group ranches will be replaced by individual ranches in the entire division.

Subdivision of group ranches is likely to lead to more dispersed settlement patterns at division level. Homesteads are likely to be smaller than they are now. This reorganization into smaller units will reduce the number of people per unit of production

(the homestead) and consequently increase the labor-time allocation for each person or for certain categories of people or both. For example, one person can effectively take the livestock of one homestead to graze and water. When the homestead breaks into smaller units, more people will be required to do the same activity that was initially done by one person. Women will also not be able to share child care responsibilities once the homesteads break up.

Group ranch subdivision is also likely to have an impact on wildlife population. Ecologists working in an area adjacent to the Maasai Mara hypothesize that dispersed homestead would reduce the effective area available to wildlife and consequently affect biodiversity (Reid & Kruska, 2001).

8.5 Impact of Road Upgrading

At the time of my fieldwork in late 2001, construction of a large border post at Tarakea was completed. Tarakea is about 8 km southeast of Oloitokitok Town and the border post is easily the most impressive construction in the division. The border post is complete with apartment buildings, offices and a large police station. During my fieldwork, rumor was rife that the Kenya government was in the process of changing the main Kenya-Tanzania border post from Namanga to Tarakea. It was also speculated that the Kenya government would construct a major highway linking the newly constructed border post at Tarakea with the Nairobi-Mombasa Road. Such a road would go right through the study area and replace the existing dry season Oloitokitok-Emali road. While these rumors are unsubstantiated, the existence of the impressive Tarakea border post does seem to support the logic of a road construction. The Tarakea border post is also

much more impressive than the Namanga border post and it would make sense that the Kenya government has plans to give it higher status than Namanga.

Improving the road that runs through the division will have important implications for crop and livestock production in the study area. During my fieldwork, key informants and people in the group discussions expressed frustration at the quality of the current road and explained that transporters charge high costs because of the poor road quality. Transport costs also tend to be higher during the rainy season when only a few large vehicles can reach the farms. Consequently some farmers in the irrigated zone prefer to leave their fields uncultivated during parts of the year. Sometimes transport costs are so high that farmers prefer to leave their produce to rot on the fields as the cost of transport to market is higher than the gross profit at the point of sale.

Improving the road quality would lower transport costs and this would have an enormous impact in Oloitokitok Division. Local farmers would have higher profit margins and higher returns on their labor. Increased profits and purchasing power would probably lead to higher investments in education and health facilities (schools and health facilities in the division are few and far apart). It is also highly likely that more children will be able to attend school as their parents will afford to send them, and their labor will be less critical in the household due to the higher returns on labor.

An improved road would benefit men and women differently. It is the cash crops sold out of the district that are affected by the poor road condition. These crops are owned by men and profits from their sale goes directly to the men. Men will therefore have a more direct benefit to an improved road than women. During the duration of my fieldwork, I did not meet women that sold produce outside the division. Unless women

take up new opportunities as a result of the improved road, the benefits of the improved road will mostly get to them indirectly through their husbands.

8.6 Future Research Directions

The results that I obtained from this research and from my field experience point to interesting research directions for the future. There is need for a quantitative investigation of how education, wealth status and stage in life cycle intersect with gender to influence roles and relations between husbands and wives. This will be an important addition to the qualitative analysis done in this research. Data on education, wealth status and stage in life cycle for the study area is readily available and plans to supplement these data with a more detailed qualitative survey are in progress.

Krugmann (1996) described irrigation water use conflict in Rombo, about 20km southeast of the study area. Campbell et. al., (2003) study on land use of Southeast Kajiado District show Rombo as one of the first places where irrigation was practiced in the division. As Krugmann demonstrates, Rombo started witnessing water use conflict as the number of users increased and the amount of river water reaching Rombo from upstream regions decreased. During my fieldwork I saw the beginning of water use conflict in all the irrigated areas that I worked in. In some places such as Empiron, farmers have developed a strict irrigation timetable to minimize conflict. Still, farmers said that irrigation time was lower than what they needed, and conflict over water was likely to increase. It is highly likely that the area under irrigation will not increase, since water and not land, is the limiting factor. Future research should investigate water use conflict and attempts being made solve them. It would be interesting to see how gender, wealth status and stage in life cycle influences access to water as the number of farmers

interested in practicing irrigation increases, and the amount of water available for irrigation remains the same.

As discussed in chapter 5, the area under irrigation increased at an annual rate of 11% between 1973 and 2000 (Table 5.2). Farmers reported using non-organic fertilizers and other chemicals on irrigated onions and tomatoes. With increasing irrigation therefore, there has been a corresponding increase in the use of agricultural chemicals in Oloitokitok Division. Farmers said that they are beginning to notice reduced soil productivity on their land as a result of using chemical fertilizers. Farmers also expressed a lack of knowledge of appropriate chemicals to use, and the correct amounts to apply. Oloitokitok Division needs a study on soil physical and chemical conditions with a view to informing farmers on correct management techniques in the context of agricultural chemicals. Initial soil sampling and analysis of soil physical and chemical conditions has been done in parts of Oloitokitok Division (Gachimbi, 2002). Gachimbi's work needs to be replicated for all soil types in Oloitokitok. Due to the increased use of agricultural chemicals in the irrigated areas, Oloitokitok Division needs a study that investigates what the current ecological impacts of agricultural chemicals are, and what continued use of agricultural chemicals would lead to. One study investigating the impact of irrigated agriculture on water quality has recently been completed (Githaiga, Reid, Muchiru, & van Dijk, 2003). Studies investigating other aspects of the bio-physical environment need to be done.

APPENDICES

Appendix 1

HOUSEHOLD SURVEY OF SOCIOECONOMIC CHARACTERISTICS, LAND USE AND GENDERED DIVISION OF LABOUR IN SOUTHEAST KAJIADO, KENYA.

Elizabeth Edna Wangui
Michigan State University/International Livestock Research Institute

Date	Questionnaire number
Enumerator	AEZ
Time started	Time finished
Notes	

A. Respondent and household data

A1 Location 1=Mbirikani; 2=Kimana; 3=Kuku; 4=Rombo
A2 Sub-location _____
A3 Village_____
A4 Respondents name_____
A5 Household Code_____
A6 Age/Age set_____
A7 Level of education 1=None; 2=Primary; 3=Village Polytechnic; 4=Secondary; 5=Post secondary 6=Other_____
A8 Gender 1=Female; 2=Male
A9 Ethnic group _____
A10 Clan _____
A11 Marital status 1=Single 2=Married; 3=Widowed; 4=Divorced
A12 If male number of wives _____
A13 Parent's ethnic group: Mother_____ Father_____

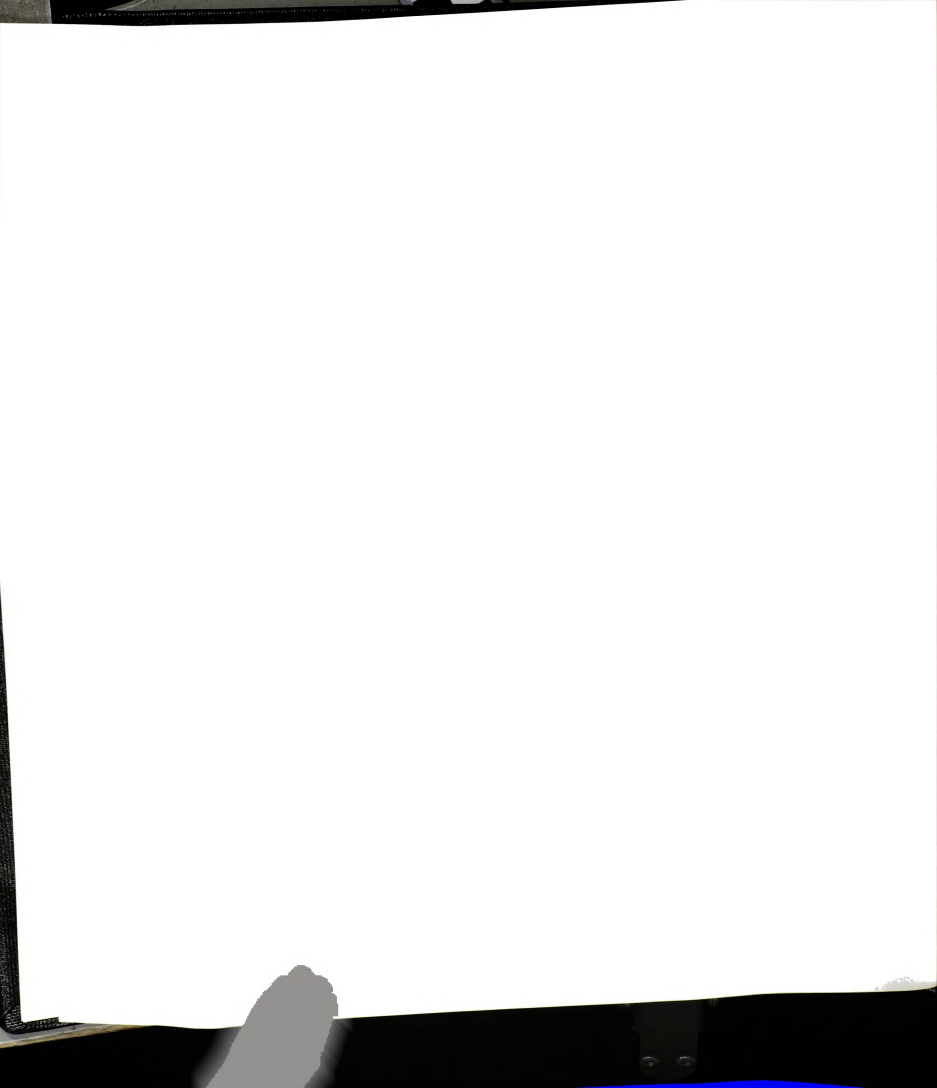
B. Indicators of wealth

B1 Which of the following items does the household have?
1=Radio; 2=Bicycle; 3=Wheelbarrow; 4=Ox-plough; 5=Vehicle; 6=Tractor; 7=Television; 8=None
B2 What material is the main house made of?
- **a.** Walls 1=Mud and cow dung; 2=Timber; 3=Iron sheets; 4=Brick
- **b.** Roof 1=Mud and cow dung; 2=Grass thatch; 3=Iron sheets; 4=Roof tiles

C. Household Income, Education and Economic activities

INCLUDE RESPONDENT IN ALL COUNTS, AND ALL HOUSEHOLD MEMBERS >16 YEARS.

C1 Gender of each adult member (>16 years) of the household. 1=Female; 2=Male
C2 How are they related to the head of the household? 1=Household head; 2=First wife; 3=Second wife; 4=Third wife; 5=Fourth wife; 6=Husband to female household head 7=Son; 8=Daughter; 9=Son in law; 10=Daughter in law; 11=Other_____
C3 Age



C4 What is the level of education for each adult member? 1=None; 2=Primary; 3=Village Polytechnic; 4=Secondary; 5=Post secondary; 6=Other_____

C5 What is their marital status? 1=Single 2=Married; 3=Widowed; 4=Divorced

C6 What are their primary activities? 1=Farming own farm; 2=Waged farm work; 3= Herding; 4=Beekeeping; 5=Jua kali; 6=Livestock trading; 7=Trading; 8=Waged non-farm work; 9=Student; 10=Other_____

C7 Where do they live? 1=On farm full time; 2=On farm part time (**SPECIFY THE VILLAGE AND SUB-LOCATION THEY LIVE IN WHEN NOT ON FARM**); 3=Other place (**SPECIFY THE VILLAGE AND SUB-LOCATION**)

Gender C1	Relation to head C2	Age C3	Education C4	Marital Status C5	Primary Activities C6	Residence C7
	1					

C8 Gender of children (people <16 years) in the home. 1=Female; 2=Male

C9 What are their ages?

C10 Do they currently attend school? 1=None; 2=Primary; 3=Village Polytechnic; 4=Secondary; 5=Post secondary; 6=Pre-primary; 7=Other_____

Gender C8	Age C9	School attendance C10

C11 What are the three most important sources of income for the household? 1=Farming own farm; 2=Waged farm work; 3= Herding; 4=Beekeeping; 5=Jua kali; 6=Livestock trading; 7=Trading; 8=Waged non-farm work; 9=Other _____

C12 Rank them in order of importance

C13 Who gets the income? 1=Male household head; 2=Female household head; 3=Wife; 4=Other_____

C14 How have their importance changed in the past 5 years? 1=increase; 2=decrease; 3=no change.

C15 Why have they changed?

Sources of income C11	Rank C12	Who gets it C13	Change 5 years C14	Reasons for change C15

C16 What are the three most important expenses in the household?
C17 Rank them in order of importance
C18 How have they changed in the past 5 years? 1=increase; 2=decrease; 3=no change.
C19 Why have they changed?

Expenses C16	Rank C17	Change 5 years C18	Reasons for changes C19

C20 Did the household receive any remittances in the past one year? 1=Yes; 2=No
(IF NO SKIP TO SECTION D, IF YES CONTINUE WITH C21)
C21 Who sent remittances?
C22 What type of remittance did they send? Eg cash, kind
C23 How much did they send in the past one year?
C24 If cash, what was the money used for?

From who C21	Type C22	Amount C23	What used for C24

D. Migration patterns
D1 Where were you born? Village_____ Sub-location _____ Location_____
IF CURRENT RESIDENCE IS THE PLACE OF BIRTH, ASK D2:
D2 Have you lived here all your life? 1=Yes; 2=No
(IF THEY ANSWER YES TO D2, SKIP TO SECTION E.
IF CURRENT RESIDENCE IS NOT THE PLACE OF BIRTH OR IF THEY ANSWER NO TO D2, ASK THE FOLLOWING QUESTIONS):
D3 When did you move here? _____
D4 Where did you come from when you moved here? Village _____
Sub-location_____ Location_____

D5 Why did you leave your previous home?

_____

_____

_____

D6 Why did you choose this place and not any other?

_____

_____

_____

D7 Which family members came with you?

_____

_____

E Patterns of crop land use, intensification and spatial diversification

Farm Level Questions

E1 Did you receive advice on crop production last season? 1=Yes; 2=No **(IF YES ASK E2 IF NO GO TO E3)**

E2 Who from? 1=Gov ag extension; 2=NGO (state which)_____; 3=Friends or relatives;

E3 How many parcels of land did you have access to last season? _____

E4 Where are the parcels located? Village, Sub-location

E5 What are their sizes (acres)?

E6 Which parcels did you use last season? Which did you lease out? 1=Use; 2=Leased out

E7 What is the main land use category on the parcels you used last season? 1=Rain fed cropland; 2=Irrigated cropland; 3=Grazing land; 4=Other _____

Parcel Number E3	Where located E4	Acres E5	1=Used 2=Leased out E6	Main land use E7

Parcel Level Questions

(FOR ALL PARCELS[1] THEY HAVE ACCESS TO, ASK THE FOLLOWING QUESTIONS)

E8 Parcel number **(MUST MATCH PARCEL NUMBER IN PREVIOUS TABLE)**_____

E9 How did you acquire the parcel? _____

E10 When did you acquire the parcel (year)? _____

E11 What size is the parcel (acres)? _____

E12 Distance from house (time taken to walk to parcel) _____ Hours _____ Minutes

E13 What was the land use/cover on the parcel when you acquired it? 1=Cropland; 2=Grazing land; 3=Swamp; 4=Forest; 5=Other _____

E14 Do you 'own', rent or share crop the parcel? 1=Owner; 2=Renter; 3=Share cropper; 4=other_____ **(IF THEY ANSWER 1 OR 2 AND PARCEL IS NOT LEASED OUT, ASK E15)**

E15 Do you have a share cropper? 1=Yes; 2=No

(IF NOT OWNER SKIP TO E22)

(IF OWNER, ASK)

[1] Parcel is a continuous piece of land belonging to one person. A parcel is subdivided into fields, each with a distinct land use. Eg Robert owns a parcel on which he has fields of maize, coffee and grazing land.

E16 How long have you owned the parcel? Number of years _____

E17 Do you have a title deed for the parcel? 1=Yes; 2=No

(IF 'YES' SKIP E18 AND E19)

E18 Has the land been adjudicated? 1=Yes; 2=No

E19 Has the GR allocated the parcel to you after subdivision? 1=Yes; 2=No.

(IF PARCEL IS LEASED OUT, ASK E20 AND E21 THEN SKIP TO NEXT PARCEL OR SECTION F)

E20 For how long have you leased it out? Number of years_____

E21 How are you paid? 1=With part of the harvest; 2=Cash; 3=Labour; 4=Other_____

(IF NOT LEASED OUT CONTINUE)

E22 For how long have you farmed the parcel? Number of years_____

E23 What crops did you grow on the parcel last season?
E24 How many acres did each crop occupy?
E25 Has the number of acres under each crop changed over the past five years? 1=Increased; 2=Decreased; 3=No change
E26 Why has it changed?
E27 During the last season, did you grow the crop mainly for cash or consumption?
E28 Rank in order of importance eg if maize is most important cash crop, write "Ca/1"
E29 What crops did you intercrop?
E30 Did you apply any manure/fertiliser/pesticide on your crop? 1=Manure; 2=Fertilizer; 3=Pesticide; 4=Other application (specify)_____; 5=None
E31 Has manure/fertilizer/pesticide application changed over the past five years? 1=Increased; 2=Decreased; 3=No change
E32 Why has it changed?

Crop E23	Acre E24	Change 5 yrs E25	Reason E26	Cash Cons **(rank)** E27/28	Inter crop with E29	Man Fert Pest E30	Change 5 yrs E31	Reason E32

F. Perceptions of soil degradation and investment in soil conservation measures : Field level questions
(SELECT UP TO THREE DIFFERENT FIELDS AT DIFFERENT DISTANCES FROM HOME (E.G. CASH CROP, FOOD CROP, GRAZING) AND ASK THE FOLLOWING QUESTIONS)

F1 Parcel number **(MUST MATCH WITH TABLE ON PAGE 4)**_____

F2 Field number_____

F3 Distance from house in minutes walking: _____minutes.

F4 Estimate the slope of the field:

1-none to slight (0-4 degrees) 2-a bit (5-9) 3-medium (10-14) 4-steep (15+)

F5 How have you used it since you first acquired it? (e.g. cleared, planted crops, grazed, abandoned...)

_____

_____

F6 What was on the field last season? (include bush, grass, what crops, etc. *in order of importance.*)

(Feb-June '01) :_____

_____

F7 How fertile is the soil of this field?

1. Very bad **2**. Medium **3**. Very fertile

F8 Since you started cultivating this field, has the soil fertility changed?

0 - no, no change Worsened: **1**-a bit **2**-allot Improved.: **3**-a bit **4**-allot

F9 Why has the soil fertility worsened, improved or stayed the same?

*because*_____

_____

_____

F10 Have you fallowed (rested) the soil on this field? 1-yes 2-no

If yes, When did you last fallow? from (year)_____ to (year)_____

F11 Is there erosion on this field? Mmomonyoko wa undongo?

0-no, no erosion 1-yes, a little erosion 2-yes, much erosion

F12 Is there salinization in this field? 1-no, 2-yes, a little, 3-yes, allot

F13 If Yes, When did you first notice it? Year _____

F14 Has the amount of salinization changed since you first noticed it? 1-worsened, 2-improved, 3-stayed the same

F15 Why has it changed? _____

_____

_____

_____

F16 How many months of the year is this field covered by crops? Number of Months _____

F17 Is there a soil and water conservation structure on this field?

1-yes, step terrace 2. -yes, stone bund 3-yes, trash line 4-yes, other_____5-no

Table of soil characteristics

Characteristic	**How is this in the soil?**	**Has there been a change in...?** 0=NO change (go to next) Decrease: 1-a bit 2-allot Increase: 3-a bit 4-allot	*IF CHANGE* **Why has there been an increase or decrease?** because...
Depth of top soil	a-deep b-shallow _____inches		
Water holding capacity	a-good, holds water b-poor, dries out _____days holds water		

F18 Do you use this input ... on this field this season?

a Household residues	**0**-no	**1**-yes, a bit	**2**-yes, allot
b. Animal manure	**0**-no	**1**-yes, a bit	**2**-yes, allot
c. Grass strip	**0**-no	**1**-yes	
d. Wood ash	**0**-no	**1**-yes	
e. Chemical fertilizer	**0**-no	**1**-yes	
f. Fungicide (eg copper, dethane M45)	**0**-no	**1**-yes	
g. Insecticide (eg Ambush, smithion)	**0**-no	**1**-yes	

h. Other? _____

G. Perceptions of soil degradation and investment in soil conservation measures :

Farm level questions

G1 Have you done anything to maintain/improve soil fertility on your farm? 1=Yes; 2=No

G2 What have you done?

Table on techniques for improving soil fertility

Technique	**Do you use it?** 1=no (go to next) 2=yes (date constructed)	*If use* **What crops do you use it on?**	**Since you started cultivating, have you reduced or increased your use of this technique?** 0=NO change (go to next) Reduced: 1=a bit 2=allot Increased: 3=a bit 4=allot	*If changed* **Why have you reduced or increased your use of this technique?** *If increased:* Did you use it before? When did you start using it? Why use it now? *If decreased* Why did you use it before and not now?
a. Household residues		crops put on:		
b. Animal manure				
c. Stone bunds		on what crops, with what material		
d. Terraces			Increased or decreased the number of terraces?	
e. Erosion trench			Increased or decreased the number of trenches?	

Table on techniques for improving soil fertility, continued

Technique	**Do you use it?** 1=no (go to next) 2=yes	*If use* **What crops do you use it on?**	**Since you started cultivating, have you reduced or increased your use of this technique?** 0=NO change (go to next) Reduced: 1=a bit 2=allot Increased: 3=a bit 4=allot	*If changed* **Why have you reduced or increased your use of this technique?** *If increased:* Did you use it before? When did you start using it? Why use it now? *If decreased* Why did you use it before and not now?
f. Grass lines				
g. Trash lines				
h. Chemical fertilizers				
i. Fallow (resting soil OR close season)		How many seasons fallow? _____ How many seasons cropped? _____	Do you fallow less or more often? Did you change the number of seasons?	

H. Herd composition, intensification and diversification

H1 What is the current herd composition? (animal, breed, number now) **(TURN OVER FOR TABLE)**

H2 How has this changed over the past ten years (general trend)? 1=increased; 2=decreased; 3=no change; 4=I did not have animals ten years ago

H3 Why have these changes occurred? 1=Disease Red intestine; 2=Disease Interfluke lung disease; 3=Disease FMD; 4=Disease ECF; 5=Disease Trypanosomosis; 6=Disease Anthrax; 7=Disease Lump skin disease; 8=Malignant cattle fever; 9=Disease Other_____; 10=Selling; 11=Died during drought; 12=Paid dowry; 13=Used in Ceremony; 14=Given as gift; 15=Birth of young ones; 16=Bought more animals; 17=Better pasture; 18=Other_____

H4 How did you graze your animals in the past 12 months? 1=Zero grazing; 2=Nomadism; 3=Close to boma; 4=Tethering

H5 (IF RESPONDENTS ANSWER TO H4 IS 2=NOMADISM) Where is the livestock grazed? Village_____; Sublocation_____

H6 How did you graze your animals ten years ago? 1=Zero grazing; 2=Nomadism; 3=Close to boma; 4=Tethering

H7 (IF ANSWER TO H4 DIFFERS FROM ANSWER TO H6 ASK) Why has there been a change in grazing method?_____

_____

_____

_____

_____

H8 Did you spend money on livestock drugs or feed in the past 12 months? 1=spraying; 2=Dip; 3=Vet drugs; 4=Feed; 5=None; 6=Other_____

H9 Has money spent on livestock changed during the last 10 years, 1=increased; 2=decreased; 3=no change

H10 Why change?_____

_____

_____

_____

H11 Has money spent on livestock changed from when your parents were your age. 1=increased; 2=decreased; 3=no change.

H12 Why change?_____

_____

_____

_____

Animal H1	Breed H1	Current Number H1	10 year Change H2	Grazing		Money spent H8	Change 10 yrs H9	Change one generation H11
				Now H4	10 yrs ago H6			
Cattle								
Sheep								
Goats								
Donkey								
Poultry								

J. Gendered division of labour: general

J1 Has the sharing of activities between men and women changed over the past 10 years? 1=Yes; 2=No.

J2 How? **(PROBE FOR TYPE OF ACTIVITES AND FOR WHO IS DOING MORE OR LESS OF THE ACTIVITIES)**

_____

_____

_____

_____

J3 Why has the sharing changed?

_____

_____

_____

_____

K Gendered division of labour in livestock production

K1 How frequently do you (RESPONDENT ONLY) perform the listed livestock related activities? Eg once daily, twice a month, all year through, etc.

K2 If the respondent grazes, ask them if it is predominantly cattle or predominantly shoats and circle response.

K3 How many hours did you spend on livestock related activities on a typical day last week? **(IF DIFFERENT FROM USUAL, PLEASE NOTE USUAL)**

K4 How has this changed over the past ten years? 1=increased; 2=decreased; 3=no change

K5 When did the change occur?

K6 Why did the change occur?

K7 How many hours did you spend on livestock related activities on a typical day during the last rainy season?

K8 How has this changed over the past ten years? 1=increased; 2=decreased; 3=no change

K9 When did the change occur?

K10 Why did the change occur?

Activity	Frequency K1	Number of hours spent on activity on a typical day last week K3	Increase Decrease No change K4	When did change occur (Event, Year) K5	Why did change occur K6	Number of hours spent on activity on a typical day during the rainy season K7	Increase Decrease No change K8	When did change occur (Event, Year) K9	Why did change occur K10
K2 Grazing 1=cattle 2=shoats									
Milking									
Selling milk									
Collecting fodder									
Collecting manure									

Treatment and prevention of diseases								

Watering

Other activities

(state which)

K11 Who else has been involved in livestock related activities in the past 12 months? 1=Hired labour; 2=Child; 3=Relative; 4=Friend; 5=Other_____

K12 How many males are involved in each activity? Ie how many hired labour/child/relative/friend.

K13 How many females are involved in each activity?

K14 Why are they predominantly male or predominantly female or about equal numbers of males and females?

K15 When during the past year were they involved (month)?

K16 Approximately how many hours did they work each day?

K17 Has the volume of labour (number workers and hours worked combined) involved increased, decreased or remained the same over the past ten years? 1=Increase; 2=Decrease; 3=No change

K18 If Change, when did the change occur?

K19 Why did the change occur?

Activity	Who else does it? K11	No of males K12	No of females K13	Why M/F/E? K14	When (month) K15	Hours per day K16	How change? K17	When change? K18	Why change? K19
Grazing									
Milking									
Selling milk									
Collecting fodder									
Collecting manure									
Watering									
Treatment									
Other_____									

L. Gendered division of labour in crop production

(FOR EACH CROP GROWN (REFER TO PARCEL LEVEL DATA) ASK THE FOLLOWING QUESTIONS)

L1 Crop_____

L2 How much time did you (RESPONDENT ONLY) spend on crop farming related duties on a typical day during the listed seasons in the past year?

L3 How has this changed? 1=increased; 2=decreased; 3=no change

L4 When did change occur?

L5 Why did change occur?

Activity	Hours per day L2	Number of weeks L2	How change L3	When change L4	Why change L5
Field preparation (clearing/burning)					
Maintaining irrigation structures					
Planting					
Weeding					
Watering					
Harvesting					
Thrashing					
Transport to market					
Selling at market					
Other_____					

L6 Who else is involved in crop related activities? 1=Hired labour; 2=Child; 3=Relative; 4=Friend; 5=Other_____

L7 What crops do they help with?

L8 How many males are involved in each activity? Ie how many male hired labour/child/relative/friend.

L9 How many females are involved in each activity? Ie how many female hired labour/child/relative/friend.

L10 Why are they predominantly male or predominantly female or about equal numbers of males and females?

L11 When during the past year were they involved (month)?

L12 Approximately how many hours did they work each day?

L13 Has the volume of labour (number workers and hours worked combined) involved increased, decreased or remained the same over the past ten years?

L14 If Change, when did the change occur?

L15 Why did the change occur?

Activity	Who else does it? L6	What crop? L7	No of males L8	No of females L9	Why M/F/E L10	When (month) L11	Hours per day L12	How change? L13	When change? L14	Why change? L15
Field preparation (clearing/burning)										
Maintaining irrigation structures										
Planting										
Weeding										
Watering										
Harvesting										
Thrashing										
Transport to market										
Selling at market										
Other____										

M. Property Rights

M1 What property are you allowed to use?

M2 What property are you allowed to sell?

M3 What property do you sell?

Property	Use right	Sell right	Do you sell?
Livestock	XXXXXX		
Milk			
Meat			
Hide			
Poultry			
Eggs			
Food crops (specify)			
Cash crops (specify)			
Land			
Trees			
Shrubs			
Water			

M4 Do you have a right to rent out your land? 1=Yes; 2=No;

N. Future

N1 What does the future hold for your children? **(PROBE THEM TO COMPARE WITH THEIR EXPERIENCE)** _____

_____

_____

_____

_____

Appendix 2

Questionnaire for Wives

ate:_____ **Questionnaire Number:** _____

ame of Household Head:_____

numerator:_____

ime Started_____ **Time Finished**_____

. Respondent data

6 Age/Age set_____

7 Level of education 1=None; 2=Primary; 3=Village Polytechnic; 4=Secondary; 5=Post condary 6=Other_____

9 Ethnic group _____

13 Parent's ethnic group: Mother_____ Father_____

. Household data

11 What are the three most important sources of income for the household? 1=Farming own rm; 2=Waged farm work; 3= Herding; 4=Beekeeping; 5=Jua kali; 6=Livestock trading; =Trading; 8=Waged non-farm work; 9=Other _____

ank 1_____ 2_____ 3_____

16 What are the three most important expenses in the household?

ank 1_____ 2_____ 3_____

25 How has the food you eat now changed from before? **(LIST FOODS EATEN)**

Now_____

Before_____

26 When did the change occur? (Year)_____

27 Why did the change occur?_____

_____

_____

_____

28 Are you buying more food now than you did before? 1=Yes; 2=No.

29 When did the change occur? (Year)_____

30 Why did the change occur?_____

_____

_____

_____

. Migration patterns

1 Where were you born? Village_____ Sub-location _____

ocation_____

F CURRENT RESIDENCE IS THE PLACE OF BIRTH, ASK D2:

2 Have you lived here all your life? 1=Yes; 2=No

F THEY ANSWER YES TO D2, SKIP TO SECTION E.

F CURRENT RESIDENCE IS NOT THE PLACE OF BIRTH OR IF THEY ANSWER O TO D2, ASK THE FOLLOWING QUESTIONS):

3 When did you move here? _____

Where did you come from when you moved here? Village _____
location_____ Location_____
Why did you leave your previous home?

_____

Why did you choose this place and not any other?

_____

_____

_____

Which family members came with you?

_____

_____

endered division of labour: general

las the sharing of activities between men and women changed over the past 10 years? 1=Yes;
).

low? **(PROBE FOR TYPE OF ACTIVITES AND FOR WHO IS DOING MORE OR S OF THE ACTIVITIES)** _____

_____

_____

_____

_____

/hy has the sharing changed? _____

_____

_____

_____

_____

K Gendered division of labour in livestock production

K1 How frequently do you (RESPONDENT ONLY) perform the listed livestock related activities? Eg once daily, twice a month, all year through, etc.

K2 If the respondent grazes, ask them if it is predominantly cattle or predominantly shoats and circle response.

K3 How many hours did you spend on livestock related activities on a typical day last week? **(IF DIFFERENT FROM USUAL, PLEASE NOTE USUAL)**

K4 How has this changed over the past ten years? 1=increased; 2=decreased; 3=no change

K5 When did the change occur?

K6 Why did the change occur?

K7 How many hours did you spend on livestock related activities on a typical day during the last rainy season?

K8 How has this changed over the past ten years? 1=increased; 2=decreased; 3=no change

K9 When did the change occur?

K10 Why did the change occur?

Activity	Frequency K1	Number of hours spent on activity on a typical day last week K3	Increase Decrease No change K4	When did change occur (Event, Year) K5	Why did change occur K6	Number of hours spent on activity on a typical day during the rainy season K7	Increase Decrease No change K8	When did change occur (Event, Year) K9	Why did change occur K10
K2 Grazing 1=cattle 2=shoats									
Milking									
Selling milk									
Collecting fodder									
Collecting manure									
Watering									

Treatment and prevention of diseases									
Other									

5=Other_____

K12 How many males are involved in each activity? Ie how many male hired labour/child/relative/friend.

K13 How many females are involved in each activity? Ie how many female hired labour/child/relative/friend.

K14 Why are they predominantly male or predominantly female or about equal numbers of males and females?

K15 When during the past year were they involved (month)?

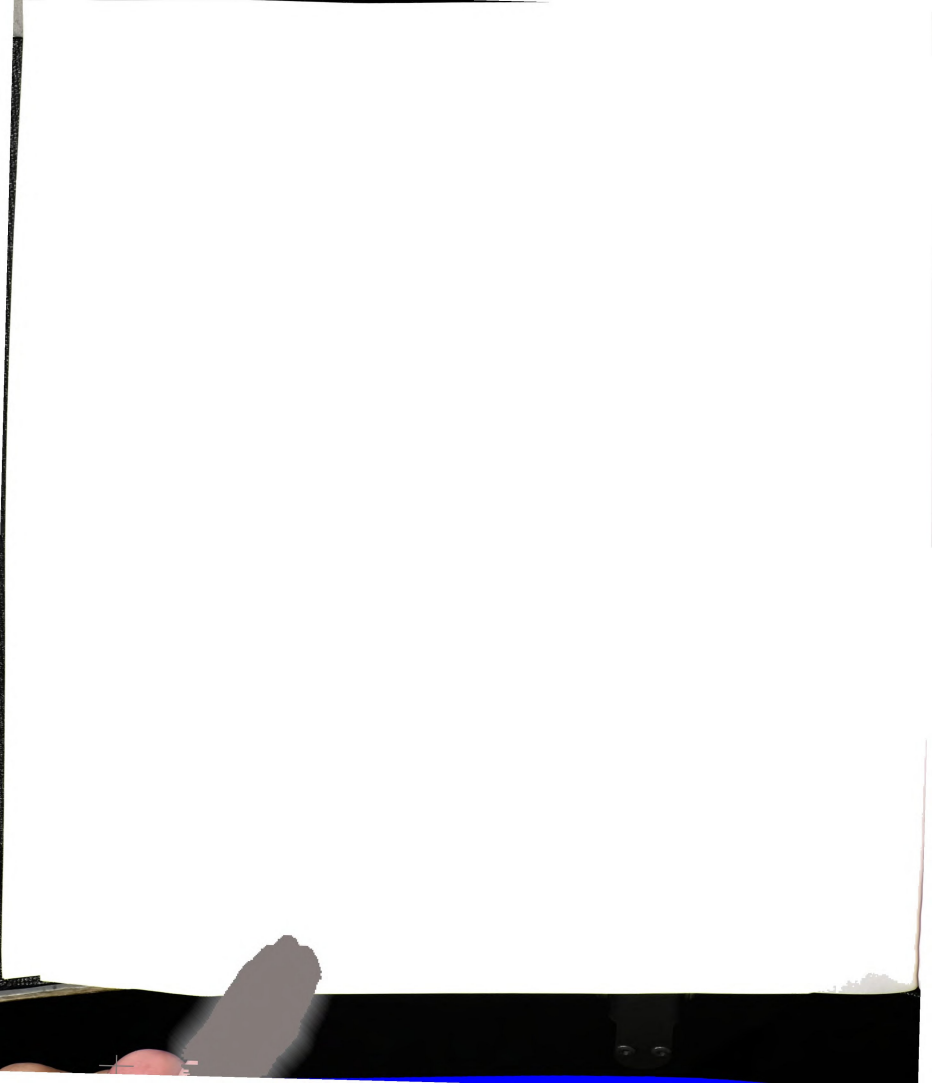
K16 Approximately how many hours did they work each day?

K17 Has the volume of labour (number workers and hours worked combined) involved increased, decreased or remained the same over the past ten years? 1=Increase; 2=Decrease; 3=No change

K18 If Change, when did the change occur?

K19 Why did the change occur?

Activity	Who else does it? K11	Number of males K12	Number of females K13	Why M/F/E? K14	When (month) K15	Hours per day K16	How change? K17	When change? K18	Why change? K19
Grazing									
Milking									
Selling milk									
Collecting fodder									
Collecting manure									
Watering									
Treatment									
Other____									



(FOR EACH CROP GROWN (REFER TO PARCEL LEVEL DATA) ASK THE FOLLOWING QUESTIONS)

L1 Crop_____

L2 How much time did you (RESPONDENT ONLY) spend on crop farming related duties on a typical day during the listed seasons in the past year?

L3 How has this changed? 1=increased; 2=decreased; 3=no change

L4 When did change occur?

L5 Why did change occur?

Activity	Hours per day L2	Number of weeks L2	How change L3	When change L4	Why change L5
Field preparation (clearing/burning)					
Maintaining irrigation structures					
Planting					
Weeding					
Watering					
Harvesting					
Thrashing					
Transport to market					
Selling at market					
Other_____					

L6 Who else is involved in crop related activities? 1=Hired labour 2=Child; 3=Relative; 4=Friend; 5=Other_____

L7 What crops do they help with?

L8 How many males are involved in each activity? Ie how many hired labour/child/relative/friend.

L9 How many females are involved in each activity?

L10 Why are they predominantly male or predominantly female or about equal numbers of males and females?

L11 When during the past year were they involved (month)?

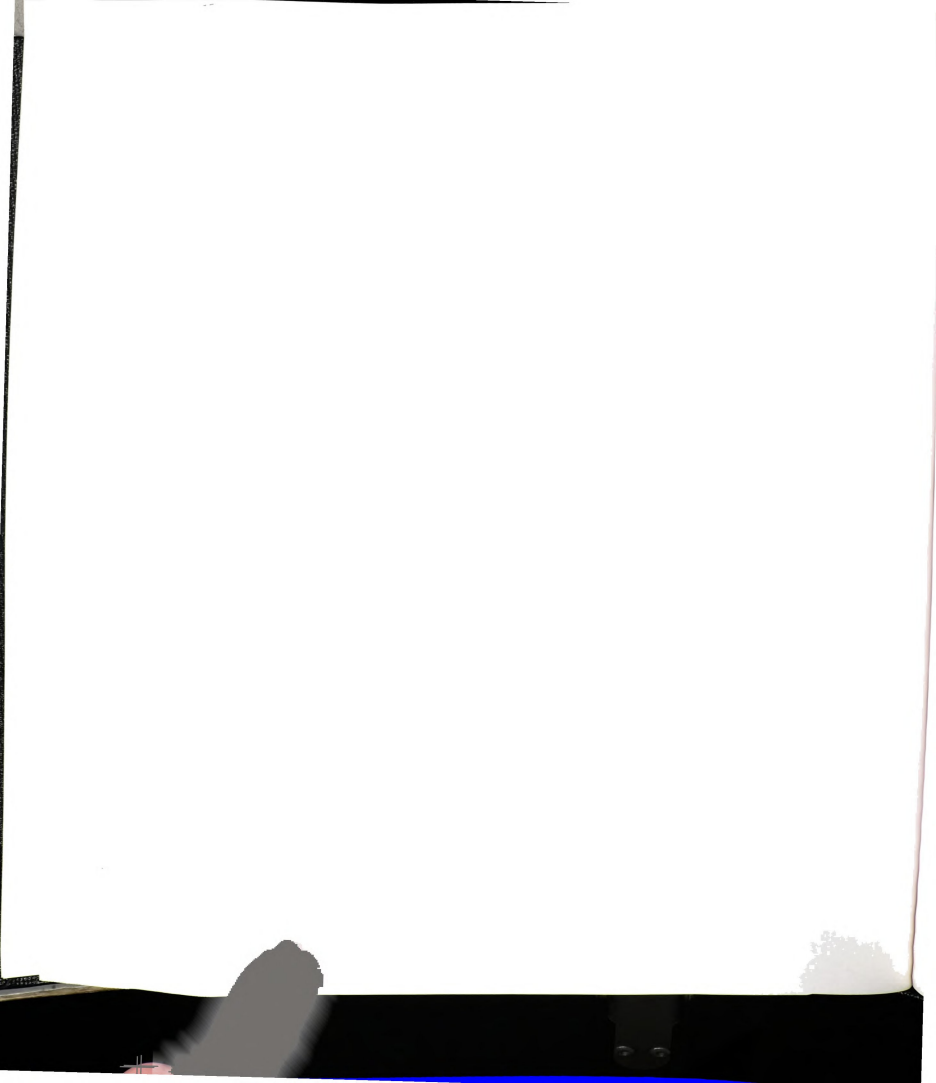
L12 Approximately how many hours did they work each day?

L13 Has the volume of labour (number workers and hours worked combined) involved increased, decreased or remained the same over the past ten years?

L14 If Change, when did the change occur?

L15 Why did the change occur?

Activity	Who else does it? L6	What crop? L7	No of males L8	No of females L9	Why M/F/E L10	When (month) L11	Hours per day L12	How change L13	When change L14	Why change? L15
Field preparation (clearing/burning)										
Maintaining irrigation structures										
Planting										
Weeding										
Watering										
Harvesting										
Thrashing										
Transport to market										
Selling at market										
Other____										



M. Property Rights

M1 What property are you allowed to use?

M2 What property are you allowed to sell?

M3 What property do you sell?

Property	Use right	Sell right	Do you sell?
Livestock	XXXXXX		
Milk			
Meat			
Hide			
Poultry			
Eggs			
Food crops (specify)			
Cash crops (specify)			
Land			
Trees			
Shrubs			
Water			

M4 Do you have a right to rent out your land? 1=Yes; 2=No;

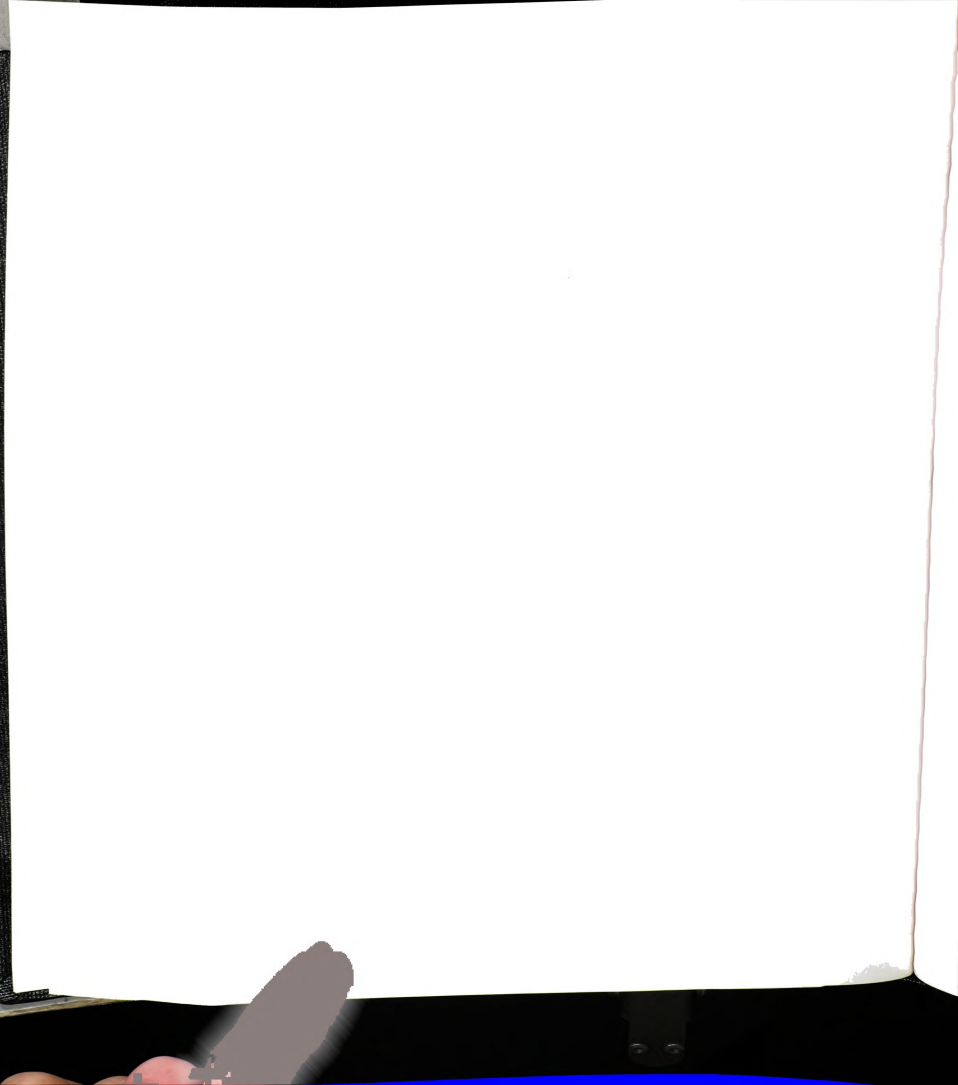
. Future

1 What does the future hold for your children? **(PROBE THEM TO COMPARE WITH HEIR EXPERIENCE)**_____

2 Do you see your life changing in the next five years? 1=Yes; 2=No.

3 If Yes, How?_____

4 Why do you expect these changes? _____



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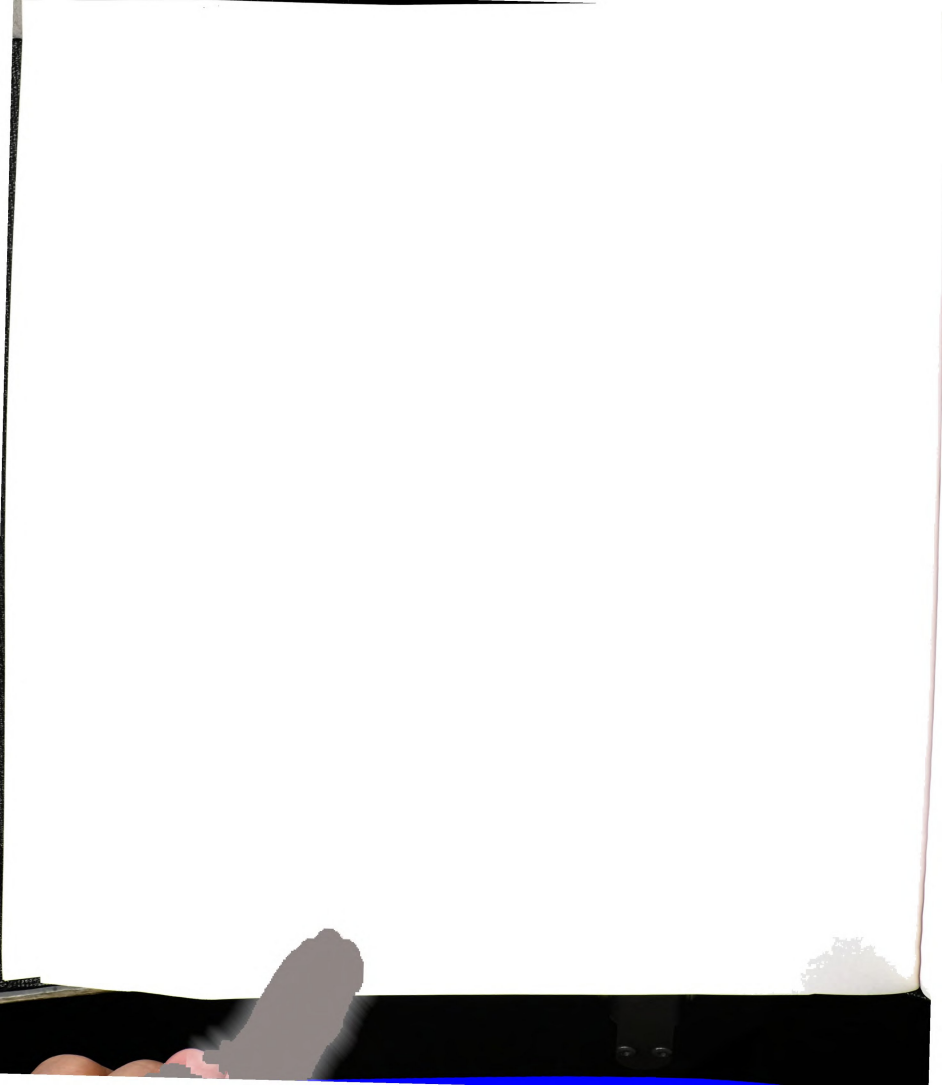

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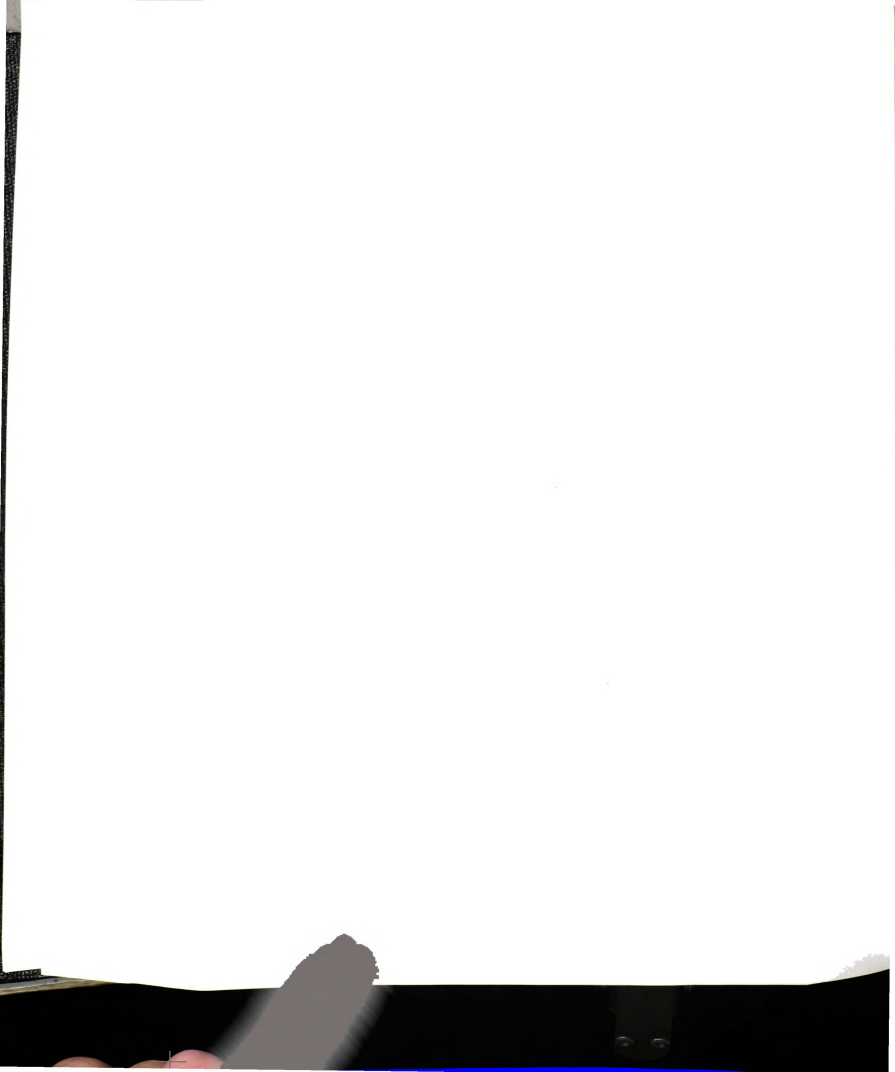

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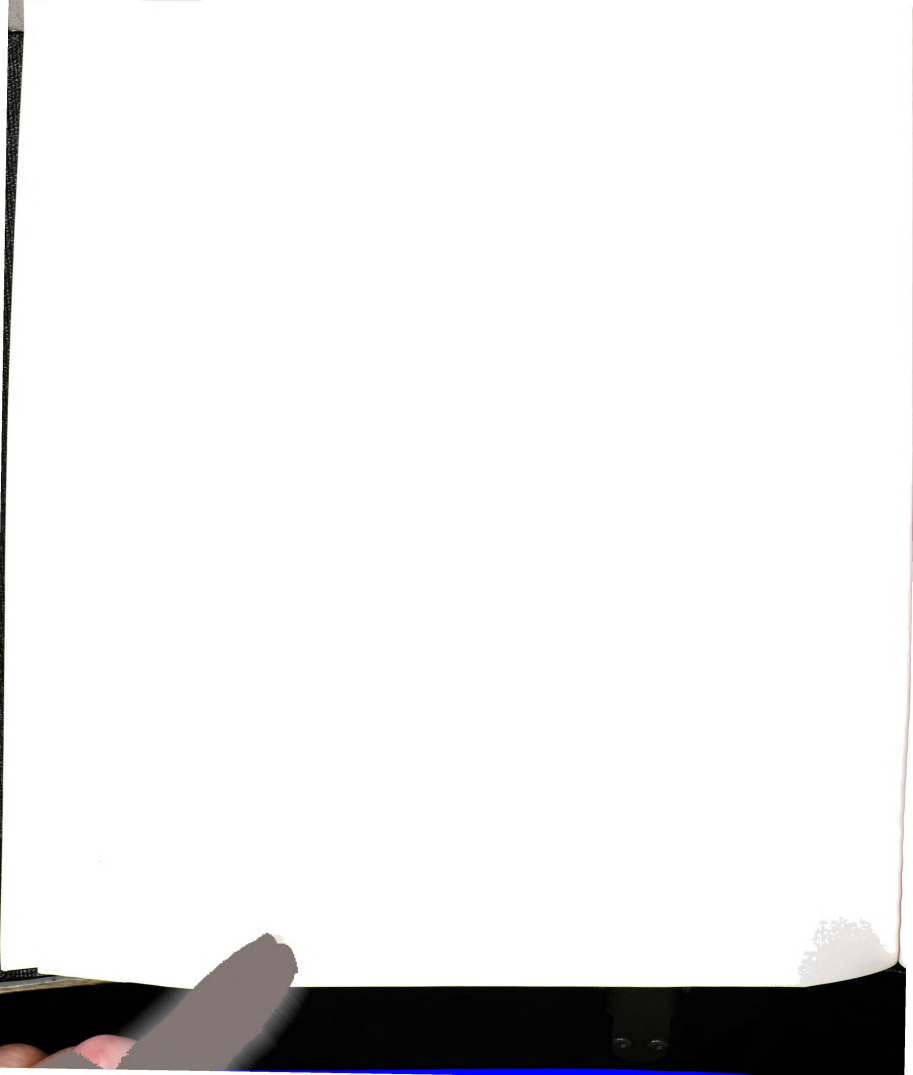

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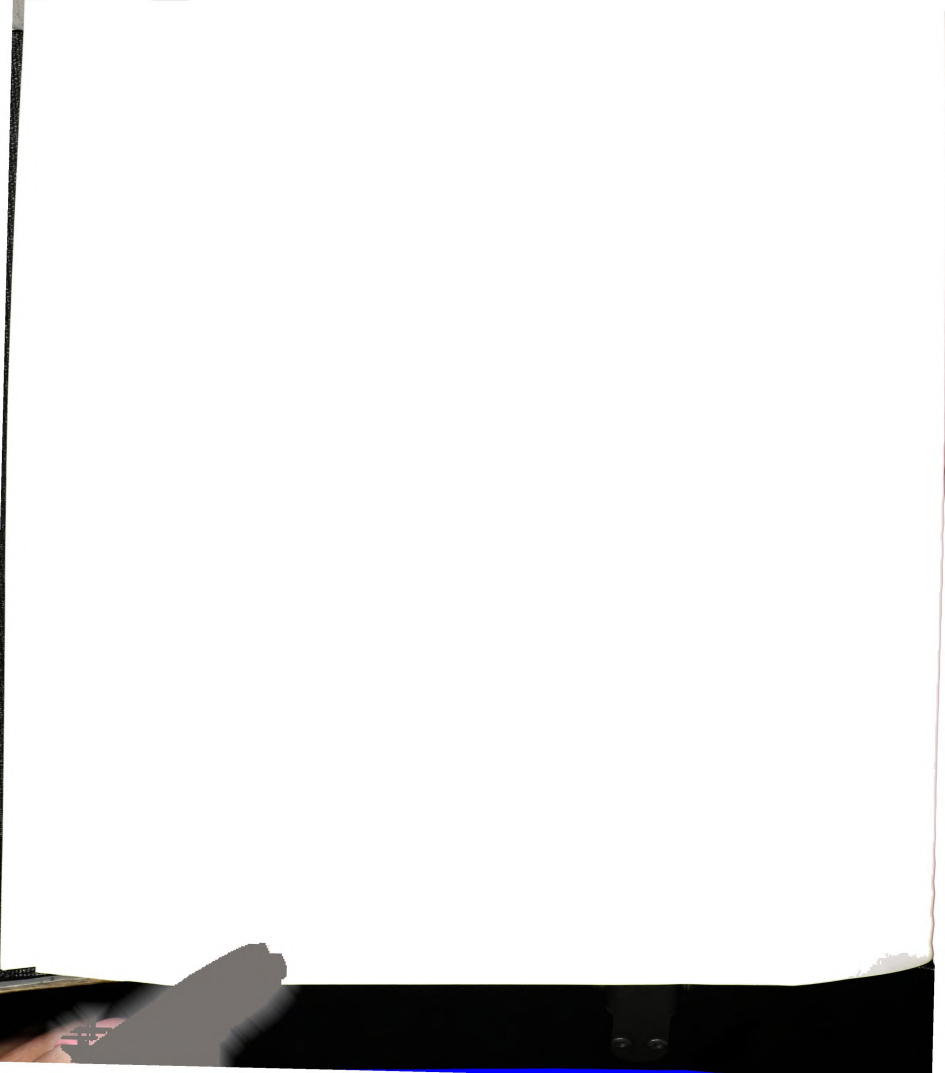

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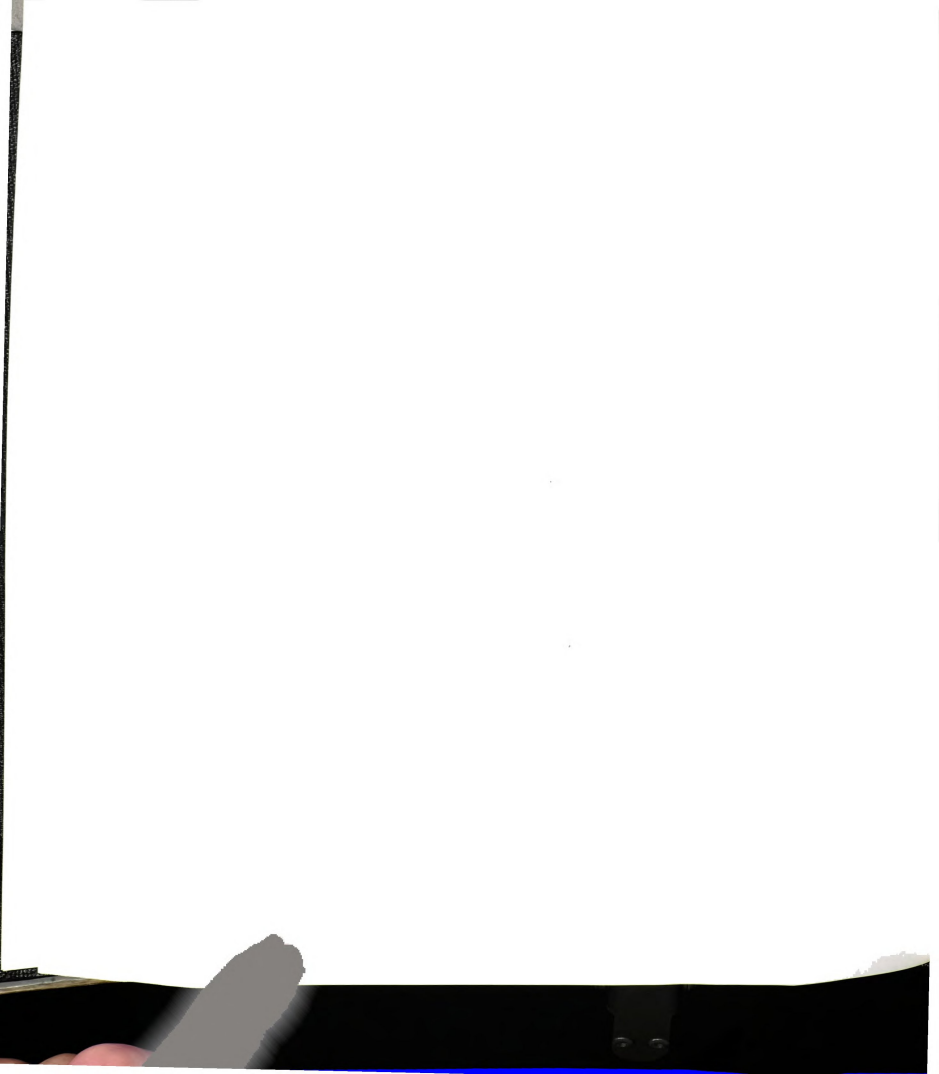

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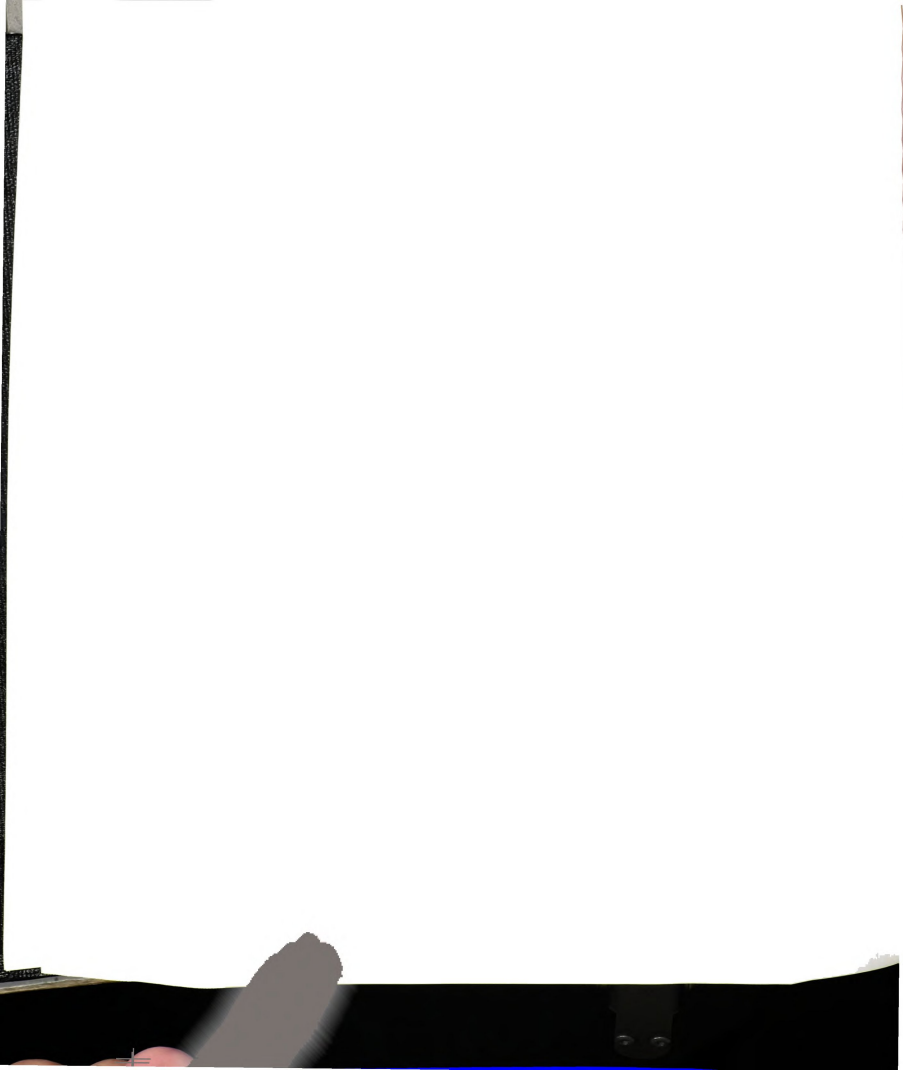

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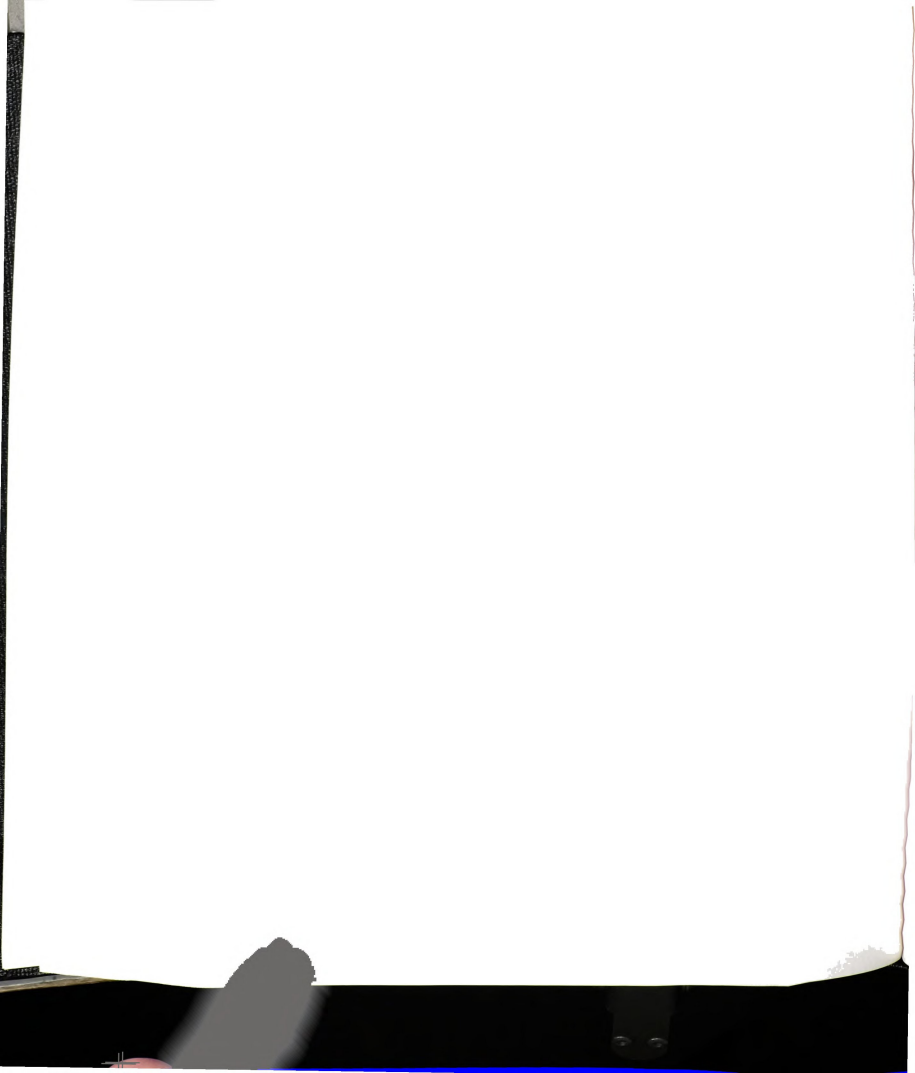

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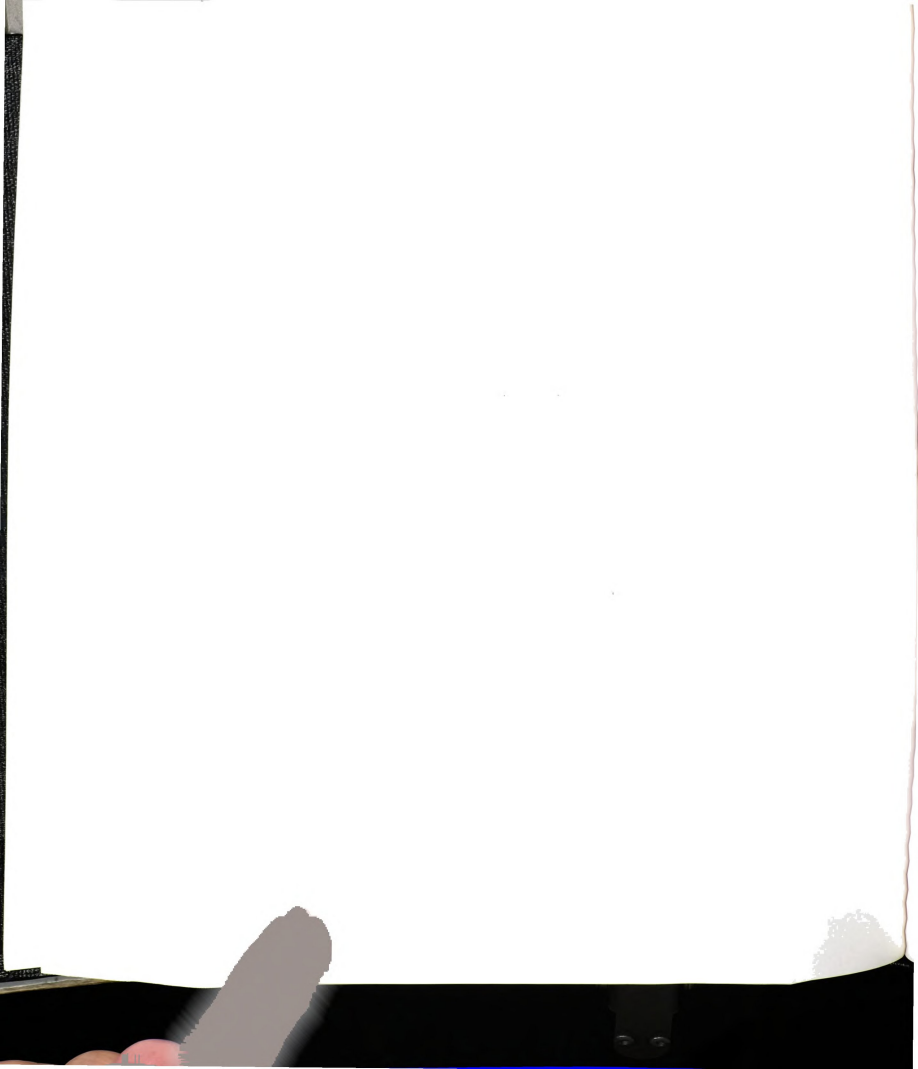

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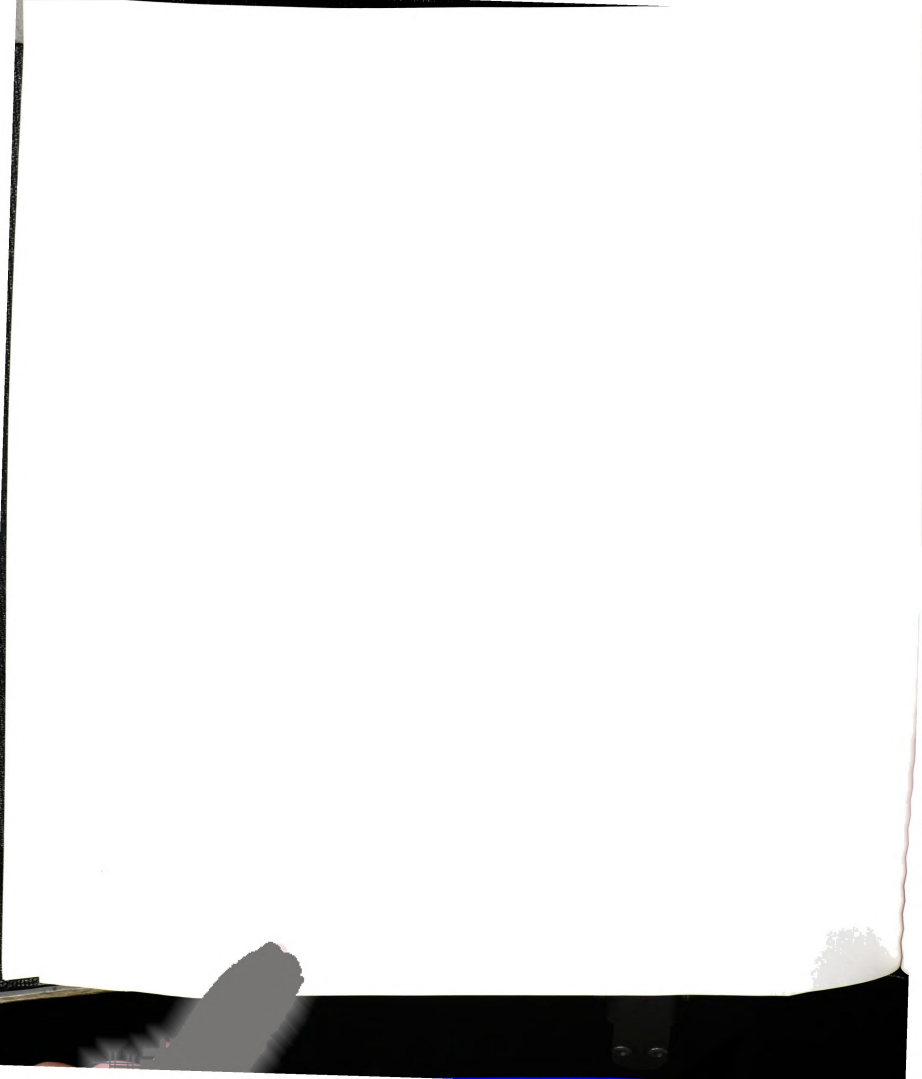

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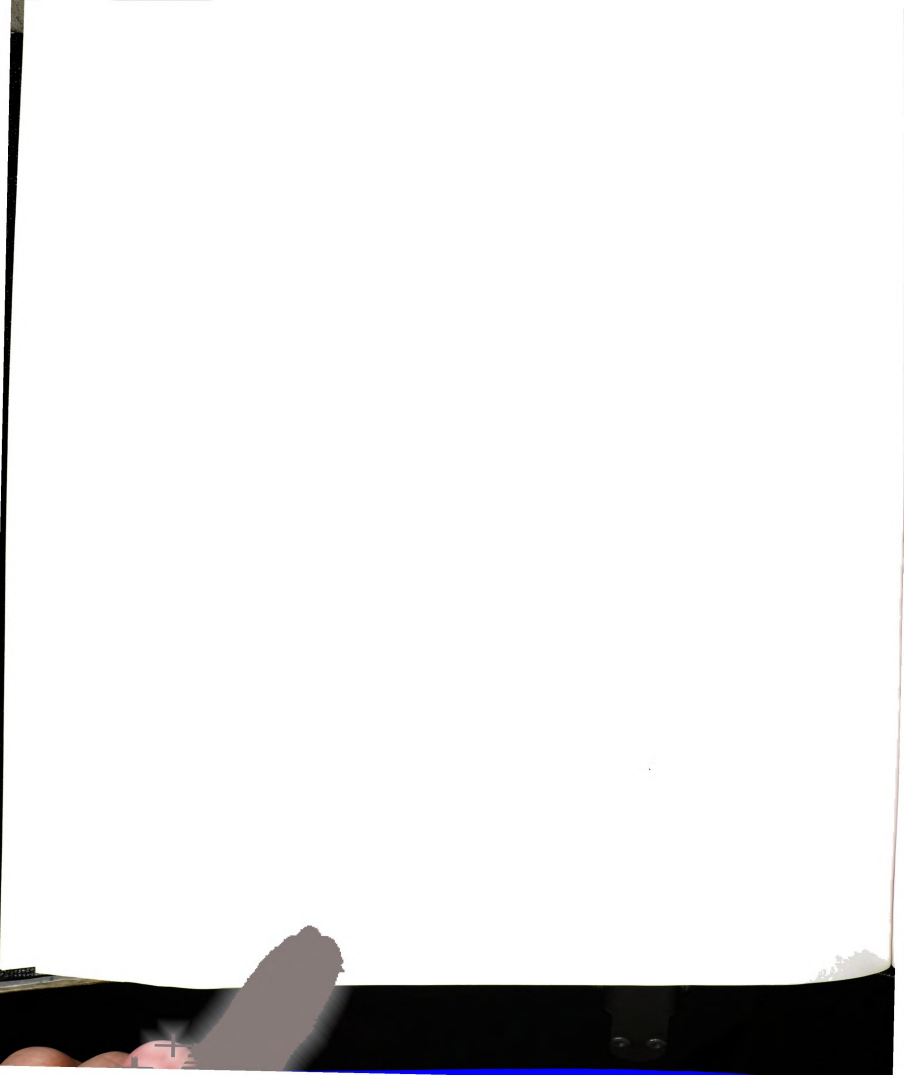

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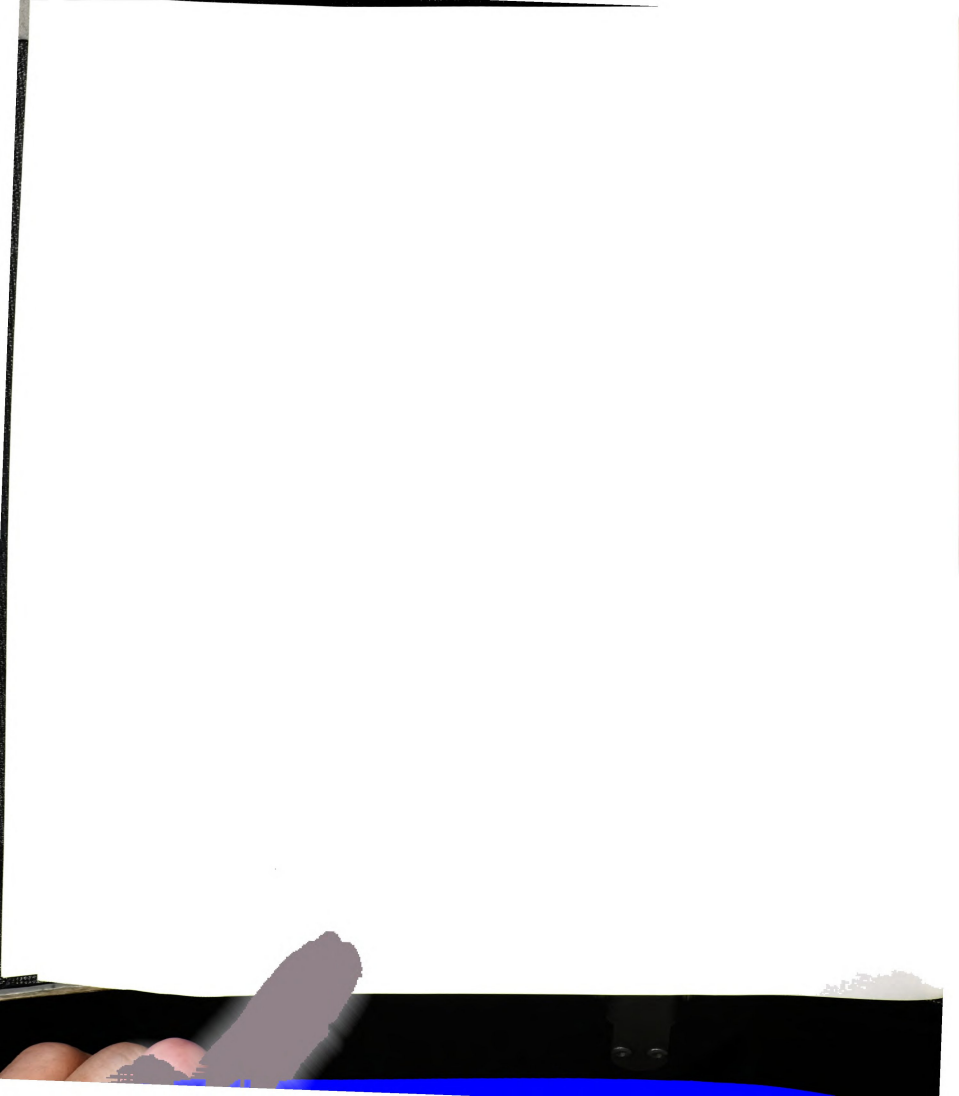

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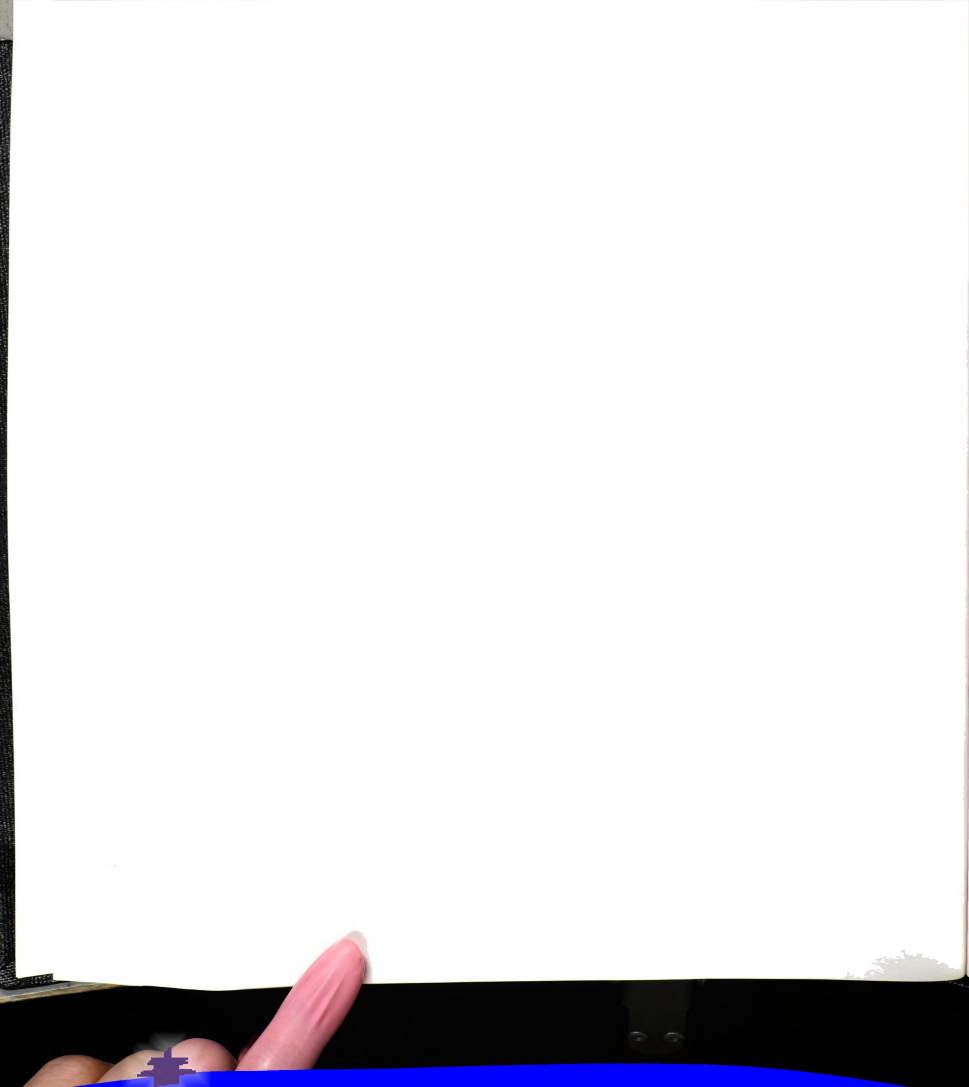

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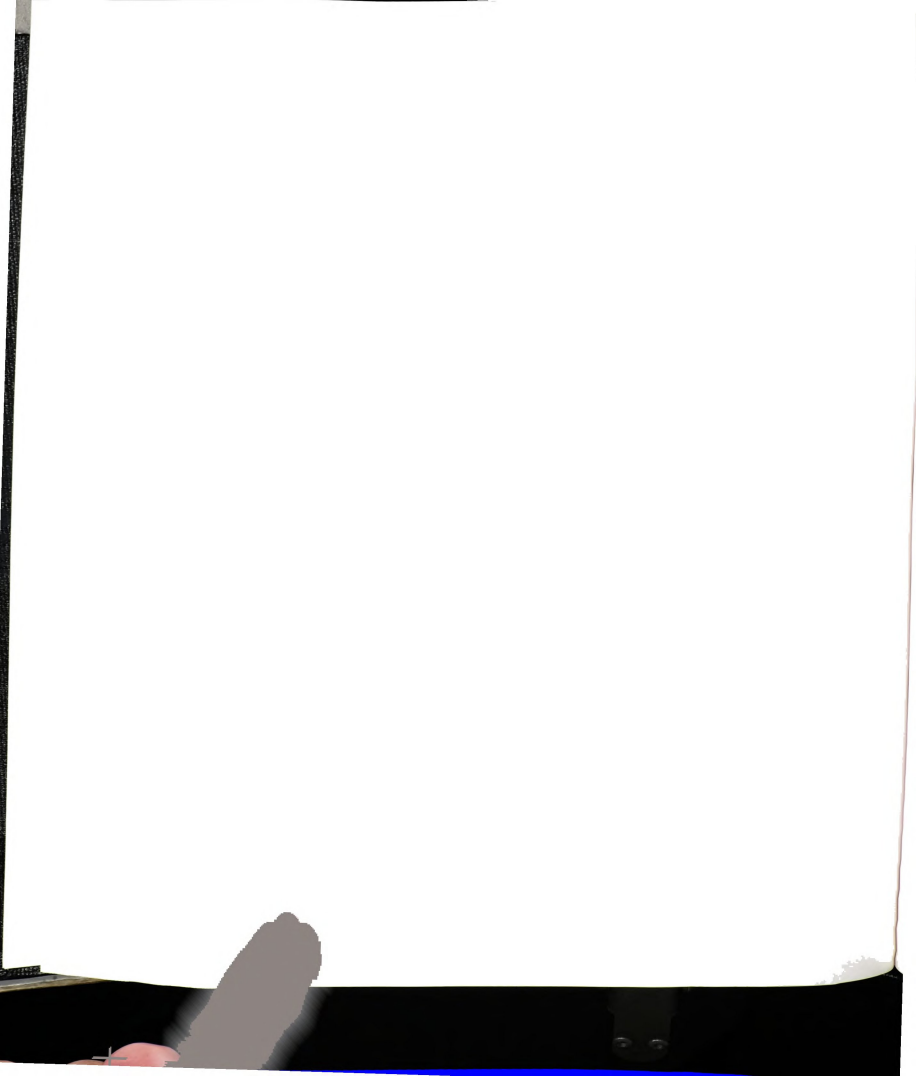

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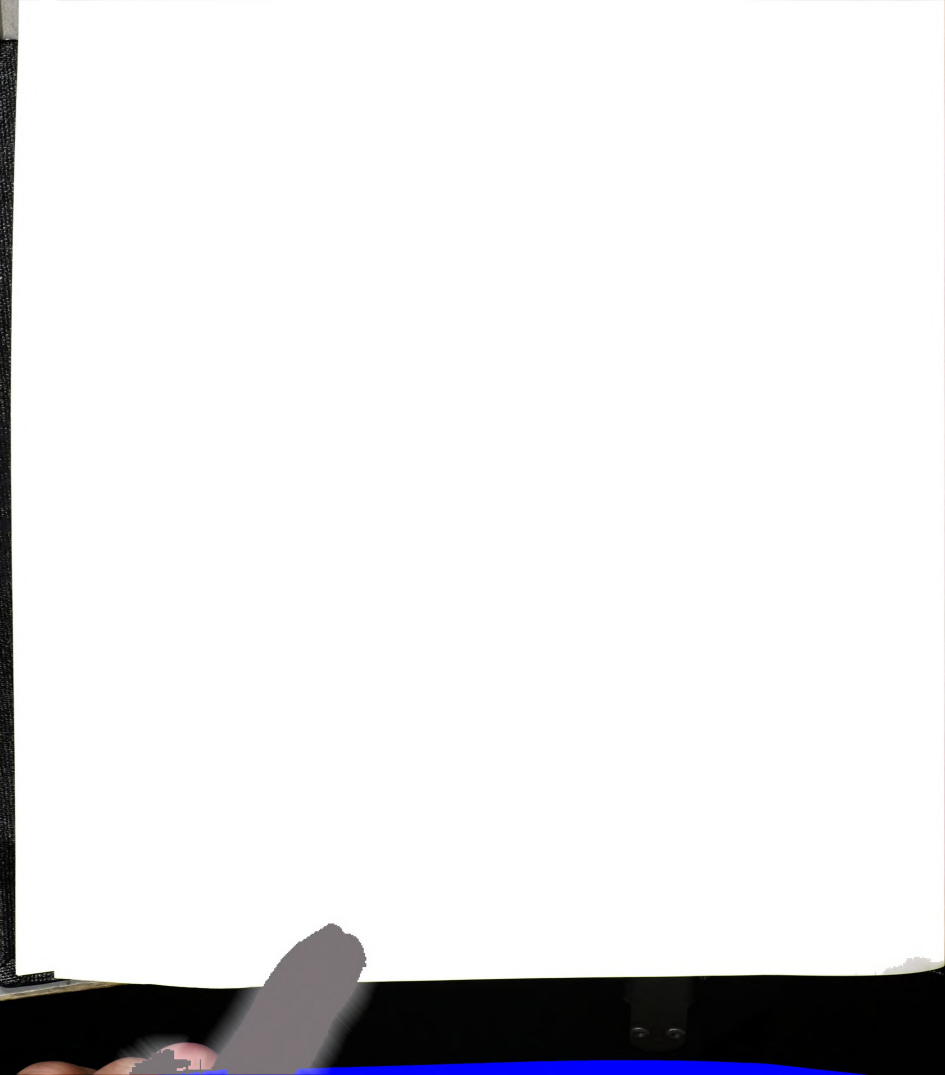

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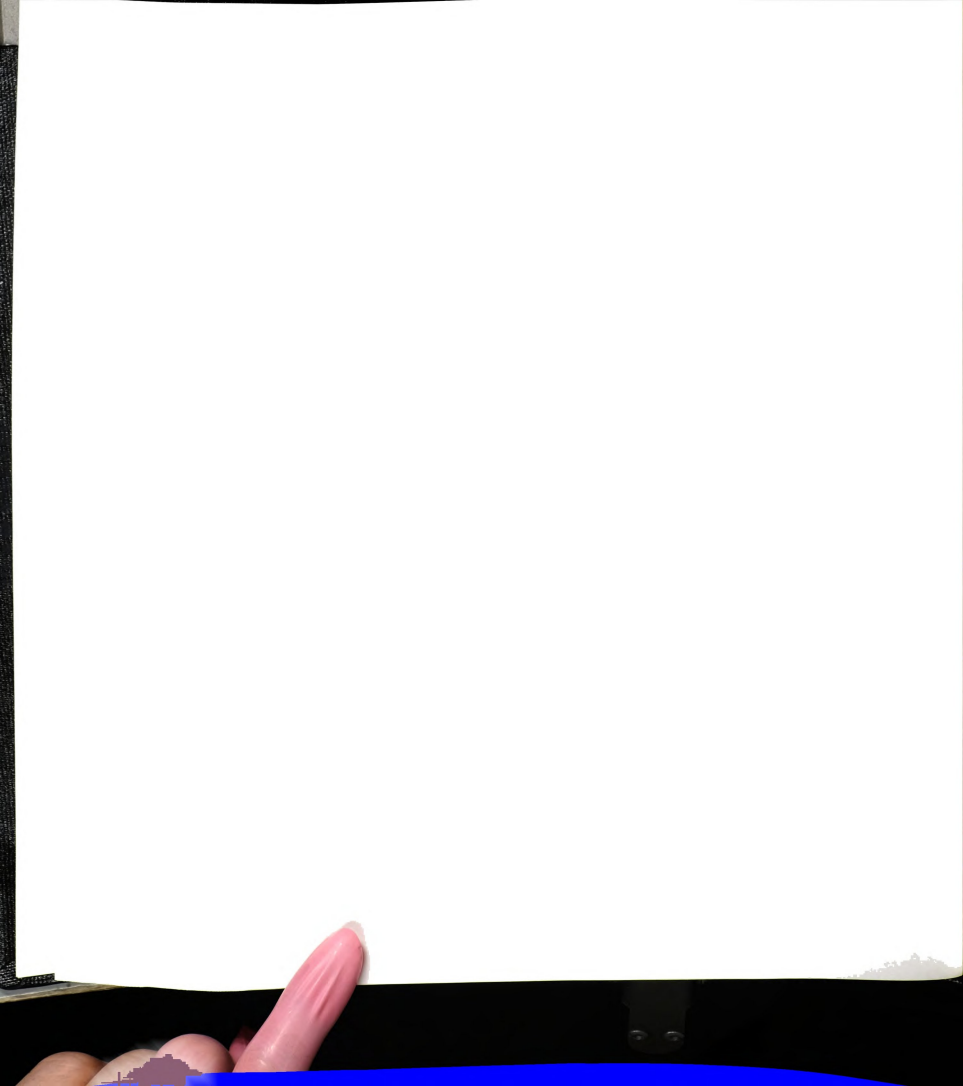

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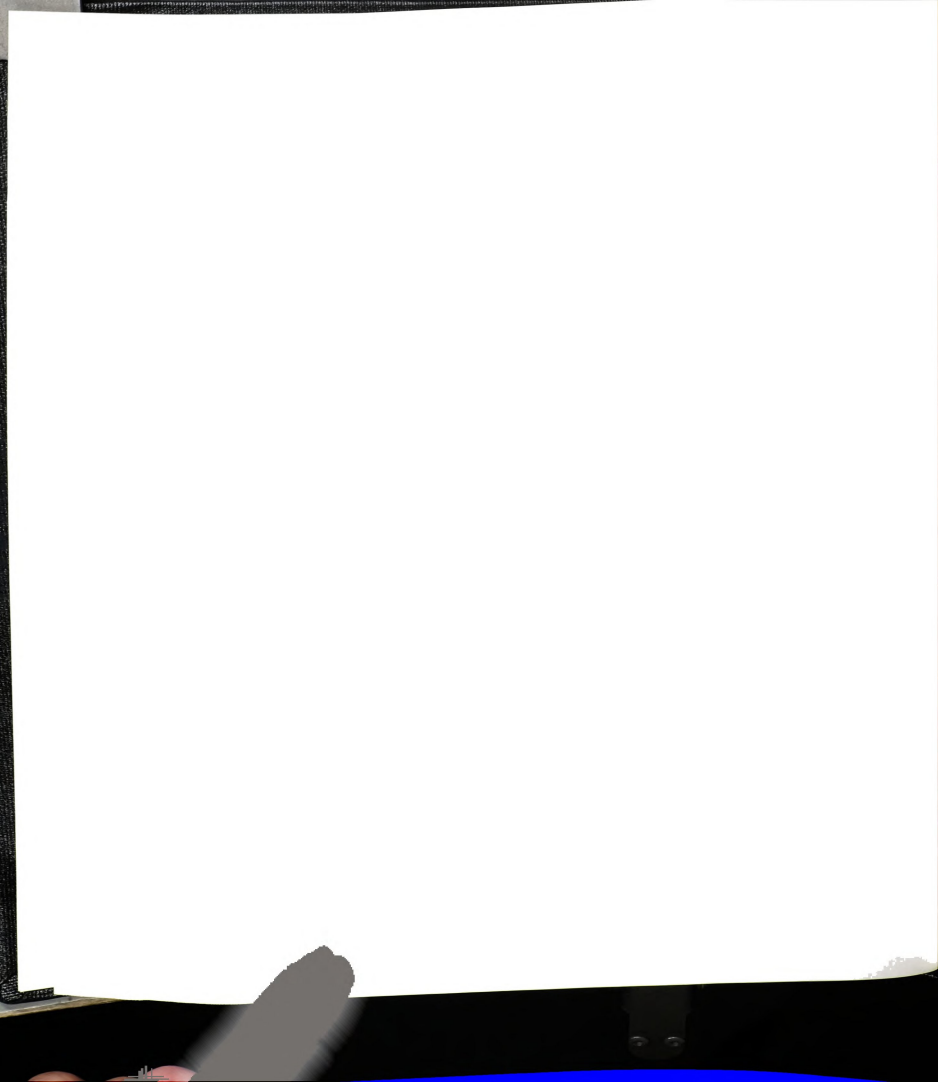

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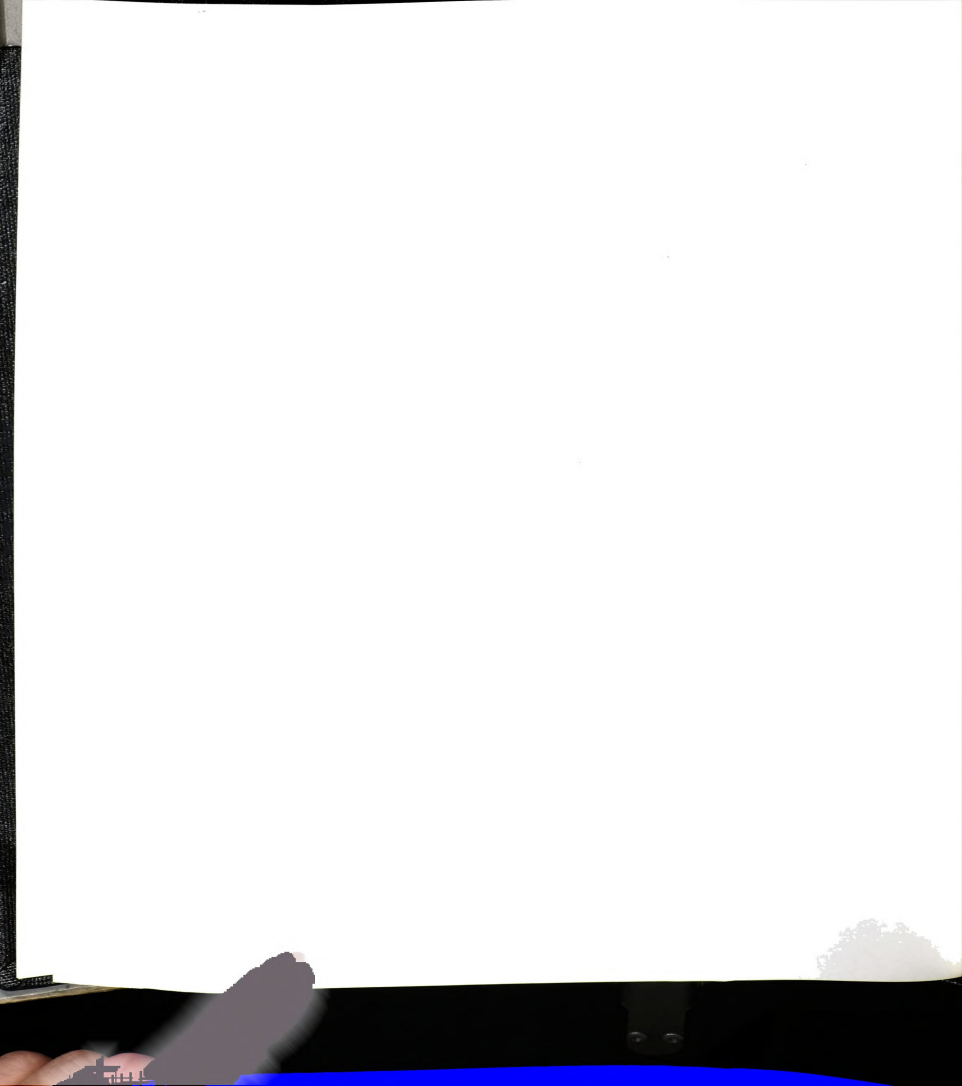

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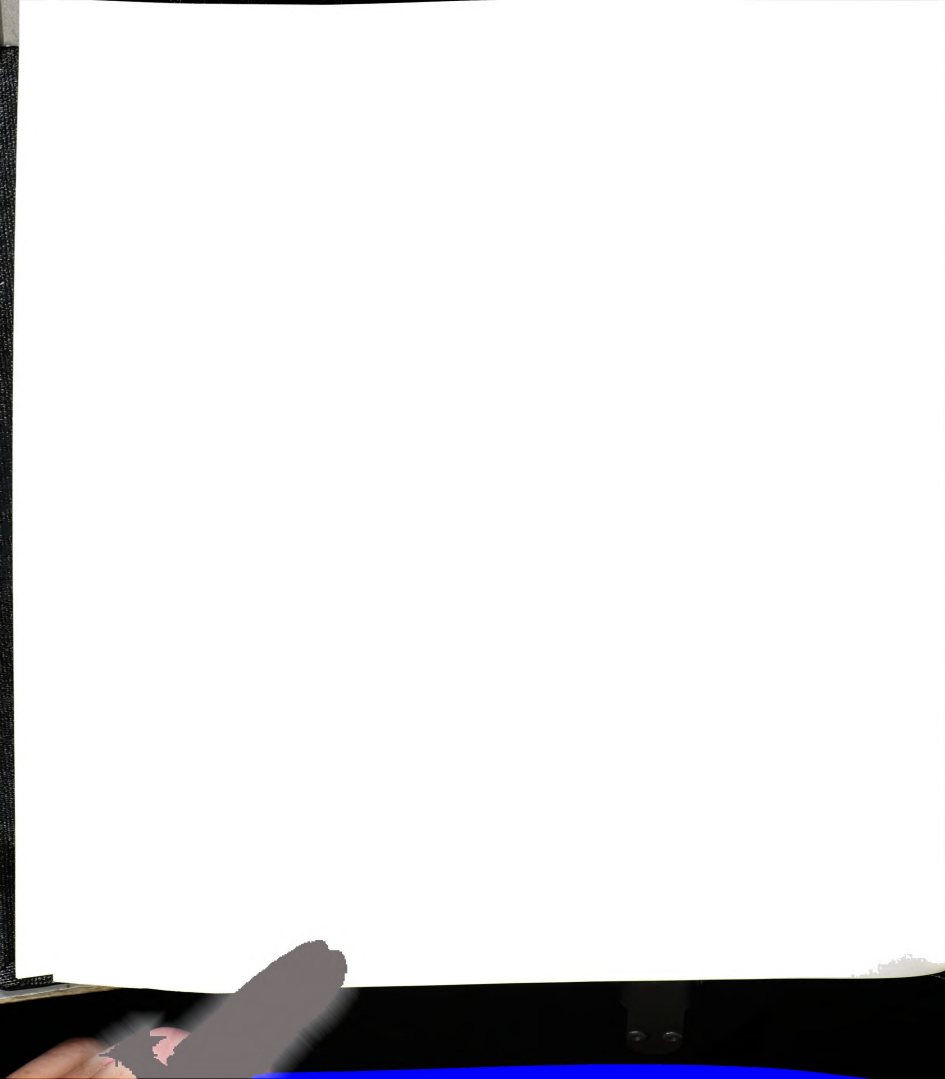

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