A co-wife for the cow:
Gender dimensions of land change, livelihood shift, forest use, and decision-making among Loita Maasai of southern Kenya

Miriam Olivia Westervelt

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I, Miriam Olivia Westervelt, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

Earth's natural forest coverage is declining at the same time as government, forestry, and development sectors are looking to forests to meet energy needs, mitigate climate change, and provide food and water security. This is a case study of Loita Forest located in southern Kenya's semi-arid drylands. The Loita area is a contemporary hotbed of competing interests in communal dry season grazing, biodiversity conservation, timber, and watershed protection. Very little is known about land change in Loita or cultural linkages accompanying it.

The study uses gender to examine the intersections of three conceptual spheres of inquiry—culture, livelihood, and environment. To confirm gender linkages empirically, it establishes baselines in history and traces cultural and environmental change over four decades. Its methods are triangulated between remote sensing, oral histories, interviews, focus groups, and participatory resource mapping and transect walks.

The findings present a new empirically-based understanding about the gender dimensions of land change. Dramatic declines in dense forest were evident along with transformations in gendered livelihood roles and intra-household and community decision-making. Wetland change dynamics indicate synergies and feedbacks with livelihood shift and underlying abiotic drivers. The thesis argues that change in this natural forest ecosystem involves a complex web of intersecting variabilities that include gender—a cultural factor that has not received much attention in studies trying to integrate natural and social sciences to understand remotely sensed land change. The results will fuel discourse about the historical basis of Maasai women's social status by carrying it forth into the 21st century with recent changes in livelihood roles and women's self-perceptions. It concludes with guidelines for gender-inclusive resource planning in the Maasai landscape.

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List of Maa words appearing in text

aitore	to rule
aitodol	to show
aure	to fear
elatia	neighborhood
emayian oo nkituaak	women's blessing
embostani	vegetable garden
emutai	disaster
encan	rain
engudi	herding stick
enkai	God
enkaji kiki oo ilkeek	a small house of trees
enkaji	house
enkang	homestead, settlement
enkanyit	respect
emanyata (manyata)	settlement for age group ceremonies (manyata is an anglicized version referring to a traditional mud/dung house)
enkipaata	ritual dance expressing triumph upon completion of eunoto
enkitok	woman
enkitudupunoto	women's empowerment
enkiyo	dead (girl) child
entasat, pl. in-tasati	old woman (from the adjective *tasat* for weak, withered)
entim	forest
esere	swamp, swamp grass, bulrush
esimu	cell phone
eunoto	male age group ceremony for warriors becoming elders
ilainosak lentim	forest eaters
iIlayiok	boys
ilcoreta	friends
ilkeek	firewood
Ilkinyaku/Ilmshuki/Iltumsika	male age group (established 2005)
Ilkisaruni	male age set (established 1980 and 1989)
Ilkiseyia	male age group (established 1968)
Ilkishili	male age group (established 1980)
Ilkisongo	section of Maasai
Ilkitoip	male age set (established 1968 and 1975)
Ilmauya	male age group (established 1961)
Ilmejooli/Ilbuluka	male age group (established 1989)
ilmurran	warriors
iloibonok	ritual experts, seers, prophets (laibon is anglicized version)
iltarakua	African pencil cedar (*Juniperus procera*)
iltorobo	tribesmen, hunter-gatherers, honey-gatherers
inkamulak oo nkituaak	women's fertility blessing
inkidongi	subclan of ilaiser clan; iloibonok belong to this sub clan
inkishu	cows

intasati	old women (from the adjective *tasat* for weak, withered
intoyie	girls
Irandai	male age group (established 1975)
Irompoi	male age group established 1995)
Iseuri	male age set (established 1952 and 1961)
isiankikin	brides
Isonjo	Bantu agriculturalists
isupuki	highlands
jembe	hoe
jiko	cooking stove
Kaputiei	section of Maasai
kimaasai	Maa language (Swahili)
kisongo	section of Maasai
kule	milk
Loodikilani	section of Maasai
maendeleo ya wanawake	empowerment of women (Swahili)
maendeleo	development (Swahili)
Matapato	section of Maasai
mau mau	African nationalist movement in 1950s
mzungu	people of European descent (Swahili)
Narok	dark, black
oira	work party
olaji	age set comprised of left and right-hand circumcision groups
olamal	delegation
olatim	branch
olcani	tree, medicine
oleparmunyo	orange climber (*Toddalia asiatica*)
olgilai	small fruited teclea (*Teclea nobilis*)
olkine loo mbeneck	Goat of Leaves ceremony
olkonyil	buffalo thorn tree (*Rhamnus prinoides*)
olmarei	family
oloiboni, pl. iloibonok	ritual expert, seer, prophet (laibon is the anglicized version)
oloirien	African olive (*Olea europaea* ssp. *africana*)
oloshon	territory, tribal section
olpiripiri	East African yellow wood (*Podocarpus falcatus*)
olporror	half an age set (olaji), a circumcision group of boys
olpul	meat feasting camp of warriors
oltiol	papyrus (*Cyperus papyrus)*
oreteti	fig tree (*Ficus thonningii*)
orperesi wouas	red oat grass (*Themeda triandra*)
oseyiai	slender cyperus (*Cyperus distans*)
Purko	section of Maasai
roncoi	people who move with cows to temporary places in dry season
shamba	vegetable plot (Swahili)
ugali	maize meal porridge (Swahili)

List of abbreviations and acronyms appearing in text

AGRIS	Agricultural Science and Technology Information
ASALs	Arid and semi-arid lands
AGRICOLA	Agricultural Online Access
AROP	Alternative Rite of Passage
BI	Birdlife International
BIEA	British Institute in East Africa
CAB	Commonwealth Agricultural Bureau
CBC	Community-based Conservation
CBNRM	Community-Based Natural Resource Management
CCL	Concerned Citizens of Loita
CEPF	Critical Ecosystem Partnership Fund
CGIAR	Consortium of International Agricultural Research Centers
CI	Conservation International
CORDAID	Catholic Organisation for Relief and Development Aid
CPR	Common Pool Resources
CSA	Climate Smart Agriculture
DBH	Diameter at Breast Height
DC	District Commissioner
DO	District Officer
DRSRS	Department of Resource Surveys and Remote Sensing
EAWLS	East African Wild Life Society
ENSO	El Niño Southern Oscillation
ES	Environmental Sustainability
FAO	(UN) Food and Agriculture Organisation
FC	Forest Committee
FPE	Feminist Political Ecology
GIS	Geospatial Information System
GPS	Global Positioning System
IBA	Important Biodiversity Area
IDS	Institute of Development Studies
IFRI	International Forestry Resources and Institutions
IIED	International Institute for Environment and Development
ILIDP	Ilkerin Loita Integral Development Programme
ILRI	International Livestock Research Institute
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
KENGO	Kenya Energy and Environment Organisations
KENRIK	Kenya Resource Centre for Indigenous Knowledge
KIFCON	Kenya Indigenous Forests Conservation Project
KFS	Kenya Forest Service
KMD	Kenya Meterological Department
KWCA	Kenya Wildlife Conservancies Association
LCE	Loita Council of Elders
LNECT	Loita Naimina Enkiyio Conservation Trust

MCA	Member of County Assembly
MEWNR	Ministry of Environment, Water and Natural Resources
MPIDO	Mainyoito Pastoralists Integrated Development Organization
NASA	National Aeronautics and Space Administration
NDMA	National Drought Management Authority
NGO	Non-Governmental Organization
OIMLC	Oltepesi Institute for Maasai Language and Culture
PAR	Participatory Action Research
PCDA	Pastoralist Community Development Association
PE	Political Ecology
PRA	Participatory Rapid Appraisal
RA	Research Assistant
RCMRD	Regional Centre for Mapping of Resources for Development
SD	Sustainable Development
SS	Social Sustainability
TNC	The Nature Conservancy
UN	United Nations
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNGA	United Nations General Assembly
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USAID	United States Agency for International Development
USGS	United States Geological Survey
WCED	World Commission on Environment and Development
WCS	Wildlife Conservation Society
WEDO	Women's Environment and Development Organization
WRI	World Resources Institute
WWF	World Wildlife Fund
UCL	University College London

Chapter 1: Introduction

Forest conditions have co-evolved, often over long periods,
with gendered capabilities and relations in resource access, use and control.
(Leach et al. 2016: 26-27)

1.1 Summary

This is a study of the relationship of gender to changes in land, livelihood, and culture. In the Global South, demands for energy, forest products, and ecosystem services are intensifying beside the need for more sustainable pathways addressing land degradation on behalf of human well-being. This thesis holds that gender-sensitive understandings about land change can improve progress on such pathways. It argues that in the context of a forest-dependent pastoralist community in southern Kenya, gender dimensions are integral to the human/environment system. This chapter introduces main issues and the conceptual framework.

1.2 Introduction

Earth's natural forest[1] coverage declined 6% between 1990 and 2015 (Keenan et al. 2015). Tropical countries, where the average rate was higher at 11%, are experiencing the greatest forest losses of all climate domains (tropical, subtropical, temperate, boreal) (Hansen et al. 2013; Keenan et al. 2015). Kenya estimates a loss of about 25% of cover between 1990 and 2000 (Kenya 2016) and the disparity between supply and projected needs for timber, poles, firewood, and charcoal in Kenya is significant (Kenya 2013, 2016a). Government, forestry, and development sectors in tropical countries are looking to forests to meet energy needs, conserve carbon stocks, mitigate climate change, and provide food and water security. International bodies and scientists worldwide are intent on understanding natural and anthropogenic drivers of tropical deforestation because of implications for the global environment and human well-being.

As developing tropical nations devolve their centralized forestry authorities to local levels and encourage more participatory management, gender-integrated forestry research has been gaining some momentum. The main constraints to this research have been lack of knowledge about gender and social science methods in the biological and physical sciences and a male-dominated forestry sector (Mai et al. 2011). Most community forestry studies about gender have been in South Asia, where devolution in the forest sector has been taking place for some time, and there are some studies of women's benefits from forest product commercialization in Africa (Mai et al. 2011). Such research will be helpful in Kenya as it tries to increase its forest cover from 7% to 10% to meet its constitutional mandate for environmental sustainability (Kenya 2016) while working on its development goals in Vision 2030 to improve women's representation at all decision-making levels so they can contribute even more to the economy (Ellis et al. 2007).

[1] The ecological distinction between natural and un-natural forest is important to this study. Natural forest, such as Loita Forest, has tree associations that evolved naturally and provide valuable ecosystem services (e.g., climate regulation, carbon storage, soil nutrients, biodiversity, and water supplies). Un-natural or plantation forests consisting of monoculture exotic species for wood-production do not provide the same ecosystem services (Tropek et al. 2014).

Further impetus for this study lies in ongoing scientific debates about (a) the environmental sustainability of pastoralist production in sub-Saharan Africa and (b) scholarly back-and-forth about the historical basis of Maasai women's marginalized status in a patriarchal society. The former debate has been fueled by incomplete understandings of dry land ecology and the intricate web of highly variable social, political, and biophysical factors (Ericksen et al. 2013, Homewood 2008). Gender is one social factor that deserves more research focus. According to Aud Talle (1988: 5), the late Swedish anthropologist, "Little prominence has been given to the study of women amongst pastoral peoples." Hodgson (2000) notes the paucity of studies devoted to changing gender relations among *pastoral* Africans compared to the wealth of anthropological research on how gender differences have changed in African *agriculture-based* societies. The latter debate revolves around the influence of colonial history and livestock commercialization on the downward spiral of Maasai women's social status but there is little empirical evidence in recent years to fuel the discourse.

These knowledge gaps call for more empirical data about gender linkages with forest lands that pastoralists depend on. This study uses gender as the main departure for studying land change and utilization of Loita Forest in Kenya's Maasailand.[2] Loita Forest is a dry season refuge and serves as a regional water tower. It is also one of the last non-gazetted closed canopy indigenous forests[3] in Kenya (Karanja et al. 2002; Wass 1995; Zaal & Ole Siloma 2006). *Iloita* women are primary users of Loita Forest for energy and water and men use it for dry season grazing and age group rituals. Their livelihood roles are gendered and gendered effects of climate change and resource scarcity among pastoralists can be severe (Flintan 2010; Fratkin & Smith 1995; Thomas-Slayter & Rocheleau 1995a). *Iloitai* have served as good stewards of the forest for over a century but in recent decades unsustainable use is reported (Maundu et al. 2001; Ongugo et al. 2011). This study's focus on gender aims to uncover social patterns that have not been empirically investigated, advance the state of knowledge in the field of gender and environment, and facilitate more evidence-based gender-inclusive forest planning in the Maasai landscape.

This is an interdisciplinary investigation in human ecology aimed at the intersections between three conceptual spheres of inquiry—culture, livelihood, and environment (Figure 1.1). It uses gender as a lens to study the linkages. At the intersection of culture and environment, gender differentiated forest use is studied (Chapter 5). At the intersection of culture and livelihood, gendered livelihood roles are investigated (Chapter 6). At the intersection of livelihood and environment, people's perceptions of land change and livelihood shift are explored (Chapters 4 and 6). The focus of the conceptual space where all three spheres overlap is gender and forest decision-making (Chapter 6). In this final space, where all the gender dimensions are visible, gender-inclusive pathways to sustainability are considered and guidelines are offered (Chapter 7).

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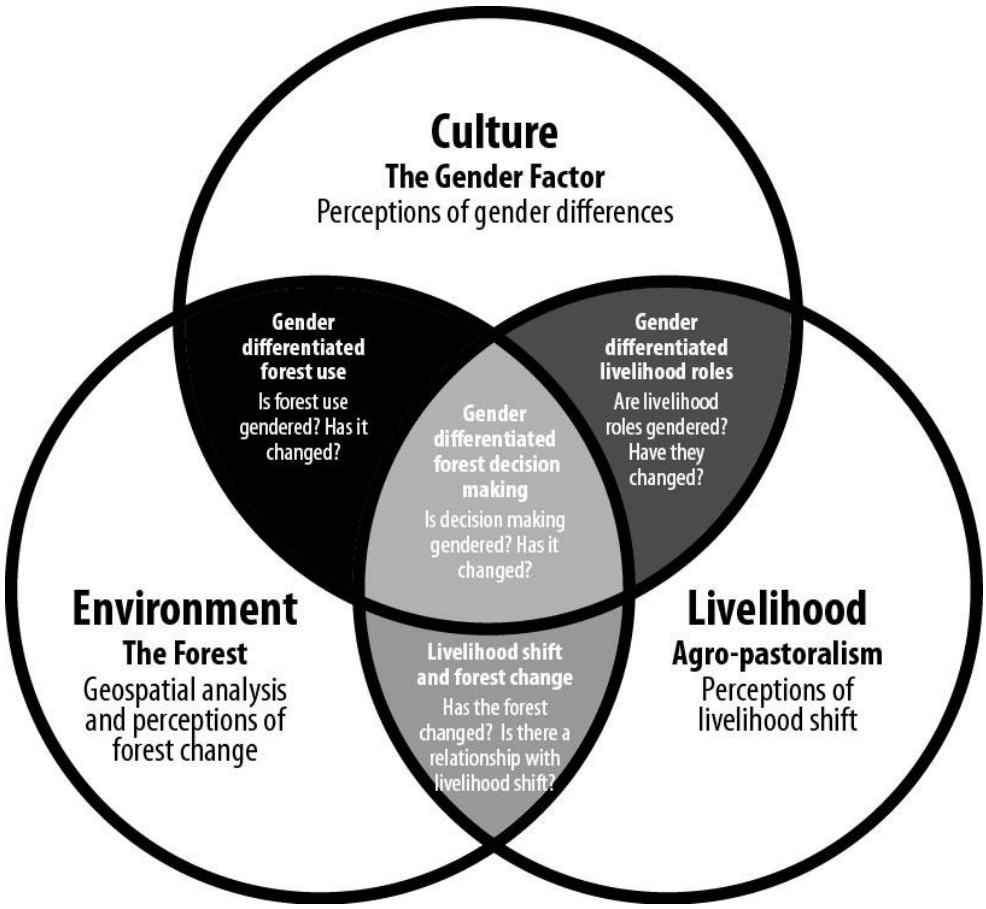
[2] Maasailand is an informal term referring to an area in East Africa where Maa-speaking communities dominate the rural population and "self-attribute to Maasai ethnicity." (Homewood et al. 2009a:1)

[3] A gazetted forest is owned by the government and has been surveyed, demarcated, and declared a forest reserve. The word gazette refers to the Kenya Gazette where the government publishes notices of new legislation. An indigenous forest refers to a natural forest composed almost entirely of indigenous species (Wass 1995).

Figure 1.1. Venn diagram of conceptual framework



1.3 Culture and gender

1.3.1 Gender theory and feminist anthropology

This investigation uses gender theory to examine the intersections between culture and forest change. Gender theory is a social theory that explains cultural phenomena based on gender. Mead (1935) laid the groundwork for gender theory in her descriptions of masculine and feminine temperaments in tribes in New Guinea in the 1930s (Delphy 1993). Sex roles theory (Connell 1987) was a direct outgrowth of Mead's work and from there evolved gender theory based in social sciences and feminism (Hare-Mustin & Marecek 1992). Today the sociology of gender is an emerging discipline trying to explain gender differences at three levels-- individual (self-concept), interactional (social interactions), and institutional (rules that shape formally organized public sectors) (Wharton 2011; Chafetz 2006). Gender theory in this study seeks gender differences at all three levels, i.e., how men and women perceive themselves, how gender relations affect perception and forest use, and intra-household and community forest decision-making.

It is important to distinguish between gender and sex differences because they are sometimes used interchangeably in social and natural sciences (Wharton 2011). Prior to the 1970s, gender

rarely appeared in titles of academic articles (Haig 2004). It appeared first in 1955 in sexological research on hermaphrodites when Money (1955) used the term to describe cases where sex roles were uncertain in the genital sense. Gender was rarely used in social science literature until the late 1960s when American feminist literature adopted it as a term having psychological and cultural rather than biological connotations (Stoller 1968). One of the first sociological works to address gender directly defined it this way: 'Sex' is a word that refers to the biological differences between male and female: the visible difference in genitalia, the related difference in procreative function. 'Gender' however is a matter of culture: it refers to the social classification into 'masculine' and 'feminine.'" (Oakley 1985: 16) Later, gender studies added 'sex category' to the terminology to explain cases, like those studied by Money (1955), where one's sex is presumed but biological criteria are lacking (West & Zimmerman 1987). In the natural sciences, gender was rarely used in titles in the Science Citation Index until 1993 when the U.S. Food and Drug Administration issued guidelines requiring use of 'gender differences' in all new drug applications. In the natural sciences, gender continues as a synonym for sex based on authors' "desires to signal sympathy with feminist goals, to use a more academic term, or to avoid the connotation of copulation." (Haig 2004:94) This study uses gender to connote a changeable dynamic influenced by culture (Deji 2011) and not a biological characteristic.

Today gender studies include feminist, masculinity, and sexuality studies and a multitude of perspectives like liberal feminism (Nussbaum 1999), standpoint feminism (Hintikka 2004), and queer feminism (Butler 2011). Debates about the social or biological/natural origins of behavior and thought (Beasely 2005; Ferree et al. 1999) may not be grounded in gender theory but in conflict theory stressing the inequality of social groups and in feminist theory (Davis 2008; MacKinnnon 1989) focused on gender inequality. Whether gender is a biological or social construct is not a research interest here. The purpose here is not to promote social change but to understand relationships with the natural environment within a particular social group using gender as a lens.

This study is feminist in its treatment of gender in three ways. First, the evidence gathering is feminist because feminist researchers "… listen carefully to how women informants think about their lives and men's lives… observe behaviors of women and men that traditional social scientists have not thought significant…and seek examples of newly recognized patterns in historical data." (Harding 1987:2) Second, its methods are at home in the feminist camp of cross-cultural gender studies searching for patterns among the diverse collectivity of women around the world (Jackson & Jones 1998). In this feminist camp, its aligns with the work of Henrietta Moore (1986, 1994, 1997) a feminist anthropologist, whose cross-cultural ethnographies show culturally and historically variable gender differences. Like Moore, the study uses time to construct the meaning of gender. As she explains:

> *All forms of social change involve the reworking of gender relations to greater or lesser degrees. This is because changes in production systems involve changes in the sexual division of labour; political conflicts involve the reconfiguration of power relations within the domestic domain and beyond; and gender as a powerful form of cultural representation is caught up in emerging struggles over meaning and in attempts to redefine who and what people are.* Moore (1997:828)

Moore's notion of gender's historical variability is also supported by Lorber (1994:54) who insists that the social institution of gender is "…. constantly created and re-created out of human

interaction." Likewise, this study investigates how gender is constructed over time as land and livelihoods change. The third way the study may be considered feminist is its consistency with feminist literature that treats gender as a cultural construct, a "system of social practices" (Ridgeway & Smith-Lovin 1999) that is relational, linked with other social structures, and situated in society at the same level as economy and governance (Ferree et al. 1999; Risman 2004). This study also sees gender as an embedded social institution of rules which are deliberately produced and reinforced over time.

In early iterations of what is called feminist anthropology today, gender was viewed as culturally constructed with variations and consistencies across cultures. For example, following a structuralist train of thought about universal binary contrasts operating across cultures (Lévi-Strauss 1969), Ortner (1974) explains gender inequality in terms of men aligned with culture and defined in terms of status roles (elder, warrior) whereas women were aligned with nature and defined in relationship to men (wife, mother). Such binary oppositions reflecting women's inferiority have been documented in the Maasai property system (Llewelyn-Davies 1981) and have been viewed as the difference between women more involved with private concerns benefiting themselves and children and men being more concerned with the welfare of society (Ortner & Whitehead 1981).

More contemporary feminist anthropology has turned away from such dualisms toward a search for shades of gray in cultural variabilities, women's individual agency, power relations, and how gender intersects with age, occupation, sexual preference, and religion (Geller & Stockett 2006). Even if sexual asymmetries and inequalities are universal in all cultures, masculinity and femininity may be less determined by social facts than by economic and political processes affecting relationships between men and women (Collier & Rosaldo 1981). Third wave feminism emerging in recent decades rejects binary oppositions for women worldwide today who hold diverse individualistic identities along a gender continuum (Walker 1992; Heywood 2006).

This study has interests in both older and newer waves of feminist anthropology, i.e., in gendered binary oppositions as well as power relations, women's agency, and the heterogeneity of women as a group of forest users. By exploring changes over time, permeable boundaries could surface.

1.3.2 Historical gender relations

A main research focus is changing gender relations which means changes in social and economic relationships between men and women. Scholarly back-and-forth about the historical antecedents of patriarchy[4] among Maasai pastoralists[5] makes the persistence of male domination a topic of interest to this thesis in terms of resource use.

[4] Patriarchy is an anthropological term often applied to gender relations among African pastoralists. Walby (1990:20) defines patriarchy as a "system of social structures and practices in which men dominate, oppress and exploit women."

[5] Pastoralists depend primarily on the production of domestic livestock for meat, milk, hides, wool and trade (Fratkin & Mearns 2003). They tend to be seasonally mobile and shift in and out of other livelihood strategies depending on economic circumstances and harsh environmental conditions, especially drought (Homewood 2008).

Scholars postulate that the portrayal of Maasai women as social victims is a consequence of history surrounding capitalism and British colonial state formation (Hodgson 2000, 2005; Kipuri 1990; Kipuri et al. 2008; Rigby 1992; Talle 1988). Historical patriarchal pastoralism has even been called a myth (Hodgson 2000) yet Maasai women are viewed as marginalized subordinates who have been subjected to domination by fathers, husbands and sons over centuries (Waller 1993; Llewellyn-Davies 1981; Spencer 1988). Today Maasai are characterized as "a textbook example of a patriarchal society" (Gneezy et al. 2009: 1637) since women are perceived as children (*inkera)* and subservient dependents needing protection (Hodgson 1999a; Chieni & Spencer 1993).

Pre-colonial records of life among Nandi and Maasai pastoralists of Kenya tell a different story (Merker 1910; Oboler 1985). In the late 19th century, records show Maasai women enjoying economic independence and sharing property rights and decision-making power with men. In Hodgson's (2000:104) interpretation of Merker's (1910) accounts (written in German and translated to English), she says "There is in fact no evidence that women perceived themselves or were perceived as the 'property' or 'possessions' of men. If anything, adult married women were the central node around which other people- 'the spokes'- revolved and joined together." Women's role as peripatetic traders was essential in acquiring food from agriculturalists in exchange for surplus milk, ghee, hides, and small stock during hard times. They controlled their travel and negotiations.

Hodgson argues further that it was during British colonial rule that the complementary roles of men and women became separated into hierarchical tiers. Colonial administrators used elders as intermediaries based on Victorian-era assumptions that older men held the most authority. The conversion to a cash economy further empowered the men to control livestock disposition, including women's usufruct rights to animals (Talle 1988). Cash from such sales was even used to pay a new plural wives tax which effectively treated them as taxable property.

Observations of rural Maasai women today confirm Walby's (1990) characteristics of patriarchy, e.g., elders make decisions about marrying daughters, girls are acquired through bride wealth, and are not free to choose their husbands (Archambault 2011), women do most of the heavy household labour and are marginalized from decision making (Kipuri & Ridgewell 2008; Obare 2003), women are physically chastised (Sonkoi 2009), elders have rights to the sexuality and fertility of circumcised women, women are excluded from age sets, and moran have rights to the sexuality of uncircumcised girls (Coast 2007).

But Maasai patriarchal domination of girls is also viewed as a practical adaptation to livelihood insecurity and the predicament of fathers who don't believe education means a good life for their daughters (Archambault 2011). Insights emanating from such ethnography can help move characterizations of patriarchy away from rigid historical stereotypes.

The present study examines persistent stereotypes and moves the discourse on historical gender relations forward with empirical data about life today.

1.4 Environment and gender

1.4.1 Historical ecology, new ecology, and forest change

The study uses historical ecology to explore complexities at the intersection of culture and environment. Historical ecology is an interdisciplinary approach to understanding influences on human-environment dynamics over time. Without a long view into history, macro-scale change drivers can be oversimplified and attributed to short-term single sources viewed as causal in simplistic linear chains. An example of an invalid oversimplification in the Mara Serengeti ecosystem is Maasai population growth → livestock numbers + subsistence cultivation → wildlife decline (Homewood et al. 2001). With the long view, mixed methods, and geospatial land analysis for 1975 to 2000, the drivers of wildebeest decline are not agro-pastoral population growth but nested effects of land tenure policies, market conditions, and mechanized agriculture.

Culture and environment converge in the same conceptual space where the social and natural science are confronting the wicked problems [6] (Rittel & Webber 1973) of today. Many wicked problems involve forests, e.g., climate change, poverty alleviation, food and water security, and energy needs. Cultural factors can inform approaches to wicked problems with problem solving that moves iteratively back and forth between hypotheses and possible solutions (Conklin 2001; Gillson et al. 2003). This approach contrasts with waterfall models, development narratives, and blueprint models that flow in a linear fashion from gathering data to a solution (Roe 1991).

In new ecology, solving wicked problems requires contextualizing with local priorities and input and re-considering ecological assumptions. Criticisms abound over forest degradation[7] narratives and exaggerated deforestation statistics that assume simplistic paradigms of forest change (e.g., climax forest community, stable equilibrium state). They contrast with flux paradigms of constant variability over multiple scales of time and space (Dublin et al. 1990; Fairhead & Leach 1996, 1998; Geist & Lambin 2002; Gillson et al. 2003; Scoones 1999). New ecology scholars warn about rigid nature versus culture polarizations that ignore reciprocal relationships between agriculture and forests in agrarian environments (Agrawal & Sivaramakrishnan 2000). Research on historical land use in Africa has challenged assumptions about negative impacts of anthropogenic change by pointing to forests that are products of farmers' efforts (Fairhead & Leach 1998).

As these cross-disciplinary interests in socio-ecological systems grow, more historically- and culturally- informed knowledge about forest change has advanced (Leach & Scoones 2013;

[6] A wicked problem "defies resolution because of the enormous interdependencies, uncertainties, circularities, and conflicting stakeholders implicated by any effort to develop a solution. Classic wicked problems include AIDS, healthcare, and terrorism." (Lazarus 2009:1159-1160). First coined by Rittel & Webber (1973) to describe social problems, the term is used today for environmental problems where uncertainties abound in complex natural systems (Berkes 2004).

[7] Forest degradation is differentiated from forest deforestation based on vegetation cover and land use. Degradation is thinning of the canopy, carbon loss, and compromised ecosystem services. Deforestation is complete tree removal for land use purposes such as agriculture or mining and natural vegetation is not expected to regenerate (Hosonuma et al. 2012). According to climate change scientists, ''Deforestation is the direct human-induced conversion of forested land to non-forested land.'' (DeFries et al. 2007:387)

Moore & Vaughan 1994; Sivaramakrishnan 1999) but gender dimensions have been overlooked, in general. Population growth and agriculture have received the most attention as causes of tropical deforestation (de Sherbinin et al. 2007) and logging, roads, urbanization and fuelwood are often cited (Chakravarty et al. 2012). But more place-based research can show how direct causes intersect with resource scarcity, changing opportunities created by markets, loss of adaptive capacity and increased vulnerability, and changes in social organisation, resource access and attitudes (Lambin et al. 2003; Geist & Lambin 2002). A multitude of factors intersecting with deforestation drivers are being studied, e.g., carbon emissions (IPCC 2013; Gash 1996), soil fertility (Tucker et al. 2007) climate change, mean annual precipitation, fire return interval and browser and grazer density (Sankaran et al. 2008; Rohde & Hoffman 2012), El Nino Southern Oscillation phenomena (Plisnier et al. 2000), fire exclusion and atmospheric carbon dioxide (Bond & Midgley 2012; Wigley et al. 2010), successional growth (Perz & Skole 2003; Bussmann 2001), international economy and national development policies (Skole et al. 1994), agricultural expansion, infrastructure expansion, and wood extraction (Geist & Lambin 2002), road access and forest elevation (Tucker et al. 2005), land tenure and property rights (Gibson et al. 2002; Mendelsohn & Balick 1995), nested resource institutions and forest governance (Ostrom 1999; Ostrom & Nagendra 2006; Tucker et al. 2007), and population growth in multiple feedback systems (Anderson 1986).

Interdisciplinary scientists in new ecology assess the environmental sustainability of land use practices using geospatial technology (Turner et al. 2007). Ecologists, geographers, and anthropologists work together to link remotely sensed data of East African rangelands with measures of pastoralist household production (Galvin et al. 2001; Homewood et al. 2001; Thompson et al. 2002). Integrating human-environment systems with remote sensing and socioeconomic data at the household and community levels can be problematic with mobile pastoralists on communally-managed land. There are also problems of extending locally-derived social data to landscape scales, spatial-temporal mismatching, and missing heterogeneity among actors (Rindfuss et al. 2004; Lambin 2004).

Using global scale forest loss satellite data, land change scientists are communicating global carbon and water cycle effects (Foley et al. 2005) and debating definitions of forest land. Tropek et al. (2014) argue that when natural forest and plantation forest are combined into a quantified measure of satellite-derived global forest gain or loss (Hansen et al. 2013), results are misleading since such forests have different ecosystem values. A country's claim of forest gain, for example, might represent a loss in biological diversity. A lack of uniform definitions of forest also precludes accurate measurements of forest degradation where carbon, biodiversity and ecosystem services are being lost (Sasaki & Putz 2009).

Furthermore, because FAO has been combining natural forest and forest plantations in its forest statistics since 2000, when a country reports a reduction in net forest loss (which might represent a loss of natural forest and a gain in plantation forest), it is not the same as deforestation slowing down (Keenan et al. 2015). Such "over aggregated statistics that obscure tropical forest trends" (Grainger 2007: 553) are pertinent to FAO's Global Forest Resource Assessment data for Kenya that show forest coverage increasing between 2000 and 2015 (Keenan et al. 2015). Just as with oversimplified macro-scale land change drivers, blueprint approaches to environmental degradation, and outmoded equilibrium and stable climax paradigms, poorly nuanced definitions

of forest could further hinder comprehensive understanding of forest-related wicked problems by eclipsing all the variabilities.

These methodological issues with linking environment and gender, remote sensing, spatial disparity, and forest definitions are important to this investigation.

The scientific recognition of all these variabilities in natural systems has been building along with the growing awareness of socio-political relationships to the environment.

1.4.2 Feminist political ecology (FPE) and gender heterogeneity

Political ecology-- the interdisciplinary study of uneven human access to or control over environmental resources (Peet & Watts 1993; Robbins 2011)—is solid conceptual scaffolding for studying gender/environment linkages. Political ecologists target weaknesses of apolitical explanations of environmental change grounded in simplistic Malthusian (Malthus 1888) degradation narratives and Club of Rome (Meadows et al. 1972) eco-scarcity models (i.e., predicting environmental catastrophe as a result of human population pressure on natural resources) as well as the modernization perspective (Rostow 1990) of the international development sector (i.e., Western technologies can simultaneously increase production and conservation in developing nations). For example, political ecologists refute the IPAT[8] formula. It completely misses micro-level social relations, world market pressures, and myriad other cultural and economic drivers of land change (Durham 1995).

Political ecology typically focuses on class and ethnicity but the gender variable has received some attention as a basis for uneven social influence. FPE is a subfield of political ecology. It asserts that women's orientations to natural resources are linked to national and global scale economic and political systems that determine their resource rights, roles, and opportunities. They will also be different from men's because women are responsible for survival needs of their households. Studies of gender's relationship with the environment from a feminist perspective have evolved from different theoretical interests: women's supposed intrinsic and nurturing connections to nature (Mies & Shiva 1993; Shiva 1988) and oppressive dominations of women and natural ecosystems (Warren 1994) (known as ecofeminism); women's material realities and unique knowledge of resources and ecosystems (especially forests) which they work in every day are structured by gender and class and need to be challenged (known as feminist environmentalism) (Agarwal 1992); gender, environment and development (Leach 2016); and culturally defined gender roles shaped by social hierarchies such as class, education, race, land ownership, and access to the state (Rocheleau et al. 1996).

Like the over-simplification of natural systems, criticisms of FPE target the treatment of gender as a linear relation that equalizes effects on men and women rather than as a process in dynamic human-environment linkages (Nightingale 2006). Also, the declining number of works labelled as FPE since its inception in the 1990s has not gone unnoticed by scholars. Possible reasons include problems with the feminist label in the Global South and the rise of post-structuralist

[8] Impact of humans on the environment (I) = Population (P) (number of people) X Affluence (A) (average person's consumption of resources) X Technology (T) (environmental disruptiveness of the technology producing goods consumed by the people) (Ehrlich & Ehrlich 1990).

third wave feminist theory (Butler 2004) in new FPE (NFPE). NFPE is redefining gender and replacing a fixed focal point of analysis with multi-dimensional identities and social differences (race, sexuality, class, religion) (Elmhirst 2011). It allows for alternative narratives and embraces a performative approach to the multiple ways gender is constructed and self-made. Though not titled as such, FPE is still found in studies about disparities in gendered access and control in resource struggles around the world including forests (Brown & Lapuyade 2001; Colfer 2005; Elmhirst 2011), water (Buechler & Hanson 2015; Ge 2011; Sultana 2011; Truelove 2011), environmental justice (Wright 2010), and climate adaptation (Buechler 2016, Wong 2009).

The theme of heterogeneity and variability in these new fields requires careful unpicking of the tangled messes at their interdisciplinary intersects because that is where the gender dimensions become visible. For example, gender differences rise in the non-homogeneous composition of communities and households. Agrawal & Gibson (1999) recognize the importance of these differences in their criticism of assumptions about shared norms and homogeneity in the 'mythic community' of community-based conservation. Community-based programs continue to be scrutinized (Western & Wright 1994; Blaikie 2006; Arntzen et al. 2003; Cox et al. 2010) including by researchers looking at participatory exclusion based on gender (Agarwal 2001). Among pastoral women, not all perceive income diversification as a means of improving their personal livelihood and social status (Buhl 2005). In studying transformations in land use among Maasai pastoralists, Brockington (2001) called for more qualitative research on the variations in intrahousehold power dynamics of husbands and wives because they are central to understanding shifting livelihood strategies. This study tries to respond to that call.

At the intersects of these new fields is where gender-differentiated effects of environmental change are visible in the literature. The study of the multiple intersections around gender from a postcolonial perspective is developing into a body of works in feminist intersectionality (Lykke 2010). Discourse at the intersects follows themes that the underprivileged in the Global South are the main victims of environmental degradation and most of them are women (Dankelman & Davidson 2013), and that poor rural women have primary roles in using resources and deep knowledge about managing them but they are marginalized from formal decision-making structures (Thomas-Slayter & Rocheleau 1995b). In environments where indigenous women are the primary gatherers of fuelwood for cooking, water for drinking, and fodder for livestock, deforestation impacts are adverse and immediate. Less fuelwood demands more of women's time and energy (Gill & Kewlani 2010), it reduces their time on food production (Kumar & Hotchkiss 1988), and it leads to malnutrition when less nutritious foods that don't need to be cooked are substituted (Agarwal 2010a). Where deforestation removes groundwater recharge zones and tree cover providing shade and protection from soil erosion, women lose access to water for drinking and growing crops. Regarding women's rights to forest resources, empirical research is thin and considered urgent in places where forest tenure is insecure or devolution reforms are taking place (Mai et al. 2011). All of these themes are of central interest to this study about a forest-dependent community.

New FPE perspectives on these themes hold that they can be counterproductive to advancing women's interests by sealing their vulnerability. They can perpetuate women's status as victims and 'sustainability saviors' (Leach 2016) whose cheap labour is enlisted in conservation projects from which they reap no benefits (Leach 1994; Resurrección 2013). Scholars warn against over-

simplifications of gender, ignoring differences among women, and viewing women as the sole change agents because it deepens gender inequalities by 'letting men off the hook' in sustainable development projects (Swarlting et al. 2014). They recommend turning away from stereotypes that feed ineffective policies and turning toward complexities in gender power relations that appear to be adapting to environmental change (Resurrección 2013). FPE topics of interest to this study are gendered knowledge (Fortman 1996), gendered rights to resources (Agarwal 1994; Wangari et al. 1996), and gendered participation (Agarwal 2001, 2009, 2010b; Wastl-Walter 1996) in forest associations, all of which are discussed in the following sections.

This research aims to leave behind the rigid understandings of forest succession, simplistic degradation scenarios, and constructions of gender that are no longer relevant for people experiencing rapid social and environmental change. It is firmly planted in FPE in its interest in the economic and political systems influencing access to livelihood resources.

1.5 Livelihood and gender

Where there is poverty in the Global South, environmental change is livelihood-related and it reflects political and economic forces operating at local and global scales (Bryant et al. 1997). This study argues that gender links with these forces at the household level. The conceptual underpinnings for a study of gender-differentiated forest use lie in sustainability and CPRs.

1.5.1 Sustainability theory, non-equilibrium thinking, land and livelihood heterogeneity

Environmental sustainability (ES) means maintaining the natural capital necessary for human well-being (Goodland 1995). For millennia, ES was maintained as pastoralists pursued livelihood security by moving with livestock over the vast East African rangelands (Robertshaw 1990). In the colonial period, they became fragmented, politically powerless, and their indigenous livestock production systems came to be viewed as environmentally destructive (Homewood 2008). Though the pastoral economy has since diversified, and geographical access to resources for livestock has been severely constrained by land privatization, wildlife conservation, and agriculture, pastoralism remains a survival strategy for over 13 million predominately pastoral people in Africa (Fratkin 2001).

The sustainability of pastoralist livelihoods in Africa is vigorously debated. First there is their long-term history of coexistence with nature which inspires the idealized vision of ecologically noble savages (Redford 1991) wherein native peoples purposefully engage in conservation of the lands they depend on based on their practical knowledge of the natural environment. This concept has been debunked by views that indigenous people's sustainable land use in the past was probably more a side effect of fewer people and lack of involvement in market economies (Hunn 1982) and that today purposeful conservation is rare among native peoples (Hames 2007). One helpful perspective in this debate is that voluntary conservation (with evidence that it is intended and planned) is uncommon in these societies and it should be distinguished from sustainable coexistence which many small-scale societies actively engage in to the benefit of livelihoods and biological diversity (Smith and Wishnie (2001). An important exception, which is also applicable in the Loita context, is the protection of sacred groves or small forest patches for ceremonial purposes (Sheridan & Nyamweru 2007).

Secondly, environmental degradation and persistent poverty among pastoralists have been attributed to raising livestock in unsustainable ways by overstocking (Lamprey 1983), overgrazing (Sinclair & Fryxell 1985), and environmental exploitation based on the model of 'pasture open to all' (Hardin 1968: 1244) where land is degraded by self-interest when livestock is privately owned. Governments, ecologists, and development initiatives have supported new land tenure regimes to return the land to equilibrium and a climax successional state (Ellis & Swift 1988). All these views have been contested for their lack of empirical evidence and the inappropriate application of temperate ecosystem equilibrium and linear climax succession dynamics to highly variable and chaotic environmental conditions in rangelands (Behnke et al. 1993, Homewood & Rodgers 1991, Sandford 1983). These arguments are based on a non-equilibrium way of thinking that highlights unpredictability and heterogeneity in pastoral drylands and societies (Notenbaert et al. 2012; Homewood 2008) and have started infiltrating SD project planning in pastoral drylands in recent decades.

Thirdly, the ecological debate is further fueled by a lack of consensus on the role of pastoralist grazing in various degrees of degraded savanna environments (Reid 2012). Grazing can have diverse effects on savanna plants ranging from an enriching response where species richness improves with moderate grazing (Oba et al. 2001) to a simplifying response where heavy grazing decreases plant productivity (Milton et al. 1994). Indeed, rangeland ecologists suggest that pastoralism may be responsible for enhancing dominant tree stands in dry woodlands in Kenya (Reid & Ellis 1995) and, with careful landscape-scale land use planning, it can be environmentally and economically sustainable alongside biodiversity conservation (Fratkin & Mearns 2003; McGahey et al. 2008; Notenbaert et al. 2012).

Forests, which contribute to the heterogeneity of pastoral drylands in East Africa, have received little research focus in the ES debate about mobile pastoralist land utilization. Highland forests[9] and glades serve as water catchment areas for people and livestock and perennial relief for dry season grazing. As once- mobile pastoralists settle, pressure on tropical dry forests has intensified (Shepherd 1992). However, where pastoralism persists in Tanzania, negative forest impacts have been attributed more to tourism and agriculture than local pastoralist utilization for grazing, fuelwood and construction materials (Homewood & Rodgers 1991).

These new paradigms-- non-equilibrium ecosystem dynamics and the compatibility of pastoral livelihood strategies with ES—advance hypotheses about sustaining pastoral livelihoods, ensuring food security, reducing poverty, and protecting biodiversity simultaneously. Without ES, social sustainability (SS) or the maintenance of human well-being (Wollenbery & Colfer 1997) is impossible and achieving both is considered urgent (Goodland 1995). As discussed earlier, in applying nonequilibrium dynamics in forested landscapes in West Africa where people cultivate, the positive impacts of anthropogenic change on biodiversity have been revealed (Fairhead & Leach 1996). But in a dryland pastoral ecosystem where cultivation activity has been intensifying in a highland forest, the insights of new ecology are waiting to be applied on behalf of biodiversity and sustainable livelihood.

[9] Highland forests differ from savanna woodlands. In literature pertaining to pastoral drylands, the difference is based on rainfall and tree cover (Reid 2012), tree height and canopy cover (Wass 1995), and canopy and understory cover (Homewood 1991). (See Sections 4.2 and 4.3.1.3 for definition of forest.)

Environmentally sustainable development, or sustainable development (SD), is addressing global poverty together with biodiversity loss and deteriorating life support systems, including tropical deforestation. Popularized in the Brundtland Report of the World Commission on Environment and Development in 1987, and advanced at the UN Conference on Environment and Development in 1992, SD is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." (WCED 1987:43) It calls for a convergence between economic development, social equity, and environmental protection. Less than stellar progress toward SD goals has been attributed to perceiving sustainability as a development and environmental issue that is not well integrated with social and economic dimensions (UNGA 2010 a,b). Conceptual frameworks in sustainable rural livelihood development recognize that complex power dynamics (Scoones 1998) and social capital (the social norms and networks that control access to resources) (Bebbington 1999) will determine if sustainable livelihoods are achievable (Scoones 1998). The social factor of gender is now viewed as fundamental to pathways to environmental sustainability (Leach 2016) and is receiving research attention in bottom-up sustainable development projects in African rangelands (Kristjanson et al. 2010; Njuki & Sanginga 2013).

In pastoralist drylands, the failure of SD projects aimed at destocking, evictions, fencing, and land privatization and ranching schemes is faulted for old paradigms of equilibrium thinking (Fratkin & Mearns 2003; McGahey et al. 2007), disregarding climate variability and severe droughts as the major stress on plant biomass in pastoral ecosystems (Ellis & Swift 1988), and exacerbating food insecurity (Swift 1991). The negative impacts of disregarding gender dimensions in African SD projects appear mostly in literature about agrarian communities where household dynamics are ignored and women become cheap labour exploited by men (Carney 1998; Schroeder 1993).

Compared to rural agricultural societies, empirical evidence for failures of pastoralist development interventions based on gender is more limited. This is because literature on women's roles in livestock production is scarce, sex-disaggregated data is less common, and entry points for intervention are more challenging because livestock value chains are more complex (Njuki & Sanginga 2013). It is further complicated by the intersectionality of gender in pastoral societies because of its inextricable linkages to age, marital status, and material production (Dahl 1987; Llewellyn-Davies 1981; Spencer 1993). However, common themes in agricultural and pastoral development are inequitable division of labour in gender-blind SD interventions (Leach 2016) and, as products become commercialized, income is often dominated by men irrespective of the labour implications for women (Katz 2000; Kennedy & Cogill 1987; Njuki et al. 2011; Waters-Bayer 1988).

Gendered roles characterize the livelihoods of East African pastoralists (Fratkin & Smith 1995; Grandin 1991; Hodgson 2000; Spencer 1993; Talle 1988). These roles are not rigid and now they are in transition (disequilibrium) as people settle into permanent communities and adopt cultivation (Fratkin & Roth 2006; McCabe 2003; McCabe et al. 2010). In the past, disregarding the importance of women in pastoralist production has undermined the success of livestock development programs (Hodgson 2001; Kettel 1992). A noteworthy historical example is the repeated failure of colonial veterinary projects in Maasailand because only men were targeted for

training programs and the traditional role of women in milk production and livestock care was completely overlooked (Hodgson 2000).

Today, SD projects ignoring gender complexities are likely to place deeper burdens on women's labour and threaten food security (Kariuki et al. 2013). Among Maasai pastoralists, a complete reversal in livestock production responsibilities has been attributed to development interventions (Wangui 2008) which recalls trends toward the feminization of labour in commercial agriculture (Archambault & Zoomers 2015; Boserup 2007). Trends toward subsistence and commercial agriculture in Maasailand raise questions about ES that are well documented.

Informed by failures and lack lustre results, irrelevance of dominant development narratives, new ecology, and the recognition of social limits and opportunities, SD has been moving toward more gender-inclusive pathways by mainstreaming gender into its programs. In places where forest commons are critical to coping with climate change and alleviating poverty, more bottom-up participatory resource management involving women has emerged as an alternative pathway to ES.

1.5.2 Common pool resources (CPRs), forest institutions, and gender mainstreaming

Forests are CPRs because they are a valuable natural resource "…available to more than one person and subject to degradation as a result of overuse" (Dietz et al. 2002:18). Reflecting the increasingly important role of forests in the world's wicked problems, research interest in forests as 'commons' has been growing but it is still sparse, particularly about gender dimensions.

Commons scholars debate conditions under which environmental collapse can be avoided (Ostrom 1990; Ribot 1999; Rangan & Lane 2001; Gibson et al. 2005). They seek empirically-based theory that challenges assumptions of common pool resource theory (e.g. the finite and predictable supply of resources, the homogeneity of users and lack of interaction between them). They study cases where commons' users cooperate and manage resources sustainably (Agrawal 2001; Ostrom et al. 2002). They scrutinize variables associated with sustainable use of CPRs, such as institutions,[10] rules, and the ability to self-organize. As many as 35 different causal variables have been identified but the noncomparability of studies precludes empirical theory (Agarwal 2001). Very broadly, it is generally understood that group diversity is important for good decision-making (Williams & O'Reilly 1998). More specifically, women's participation can improve the capacity of natural resource management groups to resolve group conflicts (Westermann et al. 2005),

In forests, where "conditions have co-evolved, often over long periods, with gendered capabilities and relations in resource access" (Leach 2016:26), the gender factor can be key to successful forest management outcomes. But it has not been a focus of forest commons research (Ostrom et al. 2002; Kopelman et al. 2002; Rocheleau et al. 1995) despite interest in the social dimensions of forest governance (Ostrom 1999) as national governments decentralize and more forests are governed by communities (Agrawal 2004). In a screening of research titles and

[10] As used here, forest institutions are formal and informal mechanisms that govern behaviors and aim for sustainable natural resource management (IFRI 2013a).

abstracts in more than 11,000 records in Google, Google Scholar, Scopus, CAB abstracts, AGRIS, and AGRICOLA, along with the websites of 24 international conservation and development organisations, only 14 records pertained to forest outcomes and women, and only two were considered high quality in study design (Leisher et al. 2016). Commons' scholars also bemoan the disconnect between their research and government policies, particularly those aimed at alleviating poverty (Agrawal 2007) which is the main thrust of SD in Global South countries.

Most scientific research on forest outcomes and women's participation is geographically limited to India and Nepal (Leisher et al. 2016; Mai et al. 2011). Leisher et al. (2016) attributes this to the establishment of over 120,000 community forestry groups in those countries since the 1990s creating a natural experiment in gender and forest outcomes. Scholars there are focused on empirical evidence of the effects of women's engagement in forest decision- and rule-making. Positive effects on forest ecology, gender equality, and resource access have been documented where more than 25% of forest committees are women (Agarwal 2009, 2010b). Gender variables also appear in empirical associations with forest conditions (Agrawal and Chhatre 2006), forest resource enhancing behavior (Mwangi et al. 2011), natural resource conflict management (Westermann et al. 2005), and forest-friendly farming systems (Gbadegesin 1996). Forest degradation and rule enforcement problems have been attributed to neglecting gender (Agarwal 2000) and women's participation is reported to have stronger effects than other variables on forest regeneration (Agrawal et al. 2006).

There are limitations to generalizing these forest outcomes to other geographical contexts. In African countries, gender studies are more likely to target market access and value chains of non-timber forest products than community forestry (Mai et al. 2011). Mwangi et al. (2011) found mixed results when they extended the studies in Nepal and India (Agarwal 2007, 2009) to East Africa and Latin America. Surprisingly, higher proportions of women in mixed-sex community forest groups resulted in *less* rule monitoring and *weaker* adoption of forest-improving technologies (e.g., beekeeping, planting seedlings). Their results might reflect differences in forest tenure regimes and gender biases in (a) the labour constraints of women who lacked extra time to monitor the forest and (b) women's lack of technology skills because of male-dominated forestry extension (Doss 2001). They also found that a higher proportion of women participated in older forest institutions and personal endowments of education and wealth were significant predictors of their participation (Coleman & Mwangi 2013). Other empirical evidence in East African countries shows that sustainable livelihoods and tree species richness result when all users, including women, are involved in forest rulemaking (Persha et al. 2011). These disparate findings highlight wide differences in gender-environment linkages across cultures and landscapes. They also affirm the reoccurring theme in this chapter about the multi-dimensional nature of gender and within-group heterogeneity based on age, wealth and education.

Despite the sparse empirical evidence, integrating gender into SD projects has been proceeding for decades. There was a big global impetus in 2000 when 189 countries at the United Nations Millennium Summit agreed to halve world poverty by 2015 and achieve Millennium Development Goals of environmental sustainability and gender equality. Gender mainstreaming,[11] gender analysis frameworks, and gender checklists have become standard

[11] According to the Council of Europe's Group of Experts on Gender Mainstreaming (1998:15): "Gender mainstreaming is the (re)organisation, improvement, development and evaluation of policy processes, so

lexicon in the international development sector (March et al. 1999). With gender equality as its main goal, gender mainstreaming aims to integrate gender concerns into organisational structures and make tools available to attain gender-specific objectives. About 40 different gender mainstreaming guides are available today for conservation practitioners working in international development (TNC 2014). Meanwhile, scholarly debate about this approach proceeds on the margins of gender interventions. Theoretical problems with gender mainstreaming stem from feminist theory with arguments about the homogenization of gender (Walby 2005) (also see Section 1.3.1). FPE scholars warn about the institutionalization of gender in projects using blunt gender analysis tools aimed at technical fixes that de-politicize gender (Resurreccion & Elmhirst 2008). There are also practical criticisms centered on the limited successes of gender mainstreaming in improving women's political agency (Kabeer 2003).

1.5.3 Resilience thinking, silos with synergies in socio-ecological systems

Resilience thinking has evolved out of the failures of SD in natural resource management. Though still in an exploratory phase (Folke 2006), it offers a useful perspective for development and conservation practitioners working on gender and forests in pastoral drylands. Viewing social dynamics and ecological functioning as linked, it recognizes that the "key to sustainability lies in enhancing the resilience of socio-ecological systems, not in optimizing isolated components of the system." (Walker & Salt 2006:9).

Resilience thinking is applied in studies of how men and women absorb shocks of climate change. For pastoralists, characteristic coping mechanisms are mobility, social networks, and herd size and composition (IPCC 2014). With increasing climate variability, significant changes in livestock production systems are necessary (Ericksen et al 2013). In East Africa, scholars examine the resilience of pastoralist livelihood diversification in cultivation, wildlife tourism, and conservancies (Bedelian & Ogutu 2017; Trench et al. 2009; Osano et al. 2013). In Mara conservancy schemes, mobility is enhanced by open rangelands but women can be marginalized from supplementary conservancy income that goes to male land owners (Bedelian & Ogutu 2017) and women value men's wage labour less than men do since it rarely contributes to household needs (Keane et al. 2016). Such initiatives therefore can compromise household food security that was once based on livestock products and income under women's control. In Turkana, a gendered climate effect is a rise in female-headed households that are more vulnerable to poverty because women lack customary rights to land and livestock (Omolo 2010). Land management scholars suggest women's empowerment will improve Turkana livelihood resilience to climate shocks (Opiyo et al. 2010). There is also evidence that in a forest- and livestock- dependent community in Mali, climate adaptation strategies are gendered to the detriment of women's workload and sustainable forest use (Djoudi & Brockhaus 2011). But in international efforts to commodify forest ecosystem services and reduce atmospheric carbon, inequitable benefits for the local stakeholders are usually overlooked (Leach & Scoones 2013). The gender factor has been largely ignored in national climate adaptation planning (UNFPA & WEDO 2009).

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that a gender equality perspective is incorporated in all policies at all levels at all stages, by all actors normally involved in policy making."

To be in line with resilience thinking (Walker & Salt 2006), gender-sensitive poverty alleviation and conservation in East African pastoral contexts should recognize cross-linkages with societal norms, climate-induced social and economic stressors that vary with household circumstances, and biophysical unpredictability. Such linkages are beginning to guide climate change adaptation and disaster relief planning (Enarson et al. 2009). There are conceptual tensions between practical (e.g., access to water) and strategic needs (e.g., access to power) in building livelihood resilience with women's empowerment initiatives (Le Maason et al. 2014). In the latter, also called the gender transformative approach,[12] women's subordination is challenged and can cause conflicts with men. On the positive side is Climate Smart Agriculture (CSA),[13] where the transformative approach delivers more lasting climate change resilience by enhancing women's access to resources, markets and technologies (Jost et al. 2014)

For the present study, the challenge is to locate the sweet spot of resilience thinking where the distinct silos— new ecology, sustainability, forest commons, gender mainstreaming, women's empowerment, gender transformative approaches, climate resilience, climate smart agriculture— align in a synergistic understanding of gender, livelihood shift, and forest change in the pastoral drylands. One interdisciplinary synergistic approach lies in community-based conservation (CBC) or community-based natural resource management (CBNRM) (Berkes 2007; Western & Wright 1994) where local people and not top-down blueprints are the agents of biodiversity conservation. African wildlife conservation has been engaged in a decades-long debate about the political ecologies of the top-down centralized fortress conservation model of environmental management versus more participatory community-centered approaches (Jones 2006). The efficacy of community-based schemes continues to be scrutinized (Blaikie 2006; Arntzen et al. 2003; Cox et al. 2010) including by researchers focused on participatory exclusion based on gender (Agarwal 2001). In community approaches to conservation and development, gender can become visible (Agrawal & Gibson 2001) and gendered knowledge can be important to successful outcomes (Fortmann 1996; Wangari et al. 1996; Rocheleau et al. 1996).

But social influences such as gender and ecological variability have remained in separate silos of interest in CBC and this has hampered its overall success (Leach et al. 1999; Ruiz-Mallen & Corbera 2013). Indeed, in gender-blind programs where external interests and elites benefit, conservation becomes bureaucratized (Dressler et al. 2010), and indigenous women are further marginalized from decision-making in an effective "double bind" (Kipuri & Ridgewell 2008). Following the doubling theme, vulnerable women will continue to experience climate disasters as "double disasters" because of climate risk reduction policies that still exclude gender (Bradshaw & Fordham 2015).

In resilience thinking, gender intersects with multiple silos of climate variability, livelihood change, disequilibrium forest dynamics, and devolving forest institutions. Empirical research on these synergies is still nascent and so vital to making progress on the pathways toward resilient socio-ecological systems.

[12] This approach to women's empowerment "refers to program approaches or activities that seek to build equitable social norms and structures in addition to individual gender-equitable behavior by addressing both the fundamental causes and sources of gender inequality." (Jost et al. 2014:10)

[13] CSA sustainably increases productivity and climate resilience, reduces greenhouse gases, and helps achieve national food security and development goals (FAO 2017).

1.6 Main research questions

In Kenya, there are numerous national reforms pertaining to gender and the environment that lead to questions. In 2009, Kenya launched an ambitious economic development blueprint known as Vision 2030 which aims to improve women's engagement in political and economic decision making. How will women participate?

In 2010, Kenya replaced its 1963 independence constitution with the new Kenya Constitution that in principle mainstreams gender into all public sectors and guarantees gender equality in fundamental needs and rights. The Constitution also aims to reach a 10% tree cover target. How will gender equality be implemented in Loita institutions? How will it reach its target?

Kenya's Forest Act of 2005 is considered the most explicit of all sub-Saharan forest laws in the protection of socio-cultural values, such as sacred forests (Sheridan & Nyamweru 2007) and it is being revised to be aligned with the new Constitution. How will it impact Loita's sacred forest and communal tenure?

These reforms are all progressing as central government authorities are devolving land administration, policy-making, and enforcement to newly established counties. As citizens are given more opportunities for democratic engagement, even more questions surface about the ways indigenous forest-dependent pastoralists occupying communal lands can participate.

The main research questions rise from three intersecting spheres of (a) culture and environment (b) culture and livelihood and (c) livelihood and environment (Figure 1.1). Additional research questions are listed in the descriptions of the data chapters in the next section.

The main research questions are:
In Loita,

- How has the land changed? How do people perceive land change?
- Is forest use gendered? How has it changed? Does changing forest use relate to land cover change?
- Are livelihood activities gendered? How have they changed? How do they relate to land cover change?
- Is forest decision making gendered? How has it changed? How does it relate to land cover change?

1.7 Structure of thesis

Chapter 2 describes the environmental and social context for investigating gender dimensions. There are descriptions of the Loita Forest environs, the study area in Empurputia, and the *Iloitai* people, with an emphasis on gender relations and historical presence in the landscape.

Chapter 3 presents research methods. It stresses the importance of the mixed methods approach.

Chapter 4 presents quantitative geospatial data on land change aligned with qualitative her-stories about elderly women's perceptions of changes in the land, livelihood, and gender

relations. It discusses methodological issues associated with satellite imagery and constructing culturally-relevant time. It suggests a narrative arc about land and cultural change. It addresses these specific research questions:

- How did the land change between 1975, 1996 and 2014? How did elderly women perceive it? How do their perceptions align with geospatial findings?
- When did changes in land use, livelihood, and gender relations occur? How do they align with geospatial findings?

Chapter 5 presents data on contemporary forest use. It examines spatial and temporal changes in resource availability with mixed methods such household surveys, participatory resource mapping and transect walks. It addresses these specific research questions:

- How do people value and use the forest?
- Where do people go for the resources they need? Have the places changed?
- What plants do people collect? For what purpose?
- Has the availability of preferred plants changed? Why?

Chapter 6 presents data on livelihood shift and decision-making. It incorporates livelihood shift and forest decision making into the land change dynamics presented in Chapter 4. It quantifies gendered asset disparity. It illustrates gender dimensions of land and cultural drivers of change. It completes the narrative arc. It addresses these specific research questions:

- Why, when, and where did livelihood shift take place? How did it align with changes in land cover? How do people participate in decision-making in the household? Has it changed?
- What are important land and forest issues facing the community? How do people participate in decision-making about the forest? Has it changed?

Chapter 7 explains how the findings confirm, challenge and expand the field of knowledge. It also presents guidelines for gender-inclusive forest planning.

Chapter 2: The study area

Entim e naimina enkiyio:
The forest where a little Maasai shepherd girl got lost

2.1 Introduction

This chapter describes where research was conducted and the people who live there. It provides the social and environmental context for the investigation by introducing gender relations and the historical, physical and biological features of the area. It explains how the historical presence of *Iloitai* pastoralists on the land has defined them as a unique Maasai section and how all these characteristics of land and people appear to be in flux.

Important historical sources are classic ethnographies of Maasai in Kenya and Tanzania. To find women's place in the Loita landscape today, secondary data from private surveys as well as graduate student theses and primary data from key informants and participant observation complement the descriptions of gender relations and this unstudied forest.

2.2 The location: Loita Forest

The study site is a new settlement area in Empurputia lying near the western edge of Loita Forest (Figure 2.1). The forest is in Loita Division, Narok County in southern Kenya about 150 km southwest of Nairobi. In Kenya, Narok and Kajiado counties comprise Maasailand.[14] Loita Division is 1676 km² of diverse ecosystems ranging from arid grasslands in the lowlands (*ilpurkeli*) to cloud forest and wetlands in the highlands (*isupuki*).

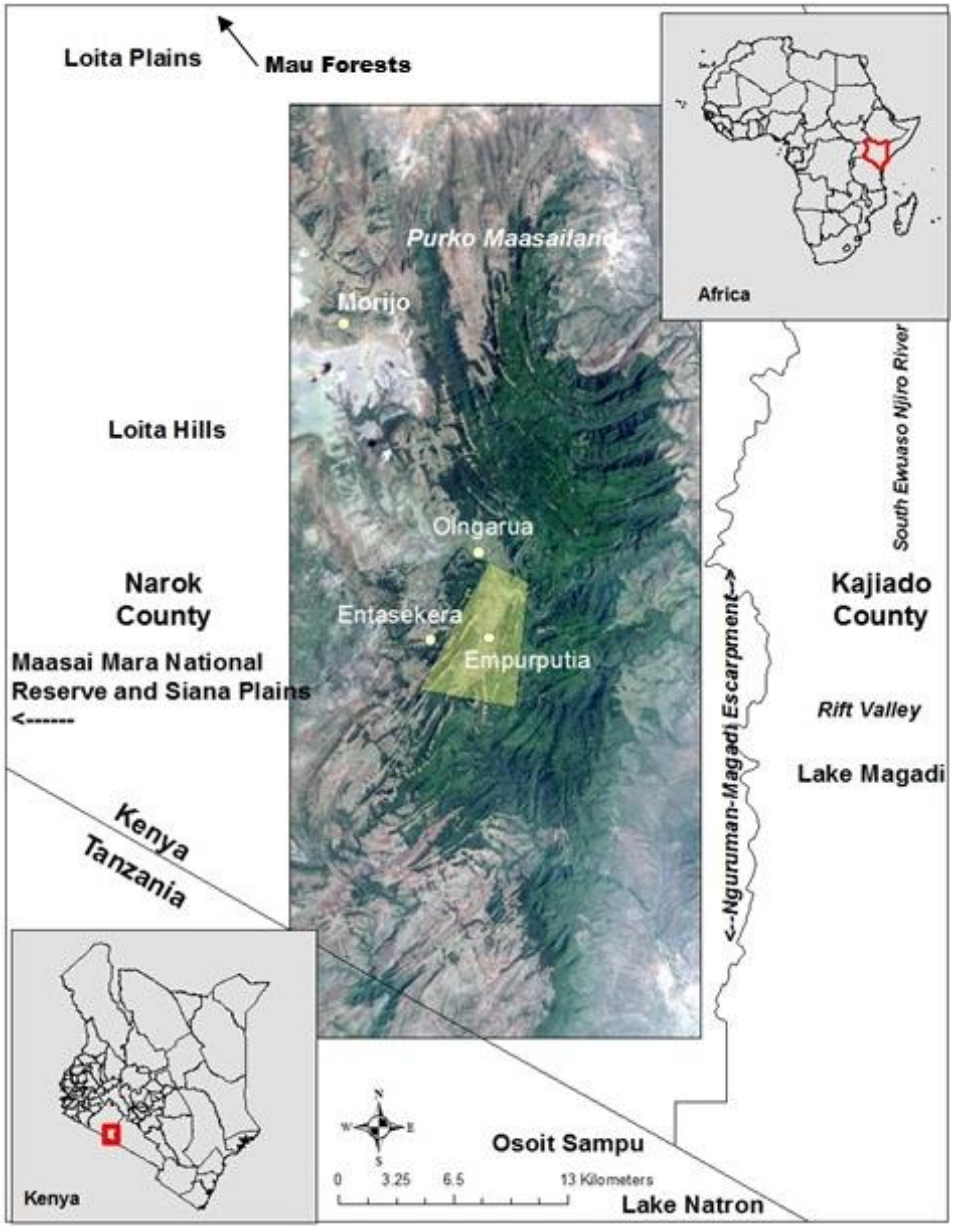
Loita Forest is known in the Maa language as *entim e naimina enkiyio* or "forest where a little girl got lost." The name is derived from this legend [15] reflecting gendered roles and perceptions of a dark and scary forest years ago:

> *There is no doubt that she was a Maasai. Straying further and further away from home, curious as most small girls would be but a little afraid as well, she entered the forbidding forest above her father's village. Once more she looked back and saw the familiar blueish smoke curling from her mother's house, her little brother Leteipa with Nanyukie toddling behind the sheep and goats, and far away the wide, wide land of Loita at her feet rolling endlessly across the hills into the great horizon. Then she followed the calves into the forest. Rather late at night, when the sun had sunk behind Osoit Sampu and seemed to burn itself out over Serengeti, the calves returned home without their little Shepherd-girl. Moran were sent at once to search for her and called her name*

[14] Maasailand is an informal term referring to the area of East Africa where Maa-speakers dominate the rural population and "self-attribute to Maasai ethnicity" (Homewood et al. 2009a:1). Maasailand, Loita Forest, and *Iloitai* Maasai extend south into northern Tanzania. The forest extends into Tanzania for 25 km.

[15] There are other versions of the same legend (Maundu et al. 2001, Steen 1998). One may find references to the "Forest of the Lost Child" though the Maa signifies a girl child (Mol 1980). Interviews confirm people stayed out of Loita Forest in the past because of eerie oral histories like this one. (See Section 4.4.2.1)

Figure 2.1 Location of Loita Forest (dark green), Empurputia (yellow), and key features of the surrounding area



amid the darkening trees, confident and casual, but gradually in desperation and sickening sadness, finally to fade away as part of history. The forest never gave her back.

Somehow, I often had to think of her looking up where the darkness of the immense forest crowns the highest tops of Loita Hills. Poor little thing, fallen asleep under a tree of a forest, where even in these days, a man will hardly enter. My little Shepherd-girl, your name which went round through the valleys from home to home in silent understanding has been forgotten. The forest keeps her memory alive. "Enaimina Enkiyoo" they are called: "Where a little girl got lost."
(Translated by Frans Mol in Mol, F. (1980:40-41)

The core dense forest extends about 300 km² and lacks official boundaries.[16] It is bordered by Kajiado County and the Nguruman-Magadi escarpment to the east, Tanzania to the south, Siana Plains stretching toward Maasai Mara National Reserve in the west, and Loita Plains and *Purko* Maasailand to the north and west (Figure 2.1). It reaches 2672 m at its highest point. Geographically isolated from remnants of other forests in Kenya and Tanzania, Loita Forest is known among botanists as "an island in a desert" (Bussmann 2001:27). The forest has water catchment protection value for the region, particularly for South Ewuaso Ngiro River drainage basin and Lakes Magadi in Kenya and Natron in Tanzania (Wass 1995). For water catchment protection alone, the dollar value of its ecological services equals that of five forest reserves combined: South West Mau, Trans Mara, Ol Pusimoru, Nandi and Cherangani (Emerton 2001).

Empurputia is a mosaic of grassland, bush, forest, and wetland with no official boundaries. The specific area studied was 31km² as defined by land and households that could be reached safely by foot (1.80529S, 35.90485E; 1.81576S, 35.92515E; 1.8706S, 35.86946E; and 1.88001S, 35.91893E). Larger Empurputia stretches east through dense forest toward the Nguruman-Magadi escarpment on the western edge of the Eastern (Gregory) Rift Valley. Along with adjacent Olngarua swamp, it is the last place in Loita where cattle can be driven on an uncontested temporary basis (*ronco*) (Kronenberg Garcia 2015).

Forest climate and vegetation provide *Iloitai* with water and pasture in dry season. Droughts occur at irregular intervals (Ericksen et al. 2013). Loita lies in the drought prone arid-semi arid Rift Valley Province where the inter-tropical convergence zone and El Nino Southern Oscillation (ENSO) create unpredictable but broadly bimodal precipitation (Hulme et al. 2001, McHugh 2006). In recent decades, *Iloitai* have depended on forest resources for family and livestock survival in times of drought that trigger malnutrition (Zaal & ole Siloma 2006, UNDP 2004).[17]

2.2.1 Climate

The average annual rainfall for Narok County is 555 mm (NDMA 2014). In Loita, rainfall increases from the lowlands at 1700 m elevation to the cloud forest plateau where the study area lies at 2050-2500 m altitude. The forest and adjacent areas are in humid to semi-humid agro-climatic zones (Serneels & Lambin 2001a) whereas the plains below are in rain shadow where unreliable rainfall is about 400 mm per year (Thompson et al. 2009). In 1997 the lowlands received more than 1000 mm and in 2001 there was no rain at all (KMD 2004, 2014).

[16] The total forest extent in this study is larger than the approximately 330 km² cited elsewhere (Karanja et al. 2002, Kariuki et al. 2016, Ongugo et al. 2011, Zaal & Ole Siloma 2006). The total forest extent in this study is bigger than 330 km² because several land classifications were analyzed (Table 4.2). One of the land cover classifications is dense forest. This dense forest classification (282 km²) more closely resembles the 330 km² cited elsewhere. As for forest boundaries, there are legal efforts to establish official boundaries in northern sections of the forest and to survey administrative sub-locations but they were not resolved at the time of writing.

[17] At the time of writing, all Loita herds and some from northern Tanzania were in Loita Forest to survive drought.

In Loita Forest, mean rainfall reportedly varies from 600 mm (Maundu et al. 2001) to 2000 mm/year (Aldrich et al. 1997). Officially categorized as a tropical montane cloud forest covered in clouds or mist, it receives more humidity than rainfall through the capture and/or condensation of water droplets that affect the water cycle, radiation balance, and other ecological factors (Stadtmuller 1987). Rainfall is bimodal with shorter rains in October-December and longer rains in March-May but Maasai differentiate seasons further using rainfall: *ilkisirat* (short rains in November-December); *aladalo* (short dry season in January -February); *alari* (long rains in March-May); *kurum ari* (end of long rains in June); and *olameyu* (long dry season July-October). The mean annual temperature is 16.5ºC (7.2- 26.9º C). Mean annual evaporation is 129 mm and evapotranspiration is 102 mm.

With climate disruption, the maximum and minimum temperatures are expected to increase, rainfall will change in intensity, duration, and frequency (Catley et al. 2013, Kenya 2012), and transhumant pastoral production will fluctuate as the number of growing days decreases by more than 20% (Thornton et al. 2009). Recent climate disruption has affected pastoral and agricultural activities, food security, and nutrition in Loita as well as traditional ceremony cycles. Examples are establishing warriors (*eunoto*) and women's blessings (*olamal loo nkituak*) which are usually held in the rainy season (Ole Saitabau 2014). Qualitative data on the gendered effects of climate change are found in Chapter 6.

2.2.2 Vegetation

Using White's (1983) afromontane classification system, Maundu et al. (2001) divided 250 Loita plant species into: 1) grassland with grasses dominant on shallow black cotton soils of Loita's rangelands [18] (2) wooded grassland with 10-40% tree and shrub cover (3) bushland where cedar-olive (*Juniperus/Olea*) association was dominant once but gave way to shrubby bush due to overexploitation (4) thickets common on disturbed forest edges and (5) dry upland forest where associations with olive (*Olea ssp.),* yellowwood (*Podocarpus spp.)* and cedar (*Juniperus spp.) w*ere characteristic (Maundu et al. 2001).

These results resemble Bussmann's (2002) classification of Loita Hills/Nguruman broad-leafed montane forest associations dominated by African olive (Olea *europaea ssp. africana*), East African yellowwood (*Podocarpus falcatus*) reaching into the tall upper story, African pencil cedar (*Juniperus procera*) and *Teclea spp.* In earlier work, he discovered that the fastest growing tree species in cedar forests is African pencil cedar which requires fire to re-generate efficiently and could explain its relative density in areas cleared by fire for grazing (Bussmann 1999). Due to high humidity levels from warm air rising from the Nguruman escarpment to the east, mosses, lichens, epiphytic fern, and orchids are common in higher elevations of Loita Forest. There are

[18] The black cotton soils of Loita and Siana plains to the north and west of Loita Forest support dwarf shrub and whistling thorn (*Acacia drepanolobium)* grasslands interspersed with croton bush (*Croton spp*.) and other woody species (Ottichilo et al. 2000). The black cotton vertisol soils are more common there than in the highlands where there are alfisols on the forest midslope and mollisols at the highest elevation. These red soils form under broadleaf forests and grasslands, retain water better, and have a wider range of agricultural uses (Eswaran et al.1997).

between 1500 and 2000 plant species in Loita, most of which have not been inventoried (Maundu et al. 2001).

Empurputia encompasses a small wetland in the study area. Literature on wetland plant associations in Loita is lacking. Research on small wetlands of Kenya indicate that plant families most commonly found include Cyperaceae such as papyrus (*Cyperus papyrus)*, Fabaceae such as Egyptian river hemp (*Sesbania sesban*), and Typhaceae such as cattail or bulrush (*Typha latifolia*) all of which have a wide variety of uses (Mwita et al. 2013, Mulei et al. 2014).

2.2.3 Wildlife

Wildlife diversity in Loita Forest today can be attributed to its remote location and cultural taboos against hunting animals for food. Pastoralists have been part of the Serengeti ecosystem for over 2000 years and have customarily hunted only in times of famine or to fulfill requirements of ceremonies such as lion-killing by moran warriors (Robertshaw 1990; Homewood & Rodgers 1991). Archaeological data and historical accounts from the colonial era suggest a positive and long term ecological relationship between Maasai pastoralists, cattle, and wildlife (Collett 1987).

A wide variety of iconic African mammals including lion, African elephant, hippo, cheetah, leopard, hyena, and Cape buffalo have been reported in Loita Forest in the past (Ole Riamit 2010; Zaal et al. 2006). But formal inventories of these big mammals are lacking and in fieldwork there were reports and sightings of only hippo, leopard, hyena, and buffalo. Locals said the decline of large mammals occurred in the past 10-20 years. In 1992-1996 field work, Bussmann (2002:52) observed "In many parts of the forest, the vegetation is disturbed by a very high elephant population, cutting wide paths through the undergrowth." Lion were present in decades past (Robertshaw et al. 1990). Geospatial analyses of potential lion corridors for accessing prey in the grasslands suggest how important the forest once was in the broader Mara-Serengeti ecosystem (Miner 2012).

Primate diversity is moderate compared to other Kenyan forests (Butynski & De Jong 2012). The absence of some primate species was attributed to the arid treeless plains below the forest which lack access corridors. Low abundance of most of the seven primate species present were linked to grazing, settlement, agriculture, logging, and burning activities.

Human wildlife conflict with baboons and buffaloes is common. Whereas in the past locals used warning systems to send out alerts about advancing dangerous wildlife and there was ample space to relocate, now human-wildlife conflict is increasingly harmful because communities are confined to specific areas, sedentarization and cultivation is an economic necessity, and wildlife habitat is declining in size and quality (Ashoka 2005).

The decline in wildlife density in Narok County (WRI 2011) is notable for the 1976-2014 period of interest to this study. In Loita Plains to the north and west of the hills below the forest, mechanized wheat farming increased from 4,875 hectares to 47,600 hectares between 1975 and 2000 (Serneels & Lambin 2001a). Wildebeest numbers plummeted by 75% (Serneels & Lambin

2001b; Homewood et al. 2001) and non-migratory wildlife in general declined 58% (Ottichilo et al. 2000). Wildlife decline is also attributed to land privatization, small-scale agriculture (Lamprey & Reid 2004), vegetation changes, drought, and poaching (Serneels & Lambin 2001b; Ottichilo et al. 2000). Human ecologists assert that mechanized agriculture is more responsible for this land change than population growth of agro-pastoral Maasai (Homewood et al. 2001) though, more generally, expanding agropastoral activity is one of the potential drivers of arid landscape fragmentation and wildlife decline (Galvin et al. 2008). Large ungulates such as wildebeest, zebra, giraffe, and gazelle are more characteristic of rangelands below the forest but during fieldwork zebra were observed grazing beside cattle in a forest glade, waterbucks were sighted in the wetland, and signs of Cape buffalo were everywhere.

Loita Forest lies in the Nguruman South Important Bird and Biodiversity Area (IBA) because of its globally threatened and restricted-range bird species (BirdLife International 2017). Species of international concern include the grey crested helmet shrike and Jackson's widowbird. It is the only IBA in Kenya where the brown-headed apalis lives. CEPF considers the forest a key area in the Eastern Afromontane biodiversity hotspot (CEPF 2016).

Seasonal wildlife migrations attract eco-tourists and $20-$35 million to the Maasai Mara ecosystem in Narok County each year (Douglas-Hamilton 1988; Norton Griffiths 1995). In Loita Forest, luxury tented campsites and eco-trekking guides are available, but this tourism value is estimated at just $40,000 per year (Ole Riamit et al. 2010) due to relatively less wildlife, insecure land tenure, and lack of infrastructure.

2.2.4 Land tenure policies

Land tenure rights in post-independence Kenya are hotly contested and pose survival challenges for pastoral people. Today land issues plague the Maasai people who comprise the largest group of pastoralists in Kenya (Coast 2002) and, specifically, the *Iloitai* who are dependent on communally-held Loita Forest coveted by multiple outside interests. These problems and the diversification of Maasai livelihoods (Chapter 6) reflect national land policies trending away from communal lands held in public trust by county councils and toward private group ranches,[19] conservancies,[20] and individual land holdings where land rights and fences preclude transhumant pastoralism.

New forms of land tenure systems in pastoral lands are legislated under a plethora of mechanisms (Doshi 2014) based on governmental concerns about land degradation, commercial value, border security, and service delivery, many of which are debated by Maasai scholars (Behnke & Scoones 1993; Homewood 2009c). Uncertainties about the shift to privatization have led to a 'land grabbing mania' (Klopp 2000:9), including green grabbing (Vidal 2008) for

[19] Under the Land (Group Representatives) Act (Kenya 1968a) and Land Adjudication Act (Kenya 1968b), title deeds are held by groups of registered land owners such that group members share in ranch ownership in undivided shares.

[20] Under Kenya's Wildlife Act of 2013, conservancies are a recognized land use where land is managed by individual owners, groups, or communities for the conservation of wildlife and livelihood sustainability (KWCA 2017).

conservation purposes, on pastoral rangelands (Fairhead et al, 2012; Galaty 2013; Wright 2016). Under the new Constitution (Kenya 2010a), land is now classified as public, private, or community land [21] but issues of rights (e.g., ownership, use, access, usufruct) can be unclear. Land disputes, lower levels of transhumance, sedentarization, human/wildlife conflicts, increasing dependence on cultivation, and chronic food insecurity among Kenya Maasai are all characteristic trends related to new land policies (Homewood 2009c, Mwangi 2007, Rutten1998).

2.3 The People: *Iloitai* Maasai

Maasai is a linguistic term referring to speakers of Maa [22] who occupy southern Kenya and northern Tanzania and participate in the same regional social, ceremonial, and economic cycles (Spear & Waller 1993). Maasai are divided into 12-16 tribal sections associated with different geographical areas of grazing rights (*iloshon*) (Jacobs 1965; Mol 1978; Tarayia 2004). Research on sectional differences is not deep but dialects, ceremonies, dress, livelihood strategies, land tenure, and social institutions can vary (Spear & Waller 1993; Spencer 1988).[23]

Among Kenyan Maasai, *Iloitai* are considered conservative, traditional, and cohesive (Maundu et al. 2001; MPIDO 2013; Ongugo et al. 2011). They are called "the unreachables" because of their remote location (Kaunga & Karbolo 2006). Scholars attribute the historical distinctiveness of *Iloitai* to their geographic distance from the centers of colonial and state influence and criticize generalities about Maasai people based on sections allied with the British (such as *Purko* Maasai) and those geographically closer to colonial activities and agricultural areas (Holland 1996, Kronenberg Garcia 2015). Among the cultural differences distinguishing *Iloitai* are vocabulary (Galaty 1993a), aesthetics in beaded personal ornaments (Klump & Kratz 1993), and higher standards of culturally respectful behavior pertaining to marriage, adultery, wife avoidance at *manyatta,* and avoidance between fathers and married daughters (Spencer 1977). Chapters 4-6 reveal how forms of *Iloitai* cultural respect (*enkanyit*) in gender relations have changed from the past, especially regarding household and forest decision-making.

They are called *Iloitai* because they have utilized Loita Hills and Loita Plains for centuries and are associated with Loita's forested dry season refuge that has spiritual value across Maasailand. Although Loita is the smallest division in Narok, both geographically and in numbers, most spiritual leaders (*iloibonok)* live there, including the prophet, Chief Laibon Makompo Ole Simel,

[21] Under the new Kenya Constitution (2010a), public land is held in trust for county residents by the county government and includes government forests, private land is held by a private individual under leasehold tenure, and community land is held by specific communities such as ancestral lands and community forests. Loita Forest qualifies as community land under the Community Land Act of 2016 (Kenya 2016).

[22] The phylogenetic position of the Maa language is classified as belonging to the East Nilotic language family falling under the Eastern Sudanese order of the phylum of Nilo Saharan African languages (Sommer & Vossen 1993).

[23] For example, most Kenyan Maasai sections divide the moran generation into right and left-hand circumcision groups. Tanzanian Maasai, such as *Kisonko*, do not (Spencer 1988). The chronology, names, and events of modern day age sets of *Iloitai* vary from data in the Kenya census (Kenya 1994) as well as other Maasai sections (Mol 1972; Hodgson 2001).

who is considered the forest's protector. Reflecting the perceived strength of *Iloitai iloibonok* among Maasai sections, neighboring peoples attending the spiritual ceremonies of *Iloitai* in the past, such as the *Siria* from Trans-Mara, are considered Maasai people today (Galaty 1993b).

2.3.1 Historical presence on the land

The distinct history of *Iloitai* unfolds in the years preceding the period of destruction (*emutai*) at the turn of the 19th to the 20th century. For centuries beforehand, Maa-speaking pastoralists utilized grasslands in the Rift Valley from northern Kenya to southern Tanzania (Waller 1990). Linguistic evidence suggests *Iloitai* may have been in the Loita region as early as the 17th century (Sommer & Vossen 1993). Around 1800 they established themselves in the Loita hills and rangelands extending all the way to Mara plains in the west up to Mau forests in the north (Galaty 1993a, Lamprey & Waller 1990). *Iloitai* gradually dominated more territory during the *Iloikop* war period (1810-1875) and eventually established hegemony without major residual resistance (Waller 1990).

During *emutai* in1883-1902 (Waller 1990), 90% of Maasai cattle and most wild ungulates died from foreign pathogens introduced by European rinderpest (*olodua*) infected cattle (Homewood & Rodgers 1991). Loita cattle herds were gone within two months' time (Waller 1988). From combined effects of cattle diseases, famine, smallpox, locusts, and consecutive droughts, it is estimated two-thirds of Maasai people died (Sorrensen 1968) or dispersed, coping by eating dead livestock, hunting, cultivating, cattle raiding, or becoming refugees among neighboring tribes (Waller 1988). Historic seasonal patterns of grazing were disrupted, and pastoralists were not lighting fires for pasture so bush habitat advanced. Scholars have traced the ecological linkages of all these events with a subsequent scourge-- the advance of tsetse-- in the early 1900s (Ford 1971; Waller 1990). These flies are the vectors of trypanosomiasis in cattle, requiring shade under woody cover to reproduce, feeding on warthog, bushbuck, and bush pig as well as people and livestock (Suttie et al. 2005).

Literature is thin on the fates of women during *emutai* but there are accounts of how the Maasai refugees fared. As social ties disintegrated, surviving women and children followed men who would provide for them or they were kidnapped as involuntary dependents, slaves, and property for trade (Waller 1988). There are also stories of children saved from starvation by giving them to non-Maasai in exchange for pledges they could be redeemed later with livestock, and of children raised and educated in missions (Merker 1910; Talle 1988). Other gendered effects were increases in marriages outside clans, inter-marriage with agriculturalists in exchange for cattle, and smaller bride wealth payments (Merker 1910).

Iloitai may not have been as devastated by the smallpox epidemic as other Maasai sections (Waller 1988) and took advantage of the regional chaos to expand their territory north to Ngong and Naivasha where *Purko* lived and eastward into *Loodokilani* and *Matapato* territory. When *Purko* and their British supporters pushed *Iloitai* back from their pastures in Lemek and Mara, they retreated to Loita hills (Waller 1990). Respectively aligned with the warring *Iloitai* and *Purko* factions were two half-brothers, Senteu and Olonana, who were rivals for ascendance as traditional Chief Laibon after the death of their powerful father, Mbatiany, in about 1890. When the defeated *Iloitai* surrendered to the *Purko*/Olonana/British alliance in Ngong in 1902, their

Laibon, Senteu, went with them. The traditional name for the study area in this research is the Swamp of Senteu because that is where he grazed his cattle. Forest conflicts today have roots in this historical *Iloitai*/Senteu and *Purko*/Olonana rivalry (Kronenberg Garcia 2015).

Maasai avoided the tsetse fly zone (roughly the Maasai Mara area today) for decades until a massive human effort in the 1950s controlled tsetse with bush clearance and grazing. Thickets and woodland decreased from 30% to 5% between 1957 and 1973 (Lamprey & Waller 1990). The subsequent irruption of wildebeest (Sinclair 1973) and increase in tree cover has been explained as an indirect result of the rinderpest, i.e., decreased pathogen → increased specialist consumer (wildebeest)→ decreased producer (grass)→ decreased generalist consumer (fire)→ increased producers (trees) (Dublin 1995; Holdo et al. 2009). This is the history of vegetation in greater Narok today: an intricate web of war, drought, fire, tsetse expansion, disrupted patterns of pastoralism, ecological succession, land uses ranging from bush clearing to national parks, and commercial wheat farming. In sum, grasslands that once sustained wildlife and pastoralism have severely contracted.

Just as the Loita experience with *emutai* was atypical, so was their transition to British rule. In 1904 and 1911, Maasai signed treaties with the British that effectively banished them to a southern reserve roughly known today in Kenya as Narok and Kajiado counties. *Iloitai* were not signatories to the agreements as other sections were. They were also never forcibly removed like other sections (Hughes 2006; Lamprey & Waller 1990) because they were still occupying core territory in Loita highlands and plains. When 6,000 *Purko* moved south into Narok and onto traditional Loita grasslands, *Iloitai* chose to retreat further into the forest, the rangelands immediately below, and what is northern Tanzania today (Lamprey & Waller 1990).

Another unique characteristic of Loita is its highland ecology. In the forest and Loita Hills, there are no records of hardships with tsetse infestation (Waller 1990; Lamprey & Waller 1990) whereas the plains below were affected in the decades following *emutai*. Therefore, the forest land where fragmented *Iloitai* re-joined others probably retained the ecological imprint of traditional pastoralism with fire-induced grasslands and forest glades. Because there was no history of tsetse-related succession there, what had been preserved could have been a dry montane cedar forest progressing from pre-rinderpest days. Its traditional function as highland dry season grazing of the *Iloitai* (*osopuko l'ool loitai*) with its glades, rivers and streams could have been safeguarded. From an ecological perspective, this is a plausible hypothesis. *Iloitai* association with the forest as a refuge in wars and dry seasons has defined their identity and their resilience as pastoralists for centuries.

Today *Iloitai* identity is being tested by land reforms undermining the customary relationship between Maasai and their landscape. Based on colonialist schemes to privatise pastoralist lands considered degraded by too many cows, the Kenya government passed the Land (Group Representatives) Act and Land Adjudication Act in 1968. This legislation was designed to encourage the formation of group ranches to give pastoralist groups legal land tenure while improving rangelands with smaller herds and commercializing livestock production (Mwangi 2007). *Iloitai* elders considered forming a group ranch at that time but did not proceed due to disagreements in the 1970s with the DC of Narok over its size and with the *Purko* over the perimeter boundary (Kronenberg 1986) as well as political infighting among two *Iseuri* leaders

(who were also clan chiefs) over group ranch boundaries in the 1980s (Kronenberg Garcia 2015). The personal rivalry between these two leaders and the alignments it created in political power in Loita helped fuel the conflicts over tenure of the Loita Forest in the 1990s (Section 2.3.6).

When group ranches in Narok and Kajiado failed to reach their goals due to elite capture, corruption in revenue distribution, and inequities in land management, elders began subdividing them into private parcels to secure legal land rights for individuals. Many of these holdings were then sold to non-Maasai to pay off debts and then utilized for speculation and collateral (Galaty 1992). The fencing of farms and ranches by outsiders further restricted Maasai from moving with their cows (Rutten 1992). Waller (1988) considers this land alienation to be the most adverse and permanent impact on pastoralism since *emutai* and colonialism. Positive land reform outcomes have been reported in Maasai Mara where conservancies, or partnerships between landowners and tourism operators, are ensuring stable payments for pastoralists but the tradeoffs in reduced livestock mobility and women's economic marginalization are significant (Bedelian & Ogutu 2017).

Loita remains the only territory (*oloshon*) still held communally by Kenya Maasai that has not been gazetted by the government or subdivided into titled private or group parcels. As of this writing, some *Iloitai* anticipate that legal registration of private land parcels will proceed as soon as boundary issues are resolved by the Loita Council of Elders (LCE).[24] As experienced in other parts of Maasailand, potential impacts of subdivision in Loita include conflict over negotiating parcel sizes and access rights, elite capture of resources, further reduction of livestock mobility, and increasing vulnerability to drought despite parcel reaggregation after subdivision (Mwangi 2007, 2007a). Furthermore, women and youth are excluded from customary land rights and resource decision-making as land is privatised (Meinzen-Dick & Mwangi 2009). Present results pertaining to the gender dimensions of pending subdivision appear in Chapter 6.

2.3.2 Demographics

Demographic trends are central to a study of land use. Population growth drives land use with other demographic, economic, political, and environmental factors that are often overlooked or oversimplified (Homewood 2008). Myopic understandings of land change in Maasailand that fixate on population increase and persistent and destructive livelihood practices will stymie forward progress on development and environmental sustainability (Homewood et al. 2009). Detailed studies on population's interaction with other change drivers in the drylands are getting underway but gender dimensions have not been a main research interest despite their obvious connection to household relations and decision-making.

There are methodological challenges to understanding demographics in African pastoralist societies. Data may be unreliable due to small sample sizes or exclusion from sampling frames, transhumance, and barriers to services because of isolation and marginalization (Randall 2008). Maasai demographers also confront mistrust of outsiders, lack of a western concept of time,

[24] In 2014 LCE was successful in resolving a dispute that affirmed Loita tenure of land on the Kajiado border that was grabbed, or 'legally stolen' according to Galaty (2013), by a foreign investor. People in Loita lowlands have started registering names of household heads (elders) in anticipation of subdivision of their community land even though LCE is not in agreement over the way forward on this issue.

reluctance to count things, definition of units such as household, physical inaccessibility to areas due to rain or remoteness, and frequent orphan-hood (Coast 2001).

With these constraints in mind, Loita appears to be growing at a faster rate than both Kenya and Narok County according to 1979 and 2009 Kenya census figures (Kenya 1981, 2010). In 1979 6,367 people lived in Loita.[25] By 2009 the population had more than tripled to 22,873. Population density had also more than tripled (from 4 to14 people/km²) in Loita.[26] The place growing the fastest was the Entasekera sub-location wherein Empurputia lies.[27] Loita households more than quadrupled in number (from 1048 to 4409).[28] In Empurputia, there was one household in 1960 and 87 households totaling about 850 people in 2014 (Chapter 3).[29]

The ethnic make-up of the population also changed. Due to in-migration of non-Maasai into Narok County, the percentage of Maasai decreased to less than half of all people (from 57% in 1979 to 47% in 1989) even though the relative percentage of Maasai in Kenya remained the same (Coast 2001). Narok had the highest rate of population growth of all 41 Kenyan districts due to perceptions of land availability by non-Maasai ethnic groups. Narok city itself is one of the fastest growing urban areas in Kenya. As in-migration of non-Maasai continues, women are increasingly educated, and land is subdivided, Narok County could see a declining fertility rate (Coast 2001).

As the Loita population grows, conflicts rise with people settling on communal land as the group ranches nearby are subdivided and people seek land to farm. A farm plot tended by a wife and a modern house built with cement and/or cedar are signs of permanent residence in Loita today (Kronenberg Garcia 2015). During field work, local elders were often in meetings about land grabs and taking actions to remove people. A gender effect is that men with wives and cows are dispersing permanent residences for their wives across Loita to be in advantageous positions for securing deeds to wet and dry season pasture land.

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[25] Randall (2006) has cautioned that pastoralists may be under-represented in Kenya census figures due to methodological issues around mobility and definitions of pastoralist household.

[26] Due to a 28% increase in the administrative extent of land in Loita since 1979 (from 1307 km² to 1676 km²), the population density figure may be a more realistic indication of change in the 1979-2009 period than the total population figures. Dispersal in Loita is highly uneven as most people live west of the forest though more people today are living on the forest edge and in clearings.

[27] Administrative designations of Loita sub-locations changed over the years. In 1979, Loita location included three sub-locations (Morijo Loita, Olmesutie, Entasekera). In 2009 Loita was in Narok South which included nine sub-locations (Morijo Loita, Olorte, Mausa, Entasekera, Olmesutie, Imartin, Ilkerin, Nkopon, Ilmarae). Today, Loita Division is in Narok South District of Narok County and contains six sub-locations (Entasekera, Morijo, Olorte, Olmesutie, Entasekera, Olngarua). The study area in Empurputia lies on the eastern edge of Entasekera sub-location.

[28] The definition of household for Kenya census purposes (persons who live together in same dwelling unit or homestead and eat together) (Kenya 2010b) was probably inappropriate for households in the study area since men often sleep and take meals in places other than their wives' houses. In a private survey, there were 2,180 households in Loita in 2009 (ILIDP 2009) which is about half of the census figure of 4409.

[29] Average household size was 9.7. (See definition of household in Section 3.4.7)

Education is a major concern because of rising school fees and the need for substitute herders and care givers when children attend school. School attendance has risen in recent decades but the percent never attending school in Narok County was five times greater than the national average (Kenya 2010b). In 2009, only 7% of Kenyan children had never attended school compared to 34% in Narok County.

Poor school attendance, particularly among girls, is common in Loita. Many *Iloitai* remain un-schooled and the gender difference is severe. In a private survey conducted in Loita in 2009, 75% of household members had no formal schooling and 68% of Loita adults were reluctant to send children, especially girls, because they saw no economic value in it (ILIDP 2009). Ninety percent of respondents said girls were not educated because they were perceived as "passers-by" in families (ILIDP 2009:6).[30] Other impediments to girls attending and finishing school were early pregnancy and marriage, school fees, distance and dangerous terrain, and ignorance about their right to education.

2.3.3 Livelihood

Maasai have a history of shifting between specialised pastoralism (Galaty 1993a) and mixed agro-pastoralism with varying levels of reliance on livestock and cultivation for subsistence and trade. Archaeologists surmise that specialised (pure) pastoralism and agro-pastoralism (semi-pastoralism) in southern parts of Kenya have been a back-and-forth phenomenon explained by interactions with neighboring agriculturalists (Robertshaw 1990). Specialised pastoralism appeared in the Loita-Mara area by 3000 BP and probably related to the arrival of bimodal rainfall patterns that favored milk and livestock production (Marshall 1990, 2000). Severe droughts at the turn of 19th century probably shifted Maasai semi-pastoralism to extreme specialised pastoralism supported by networks of exchange with crop farmers (Waller 1988).

Maasai are still known as the largest group of pastoralists in Kenya (Coast 2001). But their livelihoods today are so diversified that the term pastoralist belies economic realities. The return to mixed agro-pastoralism got underway in the past century in response to drought, epidemics, commercialization, and land alienation (McCabe et al. 2010; Thompson et al. 2009; Waller 1988). When food insecurity, land privatization and less pasture drove smaller livestock holdings (Grandin 1988), cultivating maize became a common means of livelihood diversification (McCabe et al. 2010). As this elder explained:

> *We started cultivating because we needed a co-wife for the cow.*[31] MKI-SE-64[32]

[30] Girls' low primary completion rates may be improving, however. In 2004 only one out of 17 boarding primary students who sat for final exams was a girl but in 2008 four out of 25 candidates were girls (ILIDP 2009).

[31] The implication is they needed help to sustain pastoralism. Polygyny and co-wives are the norm in conventional Maasai households (Jacobs 1965; Llewellyn-Davies 1978; Spencer 1988). Men are most likely to take another wife after age 34 (Coast 2000) to increase pastoral alliances and ensure heirs for cows, particularly if the first wife did not bear children. From the positive perspective of a first wife, a second wife can be helpful in sharing the workload (Talle 1987, 1988).

[32] This symbology is used to characterize informants according to this pattern: gender (M=male F=female), type of informant (KI=key informant WG=women's focus group MG=male's focus group

In Narok County today, there are four livelihood zones—mixed farming, pastoralist, agro-pastoral, and tourism/trade/business (NDMA 2017). This study was conducted in Narok's agro-pastoral livelihood zone where dependence on cultivation is growing. In 2001, 75% of Loita homesteads had gardens from about .5 to 5 acres in size (Maundu et al. 2001) and Loita elders estimated their plot sizes had doubled between 2007 and 2011 (Westervelt 2012). However, today they still self-ascribe as pastoralists whose lives revolve around cattle (ILIDP 2012). A man's sense of personal and economic security remains firmly tied to his cows. If a man is confronted with a serious illness, he might even choose to die in a local clinic rather than sell cows to get himself to Nairobi for hospital treatment.

In 1998, about half of Maasai households studied in Narok and Kajiado were growing maize and 20% had been cultivating for more than 10 years (Homewood et al. 2000). New foods made with maize meal and vegetables replaced the traditional diet of mainly milk, blood and meat. Cash from crops buys food along with medicines, school fees, tea, sugar, soaps, and clothing.

Despite livelihood diversification, food insecurity persists (UNOCHA 2012) and *Iloitai* have depended on government food aid in the recent past (Appendix 1). Drought effects are less severe in Loita highlands with grasses and leaves for cows to eat and soils and precipitation conductive to rain-fed crops. In Empurputia, there is a perennial swamp and beans can be harvested twice a year. Increasing numbers of *Iloitai* have been moving closer to the forest (Maundu et al. 2001) despite the challenges of poor roads to markets, wildlife conflict, flooding, less nutritious grasses, and livestock diseases.

There are gender dimensions to food security. The research on African women's livelihood adaptations to climate change is building (Russell & Vabi 2013). East African women bear heavier burdens than men from impacts of drought and dwindling pastoral resource bases (Flintan 2010; Fratkin 2001; Thomas-Slayter & Rocheleau 1995a). Increased reliance on cultivation combined with men leaving home for wage labour has disparate effects on Maasai household labour division (Wangui 2003). Also, increasing the number of small stock (*intare*)[33] changes household economy, nutrition, and milk production (Catley et al. 2013) as well as intra-household power relations. Cow's milk (*kule*) is a status food in women's domain (Grandin et al. 1991, Talle 1990) which families depend on for protein and fat (Nestel 1986). Maasai women exert considerable influence over household income generated by selling milk (Brockington 2001, Talle 1990) and fewer female cows diminishes their autonomy and agency in household resilience. A shift from breeding cows to trading cows for cash has similar gendered effects. Cattle that increase weight quickly make faster income (Letai & Lind 2013) but Maasai women have been marginalized from sale decisions despite its impact on the household (Kipuri & Ridgewell 2008; Llewellyn-Davies 1981; Spencer 1988; Talle 1990).

FC=forest committee, PO=participant observation); level of schooling (NFE-no formal schooling PE= primary education SE= secondary education HE=higher education); age (in years, usually estimated from the event calendar).

[33] In this study's pilot work (Westervelt 2012), elders on the LCE estimated the size of their sheep and goat herds had increased 85% between 2007 and 2011. The trend toward more small stock and fewer stock has been documented elsewhere in Kenya rangelands (Ogutu et al. 2016).

Other potential gendered influences on pastoralist livelihood are land privatization (fewer cows, smaller farm plots, title deeds belong to men), population growth (less pasture, fewer resources, more work to access resources), and interactions with new institutions (Cochrane et al. 2005; Fratkin 2001; Galaty 1992; Thompson & Homewood 2002).

2.3.4 Gender relations

Maasai gender relations are an intricate web of culturally entrenched patriarchy, demographics, the passage of time, and personal circumstances. This section describes two main influences on gender relations —the age set system and intra-household power dynamics.

2.3.4.1 Women defined by men and time

Gender relations are defined by the passage of time and the male age set system.[34] It is impossible to isolate gender as a single variable of influence in gender relations because it cannot be separated from age (Llewellyn-Davies 1981). The term 'age/gender organisation' is a better descriptor for gender relations because relationships among and between the sexes are linked to age. Livelihood roles are dictated by both age and gender (Hodgson 2000). Just as relations between men and women change with age, so do gendered rights and responsibilities. Milk, herding, care of young animals, house-building, childcare, water and firewood, and meals are the traditional domains of females depending on age and marital status. It is male elders, the patriarchs, and not the younger moran who control property, head households, and lead the community. Typically, moran are assigned jobs requiring hard physical labour such as herding and migrating with large animals.

Names assigned to age groups mark the progression of generations through ceremonies of the male age system (e.g., circumcision/*emurata*, moran or warrior hood/*emanyata*,[35] elder hood/*eunoto* and *olngesher*) (Table 2.1). Elders determine the timing of age group events which does not adhere to the western calendar. Using this system, the chronology of Maasai history can be traced as far back as the 18th century (Hollis 1905; Mol 1978). Elders use their political power to delay initiations of age groups and marriages to increase the pool of unmarried women they select wives from (Spencer 1993). The age set system of networks persists today as a major influence on resource allocation (Galaty 1992).

[34] Age-set (*olaji*) refers to the combined set of two male circumcision groups, a right-hand group (*emurata e tatene*) and a left-hand group (*emurata e kendianye)* (Mol 1996). Circumcisions of the right-hand group may be held 8-10 years in advance of the left-hand group. It can be confusing in the field because different names may be used for an age set (*olaji*) or circumcision group (*olporror*). For example, Talle (1988) used *Ilkisakara* to refer to the left-hand circumcision group of the *Iseuri* age set. Another name was *Ilbokisi* referring the relief boxes distributed during drought at that time. Then it was changed to *Ilkisakara* which means 'they will grab everything before the others,' a reference to competition in relief lines. Today this circumcision group is called *Ilmauya* as well as *Iltiyiogoni*. This study uses age group as a general term for either age set or circumcision group.

[35] Coast (2001) notes the decline in ceremonies surrounding moran warrior hood in Kenya due to modern pressures of education and land privatization.

Table 2.1 Male age group chronology[a]

Circumcision age group name (*olporror*)	**Age set name (*olaji*)**	**Approximate year established**
Ilkalikal	*Ilnyang'usi* (Right hand)	1939
Ilkamaniki	*Ilnyang'usi* (Left hand)	1946
Ilterekeyiani (Ilkiramat)	*Iseuri* (Right hand)	1952
Ilmauya (Iltiyiogoni)	*Iseuri* (Left hand)	1961
Ilkiseeyia	*Ilkitoip* (Right hand)	1968
Irandai	*Ilkitoip* (Left hand)	1975
Ilkishili	*Ilkisaruni* (Right hand)	1980
Ilmejooli (Ilbulaka)	*Ilkisaruni* (Left hand)	1989
Irompoi	*Ilmeshuki* (Right hand)	1995
Ilkinyaku/Ilmeshuki/Iltumsika	*Ilmeshuki* (Left hand)	2005

[a]Sources for age group information included: Galaty (1992), Kronenberg Garcia (2015), Mol (1978, 1996), Spencer (1988), OIMLC (2013) and key informants.

Because women are not members of age groups, the system is a form of male dominance that dictates women's relationships with men (Talle 1988). It is a woman's relationship to the ruling age-set and her marital status that dictates her social position. Women use the male age groups of moran they sang to (usually the *olporror* of boys who were circumcised around the time of their own circumcision) to estimate their age. Their circumcision and marriage has the effect of moving them up in status from a child (*entito*) to a married woman (*esiankiki*) (Spencer 1993).

Furthermore, it is a man's relationships with women that define his own status in the age system, which, in turn, dictates how the women he associates with fit into society. At each successive stage in his life, his relationship with his mother, sister, lover, wife, or other men's wives will also change. Accordingly, women's relationships with each other also change with each male age group transformation. How many children a wife has influences her husband's wealth and social status. In the past, older women left their homesteads to live in their son's camp (*manyata*) when he first became moran and her social status improved. At *eunoto,* her son progresses from moranhood to elderhood when she shaves his head. Mothers care for their

young sons' animals and later depend on their sons in old age. Because a father-daughter relationship demands that a daughter avoid all members of her father's age set, the daughter's behaviors are dictated by her father's age set. Adherence to these cultural expectations, especially sexual taboos, is under the guardianship of women who organize public means of humiliating men who stray. "The whole transition for a male from boyhood to elderhood hinges on the transformation of relations through women." (Chieni & Spencer 1993: 160)

This section demonstrated how gender is a mutually dependent construct of men and women bound together by the passage of time. Time itself is benchmarked by decisions of elders who achieve status through their relationships with women. Therefore, a study of gender/environment linkages demands an understanding of men and women's position in time.

2.3.4.2 Women's debatable positions of power through history

Rights to assets in rural households are starkly gendered (Hodgson 1999a). Llewellyn-Davies (1981) differentiates power relations using *aitore* which means to rule and *aitodol* which means to show (Mol 1996). *Aitore* is used to refer to a man's ownership rights to control and dispose of livestock[36] or to a woman's labour, sexuality, or potential to give birth.[37] *Aitodol* refers to a women's *usufruct* rights to cows allotted to her by circumcision and marriage, the hides of dead animals, and the slaughter of cows for circumcision and birthing ritual. Chapter 6 quantifies deep inequities in gendered rights to assets today.

It is debatable if this differentiation was always the case. In Merker's (1910) account, spousal rights to livestock overlapped and spouses decided together how animals were disposed of (Hodgson 2000). Talle (1988:66) also speaks of complementary roles before colonial expansion: "To a large extent women's and men's roles in the barter trade were complementary and equal." Similarly, Voshaar (1998:123) observed a transition in the time span of just one generation in Loita wherein "Previously men and women used to barter; now the market is only for men. It is obvious women are alienated from their work." Just as Talle (1988: 270) refers to these changes as leaving women "... at a loss," Voshaar (1998: 123) observes that in the end "...women are the losers." This trajectory in women's status is of major interest to this study as it follows gender relations over time.

Male authority over livestock, wives, children, and other household dependents persists among *Iloitai* today (Llewellyn-Davies 1981; Knowles 1993; Obare 2003; Talle 1988). [38] Talle (1987) asserts that the market economy diminished women's relative autonomy with their own allotted

[36] See Maasai legend in Appendix 4 explaining why women lost control of cows.

[37] Talle (1988) warns against applying a rigid interpretation of property ownership to women because of all the negotiations, sanctions, privileges, exchanges of goods, and continuing obligations that underpin all exchanges in Maasai culture.

[38] It is important to note the different places these researchers worked. Talle's (1988) field work was in two places in Kajiado and one in Loita (Morijo sub-location) so it is not always clear if her results apply to *Iloitai* specifically. Llewelyn-Davies (1981) studied among the *inkidongi* clan in Loita's Olngarua sub-location. Knowles (1993) studied in the Ilkerin sub-location in Loita plains, Obare (2003) in the Entasekera and Olmesutie sub-locations, and Sonkoi (2009) in Entasekera sub-location. Kronenberg Garcia (2015) studied across all sub-locations but gender was not a research focus.

animals because elders in the ruling age set alienated them from the livestock production system. Based on interviews of *Iloitai* women's groups, women are subjugated in other ways, i.e., their lack of education accelerates ignorance about family planning and alternative livelihoods and it reduces leadership opportunities and contributions to the economy (Sonkoi 2009). Traditional female circumcision is widely practiced in Loita and has permanent effects on Maasai women's health, education, and self-esteem (Sonkoi 2009).[39]

Then again, while Maasai women lament their lack of rights under traditional male dominance (Hodgson 2001; Kipuri & Ridgewell 2008; Obare 2003), they exert considerable power in the domestic domain. Women are the guardians of morality in the community (Kipuri & Ridgewell 2008, Hodgson 2005, Spencer 1993). In Loita, depending on a wife's personality and political competence, she may take charge in getting support from the ruling age set to settle a marital dispute or move her residence and withdraw labour in protest over a husband's beatings (Knowles 1993). It has been the women who form delegations to pray for fertility and lead ceremonial activities such as brewing beer, circumcisions, and building *manyata* villages (*imanyat*) for age group rituals.

Evidence is even building on Maasai women as innovators in diversifying rural household economies (Goldman & Little 2015; Hodgson 2000; Flintan 2008, Smith 2015) and on pastoralist women "pioneering pathways to stronger livelihoods" (Livingstone &Ruhindi 2013:239). But conventional intra-household gender relations may delay progress. In accordance with gender mandates under the new Kenya Constitution, Narok County's first Women's Representative in the National Assembly conducts trainings in table banking for rural women.[40] However, the net effect may not always be positive if household dynamics result in men depending more on women to provide for family needs (Brockington 2001). Maasai women can become agents of social change by exerting pressure from below (Waller 1993) yet wife beatings are not uncommon among *Iloitai* (Sonkoi 2009) when men feel they are losing control (Knowles 1993). Modern Maasai women with professional careers have risen from poverty with education, mentors, and husbands of their own choosing (Ward & Kiruswa 2012) but in Loita most girls do not complete their education because they are considered passers-by in their own families (ILIDP 2009). Chapters 4-6 explore these dichotomies within livelihood assets, resource use, and forest decision making.

2.3.5 Forest use

Loita Forest is vital to *Iloitai* livelihood and culture. First and foremost, it is their water tower. Highland trees, glades and streams provide a grazing safety-net in dry season. When dry

[39] Reportedly, about 2,000 *Iloitai* girls were circumcised every year until 2009 (Prospero World 2011). Today the ritual is still practiced but the rate is declining with legal prohibitions (Kenya's Prohibition of Female Genital Mutilation Act of 2011), education and the availability of programs such as AROP (Alternative Rites of Passage). AROP celebrates girl's eligibility for marriage without circumcision and keeps them in high school (P. Simpano personal communication, October 5, 2014).

[40] Table banking is a funding mechanism in women's groups that enables individuals to save and borrow cash. At the time of field work there were 17 women's groups registered in Loita but not all engage in table-banking schemes. Merry-go-rounds are a form of table-banking and are discussed in Chapters 6-7.

seasons intensify, the forest provides refuge for neighboring Maasai sections such as *Purko* Maasai in the north and *Iloitai* Maaasi in Tanzania. During the extreme drought of 2005-2006, cattle survived in the region because of Loita Forest (Zaal & Ole Siloma 2006). Traditionally, Maasai didn't graze in the forest all year and moved to traditional wet and dry season areas (Karanja et al. 2002). Today customary rules about forest use and grazing rights appear to be breaking down with increased settlement (Kronenberg Garcia 2015) and declining mobility.

In addition to providing water and dry season grazing, the forest is habitat for over 250 plants valued for firewood, construction materials, medicinal herbs, veterinary needs, fruits, honey, and ceremonies (Maundu et al. 2001). These plants comprise 'social forest' which is "...any aggregation of trees and other woody perennials, however spaced and wherever located, from which local people obtain trees or tree products for domestic consumption and/or commercial sale" (Fortmann & Nihra 1992:1). It is considered a sacred place (Karanja et al. 2002; Kronenberg Garcia 2017) where most spiritual leaders *(iloibonok)* live. The prestigious Chief Laibon Makompo Ole Simel lives near the study area and is considered the forest custodian. Customary use of the forest for ceremonies and the harvesting of associated plants are under his governance (MPIDO 2013, Karanja et al. 2002).

The reason Loita Forest is intact today is due to the stewardship of pastoral *Iloitai* managing forest and grassland vegetation sustainably over centuries (Blomley et al. 2007). But today drought, increasing settlement, and cultivation are driving overexploitation (Maundu et al. 2001, Obare 2003). As people move from depleted rangelands into highlands for water and pasture, the forest is becoming fragmented by settlements on its edge and vast open glades. Between 1991 and 2003 there were changes in land cover in the northwest section of the forest (IUCN 2005) but quantified change of the forest in its entirety has not been available until the present study.

Both men and women are forest users, but empirical evidence of gendered plant use is thin. Men consider pasture and water for livestock as their most important practical needs from the forest. Women's greatest needs are water, firewood, and food from gardens and milk from livestock (Obare 2003). Preferred construction species are the strong woods which deter decay and insect damage, e.g., African pencil cedar (*oltarakua)* (*Juniperus procera*) and common yellowwood (*olpiripiri*) (*Podocarpus falcatus*).[41] Maundu et al. (2001:19) observed "Modern construction therefore puts a lot of strain on *Juniperus* resources in the forest and as more families opt for this type, the species will diminish in the near future." The preferred firewood species collected by women is African olive (*oloirien)* (*Olea europaea* ssp. *africana*) which has been exterminated 10 km from the forest's edge (Maundu et al. 2001).

[41] Absolute linkages between the vernacular, English and scientific names of plants were impossible due to the lack of botanical vouchers, Maa names can describe various morphological parts of the same plant, and different scientific names may have the same Maa name (R.W. Bussmann, personal communication, January 14, 2015). The text of this study uses the vernacular Maa followed by the scientific name. Vernacular names were crosschecked with Bussmann et al. (2006), Maundu et al. (2001) and others but linkages to scientific and English names were beyond the scope of this study. From this point on in this thesis, only the Maa terms of forest plants will be used in the text after they have been introduced the first time with their (unsubstantiated linkages with) English and scientific names. (See Appendices 7-8)

Social norms and the Chief Laibon once guided the amount and species of wood people could take from the forest but today harvesting of forest resources is not officially regulated (Maundu et al. 2001, Adam et al. 2012). People are aware of forest exploitation by: intensified harvesting of pole wood for building, encroachment into forest for permanent housing, clearing water catchment areas, cultivation near rivers causing degradation of waterways, decrease in river volume, increase in burning for settlements, and burning in swampy areas causing the drying of water sources (Obare 2003). In the pilot study for this thesis, men and women said they were depending on leaders for solutions to these problems (Westervelt 2012).

2.3.6 Forest tenure and governance in flux

In addition to their unique historical presence on the land, the legal ties between *Iloitai* and the forest itself are also atypical. As mentioned, *Iloitai* occupy the only territory (*oloshon*) still held communally by Maasai which has not been gazetted by the government or titled into separate private or group parcels. Loita Forest is also one of the few indigenous trust land forests remaining in Kenya (Karanja et al. 2002). It is an unsurveyed forest unlike most of Kenya's 273 forests which are surveyed and gazetted (Ng'eno 1996). As the pastoralist resource base contracts across Maasailand, and livelihoods shift from transhumant migration and livestock to commercial markets and land (Waller 1993c), threats to the special tenure relationship between *Iloitai* and their land are intensifying. Forest access and ownership issues have been disputed between *Iloitai* elders, *Purko* Maasai who had established themselves in the northern tip of the forest before independence (Zaal & Ole Siloma 2006), the Kenya government, and organisations promoting development and conservation since the 1970s. The power politics of these conflicts have been discussed from many standpoints (Galaty 2013, Karanja et al. 2002, Kronenberg Garcia 2015, Kronenberg 1986, Ngece & Kimani 2007, Ole Siloma 2003, Voshaar 1998, Zaal & Adano 2012, Zaal & Ole Siloma 2006). Gender has not been one of them, however.

In 2002, Narok County Council (NCC) rescinded its decades long attempt to gazette the forest as a reserve for tourism, jobs and revenue after *Iloitai* leaders, supported by IUCN and other conservation organizations, took them to court. There were *Purko* leaders aligned with the NCC in that fight. If NCC has prevailed, the land grab would have extinguished *Iloitai* rights to their trust land under African customary law. In the out-of-court settlement, *Purko* Maasai were acknowledged as stakeholders in forest management. Then, in 2005, *Iloitai* halted an attempt of the IUCN to develop a forest conservation master plan because they suspected it would restrict access to the forest just as conservation plans in Ngorongoro Conservation Area in Tanzania (where IUCN was also working at the time) were restricting *Kisongo* Maasai access to grazing and water (McCabe et al. 1992). In their struggles against government gazettement and the IUCN conservation initiative, new male-dominated community groups mobilized (e.g., ILIDP, Loita Naimina Enkiyio Conservation Trust, Concerned Citizens of Loita). The success in retaining communal forest tenure has been attributed to the interventions of these new groups and their linkages with old institutional arrangements (Zaal & Adano 2012).

However, there are cautions in arriving at the overly simplistic interpretation that indigenous *Iloitai* were successful in overthrowing outsiders' attempts to take their forest in these cases. Kronenberg Garcia (2017) argues that the reality is more nuanced in layers of political ecology. Because the opposing forces in both conflicts (Loita/NCC and Loita/ IUCN) were closely

aligned with the micropolitics of two feuding *Iseuri* leaders (Section 2.3.1), who also mediated the development interventions of these two entities for Loita, the favorable outcomes for *Iloitai* could also be viewed as the result of political infighting between these *Iseuri* men and not simply because *Iloitai* integrated traditional and contemporary institutions into a united front.

Conflicts about tenure within the LCE and between opposing local interests in the forest, including Iloitai/*Purko* hostilities, persist today. In anticipation of land subdivision, the instances of people from Loita and outsiders arriving closer to the forest to claim space to settle and cultivate are "spiralling out of control" (Kronenberg Garcia 2015:251). Today people are settling in areas once used for communal open-grazing as well as those used in the past as reserves for a family's small stock or grazing only in drought *(iloolokeri*). In the absence of formal written rules about boundaries, it is customary for local elders to mediate disputes when land grabs are challenged by neighbors. Women's involvement in such disputes are unclear, though wealthy men are known to disperse wives to multiple homesteads where there is wet and dry season water and pasture as a strategy for establishing land ownership.

A word about the legal classification of Loita is necessary because it was in flux during this study due to the recent passage of the new Kenya Constitution (Kenya 2010a), new laws, and government re-organisation. During pilot work, Loita Forest was entrusted to the local community by the Kenya government in accordance with the Trust Land Act (Cap. 288 of the Laws of Kenya). The trust was legally managed by the NCC, a state authority at the district level. Formal state management was considered *de jure* and the customary indigenous management *de facto* (Ongugo et al. 2011). Under Article 23, Loita changed from trust land to community (versus public or private) land held by representatives on the basis of ethnicity, culture or similar interest. This Article of the Constitution is still waiting to be operationalized by an Act of Parliament once the multiple interests of forest users are accounted for (Adam 2012). Today there is still no officially documented acknowledgement of forest ownership. Although customary management is in effect, ownership is not recognized in the Forest Policy and Forest Act of 2005 (Ongugo et al. 2011) and management authority is still shared with the Kenya Forest Service (Mogoi et al. 2012).

In the meantime, *de facto* management of the forest remains the responsibility of elders in the LCE. This body is viewed by the community as the most powerful political body in Loita (Zaal & Ole Siloma 2006). It is a male-dominated traditional institution organized by ILIDP, a regional development project originally funded by Catholic Diocese of Ngong and the Dutch Catholic Cordaid. LCE members represent clans, age groups, location chiefs, youth groups, community organisations, forest committees, spiritual leaders, and county government officials. The LCE appoints male-dominated committees to monitor forest activities in a few sub-locations but committee members feel they have no authority.

Traditional customary practices, or sacred controls (Fortmann & Nihra 1992), remain under the governance of the Chief Laibon. LCE consults him on forest development activities (Ongugo et al. 2011). Once considered central to forest conservation (Zaal & Adano 2012), the Chief Laibon's influence has waned in recent years (Maundu et al. 2001). Scholars maintain that when the power of *iloibonok* increased in the past it displaced the spiritual powers of women, but as the influence of *iloibonok* declined it was Christian church-going women who became the

community's moral guardians (Hodgson 2005, Spencer 1993). Women's moral authority concerning sexual taboos was recently observed in Loita (Kronenberg Garcia 2015).

Women may be primary forest users for food, water, and shelter but forest decision-making is not linked to forest use (Obare 2003). Women are marginalized from forest decision-making. They might attend a local forest committee meeting but they are more active in church and organizing women's groups to raise funds for education, school fees, weddings, and health-related projects (Obare 2003, Sonkoi 2009).

In pilot work, LCE members acknowledged that traditional forest management has become complicated by the weakening of leadership structures and legal uncertainties about tenure. There is no formal forest management plan in place and forest decision-making is still guided by customary rules and practices of male elders. Kronenberg Garcia (2015) reports how skillfully the ruling male age set has mediated state interventions and managed local land disputes to retain authority over Loita Forest.

Upon the 2013 elections under the new Kenya Constitution, power started shifting outward from center to the grass roots. State government responsibilities began devolving to counties headed by governors. NCC was replaced by the Governor and Narok Executive Committee. Forest authorities have been devolving ever since and are still in flux. Gender dimensions of forest decision-making institutions are explored in Chapters 6-7.

2.4 Summary

This chapter introduced characteristics of the study area where the research methods will probe the intersection of gender, livelihood, and environment. It has highlighted the unique historical presence of *Iloitai* on their land and their ongoing customary use of Loita Forest, all of which are understood from a male-dominated perspective. Traditional dependence on Loita Forest over centuries offers a unique opportunity to study changes in culture/environment linkages.

The chapter explained how (a) Maasai history is known primarily from a cattle-centric male age-set perspective that ignores women's place in the landscape (b) accounts of women's historical complementary, autonomous, and subordinate roles fuel scholarly debate about the underpinnings of patriarchy (c) the changing Maasai landscape is influenced by variables other than population increase and (d) the identities of Maasai men and women are linked in time within a unique cultural system so that understanding one requires knowing the other.

Because *Iloitai* have maintained traditional forest relationships over centuries, the study area offers openings for tracing many cusps of transition, i.e., between pastoralism and agro-pastoralism, resource abundance and scarcity, patriarchal subjugation and women's empowerment, communal land tenure and privatization, and financial dependence and autonomy. In this way, it can help place men and women empirically in the landscape over time, however invisible or at a loss they may have appeared in the past.

Chapter 3 explains the research methods focused on these interests.

Chapter 3: Research Methods

Methodological freedom is critical to the growth of the political ecology community, ensuring that researchers eschew disciplinary-bound thinking in favor of a free choice as to which methods are most appropriate to the research questions at hand.
(Doolittle 2015:515*)*

3.1 Introduction

This is a case study that employs multiple methods. This chapter explains how the methods evolved from preliminary work to final field work. It describes how the study area and informants were selected and how each method proceeded after permissions and logistics were in place. Ethnographic issues of subjectivity, reactivity, and positionality are addressed.

3.2 Research approach and design

Data collection was a mixed methods approach using a triangulated (Jick 1979) assortment of quantitative and qualitative methods in social and natural sciences. In social science, mixed methods can produce more valid interpretations of data and inform social theory and practice (Bernard 2011; Johnson & Onwuegbuzie 2004). In natural science, mixed methods generate more realistic understandings of human/environment dynamics (Agrawal and Gibson 1999; Homewood & Rodgers 1991).

In political ecology, a field which traverses social and natural science, 'methodological pluralism' is aimed at finding relationships between what is observable in the environment and less salient social factors (Doolittle 2015). As a feminist study in political ecology using gender as a lens to understand forest and livelihood change, the methods described in this chapter represent an innovative blend of qualitative, quantitative, and participatory data gathering methodologies selected from diverse fields of scientific inquiry.

In the early stages of this study, data collection leaned more toward qualitative ethnographic methods. But the research goal was to corroborate qualitative findings with quantitative data (and vice versa) to discover meaningful patterns. This triangulated approach was intended to counterbalance the relative strengths and weaknesses of the household survey and geospatial analysis (quantitative methods) with semi-structured interviews and participant observation (qualitative methods) and resource mapping, transect walks, and event calendar (participatory methods).

The research design followed 'sequential' and 'concurrent' mixed method strategies of inquiry (Creswell 2013). For instance, some interviews and resource mapping were purposefully sequenced before household surveys to inform questionnaire content. Most household interviews were sequenced before established group interviews to discern patterns for investigation.[42] Forest transect walks were staged concurrently with household interviews to

[42] In two cases, household surveys were conducted at the end of fieldwork due to unavailability of informants beforehand.

understand forest use. Quantitative geospatial analyses and field verifications were concurrent with other methods and did not bias interview content.

3.3 Pilot work and reconnaissance

The pilot work evolved out of a visit to Loita Kenya in July 2011 when I completed a capstone research requirement in natural resource planning for a Master of Natural Resources degree at Virginia Polytechnic and State University (Westervelt 2012). As a doctoral student at UCL, I returned to Loita for four months in 2013 with small grants from the Parkes Foundation, UCL Graduate School External Training Fund and UCL Department of Anthropology to complete an immersion course in Basic Maa, secure a Kenya research permit and research affiliation at ILRI, collect secondary data at Kenya National Archives, confirm permission from Loita elders to work in the study area, and pre-test methods.

3.3.1 Maa language instruction

Basic Maa language proficiency was necessary to study in a rural community where mostly Maa is spoken (particularly by older women who are mostly uneducated), converse with informants, and enhance participant observation skills. I attended Oltepesi Institute for Maasai Language and Culture in Mashuuru (Kajiado District) [43] located in interior *Kaputiei* Maasailand and administered by the Catholic Diocese of Ngong. My Maasai teacher had instructed the Dutch priest Frans Mol, the Mill Hill Catholic missionary who founded the Institute and authored my textbooks *Lessons in Maa: A Grammar of Maasai Language* and *Maasai Language and Culture Dictionary*.

I immersed myself in formal Maa instruction from 9 am to 5 pm each weekday and in informal language and culture after 5 pm on weekdays and full days on weekends. I befriended women my age and high school students who hosted me in their traditional homes for meals and overnight stays. I practiced conversational Maa in many social settings including private homes, churches, markets, weddings and pre-wedding events, informal gatherings, formal meetings, daily walks, conversations with kitchen staff , and while accompanying priests on mission work among *Kaputiei* and *Matapato* Maasai.

Challenges I faced included (a) mastering complicated grammar construction as well as tonal and glottal pronunciations (b) unreliable internet and mobile service and (c) a midnight ride to Aga Khan Hospital in Nairobi for treatment of severe food poisoning. The language experience was valuable because it equipped me with cultural protocols for greetings and introductions. It encouraged people to engage in comfortable (albeit basic) conversation with me so I could develop friendly relationships and understand social dynamics operating around me. The hospital trip taught me to carry my own food and water when traveling in remote rural locations.

3.3.2 Research fellowship and permit

The ILRI research affiliation process was complicated and expensive. In the months between arriving in Nairobi and completing Maa language instruction, graduate students had left ILRI

[43] Kajiado County today.

because the fee structure and procedural requirements for becoming a Research Fellow had changed. With support from ILRI staff in the Livestock Systems and Environment Team as well as my UCL advisor, ILRI granted me Research Fellow status for a fee of $826.00. With this status, and another fee of $400, I was eventually granted a research permit from the Kenya National Council for Science and Technology (Permit # NCST/RCD/17/013/26) for the period June 26, 2013 to August 31, 2016.

3.3.3 Secondary data collection

I secured free remotely sensed data for Loita Forest (1975 to present) and KFS maps (1995-2010) from RCMRD in Nairobi. Access to this data was made possible by Dr. Tesfaye Korme, the Head of the GIS Unit at RCMRD who 10 years ago was involved in the Loita Forest project funded by IUCN. Together with a GIS expert at RCMRD, I learned KFS maps showed an increase in tree cover in Loita Forest from 1995 to 2010 because the forest definition included shrub land. When forest was defined as dense forest (e.g., broadleaf evergreen vegetation and riverine vegetation of 2 m minimum height covering an area of .5 hectares) and excluded the "high shrub land" classification, the result was a decrease of 3.3% in 1995-2010. RCMRD generated hard-copy laminated maps for me to take to the field.

Rain measurement data was acquired from multiple locations in Nairobi (Ministry of Water, KMD) and Narok District[44] (ILIDP, Water Resource Management Authority in Narok). Unfortunately, complete data for Loita was unavailable from 1975 due to absent or faulty rain gauge equipment, lack of staff, and decentralization of government water authorities. I secured original hand-written rain records for 1972-2002 from ILIDP for Loita.

To acquire population census data, three visits to the Kenya National Archives in Nairobi and one visit to Narok District Office of Kenya Bureau of Statistics were necessary. Payment was required for a one- year permit at Archives. Challenges to reliable census data collection included (a) the inability to make historical comparisons from census to census due to changes in administrative names of locations in Loita and their boundaries and (b) conflicting dates pertaining to Maasai age set ceremonies in Loita (particularly1989 census) which were important to the historical goals of the research. I gathered correct age set circumcision dates for Loita from the OIMLC which I later confirmed with Loita elders.

3.3.4 Local permission

There is a controversy in ethnographic methodology surrounding gaining access, that is, acquiring consent to collect information where it is needed (Glesne 1999). It centers on the influence of the researcher-participant relationship on data collection. To address the problem, this study employed two of Harrington's (2003) strategies to gain access-- the role-playing approach (i.e., positioning myself as an academic researcher affiliated with a local elder through graduate studies in the US) and the non-monetary exchange approach (i.e., nurturing the understanding that results would be shared for the benefit of the community).

[44] Narok County today.

To secure local approval, I gave a five- minute presentation in Maa to 70 elders at the Loita Leaders Peace Meeting at Ilkerin which had been convened by the LCE-- the cultural and political gatekeeper of the Loita community since the 1990s. My presentation was an important gesture because elders were aware of other 'outsiders' doing research but because they had not sought formal permission the elders were not aware of any benefits the research might have for the community. I updated leaders on the progress of my studies since I last saw them in 2011, explained the consent procedures, and promised to formally share the results.[45] I received their collective blessing and was allowed to proceed.

3.3.5 Study area selection

With a local guide, I traveled to rural settlement areas in Loita to assess logistics of maneuvering across remote terrain and any social factors that might inhibit research success. I traveled on foot because (a) I wanted an experiential understanding of the landscape and people I was studying (b) I wanted to avoid the expense of fueling and maintaining a vehicle and driver (c) most houses were unreachable by car and (d) as a mother I was not willing to risk my personal safety either riding or driving a *piki-piki* (motorbike). We hiked about 60 km through forest, swamp, streams, rocky outcroppings, and grasslands bordered by Entasekera to the west, Olngarua to the north, Nguruman escarpment to the east, and Tiamanangien to the south. I spent nights in traditional Maasai homes and carried my own food and water. Hosts were welcoming and grateful for gifts of tea and sugar.

I focused on three settlements-- Olngarua, Empurputia and Tiamanangien-- because (a) they were on the forest edge and people had lived there for decades (b) informants reported changes in livelihood and forest (c) the market, electricity, basic supplies, clinic, and mobile network were reachable within a day's walk and (d) area leaders welcomed us.

Foot travel presented opportunities for participant observation and personal encounters with passers-by. These casual meetings helped formulate interview and questionnaire content. They also dispelled misperceptions. For example, I observed that (a) men and not women constructed new houses (b) new houses were made of cedar, not mud/dung/tree poles (c) not all people were reluctant to count their cows and children (but quantities could be dubious unless probed further) (d) men and women had knowledge about medicinal plants (e) men and women grew maize and vegetables in separate plots (f) some households depended more on cultivation than livestock and (g) forest use for drought refuge had become risky because cows could die as a result of the energy required to move from the lowlands to the relatively cold highland and eat less nutritious grasses.

We defined the boundaries of the three potential areas with latitude and longitude coordinates. The four GPS points encompassed forest edge and the terrain where most houses were situated and could be accessed safely on foot. With local elders, we enumerated 239 households with 89, 80, and 70 households in Olngarua, Empurputia, and Tiamanangien respectively. Pre-testing a revised version of Grandin's (1994) wealth ranking method revealed that most households

[45] Results shared in community meetings in 2015 led to the registration of a CBO called Friends of Loita Forest (*ilcoreta l'entim oloitai*). It aims to engage villages in writing forest rules, educate youth about forest ecology, and engage women in establishing tree nurseries for income.

ranked very low in wealth. Leaders developed the rank definitions based on cows, money in bank, employees, family size, acreage cultivated, children's education, and house construction. Because this process was long, we changed the number of wealth ranks from 6 to 3 (high, medium, low). Wealth rankers also gave us names of men's and women's groups, committees, and leaders for possible focus groups and key informants.

To get a sense of forest composition and use in the three areas, we measured tree diversity in plots of 25 m X 40 m in dense forest and on the forest edge. Diversity was calculated with a rough index based on the number of trees (with minimum 8 cm DBH/25 cm circumference) divided by the number of species. Diversity was highest in Tiamanangien where *olpiripiri* was dominant. *Oltarakua* was scarce everywhere. (We walked two hours in forest to find one cedar tree in Tiamanangien.) In Empurputia, it was common to find cedar that had been burned by honey harvesters or cut by chain saws, and cedar saplings on forest edge were more abundant there. *Oloirien* was relatively abundant in Olngarua dense forest but scarce everywhere else. Despite differences in forest composition, local people complained most about declining availability of these three specific trees suggesting the forest was used for similar purposes in all three locations.

Wildlife was a safety concern. Local scouts with spears accompanied us through areas where African buffalo were active because the nephew of a host had been killed by a buffalo two days before we arrived in Olngarua and an area leader survived a buffalo attack while herding in Empurputia the week before. We saw evidence of hyena[46] and leopard attacks on livestock and heard them both at night. Though elephants are rare, Olngarua women were not collecting water or allowing young children to play outside for days before we arrived because of an elephant family in the swamp. In Tiamanangien, we passed the bones of an elephant that had been poached on an old migratory path months beforehand. Baboons were ever present on the edge of the forest. People complained of crop raids and losing small stock to baboon gangs.

This reconnaissance work determined that if funding and time were to be limited, Empurputia offered the best chance to get to households safely and efficiently. Foot travel in Olngarua swamp was challenging with equipment. Households in Tiamanangien were too widely dispersed. I also decided to purchase (a) a donkey to relieve us of carrying water and equipment and (b) personal tents and sleeping bags because of fleas in local homes.

3.3.6 Pre-tests of research methods

We pre-tested:

- household survey questionnaire
- established group interview guide (women's group, men's group, forest committee)
- key informant interview guide
- forest change maps

[46] Tragically, hyenas killed the mother of an RA while she was praying in the forest during this study. She regularly prayed in the forest from the time the RA was young. Locals believe hyena numbers are increasing and filling the ecological niche of lions that have been gone from Loita for decades.

- event calendar
- participatory resource mapping
- transect walks

Before formal pre-testing, I pre-tested portions of the survey questionnaire and interview guides with 42 individuals in governmental and non-governmental organisations in Nairobi and Narok, Maasai language and culture experts at OIMLC, and male and female age-group and community leaders. Much content was discarded for being ambiguous, repetitive, not important, or because it generated dubious data. The questionnaire and interview guides were formally pre-tested with 10 males and 10 females in Entasekera and Narok. Using beans in piles of 10 was successful for quantifying change over time. We lost a lot of time with explaining forest change maps, social interruptions from curious family and neighbors, and translating questions back and forth between English and Maa. Because we limited pre-test sessions to an hour to avoid informant fatigue, the questionnaire was not pre-tested in its entirety in single sittings. Mid-day was a good time to meet with women and after dinner was a good time to meet with men. The topic selected for studying decision-making was subdivision because it was on the tips of everyone's tongues at the time. Informants were grateful for tea and sugar as gifts.

Regarding the event calendar, older men belonging to *Iseuri* and *Ilkitoip* age-sets and women of comparable ages were helpful in adding important community events such as women's fertility blessings, drought years, agricultural fairs, solar eclipse, etc. They were unsure of actual years, however, so they had to be verified with government records, meteorological data, and memories of educated people from their school days. Informants engaged easily in participatory resource mapping and transects. Regardless of schooling, people were eager to take colored pens in hand and draw maps of where they collected water, firewood, construction materials, etc. They also enjoyed showing us the trees and shrubs they used within 50 m of the forest edge and explaining in detail how they prepared medicines.

3.3.7 Reflexive "turning back" on subjectivity and positionality

Response bias is a typical limitation of social research, especially in rapid rural participatory methods when respondents sense social pressure to provide answers the researchers want to hear (Browne-Nunez & Jonker 2008; Waters-Bayer & Bayer 1994). I considered the strong likelihood of response bias when I discovered in 2013 that no progress had been made on a forest plan (based on a western model[47]) that 19 elders had committed to in 2011 (Westervelt 2012). I surmised that their enthusiasm for the work had been strategic, not authentic, and I had been viewed in 2011 as a white person of influence to impress. After reflection and discussion with my doctoral advisor, I acknowledged that the effects of response bias were overshadowed by my own subjectivity. Because of inexperience and limited time in 2011, I could not have understood the challenges confronting leaders and preventing their progress such as widespread economic hardship due to prolonged drought, political infighting, land grabbing, court battles over insecure land tenure, and overall political instability due to government decentralization under the new Constitution. The field work that followed in 2013 took advantage of these lessons and, with the

[47] The Open Standards for the Practice of Conservation. (Available at http://cmp-openstandards.org/)

advantage of more time, I could also be more patient in seeking authentic patterns of human-environment relations. The insights of Mortimore (2005:47) were well-taken:

> *It is by trying to understand how poor people manage their livelihoods and their natural resources in conditions of great difficulty that science can learn to make itself more useful to them, rather than by promoting transformations based on imported models.*

In ethnography, a researcher's position in the community can affect the authenticity of findings. Throughout the study, I was very aware that access to authentic information would depend on my social profile and the information those around me deemed appropriate for me to have (LeCompte and Goetz 1982). I directly confronted gender and my other personal characteristics as limiting factors for data collection. In social research,

> *Gender has at least two consequences: it limits your access to certain information; it influences how you perceive others.* (Bernard 2013:331)

Positionality, or how the people being studied choose to define the investigator, is a prevalent topic in feminist studies. It can raise issues of power or privilege in research practice, particularly in studies of marginalized groups (England 2006 and 1993; Rose 1997).

In a remote area where outsiders were few, [48] my arrival in the neighborhood was a social event. As time passed I became less of a curiosity and I was less aware of eyes burning holes through my back and watching my every move. As a white American (assumed to be wealthy) who was female, scholarly, and asking lots of questions about gender differences in a patriarchal culture, I was concerned about how men would perceive me and if it would affect the gender data. As Madison (2011:8) notes in her book on the methodological challenges of ethical ethnography:

> *Positionality is vital because it forces us to acknowledge our own power, privilege, and biases just as we are denouncing the power structures that surround our subjects. A concern for positionality is sometimes understood as "reflexive ethnography": It is a "turning back" on ourselves (Davies 1999).*

I observed that when I was in a group of men, I held a "third gender" status. Men welcomed me to their men-only meetings as well as their fireside gatherings at night. Educated Maasai explained that the combination of my mature age, white hair, academic affiliation with an *Iloitai* elder, and my earlier visit in 2011 afforded me an elevated social status.[49] In other male spaces, such as eating meat in the forest, they made clear to me that my presence would be inappropriate.

Among women and children, my *entasat* (old woman) status afforded me warm acceptance, though women were reserved until we passed time together. My rapport with women was

[48] There were two other *mzungus* living within a three hour walk of camp-- a female doctor I never met and a male ecotourism camp owner I met after field work was over.

[49] Another factor enhanced my acceptance. It is the phrase *kenyor irmaasai kingaa* which means "Maasai listen more to experts from the outside." It is a reference to infighting and jealousies in a community that can make members distrust each other more than an outsider who has been welcomed into the community.

enhanced by my position as a mother, a widow, and my eagerness to engage in conversation about family. My elevated status among men appeared to fuel women's resentment (toward men, not toward me) when a widow entered a men's meeting I was attending, pointed at me and said "She is a leader. We should be her. But here women are not leaders."

"Turning back" on my positionality led to (a) avoiding money as gifts for informants (b) nurturing my profile as a student and *entastat* (c) selecting younger male and female research assistants and (d) confirming my commitment to the community with repeated visits to share findings.

3.3.8 Summary of reconnaissance work and methodological findings

- Empurputia was selected because foot travel to homesteads was safe and efficient.
- A tented camp with provisions for food and water was necessary.
- The household questionnaire required revision to meet the time limit of one hour.
- All methods required written back-translations for accuracy.
- The event calendar was helpful for historical reference purposes.
- Numbers (e.g., cows, children, acres) would require verification with probing.
- Reading maps of forest change was time consuming and not engaging for everyone so it was deleted.
- People enjoyed participatory mapping and transect walks.
- Land demarcation was a timely issue for studying forest decision-making.
- Local acceptance was enhanced by academic affiliation with an *Iloitai* elder, basic Maa language skills, the Maasai culture of hospitality, repeated visits, and mature age.

3.4 Main field work

Main field work was accomplished over four months in 2014. The earlier pilot work had enabled the research team to accomplish a lot in this period despite limited funding, i.e., securing more permissions, training RAs, pre-testing methods again, making camp, wealth ranking, sample selection, interviewing, transcribing interviews into English, and analysis and field verification of geospatial findings. During and after this field work, I was a Research Fellow at ILRI and a Visiting Assistant in Research with the Yale/UCL Collaborative Student Exchange Programme for the purposes of refining methods and statistical analyses.

3.4.1 Final permissions

The research permitting authority, Kenya National Council for Science and Technology, and the LCE had granted approvals in 2013 but the Kenya National Council also required that I make the research known to the Narok District Officer, District Commissioner, and Kenya National Archives when I arrived. Due to legal mandates in Kenya's new Constitution, decentralization of government authorities was in the implementation phase and government structures in Narok District were in flux. I hand carried my research permit to the Chief of the Governor's Staff who informed the new Education Office that I had fulfilled my legal requirement. In Loita, the District Commissioner was notified through the Entasekera location Chief who informed the District Officer. I also reported to Kenya National Archives and was issued a permit to collect

secondary data from their files. Four hard copies and one soft copy will be forwarded to the research permitting authority upon completion of this thesis.

3.4.2 The research team

The team consisted of the principal investigator and four *Iloitai* RAs and security guard. Two men (ages 44 and 23) and two women (33 and 21) were selected for RAs based on age, gender, English and Maa fluency, education, English writing skills, work experience, and recommendations from school, church, and age group leaders in the community.[50] I considered gender and age-grade as potentially confounding factors in a patriarchal and age-conscious culture (Hodgson 2001). Local leaders advised that gender and age would affect the likelihood of informants withholding information out of cultural respect (*enkanyit)* and women would be more open with female interviewers.

The study contributed to local capacity building with training RAs in GIS, map reading, and PRA and interview methods. Two females and one male RA had little work experience and were eager to join the team to build professional skills. The older male RA dispensed veterinary drugs in Loita, knew the terrain well, and resolved logistical challenges related to safe travel in a remote area lacking mobile network. The community considered his working relationship with the investigator appropriate based on gender and age.[51] RAs signed a contract and were remunerated according to the experiences of other researchers in Narok District affiliated with UCL and Museums of Kenya. They were also given money for airtime to be in communication with me when we returned to Entasekera for provisions.

The security guard was a village leader and member of the LCE. He offered his homestead for our camp and provided 24-7 security for us, our tents, and our equipment. RAs had never slept in tents and were grateful for the campfire he maintained from 6 pm to 6 am each day.

3.4.3 Training and final pre-testing

The research team met for nine days for training and pre-testing at St. Angela's Academy and the shopping center in Entasekera (a three hour walk from the campsite). Training focused on research questions and methods, questionnaire items, forest loss and gain maps, resource mapping, event calendar, interviewing techniques (e.g., PRA methods, probing techniques, using marbles for counting, verifying dates and numbers), consent procedure, wealth ranking, GPS and audio recorder equipment, scheduling interviews, gifts, work hours, salaries, erecting tents, and professional expectations (e.g., teamwork, cell phone use, punctuality). Methods were pre-tested again with 25 male and female informants. The team worked long days to accomplish pre-testing ahead of schedule because of predictions from KMD (2013) about El Nino rains in the 2014 short rainy season that would have made foot travel impossible.

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[50] A female RA left the team early due to pregnancy. She was replaced by a female school teacher of similar age.

[51] Local women commented that from a distance it appeared he was walking with his (deceased) mother who also had white hair and was the same height as the investigator.

Pre-tests revealed the following changes were needed: revising some language for the locality, changing measurements (e.g., from litres of milk to cups (one cup=1/2 litre) and hectares to acres, adding questions (e.g., changes in migration patterns, human wildlife conflict, forest rules), and deleting repetitive questions and activities requiring too much time (forest change maps).

3.4.4 Translation work

Questionnaires and interview guides were translated into written Maa in three steps. First, they were translated from English to Maa by a fluent bilingual Maa/English speaker. Second, they were back-translated (Brislin 1970) into English by another person fluent in both languages to confirm equivalence of meaning (Browne-Nunez & Jonker 2008) and to ascertain that the intent of the questions was well communicated. If they were not, then the Maa was revised. Third, research assistants made minor changes where Loita-specific language was needed (e.g., *mobile* is *Purko* Maa for cellphone but *esimu* is *Iloitai*, *olchamba* is *Purko* but *shamba* is used in Loita for vegetable plot). Interviewers recorded informant responses on-the-fly in English. Open-ended interviews were recorded live onto an audio-recorder and then they were transcribed into written English.

3.4.5 Local event calendar

Anthropologists use event calendars or event-history calendars to help improve respondents' autobiographical memories (Belli 1998) or memories of significant events in the life of a community (Leslie et al. 1999). The historical aims of the research required accurate timing of events to detect change patterns in gender/environment linkages. To address the pitfalls of retrospective data collection such as recall bias and inaccuracies, a Loita-specific event calendar was created (Appendix 1). This was a research challenge because of the lack of written records and the socially constructed concept of time in Maasai culture based on the male age-grade system and not the western calendar (Spencer 1993).

To place events more precisely in time, informants were asked in pre-tests to add to the event calendar with 'landmarks' (Loftus and Marburger 1983) that were memorable to the community such as drought years, El Nino rains, women's fertility blessings, political events, etc. Landmark events are reported to improve accuracy and reduce "forward telescoping' or estimating the time of an event as occurring more recently than it had actually happened.

Calculating ages for males was more straightforward than for females because a few men held government identification cards and birth years could be estimated for others from their age set's circumcision year. For example, if a man said he was *Ilkitoip,* and his circumcision was with the right hand (versus left hand) group of boys called *Ilkiseeyia*, then he could have been circumcised around 1968 (Table 2.1). Because he could have been 15-18 years old when he was circumcised, he could have been born in 1950-1953 making him 61-64 years old in 2014. For a more accurate birth year, the man could be probed about local events at the time of his birth (e.g., *manyata* in Kipelian to fight back *Kisongo*) or the year he may have first attended school. In the interest of time, interviewers often subtracted the average circumcision age of 17 from the

circumcision year of the age group. Using this procedure, the man was born around 1951 making him about 63 years old in 2014.

Local landmark events were useful since circumcision age could vary widely based on local and family circumstances, even by as much as 10 years. For example, if a man said he was *Ilkishili*, you could estimate his age to be about 51 since *Ilkishili* were established in 1980 (1980-17=1963 and 2014-1963=51). However, by probing with "Were you in school when the (1977) women's ceremony in Ilkerin happened and a *mzungu* woman became pregnant as a result?" you could get this answer: "Yes, I remember that. I was young and almost ready to go to school." Therefore, you could conclude he was about 5 in 1977. By subtracting 5 from 1977, the man was born in 1972 and not in 1963. Therefore, his estimated age would be 42 (2014-1972) and not 51.

Assessing ages of females was more complex since they are not considered members of male age groups. Younger women may have known their age but older women did not. When probed, an older woman might answer "I am *Ilkitoip*" because that was the age group of her husband. The problem with using a husband's age group was that she could have been 13 when she was circumcised and married to the *Ilkitoip* twice her age or more. One question that helped determine age for females was "What class were you (or should you have been) in when you had your first child?" If her child was now (or should be) in Standard 8 (about 14 years old), and she was (or should have been) in her third year (Form 3) of high school (about 17 years old) when she gave birth, then her estimated age was about 31 (14+17) in 2014.

The team agreed that when schooling was not a relevant landmark for a female, a successful approach was to ask "What moran did you sing for?" Traditionally, girls who were not yet circumcised sang for boys who were their peers or somewhat older. According to the team, girls between 8 and 14 (average age of 11) sang for moran boys.[52] Therefore, if a woman said she sang for *Ilkishili* (first established in 1980), we subtracted 17 (average circumcision age of boys) from 1980 to get an estimate of the birth year of the *Ilkishili* boy or 1963. By adding 6-- the difference between 17 (average circumcision age of boys) and 11 (average age of girls who sang to moran) -- to 1963, then 1969 would be her birth year and she would be 45 in 2014. Alternatively, one could arrive at 45 by subtracting 6 from 51 (an estimated average age of *Ilkishili* in 2014 calculated by subtracting 1963 from 2014). Further probing with landmarks such as "Can you remember the eclipse of the sun all day? Or the fertility blessing at Ilkerin? Or when Kenyatta died?" were helpful in arriving at more precise birth years.

3.4.6 Ethics and gifts

We gained verbal (not written, due to low literacy) permission from the head of each household and from each male and female informant. Verbal permission was obtained twice—when

[52] Age calculations for older women were different because we learned circumcision age was older in the past. (See widow's reference to *'big girls whose breasts had fallen'* in description of *olpul* in Section 4.4.2.2.) The change in girls' circumcision age is also reported among *Matapato* (Spencer 1988) and was occurring about the same time the widow quoted above was a young girl and *Ilnyang'usi* were moran in the 1940's. She herself was 18 when she was circumcised (Table 4.1).

scheduling an interview and before proceeding with each interview. Respondents understood the academic purpose of the research, the confidentiality of names and information, and they could decline participation at any time. Verbal permission was obtained for audio-recording and photographs.

Gifts for participation were 1 kg of sugar and 50 g of tea leaves or mobile airtime (a Safaricom scratch card of equivalent worth). Men typically chose airtime while women chose tea and sugar. In the case of group interviews, a meal of meat, rice and potatoes was provided. An educated elder observed that because life was changing quickly the study would probably be the last Loita research project conducted by an outsider where informants did not expect money for participation or photographs.[53] His insights at the end of the project reflected well on the conduct of the research:

> *You had very clean research because people viewed you as a source of knowledge that will benefit the community and not as a source of money.* MKI-SE-45

3.4.7 Final research methods

The final mixed research methods are described below. Table 3.1 presents quantitative and qualitative data sources and sample sizes. Figure 3.1 locates households visited in the study area.

The social context for the methods is organized according to a demographic schema: (a) the Loita Maasai section (*oloshon*) known as *Iloitai* (b) the neighborhood (*elatia*) known as Empurputia (c) the household[54] (*olmarei*) and (d) the sub-household (*enkaji*) (Coast 2001, Grandin 1991). Group interviews, key informants, and forest transect walks-- were derived from the neighborhood (*elatia*) level of forest users. Gender analyses of household data and resource maps were at the household (*olmarei*) level. The *intasati* histories of older women and other key informant interviews also represented the sub-household (*enkaji)* level.

Conventional Maasai culture is polygynous and in this study most households are represented by the husband and first wife. Sub- households are customarily controlled and managed by wives though Talle (1987) asserts Maasai women are losing their autonomy as decision makers as husbands take more control over property in the market-driven (versus subsistence) economy. Households were typically headed by a person who made major decisions on the family's behalf and upon whom everyone depended. When an *olmarei* included a father and son or two brothers

[53] Only one woman—not an informant and not *Iloitai*-- expected to be paid for a photograph of her butchering a calf that died from East Coast Fever. She was from Maasai Mara area where many locals depend on income from tourists.

[54] Household was defined as "… the Maasai entity of an *olmarei* (pl. *Ilmareita*) within the homestead (Maa *enkang* Pl. *Inkang'itie*), that is, one household head with his or her dependents, which may include, in the case of male-headed households, more than one wife and her children and grandchildren, parents and dependent siblings, as well as non-related individuals who reside with the family and depend on them for food in return for assistance with household chores (most commonly herding)." (Serneels et al. 2009:47)

Table 3.1 Primary and secondary data sources with number of informants in mixed methods

Primary data sources					Secondary data sources
Quantitative	**Qualitative**	**Participatory**	**Men**	**Women**	**Quantitative**
Household questionnaire	Household questionnaire		30	40	Landsat images (1976, 1995, 2014); census data; rain data
		Transect walk	7*	9*	
		Mapping local resources	7*	7*	
	Semi-structured interview of established groups	Mapping priority plants	27	21	
	Semi-structured interview of key informants		12	20	
	Participant observation				
Total			69	81	

*These informants are included in the household sample.

with their own cows, wives and/or children who depended on them, then two households were enumerated. In the case where a household head had another home and family settled elsewhere, only the household in Empurputia was counted and if s/he was away at the time, the local household was still included in the count. A household head could also be a widow or a separated or divorced woman. If an individual had no home, livestock, or family, s/he was aligned with the *olmarei* that s/he mostly depended on.

3.4.7.1 Household sampling and questionnaire

a. Household sampling frame and wealth ranking

The household sample represented the settlement area known as Empurputia. To derive a sample representative of wealth differences, we used a revised version of Grandin's (1994) participatory wealth ranking method with just three (versus six) wealth ranks. The activity was important since wealth can affect livelihood, gendered livelihood roles, and forest use (e.g., size of herd and cultivated plots, milk production, capacity to buy timber, firewood, and medicines) (Brockington 2001, Grandin 1994, Talle 1990). A local man and woman spent two hours with the team defining the characteristics of wealth ranks and their importance (Table 3.2), naming the heads of all households, separating index cards (upon which a RA had written names) into appropriate wealth rank piles, and randomly selecting cards out of a hat for the sample.

Thirty households were selected using a random stratified proportional sampling method based on wealth. Of the 87 households in Empurputia, 6 (7%) ranked high wealth, 18 (21%) ranked medium wealth, and 63 (72%) ranked low wealth (Table 3.3). These results were comparable

Figure 3.1 Locations of households visited with reference points[a]

[a] Reference points have red stars (Entasekera, Campsite, and Esoit Primary School)

Table 3.2 Participatory definitions of wealth ranks X relative importance (1=most important)

Relative importance	Characteristic	High wealth	Medium wealth	Low wealth
1	Children's education	Completed Form 4	Completed primary	Some or no primary
2	Health	Excellent	Fair	Poor
3	*Shamba* (garden plot)	More than 5 acres	2-5 acres	Less than 2 acres
4	Children[a]	More than 20	5-20	Less than 5
5	Cows	More than 200	20-200	Less than 20
6	Clothing	Many new clothes	Some new clothes	Old clothes
7	Vehicles	Car or truck	None	None
8	Money in bank	Money in bank	No money in bank	No money in bank

[a] It was necessary to distinguish between wives and children because of the man's comment "My wife is also a child." Only sons and daughters (and not wives) were enumerated as children.

Table 3.3 Composition of population in field work and pilot study X wealth rank

	Number (percent) of households	
	Field work	**Pilot work**
High wealth	6 (7%)	3 (4%)
Medium wealth	18 (21%)	14 (17%)
Low wealth	63 (72%)	63 (79%)
Total	87 (100%)	80 (100%)

with pilot study results and provided a rough measure of confidence that this participatory activity was representative of wealth groups in the study area.

Guiding the decision to select 30 households were (a) available time (b) qualitative research guidelines suggesting a minimum sample size of 30-50 (Bernard 2013; Morse 1994) and (c) a general rule of thumb in statistics called the 'central limit theorem' which holds that when sample sizes reach 30 the mean and standard deviation will approximate the true mean and standard deviation of the population which is important in quantitative analyses (Bernard 2013, Weiss 2012). Because 30 households represented a third (34%) of the total households, it also increased the likelihood of saturation (Glaser and Strauss 1967; Mason 2010) meaning that adding more people would not necessarily add to a better understanding of gender differences.

To prevent bias, household cards were randomly drawn from three hats stratified by wealth rank so that the number of people drawn from the hats were proportional to the wealth differences in the community (Table 3.4). For example, 22 cards were randomly drawn from the 63 cards in the low wealth hat so that about 72% of the sample would represent low wealth. Once interviews were underway, replacements were needed for households and individuals who were unavailable.[55] Due to the small number of high and medium wealth households, they were combined into one category called medium wealth.

As a study of gender differences, heterogenous characteristics of men and women were also analyzed (Table 3.5). In the four cases where household heads were women without spouses, we randomly selected men of equal wealth rank as substitutes to reach an equal number of men and women in 30 households. As a feminist study, an extra sample of 10 young women was included to discern patterns in age. This extra sample included nine young women in extended families (e.g., wives of brothers) and one unmarried woman teaching in the local primary school. In general, all men were married and only two wives were not first wives, men were older than women, more men had schooling, and more young women had schooling compared to older people.

[55] In the final sample, the number of medium wealth households became 4 (from 6) and low wealth became 24 (from 22). In one medium wealth household, the woman was not available, so a high wealth woman replaced her which brought the total number of high wealth households to 2.5 (2 complete households and 1 wife) and medium to 3.5 (3 complete households and 1 husband), for a final total of 6 medium and high wealth households combined. In 6 households, the male household head was not available (herding, working far away, death, separated from wife) so men of the same wealth rank were randomly selected as substitutes.

Table 3.4 Stratified proportional sample based on wealth ranks and available informants

	Number (percent) of households		
	In Empurputia	Cards drawn for sample	Final sample
High wealth	6 (6.9%)	2 (7%)	6 of medium and high wealth combined (20%)
Medium wealth	18 (20.7%)	6 (20%)	
Low wealth	63 (72.4%)	22 (73%)	24 of low wealth (80%)
Total	87 (100%)	30 (100%)	30 households (100%)

Table 3.5 Demographic characteristics of men and women in final household sample

					Percent in age category [a]			Percent educated	
Sex	Total	House-hold heads	Average number of dependents	Average age	20–29	30–39	40+	No school	Some school
Men	30	30	8.7	44	16.7	6.7	76.6	66.7	33.3
Women	30	4		33	26.6	56.7	16.7	76.7	23.3
Young women[b]	10			22	100			60.0	40.0

[a] Each 10-year age category combines two 5-year categories used by Maasai demographer Ernestina Coast (2001).
[b] Data for young women as a separate group are presented only when differences were found between young and older women. Younger women had more schooling than men and women.

b. Household questionnaire

The objective of the household survey questionnaire (Appendix 2) was to generate quantitative information about gendered livelihoods and resource use and combine it with qualitative data in interviews to answer research questions. It also gathered qualitative data that was categorized and analyzed quantitatively. Its content and format (Table 3.6) evolved over a period of three years. Preliminary work and pilot work revealed that changes in resource use and loss of priority species were quantifiable and the themes of gendered forest use, livelihood roles and decision-making were valid topics for scientific inquiry. Content and format underwent major overhaul after pre-testing in 2013 and minor changes were needed after final pre-testing in 2014.

Table 3.6 Household questionnaire content and format

Closed-ended questions	Open-ended questions
Interview data, demographics, GPS coordinates	Challenges to livelihood
Household assets	Forest rules
Livelihood roles, activities, diversification	Forest decision-making
Income and expenses	Subdivision
Projection scenarios for high priority resources	Projected future for grandchildren
Forest resource use	Importance of forest

The average time required was 85 minutes. Start time was recorded when the interviewer asked the first question. Stop time was recorded when s/he stood up to leave. Time lost to distractions (women tending to children, checking on weak cows, greeting curious neighbors) was included in the average interview time so the actual time spent talking with the respondent was about 70 minutes. Two questions were asked twice to check informant reliability, i.e., "How many cows do you have?" and "What size is your *shamba*?" If responses were different, the informant was probed further and the interview was longer.

c. Household participatory resource mapping and transect walks

Informants were invited to participate in two rapid ethnographic assessment activities: participatory resource mapping and transect walks (Chambers 1994). In political ecology, case studies have combined participatory mapping (or sketch maps) of forest resources, transect walks, oral histories, and historical timelines with more traditional quantitative data collection methods for planning or policy-making (Doolittle 2010; Kalibo & Medley 2007; Rocheleau 1995). The aim of this study was to uncover gendered and situated knowledge of the forest to triangulate the more formal questionnaire clip-board method and allow people to lead data gathering.

Husbands and wives in seven households were randomly selected from the 30 households to spend an hour together drawing a map of the resources they depend on in their immediate environs. Each was given a colored marker and newsprint to draw their house and arrows indicating where they went for the resources they needed (e.g., water, fuel wood, grazing) as well as where household products were destined for sale or trade. The individuals responsible for each livelihood activity were recorded. For the participatory transects, seven men and nine women were asked to walk separately into the forest from the forest edge to explain their individual use of forest vegetation. These sessions were ended after walking for 50 m or about a half hour.

Limitations of participatory methods such as language barriers, domination by powerful groups and individuals, and gender bias (Waters-Bayer & Bayer 1994) were addressed by hiring local Maa speakers trained in probing, random sampling, familiarity with power structures in the community that may have tried to dominate, and speaking with both men and women.

3.4.7.2 Semi-structured interviews

Semi-structured interviews were designed to complement the household questionnaire, interpret its findings, and produce nuanced ethnographic detail. Whereas the questionnaire generated "How much? Who? What? When?" data, the interviews were intended to answer "Why and how?" data. These interviews followed written guides for gender comparisons and consistency between interviewers

Interviews in Maa were conducted by gender congruent RAs. Interviews of fluent English speakers were conducted in English by the researcher. Most lasted about an hour. In some cases, interviews were abbreviated because informants had limited time or the focus of the interview

was very limited, such as forest songs. All interviews were audio-recorded and transcribed into English.
To analyze this qualitative data, *Nvivo* software helped organize data and perform quantitative frequency counts and searches for trends. These content analyses brought to light the reality that "Good research is not about good methods as much as it is about good thinking" (Stake 1995:19). Multiple perspectives of experienced qualitative researchers might have improved the consistency and reliability of the *Nvivo* coding process, but some authorities question the value of a teamwork approach in projects with single investigators (Bazeley & Jackson 2007) and it was not practical within the limitations of the study.

a. Interview sample

In contrast to aiming for probabilistic representation, the interviewee selection process involved a lot of participant observation and direct inquiries about male and female groups or individuals who were competent in forest knowledge, culture, history, and forest songs. In the interest of efficiency with limited time, two established self-help groups of men (N=22 men), two established self-help groups of women (N=20 women), and a gender-integrated forest committee (5 men and 1 woman) were interviewed separately in group gatherings. In addition, 12 male and 20 female key informants were interviewed individually. Seven females were specialised informants about forest songs and three females were widows.

In purposive non-probability sampling such as this, 10-13 well-chosen informants are viewed as sufficient to define a cultural domain and a complete thematic codebook can be developed with just 12 carefully selected interviews (Guest et al. 2006). Also, 30-50 interviews are considered sufficient in ethnographic grounded theory studies (Bernard 2013; Morse 1994; Weller & Romney 1988). With these guidelines, the number of interviewees (27 men and 21 women in established groups, and 12 men and 20 women as key informants) was considered an acceptable balance to the household survey (N=30 men and 40 women) for enhancing validity and approaching theme saturation with mixed methods.

b. Established group interviews

Established groups of men, women, and forest committee members met separately for about two hours in a local school and community center. Working first in teams and then returning to the main group for open discussion of grand tour and mini-tour questions (Spradley 2003) (Tables 3.7-3.8), explicit details and diverse opinions were generated on a variety of topics. Using a laminated Google map of the study area, the groups also mapped changes in availability of high priority plants over time.

All questions were written on prepared flipcharts to help RA facilitators follow the order of questioning and pace probing and discussion toward timely completion of the sessions. Open discussion and differences of opinion were encouraged. The sessions were audio-recorded and transcribed into English.

Table 3.7 Semi-structured interview guide for established gender groups

Grand tour questions	**Mini-tour questions**
1. Have livelihood activities changed in the past 10-20 years?	1. How have they changed for men and women and why?
2. Has the forest changed?	2.What caused the change? On this map, where are high priority plants located today and 10-20 years ago?
3. Have forest ceremonies changed?	3. How have ceremonies changed for men and women and why?
4. Has decision-making in the household changed?	4. How has it changed for men and women and why?
5. Has decision-making about the forest changed?	5. Has it changed for men and women and why? Is subdivision a good idea? Why or why not?

Table 3.8: Semi-structured interview guide for established forest committee

Grand tour questions	**Mini-tour questions**
1. Has the forest changed?	1. What caused the change? On this map, where are high priority plants located today and 10-20 years ago?
2. Has the forest decision-making process changed from the past?	2. How has the decision-making process and women's participation changed? Why?
3. What decisions does the community and this committee make about the forest?	3. How will the community decide about subdividing the forest?
4. Are there forest rules?	4. How are rules made and enforced and how do women participate?

c. Interviews of key informants and older women (*intasati)*

One-on-one interviews with local experts followed the established group interview guides but they also probed informants' areas of expertise (Table 3.9). For example, interviews of area leaders also focused on decision-making and interviews of spiritual leaders also focused on forest ceremonies. In the case of women who sang forest songs in the past, the focus was exclusively on the content and historical background of songs. Most key informant interviews were about an hour but *intasati* interviews required more time.

Intasati interviews took place over several days. Family portraits constructed over days have provided qualitative detail about livelihood change of Maasai living in Kajiado, though they were male household head-centered (Cochrane et al. 2005; Homewood et al. 2009; Serneels et al. 2009). These interviews depended heavily on the local event calendar to frame chronological progression of personal history and to mitigate the likelihood of inaccurate recall of numbers and dates of ceremonies. Interviews allowed a lot of space for spontaneous tangential lines of inquiry for gathering explicit detail. Chapter 4 describes *intasati* interview methods in more detail.

Table 3.9: Semi-structured interview guide for key informants and *intasati*

Grand-tour questions	**Mini-tour questions**
1. Has the forest changed?	1. How? Why? How old were you at the time?
2. Has forest use changed?	2. Why did you go to forest when you were young and when you were married? What plants did you use? Why did it change?
3. Has livelihood changed?	3. How did you get food/livestock/money when you were young and when you were married? When did cultivation start? How old were you at the time? Is life easier or harder for men and women today? Why?
4. Has decision-making changed in the household? In the community?	4. How were decisions made when you were young and when you were married? How is it different today? Why did it change?

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3.4.7.3 Geospatial analysis and verification of land change

This study used land change science to quantify forest change on spatial and temporal scales. Landsat is commonly used in thematic analyses of forest dynamics because it offers the longest running time series of systematically collected data, the spatial resolution facilitates interpretation, and large sets of data are freely available (Cohen & Goward 2004). Landsat and GIS have advanced not only empirical understandings of the coupling of human-environment systems and sustainable land use practices, but also the public's understanding of forest loss and degraded global carbon and water cycles. Though the matching of social, environmental, and remotely sensed data at such diverse scales of analysis present interpretation challenges (Turner et al. 2007), human ecologists have successfully linked land change with measures of pastoralist household production in East African rangelands (Galvin et al. 2001; Homewood et al. 2001).

The study used Landsat satellite data and GIS software to detect forest change and link it with data generated by the methods described above. I took an introductory GIS course and worked with geospatial analysts at ILRI to calculate forest gain and loss using global forest loss data made available by University of Maryland (Hansen et al. 2013). I also verified the accuracy of that data by visiting 30 GPS locations where forest gain and loss were indicated and inquiring about land change at those locations with residents. Ultimately, land change datasets were generated with Landsat images of 1976, 1995, and 2014 after verifying five land classifications—dense forest, light forest/bush, grassland, hydrophytic (swamp) vegetation, and bare lands—in the field. Chapter 4 describes these methods in detail.

3.4.7.4 Participant observation

Participant observation was a strategic qualitative method for acquiring experiential data about the land and people. In the amalgam of mixed methods, it furnished real world perspective and validity to data acquired by the other means. Circumstances that positioned me well for developing rapport with local people were the rolling exchange of introductions and news while hiking, basic Maa language skills, and my social position as an outsider and as an older woman with an academic affiliation associated with an elder. My earlier visits to Loita were also instrumental. As Bernard (2013: 317) has noted, in participation observation "Bottom line: Presence builds trust. Trust lowers reactivity. Lower reactivity means higher validity of data."

As a participant observer, I took copious field notes and recorded qualitative data about my impressions of people, conversations overheard, activities of men and women, things I didn't understand and needed to clarify with RAs, etc.[56] Some examples of what I recorded during participant observation were locations of cedar saplings, number of dead livestock, and prices of items in the market. With the women and children of the homestead where I was camped, I milked, fetched water, cut and hauled firewood, shucked corn, filled the corn crib, and herded small stock into the kraal at dusk. Events I attended included a burial, pre-wedding ceremonies, pre-circumcision ceremony, and school fundraisers. When I was in Entasekera, I went shopping by myself and attended Mass. At a traditional wedding, I joined the women in welcoming the new bride with singing and dancing. At that same wedding, I was given the honorary role *(enkitok natalaa enkerai*) of untieing the calabash (*enkayiam*) from the bride's back, removing her shoes, and placing a baby on her lap.

3.5 Follow up fieldwork

CI provided an unsolicited small grant to follow through on my recommendations from the field work, mainly those regarding decision-making. I returned to Loita for three weeks in 2015 to share research findings with community leaders and collect more data on forest rules among established groups. Three RAs (two males, one female) from the original research team assisted. At this stage, pure research became participatory action research (PAR) as informants became "…actively engaged in the quest for information and ideas to guide their further actions" (Whyte et al. 1989:514).

3.5.1 Research methods

3.5.1.1 Semi-structured interview

a. Sampling

Two gendered groups of leaders were selected as informants—the women's merry-go-round group and the local (male-dominated) Forest Committee. The women's group was chosen because field work revealed that both men and women regarded its members as leaders. Factors guiding selection of the Forest Committee included the recent ineffectiveness of LCE due to

[56] It was not always possible to be an observer in the background and avoid being the center of attention. Early in the fieldwork, when I arrived late to a burial ceremony where over 500 people were gathered. The pastor stopped his preaching and shouted "Welcome!" directly at me in English. Trying to become invisible, I sat down among the women and replied "*Ashe oleng*." (Thank you very much.) He responded, "Do you speak English?" By then all eyes were watching me. When I answered "*Ee. Ayiolo kimaasai enkiti*" (Yes. I know a little Maa.) there were waves of laughter. My RAs informed me later that the laughter reflected the crowd's amusement because it was uncommon for a lady to speak and it was even odd to hear a white woman speaking Maa. This occasion may have worked to my benefit serving as an informal announcement of my arrival in the area and positioning me as an outsider who was welcomed and taking part in community events.

political infighting and the study's finding that the community recognized the Forest Committee as a forest decision-making institution.

b. Gender-integrated interview of established groups

The Forest Committee and women's group were invited to meet at the local PCDA center in Entasekera for a presentation of research findings, discussion, and a meal. The combined group met for two hours and worked in three gender-integrated teams to address assigned topics (Table 3.10) and report back to the whole group for discussion. Proceedings were audio-recorded and transcribed into English.

Table 3.10 Semi-structured interview guide for gender-integrated discussions on forest rules and decision-making

Grand tour questions	**Mini-tour questions**
1. Are written forest rules needed? Why?	1. Do men and women have different ideas about rules that are needed? Why? What rules are needed for: a. *oltarakua* b. *olpiripiri* c. *oloirien*
2. Is there gender equity in the Forest Committee?	2. Why aren't there more women in the Forest Committee? What could women contribute?
3. Does the community want the forest subdivided?	3. How will men and women voice their concerns sbout subdivision?

Because of this meeting, the informants formally registered with the Narok County government a new gender-integrated community-based organisation to write forest rules, educate youth about forest ecology, and establish tree nurseries designed to earn income for women. The extent to which this development will proceed into further PAR that advances rigorous science and addresses forest issues is beyond the scope of this study but guidelines for such initiatives are presented in Chapter 7.

Chapter 4 presents results of the geospatial analysis and *intasati* interviews.

Chapter 4: Gender dimensions of land change

When the gaze begins from space,
and when the gaze-from-space is uninformed by the logic of gendered livelihoods and landscapes, then the erasure of women's place in the mapped spaces is all but certain.
(Rocheleau 1995: 463)

4.1 Summary

This chapter explores a gender-sensitive view of the landscape with geospatial analyses and life histories of older women. It provides the background for understanding change in the next chapters by establishing historical baselines and overall trends. Oral histories uncovered many gender dimensions of quantitative land change and some immediate drivers but root causes were vague. Methodological issues with forest definitions, scale disparities, and culturally-constructed perceptions of time are addressed. Rich ethnographic detail provides historical texture for understanding the influences of intra-household dynamics on land use.

4.2 Introduction

Land change scientists addressing wicked problems [57] of climate variability and ES view forest change as an amalgam of situation-specific inter-relating factors operating at different scales of space and time (Lambin et al. 2001, 2003; Turner 2007). They acknowledge that local place-based studies can expand the data base of situation-specific land dynamics and improve projections of change (Serneels & Lambin 2001a; Skole et al. 1994; Young et al. 2006). Such an outcome is possible from this study.

This study posits that behavioral changes in forest use are the results of human decisions and the failure to systematically investigate culture/environment linkages can inhibit realistic understandings of forest change. A better grasp of the livelihood decisions that both men and women make can improve forest change projection scenarios. The implications are not only local because knowledge about change in land cover improves regional climate models in Africa (Hulme et al. 2001).

Scientists recognize that social dimensions of forest use need better integration into land change (Redman et al. 2004). Efforts to integrate biophysics, socioeconomics, and remote sensing into coupled human/environment systems are growing because of improvements in data access, processing power (Fox et al. 2003; Galvin et al. 2001; Geist & Lambin 2002; Turner et al. 2003, 2004) and definitions of land cover (NASA 2015b). As a result, the social factors affecting tropical forest management outcomes are becoming clearer. These factors include gender (Colfer 2013), women's level of participation (Agarwal 2009), mixed gender groups (Mwangi et al. 2011), market access (Mai et al. 2011), division of labour (Rocheleau et al. 1995), and social capital (Westermann et al. 2005). Feminist geographers assert that in gender-blind GIS projects, communities and women are treated as homogenous entities (Moss 2002) and gender-sensitive applications in GIS climate change studies are few despite their gender- differentiated impacts

[57] See footnote 6 in Chapter 1 for definition of wicked problems.

(USAID 2015). The use of gender as a main entry point for exploring how social patterns align with remotely-sensed forest change is largely unexplored.

In the arid and semi-arid lands (ASALs) of Maasailand, remote sensing data combined with census data, household surveys, and interviews are parsing out the land change drivers. In the Mara-Serengeti ecosystem, geospatial mapping of habitat diversity, wildlife species richness (Ogutu et al. 2016, Oindo et al. 2003), human settlement, and agriculture (Serneels & Lambin 2001a) indicate declines in biodiversity since the 1970s on, as well as shifting ratios of wildlife to livestock (Ottichilo et al. 2000). These changes are driven by combinations of macroscale factors of economics, politics, and land tenure (Bedelian 2014) and not by single causes such as population growth and subsistence agriculture (Homewood et al. 2001). Such studies encounter methodological obstacles to linking pixels on images with social patterns. They report problems with spatial resolution and generalizing social patterns from point–by-point household data on the same scale as continuous spatial data, especially when land is communal, people and livestock are mobile, and households are not directly linked to the same land points over time (BurnSilver et al. 2003; Campbell et al. 2005).

With forests, there are challenges in defining what forest cover is and interpreting satellite data in consistent ways (Fairhead & Leach 1998; NASA 2015a; Townshend et al. 2012). Measurements of global forest area can vary by as much as 6-13% of the earth's land area (NASA 2015b; Sexton et al. 2016). This has resulted in huge discrepancies in global deforestation estimates that range from 25% reduction in the rate of tropical deforestation (FAO 2010) [58] to 64% acceleration from the 1990s to 2000s (Kim et al. 2015). [59] When FAO changed its definition of forest between the 1990 and 2000 Forest Resource Assessments from 20% to 10% minimum forest cover to enable policy-making with globally consistent data (FAO 2006), it effectively increased global forest area by 15% (WRI 2001), thereby complicating change calculations even more. Like land change in ASALs, the drivers of forest loss appear not to be single factors but synergies between regional and even global underlying causes and local activities (Geist & Lambin 2002; Lambin & Meyfroidt 2011).

Another source of discrepancy in change estimates is classifying intermediate land cover like savannas, shrub lands and mountain ridges (Sexton et al. 2016). This was certainly the case with perennial swamp vegetation in the present study. It has been erroneously interpreted as forest in a global data set for reasons having to do with Landsat image resolution and lack of field verification (Hansen et al. 2013). Misleading local references to glades as forest has been another source of confusion (Maundu et al. 2001). With glades, fire is an important factor to consider because of its role in efficient regeneration of African pencil cedar (*Juniperus procera*) in this landscape (Bussmann 2001).

All these issues are pertinent to interpreting the conflicting reports about the changing status of Loita Forest. In the 1950s, it was reportedly uninhabited (Betts 1952) and a showpiece forest under excellent management by Maasai people (Talbot 1960). In the 1990s, it was a closed

[58] FAO (2010) used the criterion of >10% tree cover. Forest was land spanning more than 0.5 ha with more than 10% tree canopy cover and trees higher than 5 m or having the potential to reach 5 m in height.
[59] Forest cover was defined as "parcels >1hectare in area and comprising pixels with >30% tree cover." (Kim et al. 2015:3496)

canopy forest [60] (Wass 1995) but only a decade later as much as 50% of its tree cover was gone (Maundu et al. 2001) and yet it continues to be referred to as an undisturbed forest (Ole Raimit et al. 2010) and one of the last indigenous forests with little or no degradation (Karanja et.al. 2002). Findings of forest loss in Loita would be consistent with trends in tropical Africa where imagery shows forest decline accelerating from 1990 to 2010 (Kim et al 2015) and 2000 to 2012 (Hansen et al. 2013).[61]

Other confounding factors in establishing baseline forest are anthropogenic forests which appear to *increase* with population density and time lags in forest-savanna transitions due to climatic change. These factors are well documented in West Africa and have justified major revisions in deforestation estimates there (Fairhead & Leach 1996, 1998). Rainfall variations and climate events such as El Niño also impact satellite-based land cover data in Maasailand (Galvin et al. 2001) and could be relevant to Empurputia wetlands.

There are few remotely sensed data on land change in the Loita highlands. As communal land managed by pastoralists experiencing climate change and livelihood shift, the human/environment linkages are self-evident but there is little empirical evidence for it. Further north, commercial logging driven by corruption, insecure land tenure, and ineffective institutions have been the nested drivers of significant loss of Mau Forest between 2000 and 2012 (Ng'ang'a 2014).[62] When IUCN studied Loita Forest change from 1991 to 2003 using Landsat images of its northwest corner, it engaged male elders in GPS, GIS and remote sensing technologies, data collection, and sharing indigenous knowledge (IUCN 2005).[63] Contentious political realities limit the extent to which those findings can be generalized to the larger forest because the project was not welcomed in other locations despite the laudable participatory approach.[64] Reporting 3% net forest *gain* from conversions from shrubs, grasslands, and riverine vegetation, it also cited anecdotal reports of forest loss and some remotely sensed forest depletion from cultivation. Such inconsistencies between views of the community and empirical findings about forest loss and bush gain have been noted by ethno-botanists working in Loita (Maundu et al. 2001).

This chapter addresses the incongruities between perceptions of forest conditions and the scant empirical evidence that exists. It takes a gender approach to exploring links between human dimensions and temporal changes in land cover.

4.3 Methods

4.3.1 Land change

[60] Forest was a "A continuous stand of trees, at least 10 m tall and their crowns interlocking." (Wass 1995:8)
[61] Forest was land cover with >25% tree cover at the Landsat pixel scale of 30 m X 30 m spatial resolution for trees >5 m in height. This definition facilitated global-scale assessments with Landsat and MODIS systems. (Hansen et al. 2010)
[62] Forest loss was defined the same as above.
[63] Forest was defined as "areas under total forest cover." (IUCN 2005)
[64] See Section 2.3.6 for background on local resistance to the IUCN project.

This study used post-classification comparison (Singh 1989) also called delta classification (Coppin & Bauer 1996) to detect land change. This straightforward and inexpensive technique has successfully analyzed changes in forests, urban areas, and coastal zones (Hall et al. 1991; Jakubauskas 1989; Mas 1999; and Yuan 2005). Its advantage is that it can address variations and erroneous data in vegetation, soils, and atmospheric conditions since each image is classified independently. Its disadvantage is that the change map can represent the product of multiplying inaccuracies of each land classification such that the potential for inaccuracies will increase with the number of classifications (Coppin & Bauer 1996; Gordon 1980). For example, two remotely sensed images post-classified at 90% accuracy will generate a joint product of change detection that is 81% accurate. This study addressed this weakness by going to remotely-sensed points in the field during the main field work in 2014 and in follow up work in 2015, interviewing local people, and ground truthing land cover change.

4.3.1.1 Initial field verification and accuracy assessment

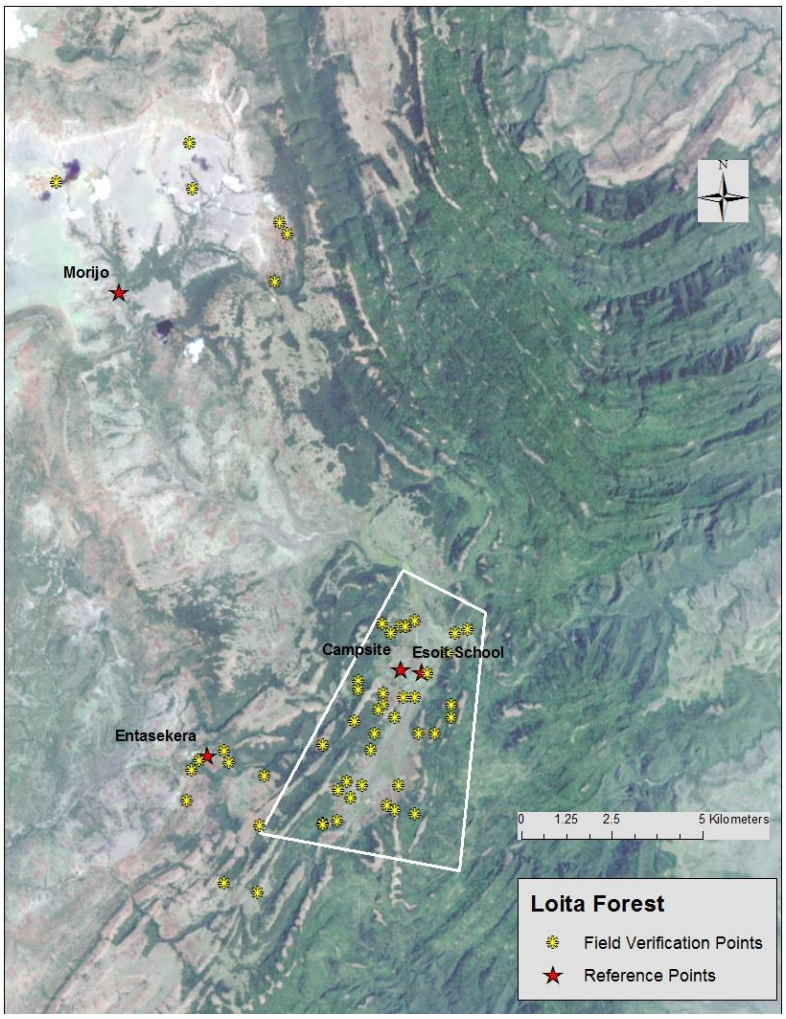
The investigator completed a course in ArcGIS at ESRI. As a Research Fellow at ILRI, she worked with geospatial analysts to calculate forest gain and loss using existing data. Land cover was initially assessed with satellite data of fine resolution (30 m) images of global forest loss and gain for 2000-2012 (Hansen et al. 2013). The data is freely available online at http://earthenginepartners.appspot.com/science-2013-global-forest. Data were geo-referenced and maps were created to gain an initial understanding of loss and gain. Thirty GPS points were randomly selected for field verification of thematic accuracy, an important step in remote sensing analysis (Olson et al. 2004; Congalton & Green 2009). The research team visited those points (Figure 4.1) with key informants who shared local knowledge of land history and vegetation.

Only one out of 15 (7%) forest gain points could be verified with confidence due to problems with interference in the forest gain image, the inability to reach points due to dense forest and wildlife, and questions about vegetation interpreted as forest.

Most (9 or 60%) of the 15 forest loss points were located where forest (*entim*) had never existed. Locals insisted that only tall swamp grasses (*esere* and *oltiol*) [65] had been there in 2000, elephants were not visible in the grasses because they were so tall, the grasses were taller than a man plus his herding stick (e*ngudi*), and the grasses disappeared in the past 10 years. Only 5 out of the 15 (33%) loss points could be confirmed as forest loss from cultivation. Due to this low accuracy, this data could not be used to quantify forest loss because tall wetland vegetation (macrophytes) had been erroneously interpreted as forest in the reference data. This experience

[65] Bulrush or cattail (*esere*) and papyrus (*oltiol*) are wetland plants that can reach up to 5-9 m (McClanahan & Young 1996) and are typical in Kenya wetlands (Mwita 2013). The shoulder height of a male African elephant can reach 3 m (Shrader et al. 2006). A man plus his herding stick (*engudi)* might reach 4 m (personal observation). Such metrics were helpful in assessing vegetation heights with informants.

Figure 4.1 Verification points visited in Loita Forest and Empurputia (bordered in white) for thematic accuracy assessment of satellite imagery in Hansen et al. (2013)



highlighted the limitations of global gaze GIS approaches that miss fine local scale land dynamics (Olson et al. 2004) and the very high-resolution data needed to distinguish small wetlands (Mwita et al. 2013).

4.3.1.2 Image acquisition

New Landsat image scenes were acquired for free from the USGS website at http://earthexplorer.usgs.gov/. Images were reviewed for the years 1976, 1995 and 2014 to trace change from a baseline established at the earliest available year of a relatively cloud-free (< 10% cloud cover) image and to construct two comparable (19-year) time periods for analysis. Dry season anniversary months were selected because of the presence of persistent and perennial woody vegetation in those months and fewer problems with sun angle differences (Singh 1989). January and February dates were chosen because the area receives long rains in March-May,

short rains in October-November,[66] and January and February fall within a relatively dry period known by locals as a time of scarcity (Ole Saitabau 2014). Fortunately, a cloud-free image was available in January for 1995 when the area experienced an unusual amount of rain in February 1995. The image sources appear in Appendix 3.

Satellite images with the least cloud cover were downloaded. Cloud removal using masking techniques was not possible with Landsat 2 because ArcMap was not available for the 1976 image. The extent of clouds and shadows in the 1976 image were classified by visual inspection and then added to the appropriate land classification total. This accommodation was considered reasonable because the 1976 totals were only used for comparing relative land cover percentages, not for calculating percent change. Images were orthorectified in a Universal Transverse Mercator projection with a WGS84 datum, resampled by cubic convolution, and were in GeoTIFF data format.

Images were clipped to the extent of the entire forest (with four boundary points of 1.571ºS, 35.804ºW; 1.571ºS, 36.011ºW; 2.048ºS, 36.012ºW; and 2.048ºS, 35.804ºW) and the study area (1.80529ºS, 35.9048ºW; 1.81576ºS, 35.92515ºW; 1.8706ºS, 35.86946ºW; and 1.88001ºS, 35.91893ºW). The band combination was changed to 4-3-2 which is commonly used for vegetation analysis (USGS 2015). Band 4 is near infrared, Band 3 is red, and Band 2 is green.

4.3.1.3 Training data, field verification, and change detection

Data processing and classification were accomplished with methods described by Lillesand et al. (2014). The simple classification scheme adopted was dense canopy forest (≥ 40% canopy with closed stands of canopy trees ≥ 5 m tall),[67] light forest/bushland (< 40% canopy with open stands of mostly bushes), grassland (mostly grasses interspersed with woody plants), hydrophytic vegetation (mostly wetland plants), and bare land.[68] Rigorous and time-consuming validation of training samples for each image were based on ground-truthed data and visual evaluation of color tones, texture, pattern, and associations with topographic features. Dense forest appeared deep red, light forest/bushland was less red and interspersed with mottled patterns of individual trees, grassland was grayish pink, hydrophytic vegetation was consistently light pink with no

[66] Rainfall in Loita in February 1976, February 1995, and January 2014 was 45 mm, 130 mm, and 27 mm, respectively (KMD 2004, 2014). High rainfall in 1995 affected reflectance in the forest canopy so considerable time was devoted to differentiating forest and hydrophytic classifications in that image.

[67] Most countries use minimum crown cover of 30% to define forest. The forest classifications in this study were differentiated between dense (≥40% canopy) and light forest by ground-truthing the difference in the field using a spherical crown densiometer according to Lemmon (1956).

[68] Characteristic trees and shrubs found in dense forest included *olpiripiri, enkashe, olarioi, olgilai, olkonyil, osokonoi, oltarakua, oloirien,* and *oleparmunyo*.
Characteristic trees and shrubs found in light forest/bush land included *osentu (oleleshua) entulelei, oleparmunyo, olkilorita, oltarara, olmusakua, osinoni, oloiyapiyap, olamuriaki, olmisigiyioi, oloponi, olosesiai,* and *olgirigiri.* According to Talbot (1960), *osentu (oleleshua*) has been described as the characteristic bush in succession from red oats (*orperesi wouas*) grassland to *leleshwa (osentu/oleleshua)* bushland to cedar (*oltarakua*) forest in this ecosystem (Talbot 1960).
Characteristic grasses were *orperesi wouas* and *olmagutian*.
Characteristic hydrophytic vegetation was *esese, oltiol, oseyiai, and olobobo*.

patterns or gradations of color, and bare land appeared grey. To generate high-quality training data, polygons representing the five classifications were created in ArcGIS.

On return trips to the field, the team took GPS points at sites representing the five land classifications. This reference data was helpful in confirming and further training map data. Due to practical limitations, there was not enough data to generate a valid error matrix for thematic map accuracy assessment (Congalton & Green 2008). The total extent of each of the five classifications was calculated in square meters and then compared between years to detect change. Due to dramatic differences in image quality between 1976 (Landsat 2) and the other years (Landsat 5 and 8) only relative percentages of land cover were compared between 1976, 1995 and 2014. Change detection was calculated in percentages for 1995-2014 only.

4.3.2 *Intasati* her-stories

The *intasati* her-stories consisted of qualitative data about the life histories of older women (all widows) from the time they were young uncircumcised girls to the present day. According to Hodgson (2001:11), "Social changes in gender relations… only become visible in greater time depths, such as decades or generations." Having passed their child-bearing years when Maasai women hold subservient status in their culture, widows can become powerful authority figures (Hodgson 2001; Little 1987; Talle 1988) with deeply nuanced perspectives. Grand tour questions addressed the research questions (Table 3.9) and mini-tour questions were individualized for each interview depending on their personal experiences and knowledge.

With the her-story approach of feminist historians, women become visible "as a focus of inquiry, a subject of the story, an agent of the narrative." (Scott 1999:17) The interviews followed the benchmarks in their lives -- as children (*intoyie*), wives and mothers with young children (*isiankikin*), and post-menopausal women with circumcised children (*intasati*). These benchmarks roughly paralleled the temporal span of forest change under analysis.

For specific timing of events, Maasai use a system based on culturally defined phases of male maturation and male age groups.[69] The formal progression in all men's lives is from boys (*ilayiok*) to morans[70] (*ilmurran*) to elders (*ilpayiani*). Characteristics of male age groups and celebrations differ depending on periods in history, localities, and Maasai sections (Kronenberg Garcia 2015; Spencer 1988 and 1993; Talle 1988).[71] All Maasai women do not progress through age groups and traditionally never attain a social status with power over livestock or their own bodies (Talle 1988). Older women often define themselves in relationship to male age groups either as their daughters, lovers, wives, or mothers and they structure time accordingly (e.g., *My father was Ilterito* or *I sang to Ilkiseyia moran.*) References that helped *intasati* place their life events even more precisely in time were the event calendar, age group ceremonies, and

[69] Age group is a general term for a man's age set (*olaji*) or circumcision group (*olporror).* (See Table 2.1)
[70] Moran is an anglicized version of the Maa word for warrior (singular *olmurrani*, plural *ilmurrani*). It is used throughout to mean circumcised unmarried men.
[71] For example, most Kenyan Maasai sections divide the moran generation into right- and left-hand circumcision groups. Tanzanian Maasai, such as *Kisonko* do not (Spencer 1988).

approximate ages of children in the homestead (*enkang)* during interviews (e.g., "Were you this child's age at that time?").

Maasai widows can be a heterogenous group based on personal circumstances (Coast 2001). The lives of *intasati* in this study were similar and different in many ways. Their life experiences with livelihood roles, forest use, and power relations with men were generally the same. They were also all *intoyie* and *isiankikin* before 1976, their fathers were *Ilterito*, they never attended school, they gave birth to roughly the same number of children by 1995, and they were all widows living with sons and grandchildren (Table 4.1).

Table 4.1 Demographic characteristics of *intasati*[a]

Year born	Her approximate age in			Circumcised		Age set of her father	Age set of moran she sang for (circumcision group, year group established)	Age set she married (year married-year widowed)	Child-ren	Grand-children
	1976	1995	2014	Year	Age					
1955	21	40	59	1968	13	*Ilterito*	*Ilkitoip* (Right hand *Ilkiseyia,* 1968)	*Ilkitoip* (1969–2014)	8	30
1931	45	64	83	1949	18	*Ilterito*	*Ilnyangusi* (Left hand *Ilkamaniki*, 1946)	*Ilnyangusi* (1949–1985)	7	20
1937	39	58	77	1957	20	*Ilterito*	*Iseuri* (Right hand *Ilterekeyiani,* 1952)	*Iltareto* (1958–1970)	7	16

[a]Years were generated using the event calendar and corroborated with family members when possible

The ways they were dissimilar were mostly demographic such as age, age of circumcision[72], age group of men they sang for and married, number of co-wives, places they migrated, decades they were widowed, and whether they bore children as widows.[73] The youngest was recently widowed, had cows, and fetched her own water and firewood. The eldest was completely dependent on her sons due to ill health and lack of cows when she was widowed. Widows have different challenges depending on wealth and family circumstance:

[72] In the 1950s, the age of girl circumcisions among *Matapato* Maasai started to become lower because of decline in traditional moranhood and increasing pregnancies among uncircumcised girls (Spencer 1988). This trend has continued in Maasailand (Coast 2001; Archambault 2011).

[73]Although it is uncommon for widows to re-marry because of practical complications with property and milking rights (Coast 2001), widows bearing children with lovers is socially accepted. The children belong to the late husband's patriline. In the case of one *entastat,* five of her seven children were born during widowhood and she refused to identify the father(s) for the interviewer.

> *My husband started drinking alcohol and became stupid. Before it was a woman without a husband who had problems. Today it is a woman without a husband who has no problems. They have a chance to go around and have a small business.* FKI-NFE-59
>
> *A widow who has riches is not oppressed. Today there are widows in this area who don't have owners and they don't have a shamba and maize. A man will come and tell her "I will buy your ox with this heifer." She gives him that ox but when she goes to look for that heifer it becomes a fight. She is told "Go remove the bones of your dead husband and then I will give you the heifer!"* FKI-NFE-77
>
> *I had challenges because he died without cows. I was the one to circumcise the children. I cultivated shamba for them. I also went borrowing. The whole burden was on me. People take care of a widow if she wakes up and cries for help*. MKI-NFE-83

Interviews for each *entasat* ranged 3-12 hours long over several days. Interviews were flexible in time and locations and continued during household, childcare and livestock duties such as searching for lost cows weakened from drought, suckling a crying grandchild, making meals for children, tending a girl who had given birth, checking calves, counting cows at sunset, and collecting firewood and water. Only the investigator, the informant, and a female research assistant (who verbally translated questions and answers) were within earshot during interviews. A total of 26 hours of conversation were audio-recorded and transcribed into 88 pages of typed text. Data was loaded into *Nvivo* software to conduct queries of coded content.

This chapter addresses questions emerging from the intersection of culture, environment, and livelihood (Figure 1.1):

- How did the land change between 1975, 1996 and 2014? How did elderly women perceive it? How do their perceptions align with geospatial findings?
- When did changes in land use, livelihood, and gender relations occur? How do they align with geospatial findings?

4.4 Results

This section describes how and when the land changed between 1975 and 2014 and how the *intasati* her-stories aligned with the quantitative data.

4.4.1 Land change

Quantitative extents of land cover for Loita Forest and Empurputia appear in Tables 4.2 and 4.3. Land classification maps are presented in Figures 4.2 and 4.3. Graphic illustrations of land change are in Figures 4.4 and 4.5.

In the Loita Forest area, grassland was the dominant cover comprising over half of the area from 1976 to 2014. Despite grassland's characteristic resilience in this ecosystem (Homewood & Rodgers 1991), it showed a 14-21% decrease in Loita Forest area and in Empurputia from 1995 to 2014. This is associated with the significant increase in light forest/bushland in both spaces. Indeed, bushland establishment was the biggest change in both places, particularly in Empurputia where it increased 147%.

Table 4.2. Loita Forest: Extent of land cover in 1976, 1995 and 2014 and percent change between 1995 and 2014

Land cover	1976		1995		2014		Change (1995-2014)	
	km²	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**
Forest total	467.55	37.79	434.78	35.16	517.53	41.85	82.75	19.03
Dense forest	197.58	15.97	303.85	24.57	282.44	22.84	–21.41	–7.04
Light forest/ Bushland	269.97	21.82	130.93	10.59	235.09	19.01	104.16	79.55
Grassland	747.60	60.42	732.98	59.26	630.40	50.97	–102.58	–13.99
Hydrophytic vegetation	2.24	.18	1.82	.15	2.37	.19	.55	30.21
Bare land	19.94	1.61	67.15	5.43	86.4	6.99	19.25	28.66
Total	1237.33	100.0	1236.73	100.0	1236.78	100.0		

Table 4.3. Empurputia: Extent of land cover in 1976, 1995, and 2014 and percent change between 1995 and 2014

Land cover	1976		1995		2014		Change (1995–2014)	
	km²	**%**	**km²**	**%**	**km²**	**%**	**km²**	**%**
Forest total	19.90	65.04	18.3	59.8	21.91	71.59	3.61	19.72
Dense forest	6.84	22.36	14.11	46.1	11.56	37.78	-2.55	–18.07
Light forest/ Bushland	13.06	42.68	4.19	13.7	10.35	33.81	6.16	147.01
Grassland	9.91	32.37	9.80	32.0	7.79	25.45	2.01	–20.51
Hydrophytic vegetation	.48	1.56	1.50	4.9	.60	1.96	–.90	–60.00
Bare land	.32	1.03	1.10	3.30	.31	1.00	–.79	–71.81
Total	30.61	100	30.70	100	30.61	100		

In Empurputia, forest was a more dominant land cover (Figure 4.4). Dense forest loss was apparent in both spaces between 1995 and 2014 but more so in Empurputia where it decreased from 14.11% to 11.56% km² or 18%. The pattern of dense forest decreasing as light forest/bush increased (and vice versa) was characteristic of both places. These trends are suggestive of ecological forest succession dynamics when bush encroaches as it is driven by such factors as

Figure 4.2 Loita Forest area: Satellite images with land cover classifications for 1976, 1995 and 2014

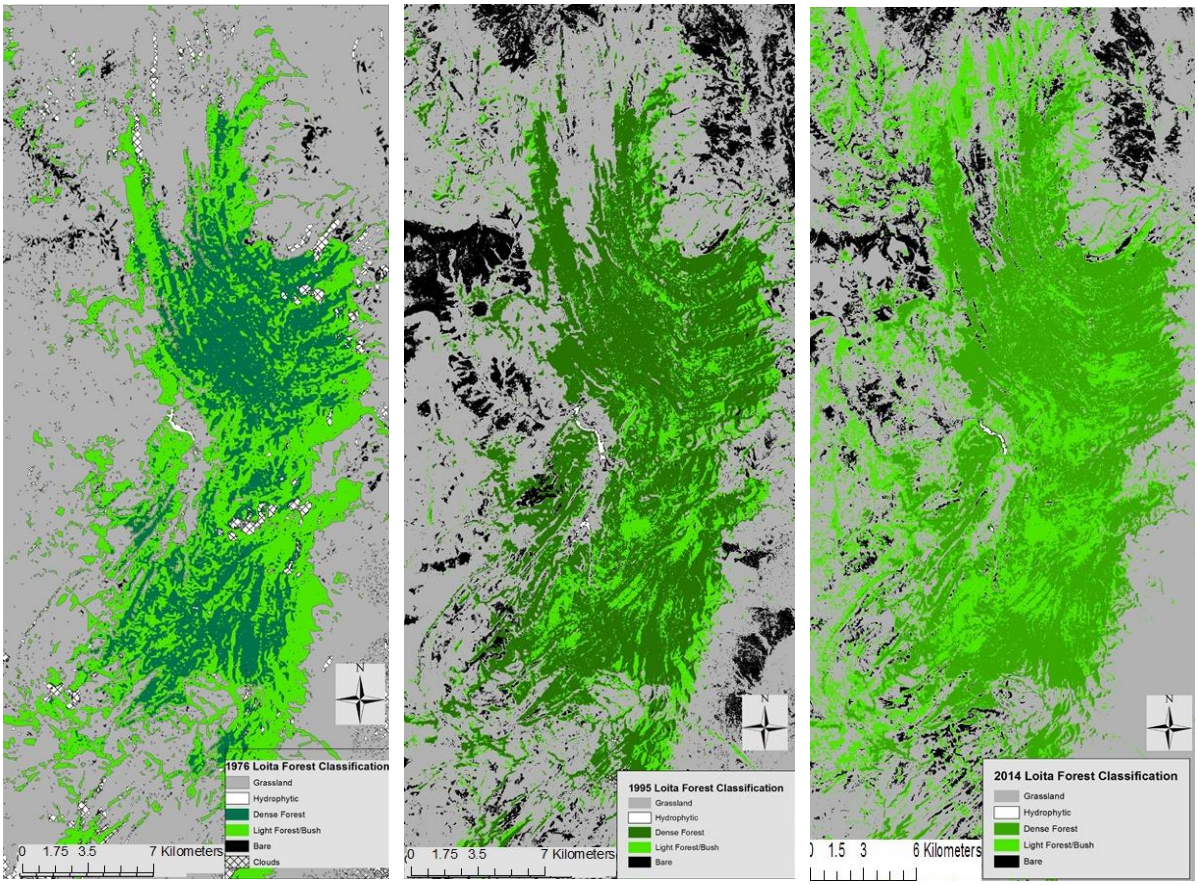


Figure 4.3 Empurputia: Satellite images with land cover classifications for 1976, 1995 and 2014

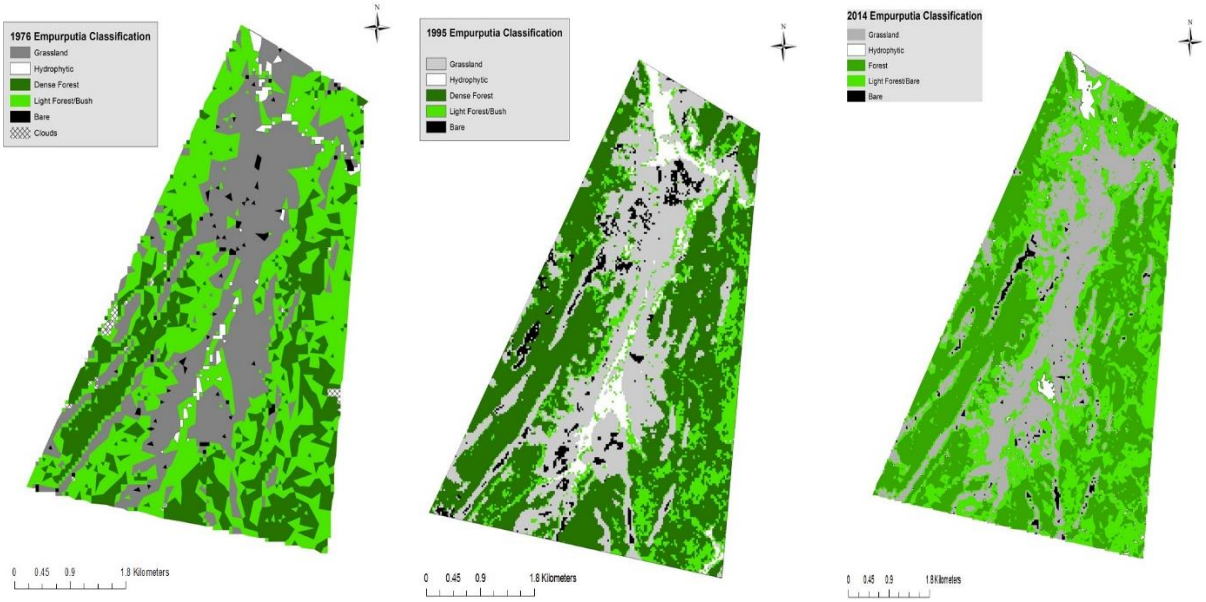


Figure 4.4 Loita Forest area: Land cover change 1976-2014

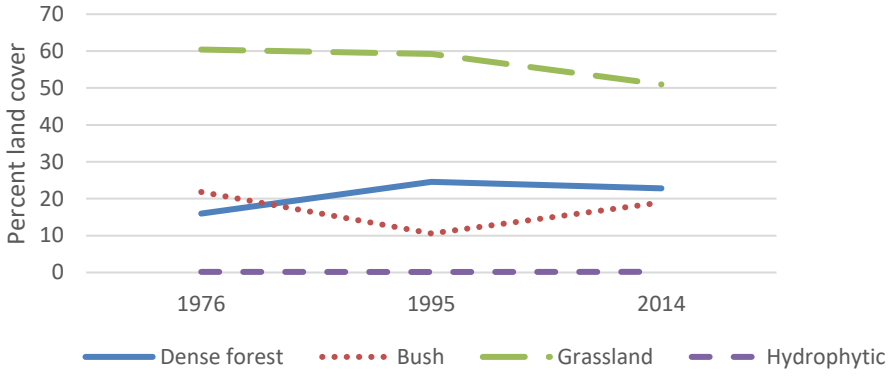
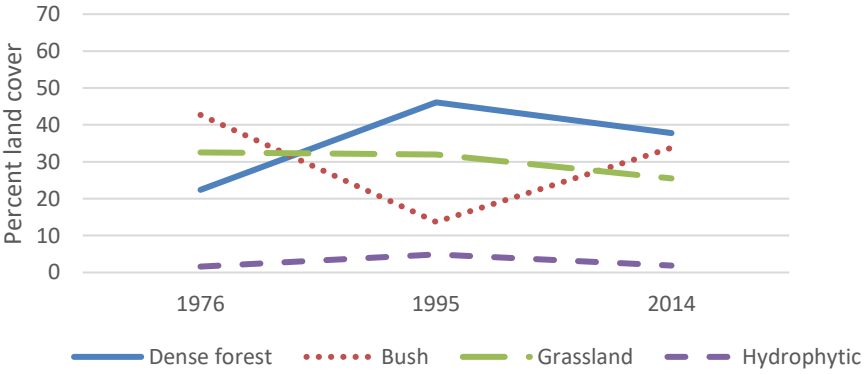


Figure 4.5 Empurputia: Land cover change 1976-2014



fire, climate, groundwater levels, wild herbivores, and anthropogenic influences. In African savanna ecosystems, anthropogenic fire is a management tool for suppressing bush encroachment. In heavily grazed areas when fire is excluded, the seedlings and saplings of encroacher species can establish and intensify within once sparsely treed grasslands along a linear rainfall gradient (Rohde et al. 2012; Sankaran et al. 2008). Furthermore, positive feedback loops can affect climate and further degrade ecosystems because of modifying surface albedo, the carbon cycle, and precipitation recycling (Lambin et al. 2003). In any case, there was a clear association between bush establishment and dense forest loss and the phenomenon was accelerated in Empurputia.

There was significant (60%) loss of hydrophytic vegetation in Empurputia wetlands between 1995 and 2014. [74] Although it's a relatively small land extent, this trend signals deterioration of a key natural resource. In losing relatively more hydrophytic vegetation, dense forest, and

[74]See Footnote 68 for characteristic vegetation.

grasslands, and gaining more bush than Loita Forest, Empurputia is a microcosm of trends of ecological change in the region, and at a faster pace.

Bare land was the smallest land cover in Empurputia. Unfortunately, due to Landsat's limited capacity to differentiate farm plots from bare ground or low vegetation, it was not possible to quantify loss or gain of cultivated land and link it to other land patterns. Others have documented confusion in classifying land cover at forest edges in deforested areas and distinguishing small plots from grasslands (Baldyga et al. 2007). Small agricultural clearings in heterogeneous landscapes such as Loita Forest require higher spatial resolution (5-15 m) and algorithms that can account for differences in spectral reflectances that are not pronounced such as between cultivation and grassland (DeFries et al. 2007).

These results highlight how important local situation-specific land change data can be to larger scale multitemporal trends. For example, verifying vegetation changes with local people was critical to explaining the discrepancy between present findings and a global database on forest loss (Hansen et al. 2013). Based on this study's local field verification, interviews, and secondary climate data[75], this discrepancy was probably due to erroneous interpretation of actual swamp grass (as tall as 3-5 m) as forest (Figure 4.6). Similar limitations of this global data set have been documented elsewhere.[76] These issues are relevant because un-groundtruthed coarse interpretations of global forest loss data can generate policies based on unfounded models. In this case, the global gaze would grossly underestimate the human-environment interactions of land use and local hydrology in shaping land cover. The implications of local forest dynamics for the biophysical functioning of the region are discussed in Chapters 5 (Section 5.5.3) and 7 (Section 7.2.1).

4.4.2 1976 and before: Exposition

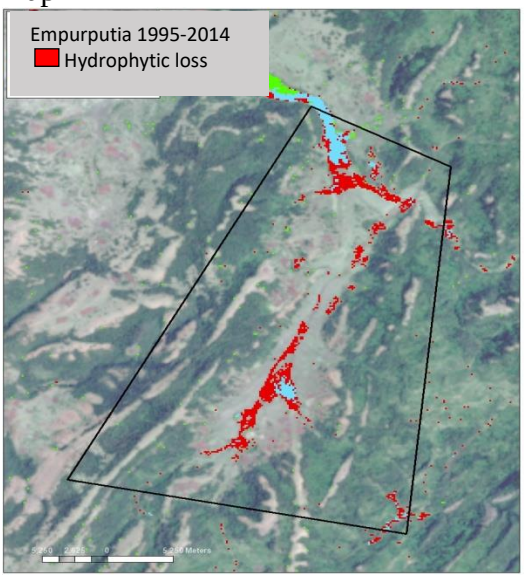
This period is called the exposition because it establishes the baseline for measuring change.

Early studies have depicted Loita Forest as a showpiece forest. Since then there has been relatively little research in Loita Forest but writers continue characterizing it as before, e.g., "While many of Kenya's broadleaf highland forests have been destroyed during the past fifty years, the Loita Forest represents an outstanding exception to this trend and a demonstration of

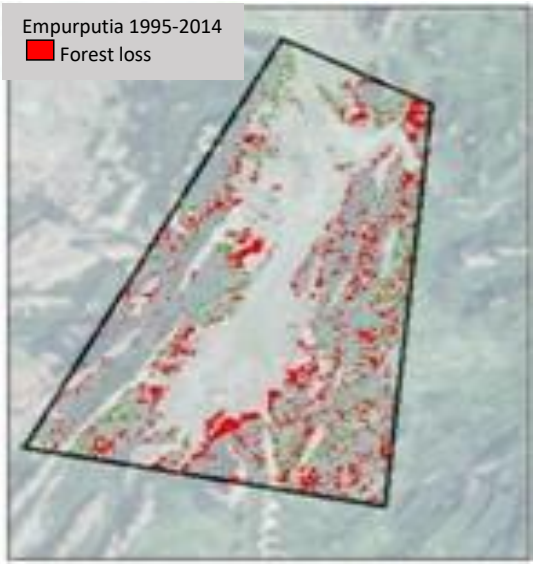
[75] High rainfall favoring wetland vegetation preceded 2000 (KMD 2004). The average monthly rainfall for Loita was 46 mm in 2008-2013 (NDMA 2014). In the El Niño year of 1997, the average was more than double at 95 mm. In nearby Narosura, 457 mm of rain fell in October to December 1997 followed by another 173 mm in January 1998 (KMD 2014). In the first three months of 1999, 216 mm of rain fell.
[76] Critical comments pointing to the inaccuracy of the global forest loss data set (Hansen et al. 2013) include (a) overestimating forest cover by using the definition of forest as land with trees taller than 5 m and (b) underestimating natural forest loss due to including plantations and agroforestry as forest which effectively also underestimates threats to biodiversity and ecosystem services (Bellot et al. 2014; Tropek et al. 2014).

Figure 4.6 Hydrophytic vegetation loss (Map A) and forest loss (Map B) in Empurputia for 1995-2014 compared with findings of forest loss for 2000-2012 using global data set (Map C) (Hansen et al. 2013)

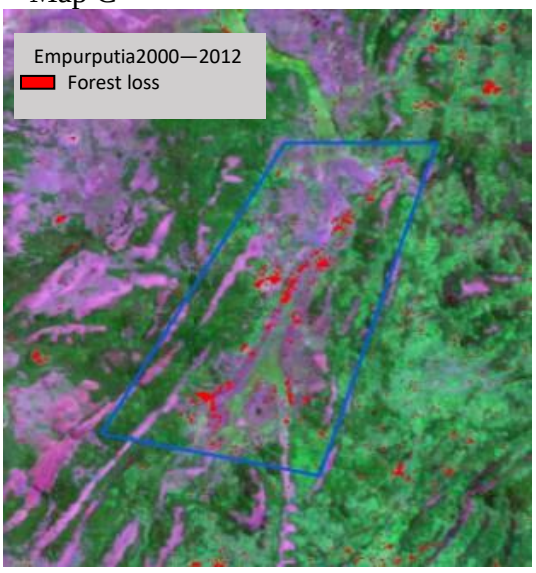
Map A



Map B



Map C



the potential of local stewardship." (Blomley et al. 2007:12) Such descriptions could serve conservation or indigenous people's development goals but based on present findings the forest and people who live there have not been immune to change.

In the early days before 1976, livelihood roles and forest use followed strictly gendered power relations. This section adds her-story to gender-blind narrative about pastoralists living in "the best managed land under long term Maasai occupation that we have ever seen." (Talbot 1960:54) It gives oxygen to a more realistic understanding of the primary resource users. The gender lens

produces new knowledge about traditional forest use, a culture in transition, and the pioneers of livelihood shift.

4.4.2.1 1976 and before: The land
The showpiece forest and swamp of Senteu

Changes in Loita Forest occurred at a slower pace compared to other Maasai lands in this period. Unlike the rest of Narok, the Loita Hills to the Siria escarpment were relatively clear of tsetse-driven ecological change after the turn of the 20th century (Waller 1990). In the 1950s, British government records referred to Loita forests as uninhabited and having valuable timber that was too far (225 km) from the railway to be exploited (Betts 1952). When Maasai forests were inspected by the Forest Department for timber potential, officials recommended a Forest Station in Loita but the Maasai Council rejected it. Ultimately, gazettement of Loita forests was not considered as urgent as Mau forests.

In 1960, the Loita highlands were described this way: "The combination of moderate burning and moderate grazing has maintained the area in a highly productive mixed grassland and effective watershed forestland for over 50 years. This area might be used as a show piece or demonstration area to point out to other Masai what a good management job Masai can do." (Talbot 1960:54-55) In contrast, the Loita plains, Mau forest region, Mara Fly region, and Trans-Mara highlands were reported as mis-used by Maasai from livestock overgrazing, unmanaged burning, and/or cultivation. Talbot (1960) also spoke of less disease and fewer parasites in the Loita highlands and the availability of ample grazing. These conditions were corroborated by the first person to settle in Empurputia—an *Iseuri* age group leader:

> *I was the first. I moved here with 100 cows when Ilmauya [77] were moran before independence. Ticks made me run away from where I used to live in Kisokon [78]. The cows of my grandfather Senteu [79] grazed here a long time ago. All this place from Olngarua to Empurputia was the Swamp (esere) of Senteu. There were no people.* MKI-NFE-80

The 1976 satellite image showed expansive grasslands comprising 60% of Loita Forest area cover. The relative cover of dense forest and wetland vegetation was greater in Empurputia and the grassland extent was about half of the Loita Forest area. These results highlight diversity in these ecosystems and the need to assess their change dynamics separately, as this study does in the following sections.

Compared to the population density of 13/km² in Narok District in the 1970s, there were fewer people in Loita—only 4/km² --and even fewer in the Entasekera sublocation where Empurputia is located (Kenya 1981). The dark forest (*entim narok*) was a place people feared. It could "eternally swallow adults" (Tarayia 2004:188) and was full of monsters:

[77] *Ilmauya* were moran 1960-1967. Independence from Great Britain was in 1963.
[78] Ticks carry East Coast Fever (*oltikana*), a fatal livestock disease in Maasailand even today.
[79] Senteu was Chief Laibon of *Iloitai* and favorite son of the Maasai prophet Mbatiany who predicted the coming of white people (Ndege 2003, Ole Sankan 1971). He was born around 1850 and died in 1934 (Mol 1996). This informant said Senteu moved to the area from Ngong when the informant's father, Simel ole Senteu, was still a boy. Ndege (2003) says it was about 1910 when he moved.

> *This forest stayed a long time without people getting into it because of strange stories about a giant animal called Naibor.* MKI-NFE-64

> *There was the story about trees with edible fruits. If you cut them a giant would hit you with its branches. There was also the story of a forest animal with one sharp leg. If you went into the deep forest while herding it would kill you with that leg.* MKI-NFE-48

> *There was an animal that looked like algae that lived in trees. It had one eye and killed buffaloes and ate them. If you cut a tree it would spill blood. Parents told us if we cut a tree even for a toothbrush the laiboni would know. There was also Enkuku Naibor a giant forest baboon who talked. When I was a boy I believed that if I was near that Naimino Enkiyio I would not cut a single tree*. MKI-HE-50

This study shows that whereas the remote forested watershed in Loita may have represented a showpiece of good management by Maasai a half century ago, Empurputia is a demonstration of change drivers converging between 1976 and 2014.

4.4.2.2 1976 and before: *Intasati* her-story
We migrated with the rains, we followed moran to the forest, we planted the houses ourselves, we pulled construction materials home like a prisoner

This section highlights gendered power relations and resource use as *intasati* were girls (*intoyie*) and young mothers (*isiankikin*).

Livelihood was described as specialised pastoralism. People moved to where elders said the rain and good grass were—to the places that liked cows. Forest glades were created with fire so cows could graze. This 83-year old *entasat* described the details of 18 moves and marked the passage of time with rain, location, and male age groups:

> *We moved. We moved. My father was Ilterito [80] and moved only to places that had rain. When men heard it had rained in another place we moved there. They followed good grazing. I remember the forest was burned a lot (oleng) so cows could get new grass (empejoto) and graze without being disturbed by wild animals. We stayed in Olmesutie for a short time because the short rain ended very fast and it started raining in Mausa so we stayed there six months. Then we circumcised Ilkiseyia [81] in Olorte. What made us move to Emorogi was to look for grass. The men drove the cows and we drove the sheep goats and calves and we carried the little ones on our backs. We were just pastoralists (roncoi). There was no cultivation.* FKI-NFE-83

Moves were also driven by men's violence with other tribes, clans, Maasai sections, and even within age groups. In this description appear tensions over territory extending back to the early 20th century and those between *Purko* and *Iloitai* continue today (Kronenberg Garcia 2015):

[80] *Ilterito* was the ruling age set (Spencer 1988; Kronenberg Garcia 2015). British colonial administrators used the authority of age sets to control moran cattle raids and so *Ilterito* power was solidified and used by the British before 1976. *Ilterito* were warriors from 1926 to 1948, held their *eunoto* in 1948 (Mol 1996) and by 1976 were likely transferring authority to *Ilnyang'usi*.
[81] *Ilkiseyia* circumcision group was established in 1968.

> *There was violence between Purko and Iloitai. They speared each other. One from the Purko family of Ntanai died and one from the Loita intorobo*[82] *family of Olokipai died. Ilterito men despised each other.*[83] *So we moved to Olngarua and we stayed until inkidongi came to bewitch my father. Then we went to Murja for some time and when Ilkiseyia were moran there was violence with Sonjo.*[84] *They came and raided cows in Kipelian and an old man who was Ilnyangusi was killed. They made a manyata* [85] *in Kipelian to fight back the Sonjo. So we were all moved to the manyata of those Ilkiseyia morans so they could fight back the Sonjo. There is where I gave birth to my first born.*[86] FKI-NFE-59

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Uncircumcised girls accompanied moran to the deep forest for *olpul*, a meat-eating feast and period of physical and spiritual restoration (Burford et al. 2001, Spencer 1988). The sites were always in the dark remote forest in accordance with cultural taboos against moran eating meat seen or touched by married women.[87] *Olpul* lasted days or months depending on the number of cows elders provided. It was this generation of men *intasati* referred to when asked to estimate their own ages.

> *We herded when we were young. When we grew we sang for Ilkiseyia and we became girls of moran. They took us to olpul in the forest. They slaughtered cows and we could stay there three months. Maasai moran went to eat meat in the forest because it was their strength. They could not go to olpul without the company of the girls who sang for them.* FKI-NFE-59

They ate meat (*inkiri*) and drank herbal soups (*imotori*) infused with roots, leaves and bark of specific forest plants in accordance with gendered purposes:

> *There were two pots buried in the ground. The herbs boiled for men and girls to kill thirst were olkilorii,*[88] *olkonyil, oledat, olkirenyi, and olakediai. But that pot with olangunguai girls were not allowed to drink. It was for moran to make them go crazy, not fear anything, to make them brave when they go stealing cows, hunting buffaloes, and killing lions.* FKI-NFE-83

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[82] *Intorobo* is the feminine form of the masculine *iltorobo* (Mol 1996) which local people used to refer to honey gatherers in Loita Forest. Maasai scholars describe them as indigenous people who once occupied the highland forests of Kenya (Yeoman 1993), who until recently subsisted by hunting, fishing, and gathering, and who today own livestock and live in small isolated groups (Spencer 2012).

[83] Such rivalries can start during moranhood and extend into elderhood (Kronenberg Garcia 2015; Spencer 1988). For example, forest conflict in the 1990s was fueled in part by inter-age set rivalries among *Iseuri* (Zaal & Ole Siloma 2006).

[84] In the early 1970s there was violence with Sonjo (*isonjo*) over livestock theft (Goldman et al. 2014). Sonjo are Bantu agro-pastoralists in northern Tanzania who continue to clash with *Iloitai,* including in 2012 (Kronenberg Garcia 2015).

[85] Manyata is an anglicized version of *emanyata* which means a settlement where male age grade ceremonies were held. It also refers to the style of mud/dung houses constructed for those events.

[86] Approximately 1970.

[87] The basis of this rule was to prohibit moran from sex with married women since the wives of morans' fathers were considered mothers (Spencer 1988; Talle 1988).

[88] See Burford et al. (2001), Bodeker et al. (2001) and Duke (1992) for antibacterial, antifungal, and antiviral pharmacologic properties of *olkiloriti* (*Acacia nilotica*). Inhibition of human immunodeficiency virus (HIV-1) has also been documented for this plant (Hussein et al. 1999, Tan et al. 1991). Merker (1910) reported use of *olkiloriti* and *olkonyil* among Samburu at the turn of the last century. *Olkiloriti* grows in arid bushland, where this *entasat* lived as a girl, so it was likely carried to the forest for *olpul*.

Depending on ages of informants, stories conflicted about sex and using forest plants for birth control at *olpul*. The older *intasati* (and older elders, as well) insisted there was no sex and no herbs used for birth control because sex was taboo in *olpul*. However, the youngest widow (and younger elders) spoke of forest herbs taken at *olpul* to prevent pregnancy, suggesting a relaxation of cultural expectations in more recent times: [89]

> *We drank herbs in olpul—olkonyil, osokonoi, enkoriri. When you drank them, you could not get pregnant. About 10 roots were boiled and in the morning moran and their girls drank it. When Maasai drink this herb they no longer sire children. It kills the eggs of both men and women.* FKI-NFE-59

> *We were big girls whose breasts had fallen, and we were told where to sleep and nothing would happen or the meat would smell.* FKI-NFE-83

> *Moran and girls did not sleep together because the meat would not be good to keep them strong. If a moran sneaked sex he would be caned and chased away.* FKI-NFE-77

During interviews, all three *intasati* enjoyed singing the songs they praised their moran with long ago (Appendix 4). Many verses referred to forest giants that moran saved them from. *Olpul w*as the happiest time of their lives:

> *The only time I was happy was when we went to the forest and played with moran. We went without clothes and put on swords like morans.* FKI-NFE-83

> *We were happy because we were girls of moran, our hearts were happy, we played and sang until evening. Happiness was full in my body.* FKI-NFE-59

Their lives changed abruptly from the days of *olpul* to their circumcision and being married off. Men had all the decision-making authority over them:

> *When I was to be circumcised, elders went to the forest to request morans to allow us to be circumcised. The moran told them we will allow it when we are done slaughtering the oxen. Then we all came out of the forest. My lover moran stayed around to see whether I would cry when I was circumcised. After we were circumcised we didn't follow moran. They didn't want us. We had become women and we no longer drank herbs for family planning.* FKI-NFE-59

> *Women were not involved in marrying girls because they feared men. A girl would not go out of her home until her father gave her away. There was no quarrelling because women feared men. He would say I am the one to decide for my child. If she said something he would beat her. Men had power over everything,* FKI-NFE-77

As wives, there was a lot of fear (*kaure*) of men. The older *intasati* [90] mentioned beatings 12 times, fear 35 times, and often in the context of respect (*enkanyit*) (13 times) that dictated

[89] See Leakey (1930) for strict rules about sex with moran and strategies for contraception (not involving herbs) that were probably in effect when older *intasati* were young. In contrast, Talle (1988) spoke of moran secretly stealing sex with girls at *olpul* at the time of her field work in 1979.

[90] Older women in Maasailand report frequent beatings "like a donkey" (Hodgson 2001:43) for not conforming (Spencer 1993). A *Matapato* woman who was 63 in 1976 when beatings by brothers, fathers, moran, and husbands were common, said "It is the men, of course, who control things, but the wives do

appropriate behaviors based on gender, age and marital status (Coast 2001; Talle 1988; Spencer 1988):

> *I feared my husband so much I couldn't even cook when he was inside the house or when he was looking at me.* FKI-NFE-59

> *We feared men. It was a way of respect. We feared to look at them or say anything when they were standing because we had respect. A woman feared her own husband and men in other bomas. If she woke up [91] and spoke she would be beaten or cursed by men of the same olporror. We had respect which made us fear men.* FKI-NFE-83

> *A woman was beaten for not taking care of cows, because of a lover, or because he was poor. They beat us and we accepted it. We were seen as children.* FKI-NFE-77

Men relied on women for every aspect of house-building. As one *entasat* put it *"If the woman didn't build it, you slept outside*. *Men never constructed houses.*" (FKI-NFE-59) Their memories of building were meticulous in detail:

> *When we were moving, we made houses of skin (ilngoborri) with only one bed. We didn't stay a month. If we stayed longer, we made manyata houses out of dung. I went to the forest and cut olmisigiyioi and olkinyei strong enough to hold the skins. I planted sharp sticks, tied them with ropes, attached the skin on top, and we squeezed to sleep. In the morning, I untied the ropes and put the sticks parallel on the back of donkey with the skins because there were no sticks where we were going. We are the last generation to live in skin houses.* FKI-NFE-77

> *When not moving, I made a nice manyata house of cow dung. I measured where children will sit, where men will sit, and a place for the calves and young goats and sheep (olashepani). I went to the forest for posts (mbokishi) of oloirien, olmisigiyioi, olgilai, olmaroroi, ormorijioi, and oledardar. I used strings (esopikiai) to tie the sticks of oloirien, oloyiangalani, and olokildiai on the roof. I carried as many as I could. When I arrived home, I requested the children to bring me a cup of water. In the morning, I put cow dung on the ground so the posts were straight. I dug holes for center post (engape) of olkinyei, planted the four walls and tied the sticks around the posts. I plastered with cow dung. I went back to the forest for straight posts to make a nice bed and mat (olarusai olamsai) of osinoni so it does not hurt me and the baby.* FKI-NFE-77

The youngest *entastat* seemed more resentful of the inequitable labour burdens of construction: [92]

> *Men ordered us to go get fencing materials from the forest despite our other house duties. If you didn't do it, you were beaten. For us work was hard. We didn't rest the whole day. You repaired the house, took the panga to the forest for fencing material, you tied them, and pulled*

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not mind for they do not want to interfere in matters that belong to the men" (Spencer 1993:167*)*. Today Maasai women's non-acceptance of physical abuse is considered a barometer of societal change (Goldman & Little 2015).

[91] Stood up.

[92] It is estimated men laboured about 2 hours per day with livestock since herding was done mostly by older children in this period (Rutten 1992). Women's workload was greater, especially while migrating, building shelters, and milking large herds.

them home like a prisoner. Men did nothing since boys did the herding. Men sat in the shade playing entotoi.[93] *They played until evening.* FKI-NFE-59

There was also labour in collecting fuel and water, both tree- and forest-related activities. Work was more differentiated by age back then, not a lot of firewood and water was required for the simple diet, and in times of drought, tree bark tea replaced milk as food for children:

Women did not go for water, only us children. We didn't have big containers. We used calabashes. When you filled it you put it in the corner of the house since it had little use. There was no bathing. No cups. FKI-NFE-83

When a woman went for firewood it would last two weeks. Cooking was little because we only cooked blood. Firewood was near because people were few and giving birth was small. A woman gave birth to one to two and then she cut.[94] *There was no flour. No cultivation. When milk was plenty we drank it as food. When there was less we drank blood and slaughtered cows for meat. There was a diet called inkipot, and mpuko. Blood was harvested from the vein of a cow in a gourd (esiangau) curdled, cooked in a pot, and served with a knife. We had it with tea as you would use cake or bread. You might confuse it for steak. For mpuko, water was put in a pot with milk and blood. Cow fat was added and you drank it. That kept us alive.* FKI-NFE-59

When milk was not enough we put aside milk for the man and went to the forest for the bark of ormisigiyioi to make tea for the children. FKI-NFE-83

The *intasati* communicated a sense of personal (albeit subservient) identity in their forest-related activities of the past (also see fertility blessings in Section 4.4.3.2):

We planted the houses ourselves, without men. FKI-NFE-83

We owned nothing. Only the food in the fire. FKI-NFE-77

What made me the happiest was when I was in the forest with morans. I did not have stress in my heart. I liked the singing. There was no hunger since we ate meat and if you felt like sleeping you went to sleep. FKI-NFE-77

From this exposition period, characterized by relatively few people, dominant grasslands and woodlands, sustainable livelihoods, and strictly gendered identities and activities, local lives and land cover started transforming.

[93] *Entotoi* means small pebbles and refers to the stream of the same name flowing down the escarpment nearby (Mol 1996).

[94] Lower fertility is a possibility early in this period but evidence is scant. Around 1950 the fertility rate was about 3.2 for Kenya Maasai (McKay 1950). In1998 it was 9.2 in Narok County (Coast 2001). The Maasai demographer, Ernestina Coast (2001) discussed historical evidence for a rise in fertility among Maasai in Narok County from the 1970s to the time of her fieldwork in 1997-1998.

4.4.3 1976 to 1995: Rising action

This is called the rising action period because the drivers of livelihood transformation were becoming apparent. Grasslands appeared relatively unchanged while the negative association between dense forest and bush was clearly underway. Dense forest was increasing as bush declined, perhaps following a cycle of natural succession.

Older people had memories of a healthy forest ecosystem at the end of this period, as reflected in the vision statement elders wrote for a forest plan they developed in 2012:

> *Our vision is a Loita community that legally owns its land and has capacity to sustainably manage and equitably benefit from a healthy ecosystem as it was in 1994.* (Loita Council of Elders Community Natural Resources Management Workshop, July 19, 2011) (Westervelt 2012)

The her-story below sheds light on women's lack of opportunities to "equitably benefit" from the ecosystem like the elders did. It shows how women's workload increased with cultivation, cows became cash they had no rights to, and diet shifted away from the milk they had authority over. Women remained actively complicit in defining themselves in terms of their fertility. This is when *intasati* first mentioned development, cultivation, schools, and political leaders— roots of the major transformation ahead in 1995-2014.

4.4.3.1 1976-1995: The land

He wanted to move where…the cows could be near the forest. FKI-NFE-77

A very plausible factor in this period's dense forest gain is the fire cycle of *olatarakua* cedar. With *oloirien,* it was once the dominant tree canopy association here (Bussmann 2001; Maundu et al. 2001). After a fire, herbaceous species and cedar seedlings fill in. When closed canopy is reached, cedar outgrows and out-competes other tree sub- associations depending on the seed bed and soil and climate conditions. Synergistic effects of people with non-anthropogenic variables such as fire/rainfall/water table/large herbivores have been observed in Maasailand woodlands (Dublin 1995; Homewood & Rodgers 1991). Indeed, these dynamics are so interwoven that climax vegetation and ecological balance are very debatable concepts in woodlands (Fairhead & Leach 1998; McNeely 1994; Pellew 1983; Scoones 1999). The effects of frequent burning on the hydrology of this area have been mentioned (Talbot 1960)[95] and ever-changing oscillations in the forest/grasslands/swamp mosaic are likely the norm in Loita.

Rainfall is also likely involved in the increase in dense forest (and water catchment) along with the doubling of the extent of hydrophytic vegetation in Empurputia. [96] Also, there was minimal

[95] Talbot (1960: 16, 52, 56) described how prevalent the burning was in Loita Forest: "New grassland areas are continually being cleared from forest or bush by fire… There is apparently little burning of the grasslands themselves." But he also recognized its effects on the watershed: "The most immediate management requirement is control of the watershed burning in the north and west of the plateau, which burning already appears to have adversely affected stream flow to the grazing lands below."

[96] Historical rainfall records for the area were unavailable for years prior to 1973 which precluded fair comparisons with 1976-1995 rainfall.

pressure from human activities and grazing in the wetland itself due to impassable water levels and presence of dangerous wildlife (Robertshaw 1990).

Bare land was relatively small in extent. The qualitative data in this chapter cannot support a link with a climate/cultivation hypothesis because the imagery did not differentiate cultivated plots from grassland. The challenge in distinguishing crops from natural vegetation with remote sensing has been documented elsewhere (Mwita et al. 2013).

4.4.3.2 1976-1995: *Intasati* her-story

We *didn't follow cows anymore; they bought me medicine that bubbled when I gave birth; we went to the forest for fertility blessing (emayian oo inkituaak)*

This period highlights traditional gendered power relations as *intasati* settled into family life on the edge of a dark forest as young mothers raising children (*isiankikin*). Men burned in the forest for pasture and for safety from wildlife:

> *We moved to this forest the year when Ilbuluka were circumcised.*[97] *You could not see a place which had light. We feared the forest. The dark (entim narok) was continuous. You didn't have a place to pass. They burned places in the forest for grass and for people to pass.* FKI-NFE-83

> *We didn't follow cows anymore. He wanted to move where he could make his own home and cows could be near the forest because leaves for cows never get finished.* FKI-NFE-77

> *There was a lot of burning to remove empejoto, a lot. Today it is not burned. There were wild animals. The only ones that ate people were lions. The moran went to fight them because they were just as brave as the moran. Elephants loitered in that swamp. The grass was so tall you could not see them. When we were junior women was the last rhino we put our eyes on*. FKI-NFE-59

This is when they first mentioned cultivating, selling cows, cash, education, and new foods and medicines. Children's births were the benchmarks of time:

> *When I gave birth to the last born was when we started educating children.*[98] *Before there was no schooling.*[99] *Selling of cows also started then. Cows were taken to Ngong and they could buy me fat and flour. When I gave birth to the last born they bought me sugar and medicine that bubbled.*[100] *I did not know those foods when I gave birth to the others.* FKI-NFE-59

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[97] This left-hand circumcision group (also called *ilmejooli*) of *Ilkisaruni* age set was established in 1988.
[98] Approximately 1990.
[99] Data on school enrollment in Loita and Narok County are scant for this period. According to one estimate, 50-55% of boys and only 15% of girls attended school in Loita in 1990 (Voshaar 1998). Holland (1998) reported attendance of one sixth of Maasai children in Narok District. In remote Empurputia there were no primary schools within walking distance until 2002. There was no secondary school in Loita until 2006. Resistance to formal education persists today. In 2009, 68% of household informants were reluctant to send children, particularly girls, to school (ILIDP 2009). Primary education became compulsory and free in Kenya in 2003.
[100] Antacid.

Men dominated decision making over cows and cash. During Talle's (1988) work in the area in 1979-1981 she only saw two occasions of women's decision-making autonomy (one was a widow) in selling animals (not cows).

> *Women followed men. They had no power over a cow or a girl child. Men decided what cow to sell. If she told him which one, he would beat her and say "What cow did you bring here? Just watch and don't complain."* FKI-NFE-83

In digging small vegetable gardens on the forest edge to feed children, wives encountered wildlife conflict and resistance from husbands who shunned digging. This timing of depending on gardens followed the drought of 1983-84 when *Iloitai* received food aid:

> *We started to catch development. When I gave birth to the sixth child, I removed a small garden behind the house for the children to eat.*[101] FKI-NFE-77

> *I saw it rained here and a shamba did not die. In my second year here,* [102] *buffaloes, elephants and wild pigs destroyed crops and ate the maize. We were afraid. We didn't chase them away. We just sat and watched. We didn't get anything. Later we hit containers to scare them away.* FKI-NFE-83

> *I started a small shamba during the eunoto of Ilkishili.* [103] *My husband did not think it was a good idea. He said "Who told you to cook these leaves? Give me milk." It continued that way until a year later I cooked onions and tomatoes with flour and he ate it and got satisfied. He woke up and he dug the whole shamba.* FKI-NFE-59

The forest uses they described concerned their reproductive role, i.e., pregnancy, children's medicines, and fertility blessings:

> *Children's diseases were not many, only colds and chicken pox. When children became ill old Maasai women knew the medicines and told us "this leaf or root likes that disease."* FKI-NFE-83

> *During the third trimester women were not allowed to feed a lot so that the something in the stomach would not become big. I was given a glass of fat to drink and osumeitai. The roots were ground and mixed with water and when you drink it you vomit very much.* FKI-NFE-59

> *When you saw your child's teeth were coming out you went for osanangururi.*[104] *The child will get diarrhea and become skinny while teeth are growing. You scratched it until it was white, and you put it on the neck of your child so that the teeth didn't beat the child.* FKI-NFE-77

Preceding fertility blessings, two *intasati* traveled in a delegation (*olamal*) all over Loita to secure cows, money, and gifts for the elder who would bless them. Talle (1988) reported these events reflected community anxiety about low fertility and so the taboos about sexual relations became relaxed. *Intasati* conveyed an uncharacteristic sense of power about *olamal*. Asserting

[101]Approximately1983.
[102]Approximately1990.
[103]Approximately 1987.
[104]This plant (*Scutia myrtina)* still has medicinal uses today. (See Appendix 7)

their role as reproducers and "custodians of the moral order" (Spencer 1988:207), they even became violent to remove threats to their fertility:

> *The only opportunity women had to voice their views at that time was when we arranged for women's blessings. A man would slaughter a cow for us and in the barazas we would choose an elder to bless us. We discussed the women preventing the blessing because for example one had beaten her husband or just eaten*[105] *her child, or had a child out of wedlock. So, they were excluded and we would cane them so we were smelling good and we can go get blessed.* FKI-NFE-59

The *Iseuri* elders lead the ritual and decided where it would take place:

> *Men and women never stood together and discussed. Women did not go near men. The only time women had barazas was when they wanted to be blessed or if a woman had eaten a child. we would all go beat her.* FKI-NFE-83

> *The olamal I remember was during the time of Iseuri.*[106] *The man who presided over the blessing ceremony decided where the women would be blessed-- in oreteti*[107] *or using a calf. The women smeared themselves with cow fat and went to the forest with eight men who took them. The men found the oreteti with many hands (inkaik)*[108] *which touched the ground. Women went around and bent over the right hands of the oreteti then the left hands. They removed their belt (enkitati) that tied the lower shuka (olkesena) and hung it on the hands.* FKI-NFE-83

> *They slaughtered a cow about to give birth and poured the placenta fluid into leaves. As we went through the line the men spit (enkamulaki) on us and other men put wreaths of osinantei*[109] *on our necks.* FKI-NFE-77

The same *Iseuri* elders ushered in the most powerful catalyst of social, political, and economic change in Loita -- ILIDP. Nontraditional male leadership had arrived:

> *Loita started to have leaders with the Iseuri.*[110] *When I was a young girl there were no political leaders. The first to bring good leadership was Ole Sonkoi, the first leader of the Ilkerin Project.*[111] *When Ilkerin Project was being constructed I was pregnant with that boy. When Ole Sonkoi was the leader of Ilkerin was when I gave birth to him.* FKI-NFE-59

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[105] Miscarried.

[106] Kronenberg Garcia (2015) suggests the beginning of *Iseuri* governance was around 1984 when they had completed their stool ceremony and became firestick elders to recently initiated *Ilkishili* moran.

[107] Strangler fig (*Ficus thonningii*), a holy tree in Maasai culture, is used today in ceremonies and to clean calabashes.

[108] Aerial roots which hang from *oreteti.*

[109] This yellowwood (*Podocarpus milanjianus*) is also known locally as *olcani le kule* which means tree of milk because of its sap. It is used today for commercial timber and medicinal purposes, including strength after birthing. The placing of *osinantei* wreaths was reported by Mol (1978) in a 1976 fertility blessing in Loita filmed by Llewelyn-Davies (1984). Spitting was an act of blessing in this context.

[110] The *Iseuri* age group leader (*Ilterekeyiani* circumcision group) who said he signed the agreement establishing ILIDP and helped Voshaar build the road to Ilkerin in the 1970s was also the first person to permanently settle in Empurputia.

[111] Ole Sonkoi served as the first African leader at ILIDP from 1985-1997.

I was pregnant with the sixth child at the opening of the Ilkerin Project dip.[112] FKI-NFE-77

As Maasai scholars have documented (Goldman & Little 2015; Hodgson 2001), social movements affecting Maasai women were beginning to mobilize around this time but their influence was not widespread. Women's empowerment groups were getting established under ILIDP's new leadership and the community was rallying to stop the government's attempt to gazette their land as a reserve for tourism. But the *intasati* made no mention of them because, as they said, they were not welcome in men's meetings. They did not know what subdivision was. They were more focused on surviving. It is the younger women in the next chapters who were more eager to engage in these new movements.

4.4.4 1995-2014: Transformation

In this period, land and culture transformed in comparison to the past.

This was a period of accelerated change driven by God (*enkai*) and development on a macroscale. On a more immediate scale, there was increased settlement, cultivation, markets, church, and school. Concomitant changes in land and culture were dramatic compared to the early days. Shifts in roles and power relations were painfully clear in this *entasat'*s casual conversation with an elder that was overheard during participant observation:

Entasat: *Why don't you men do your duties?*
Elder: *What duties are you talking about?*
Entasat: *All the duties of the family. It's only women who are doing everything. Even the work of herding you leave to women. It is too much.*
Elder: *You should help us*.
Entasat: *You men go around the villages and come back home without food. You go to casual work to get money to take alcohol (maratina) but not to feed the family.*
Elder: *You women nowadays are very aggressive and capable in everything. You can manage the family better than us. So, continue to help us.*
Entasat: *All right. We will leave you men to keep singing the same song (aigil etoki nabo) while we women go forward and change to be heads of households. You should appreciate our efforts.*
Elder: *I agree. We appreciate your efforts.*

Coming from a post-menopausal *entasat* less bound by traditional patriarchal control, there was no rebuke by the elder for this message. But the content and confrontational tone mirrored the dismantling of traditional *enkanyit* norms. Gendered duties had changed dramatically and so had land cover. There were definite linkages between the two.

4.4.4.1 1995-2014: The land
Men are finishing the forest, the water was killed.

This is when the biggest land changes occurred (Tables 4.2 and 4.3) (Figures 4.2 and 4.3). Dense forest declined (Figure 4.7) and light forest/bush increased everywhere (Figure 4.8). In

[112] This event took place in 1983.

Figure 4.7 Loita Forest and Empurputia: Dense forest loss (red) and gain (green) 1995-2014

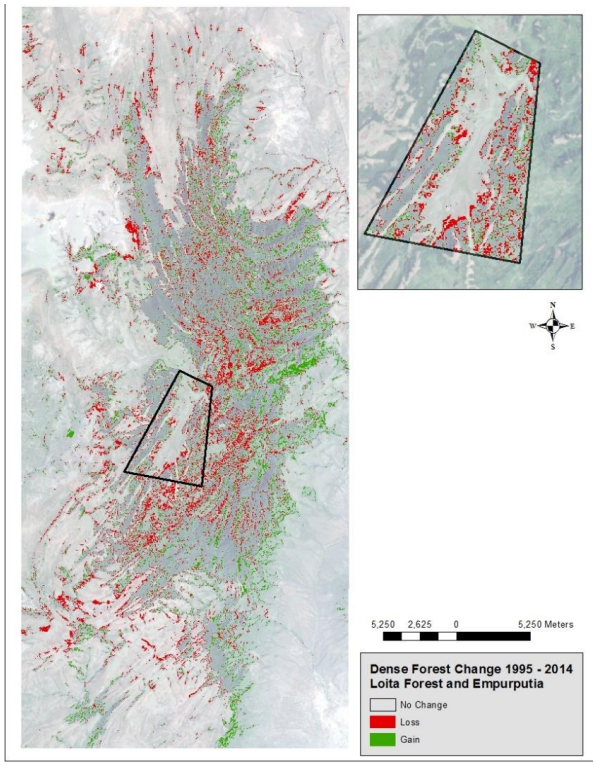
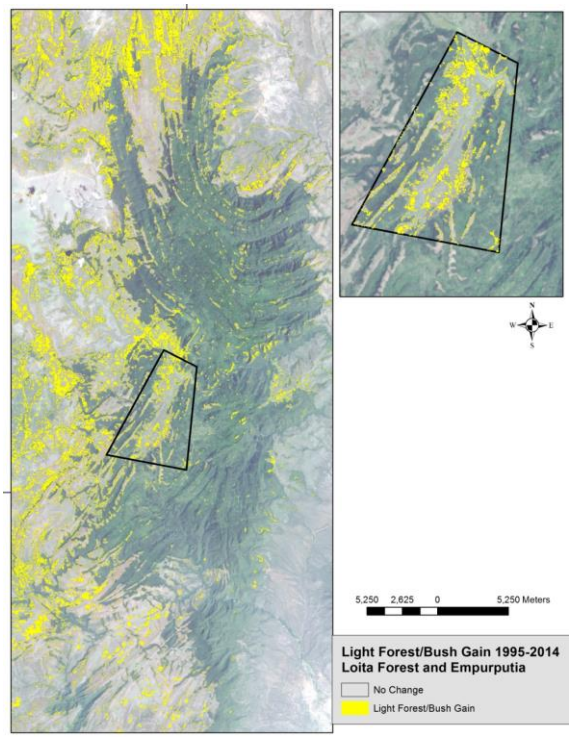


Figure 4.8 Loita Forest and Empurputia: Light forest/bush gain (yellow) 1995-2014



Empurputia, more than half the perennial swamp vegetation disappeared (Figure 4.6). Empurputia exhibited the same change trends as Loita Forest, only they were more exaggerated.

The patchy or diffuse spatial appearance of dense forest loss has been associated with small holder subsistence agriculture (Geist & Lambin (2001). Positive trends in rain-fed subsistence cropping in Maasailand are well documented (Campbell et al. 2005, Homewood et al. 2001, Serneels & Lambin 2001a). But qualitative data cannot link with dense forest loss due to increased cultivation in this period because, as mentioned, land cover patterns for cultivation are difficult to distinguish with Landsat (Campbell et al. 2005). According to *intasati*, the biggest change was men's new role of taking *oltarakua* timber with power saws for houses and fencing. Dense forest loss was much greater in Empurputia than Loita Forest (18% compared to 7%). These dynamics resemble what is called "cryptic" forest impoverishment in Amazonian contexts where the extent of forest degradation from logging and/or fires is not fully reflected in deforestation mapping because forest cover is reduced or degraded but not eliminated (Nepstad et al. 1999).

As for bush gain, bush and herbaceous vegetation were observed in areas where (a) forest edges were once cleared for cultivation plots but later abandoned and (b) there was elephant damage 10-20 years ago. The relationship between elephants and bush establishment is complex (Dublin 1990; Moss 2011) and probably accounts for part of this increase. The impact of elephants disappearing is likely nested with effects of cultivation, less burning, and repeated trampling by buffalo common that are common in Empurputia today along with accompanying changes in soil nutrients, bacteria, and physical structure. Buffalo are known to inhibit dense forest regeneration in this ecosystem (Bussmann (2001). The bush increase in the forest also recalls the same pattern operating in the historic period of *emutai* (Waller 1990) when historic seasonal patterns of grazing were disrupted and pastoralists were not lighting fires. The difference is that today the phenomenon includes land classified as forest, not just grassland.

Perceptions about the flooding and the swamp drying aligned with satellite images and records of El Niño (ENSO) rains in 1997-98 (Karanja & Mutua 2000) and severe drought in 2000-01 and 2004 (KMD 2014). ENSO history of increased rain during the short rainy season in East Africa (Hulme et al. 2001; McHugh 2006) was substantiated by a record 456 mm of rain in Loita during the 1997 short rains (October-December) followed by another 173 mm in January 1998 (KMD 2014) (NDMA 2014).[113] Swamp grasses (up to 5 m tall based on interviews)[114] probably flourished with ENSO and died back with drought (Crafter et al. 1992).

Interviews suggested tall swamp grasses disappeared with people settling in this highland drought refuge and cows over-grazing, trampling, and compacting soils in the swamp. Erosion effects of overgrazing were observed in the swamp, e.g., the dried swamp land was covered with pedestals of soil held against erosion by tussock plant roots and exposed soils between the pedestals had washed away. This desiccation probably related to forest loss but research on deforestation of indigenous montane forest ecosystems such as Amboseli and Mau Reserve

[113] The total rain for 1997 was 1047 mm compared to the average of 525 mm (based on 1996-2013 totals). In contrast, 2000-2001 rainfall was 286 mm and 2004 was 0 mm. (KMD 2014)

[114] The dominant grasses were *oltiol* emergent sedge papyrus which can reach 5m in small Kenya wetlands (Ashley et al. 2004) and *esere* cattail or bulrush.

demonstrate how variable this process can be on water systems depending on location-specific factors such as climate, geology, and land use (Mango et al. 2011, Meijerink & van Wijngaarden 1997).

4.4.4.2 1995-2014: *Intasati* her-story
God showed women how to fight back men and throw the respect (enkanyit) away.

This section highlights transformations in gendered power relations and resource use as *intasati* became widows with grandchildren. The women understood the drying of the swamp as triggered by an epic climate event (El Niño) that happened one night full of lightning:[115]

> *It rained and there was a lot of water that went up to ilodokilani. People moved in the night with cows and children. The Olasur river became thick. The forest started getting channels in the soil. The water grew and became the height of this tree. Then lighting struck a rock and it shook and broke. It was like God (enkai) had come. The water migrated away and removed this swamp.* FKI-NFE-59

> *When we moved to this forest the swamp was big. You could not go through. Water was deep up to my chest. Swamp grass (esere) was as tall as that oltarakwai and there were hippos. That time it rained lightning struck at night and finished that place where the rock was. In the morning hippos were gone. The water was killed.* FKI-NFE-83

The swamp drying was also attributed to droughts caused by God which forced more people into the study area to graze and access water.[116] Soils were probably compacted reducing water infiltration and increasing runoff and erosion:

> *Maybe God is making the swamp dry. Before when droughts were big, cows didn't get finished. They had a lot of grass and never became skinny. Today droughts can be longer and cows get finished. They eat the swamp grass and when cows are many they step on it and remove the water. Now cows fear being hungry more. Who does not feel his stomach complaining? It affects them in the same way as people. Everyone becomes troubled.* FKI-NFE-77

> *When we were children and young ladies there were not many droughts. They were not this big. What is bringing them is God. Today there is livestock rearing in this forest and settlement destroyed the swamp until it died.* FKI-NFE-59

Drought pressure intensified cultivation and men's off-farm work to save cows from being sold, thereby increasing women's workload at home to produce food and income. Accelerated by

[115] Elders confirmed these physical events but explained the draining of the swamp differently. They said after El Niño rains a natural dam eroded and undercut river banks and permanently changed swamp water flow.
[116] Loita population increased from 10,303 in 1989 to 15,557 in 1999 and 22,873 in 2009. This surpassed the growth rates of Kenya and Narok County (Kenya 2010b). The forest provided dry season refuge for most Loitans during droughts in 2000-2001, 2005-2006 and 2008-2009. When there were maize shortages in the 2000-2001 drought, some people survived on forest roots and fruits (Kronenberg Garcia 2015).

education and Christianity, the rhythm of life was different and women's workload increased. Days in the forest with moran, blessings, and getting materials to build houses were gone:

> *Most women depend on themselves today. Men no longer provide for them. Women just struggled on their own. Development has become hard in the earth so women own themselves. Men don't own women anymore. It has become hard.* FKI-NFE-83

> *In the past, our duties were those which men told us to do. That is no longer. Today he builds the house, sires the children, looks for someone to do herding, and then he goes. Women cultivate, do the herding, care for children, and spray the cows. There are many families where the husband doesn't know where to get money to pay school fees or get food. But when they hear there is a baraza, you will not find even one man to lift this skinny cow here. They have become wanderers and loiterers. Is not life for the woman harder?* FKI-NFE-83

> *Development (maendeleo) has taken the ceremonies. Ilkishili say those oxen are slaughtered for nothing. They see oxen as money. Education is changing minds. Olamal has been thrown away because women have hated giving birth. Many people have gone to church and it is making them leave many traditional practices. The reason they discourage girls circumcision is because of church. This is the end of ceremonies. We were lucky to finish ours.* FKI-NFE-77

Freed from house construction labour, women's lives were easier but this role change meant men were "finishing the forest." Men were taking a lot of timber (*oltarakua*) to build houses and fences and the bush was replacing it:

> *It is only the making of houses which has become easier for ladies. Young people don't like houses of skin anymore and they dislike manyata houses more. What has caused the change is education. You educate a child and they make you a grass thatch or iron sheet house with timber. We are the last to live in skin houses.* FKI-NFE-59

> *Today when you are married you are brought to a house of grass or iron sheet. When you get a good house planted for you has not life become good?* FKI-NFE-83

> *My son constructed this house because I don't know how. The reason men construct is so we get houses that do not leak on you and the calves. You don't wake up in rain and collect cow dung and climb to the top in the dark and plaster. No more plastering for women. Men cut cedar for construction with power saws today.*[117] *They are finishing the forest. Cultivation does not injure the forest but it destroys the oltarakua because it's the one used for fencing shambas.* FKI-NFE-77

> *The bush grows quickly when people settle in the forest and cut tall trees because it gives bush sunlight and a chance to grow up. Before we used bush for fencing and houses but now they men use timber from the forest.* FKI-NFE-55

[117] Houses built by men during field work had grass or iron sheet roofs. Those with grass roofs used *oltarakua* (cedar) timbers under the grass and for the walls. Those with iron sheet roofs used *olpiripiri* timbers under the iron sheets and cedar for the walls. Cedar was used in the construction of all but two houses owned in the study and both were traditional mud/dung huts where women lived.

Opinions about whether life was easier highlighted the heterogeneity of *intasati*. The youngest widow (whose husband died of alcohol abuse and left the family with many cows) thought life today was easier for Maasai in general but she resented women's increased workload due to men's absence from home:

> *It's easier today because there is food. Life was hard up to the time I was circumcised but I never knew that because most of the time we spent in the forest with moran. When we returned home, life was hard. People had no food. They were in poverty. Imagine. Blood is what we ate and what kept us alive. We drank blood in the morning and the evening when there was no milk to mix with the blood.* FKI-NFE-59

> *But life for the woman is also harder. She is the one responsible for children, cows, and shamba. Where are the men? They are just loitering and drinking alcohol. Today families belong to women because they can sell a cow and husbands are not aware because it is long since they were seen.* FKI-NFE-59

The eldest (whose impoverished husband left her destitute years ago with no cows and seven children) spoke of a harder life even though women had thrown unconditional respect for men away:

> *Life is harder for women. There was a time when earth was good but development has become hard in the earth so today every woman owns herself. Men don't own women anymore or provide for them. Women just struggle on their own. Women can stand in front of men and tell them what to do—ABCD. God showed them how to be strong and fight back their men, to throw respect away. It's the women who are powerful.* FKI-NFE-83

The third widow (whose husband died when she was young, left the family with many cows, and who had nine children as a widow because "there were more children in my body") said life was harder for everyone:

> *Life is harder for women because they have children in school who need food, clothes, books, shoes and pens. They don't depend on men because now they have ways to get money. They sell maize and they also go for business. The man only depends on cows but drought kills cows because they have no place to graze. Life has become heavy.* FKI-NFE-77

The quote above epitomizes a perfect storm of cultural and environmental forces feeding each other into the climax of this period. Meta-analyses of the drivers of tropical deforestation point out how underlying causes of change can work together to drive local activities that cycle back on main driving forces (Geist & Lambin 2001)—in this case, dense forest loss further exacerbated the degraded hydrology of wetlands stressed by overgrazing which together fed back on the underlying driver of less pasture.

4.5 Discussion

Triangulated methods were solid scaffolding for examining gender linkages with the environment. Table 4.4 presents the main themes surfacing in a narrative arc covering three periods of time which this thesis calls Exposition (Before 1976), Rising action (1976-1995), and Transformation (1995-2014).

Table 4.4. Prevalent themes in gender dimensions of land change based on *intasati* her-stories and geospatial data

Theme	**Exposition (before 1976)**	**Rising action (1976-1995)**	**Transformation (1995-2014)**
Life stage of *intasati*	Uncircumcised girl (*entito)*	Mother with children *(esiankiki*)	Widow with grandchildren *(entastat*)
Life stage of elders	*Ilterito/Ilnyangusi*	*Ilnyangusi/Iseuri*	*Iseuri/Ilkitoip*
Land	Showpiece forest, expansive grasslands, lion, rhino	Healthy ecosystem, natural succession, the swamp was big, elephants	18% dense forest loss, 147% bush gain, 21% grassland loss, 60% wetland vegetation loss
Fire	Moderate burning of grasslands by men	Men burn in forest for grass and people to pass	Men burn less
Climate	Cows did not get finished in droughts	Longer droughts, swamp dried after El Niño, cows die more often so men depend less on cows	
Population (Loita)	4 people/km², no people in Empurputia	10,303 (1989)	22,873 (2009)
Livelihood	Specialised pastoralism, men and women associate dark forest with monsters and fear	Men move so cows can be near forest, women dig gardens, men take cows to Ngong for sale	People settle permanently, men clear maize plots, women cultivate and have small businesses, market is closer
Gender relations	Women fear men out of respect (*enkanyit*), have no power, own only the food in the fire		Men don't own women, wives make livestock decisions
Food	Milk, meat, blood; less cooking so less going for water and firewood	Milk, meat, blood, maize meal; more cooking and cleaning	Milk, meat, maize, vegetables; women cook food from shops, need more water and firewood
Construction	Women make *ilngoborri* skin houses while migrating	Women make *manyta* houses, haul pole wood out of forest like prisoners	Men make permanent houses and fences of timber (*oltarakua, olpiripiri)*
Ceremonies	Girls go to forest for *olpul* with moran, women go for fertility blessings		Men have fewer ceremonies, no more *olpul* for girls, fewer fertility blessings for women
Development	None	Women need income to pay children's school expenses, people go to church (not forest ceremonies), ILIDP teaches farming skills and women's empowerment	

4.5.1. Triangulating pixels with her-stories and male age group events

The rate of dense forest decline was more accelerated in Empurputia than in the entire forest but both trends are in line with global patterns, i.e., earth's natural forest lost 6% in 1990-2015 and tropical countries lost 11% in 2000-2012 (Keenan et al. 2015). Land change scientists report an accelerating rate of forest loss worldwide between the periods 1990-2000 and 2000-2010 with tropical Africa (especially DRC and Madagascar) showing the largest increasing rate of all continents (Kim et al. 2015). This pattern has been confirmed in other studies of the same periods (Ernst et al. 2013; Hansen et al. 2013) but persistent issues of consistency in forest definitions (tree cover, tree height, potential to reach tree height, land extent) frustrate precise comparisons. In general, the results contradict characterizations of the forest as undisturbed with little or no degradation.

Present data are not in line with works indicating local and national forest gain. When this study carefully examined satellite images suggesting net forest gain in Kenya in 1990-2010, and it re-classified forest to exclude "high shrub land," the result was net forest loss. This result, combined with the discovery of an erroneous classification of wetlands using a global gaze approach, confirms the importance of differentiating intermediate land covers (Sexton et al. 2016) including wetland vegetation (Mwita et al. 2013). These findings feed cautions about developing policies based on oversimplified land change patterns (Homewood & Rodgers 1991; Lambin et al. 2001) that do not account for differences in land cover classifications or forests consisting of indigenous vs. plantation trees (Tropek et al. 2014). The underlying drivers of forest and wetland change, and the ecosystem services of natural and plantation forests feeding back on those drivers, are not straightforward and are still being explored.

The qualitative methods were essential to interpreting geospatial data with confidence. Her-stories using male age group ceremonies as benchmarks led to more nuanced understandings of gendered roles in the survival strategies of pastoralists driven to the highlands. Shifts in gendered roles—particularly house building-- are germane to projection scenarios about the forest's capacity as a water tower. The painstaking field verification of satellite imagery uncovered the erroneous interpretation of wetlands as forest. As biophysical indicators of local hydrosphere, wetland conditions should be a high priority for determining environmental and social resilience to drought. Small freshwater wetlands are degrading in East Africa (Ashley et al. 2004; Chapman et al. 2001). There is momentum to inventory wetlands (Dugan 1993; Hughes 1992; Rebelo et al. 2009), monitor them (Haack 1996), and improve detecting wetland changes with satellites (Munyati 2000; Owor et al. 2007; Ozesmi 2002). But even careful visual inspection of satellite images can be compromised by local climate variables and methods not yet standardized in land science (e.g., forest and wetland definitions, accuracy assessment). Better technology and more time for accuracy assessment would have improved human/environment linkages about cultivation activity.

The methodical qualitative exploration of the lives of *intasati* exposed culturally relevant proximate drivers of land change. Gender- and culture- sensitive benchmarks in the event calendar were successful in timing cultural and land change as her-stories progressed from "*We moved, we moved. My father was Ilterito and moved only to places that had rain…I remember the forest was burned a lot so the cows could get new grass"* to "*When I gave birth to the sixth child I cleared a small garden for children to eat"* and finally to *"My son constructed this house because I don't know how. Men cut cedar for construction with power saws todays. It is finishing the forest."* As a result, knowledge of fire, settlement, livelihood shift, and timber extraction informed how images were interpreted.

Fire regenerates cedar which once defined the dominant vegetation association in Loita Forest (Maundu et al. 2001). Fewer fires in recent decades could be responsible for natural gaps in forest canopy which is slowly filling with broad-leaved species today (Bussmann 2001). Cultivation probably contributed to more bare ground and forest loss in recent years but, unfortunately, quantifiable classification of cultivated plots was impossible due to the absence of definable patterns of vegetation indices with Landsat. It is likely that fewer fires, clearing for men's large maize plots, and timber harvest had nested effects with drought. Research constraints limited thematic map accuracy assessment of this dynamic.

It is interesting to examine congruities and inconsistencies with other sources of land change data. When KFS satellite images suggesting net forest *gain* in Loita were re-examined at RCMRD, and forest was re-classified to exclude "high shrub land," the preliminary result was 3% forest *loss* in 1990-2010. This supports the general trend of forest loss in this study and the need to differentiate dense canopy forest from bushlands. On this basis, caution is warranted in national policies based on Kenya's net forest gain at an annual rate of .1% since 1990 (Kenya 2016). Present results also did not mirror a remotely sensed 3% forest gain in a northern section of Loita (IUCN 2005) probably due to differences in land classifications, terrain and time scale.

Land change scientists emphasize the greater value of addressing underlying causes of forest degradation rather than its consequences as manifest in local human activities (Olson et al. 2004). Unfortunately, compared to proximate drivers, the underlying drivers were not well understood by *intasati.* The underlying drivers (Figure 4.7) were mentioned tangentially and attributed to forces beyond their control. Underlying economic and socio-political drivers merit attention in Loita considering the potential for declining regional ecosystem services from degradation of other Kenya indigenous forests in Taita Hills (Pellikka et al. 2009) and Mau forest complex (Baldyga et al. 2007). They are addressed in the following chapters.

4.5.2 Building a narrative arc of gender links with environment

The disparity in scales in this chapter begs for integration so the thesis uses a narrative arc to explain how cultural and environmental factors inform each other over time. This framework also serves as solid scaffolding for the data build-out in Chapters 5 and 6.

- The exposition was the years leading up to 1976. The baseline was characterized by a deeply patriarchal culture, expansive grasslands that dominated the terrain, and a showpiece forest. Human activities were not as forest-oriented as today. Monster tales served to keep people out. Men used fire to create forest glades for pasture in dry season. Women related to the forest in terms of fear and hard labour but also personal freedom, depending on their stage in life. Driven by rains and men's wars, women were always moving and constructing skin houses with pole wood they saved and strapped to the backs of donkeys or mud/dung huts that required constant repair. Women feared men out of respect (*enkanyit*), beatings were common, and they owned nothing. The happiest time of their lives was as uncircumcised girls living in the forest with moran (*olpul*).

- The rising action was 1976 to 1995. The ecosystem was healthy. Patriarchy persisted. Grassland cover remained the same. Activities were more oriented toward the forest as people started settling. Frequent fires for pasture and pathways to keep cows and people safe from wildlife probably served to regenerate dense cedar forest. Forest succession took place. Women's forest relationship was driven by their identity as reproducers. They went to the forest for fertility blessings, herbal medicines for children, and to cultivate vegetables on the forest edge to feed children despite men's disdain for digging in the soil. Women had no power over a cow or a child. Development arrived in the form of school, churches, and new male-dominated institutions.

- The transformation was 1995-2014. Baselines in ecological and gender relationships transformed. Drought and less pasture drove more people to settle near the forested wetland. The wetland dried from overgrazing, climate variability, timber harvest and cultivation that followed changes in topographical features due to El Niño rains and flooding. Dense forest declined as bush took over even the grasslands. Women's relationship to the forest as house builders was usurped by men harvesting cedar with chain saws. Cows and the land became sources of cash, even for women. Women considered going to the forest for blessings a waste of time better spent producing food and money. Men were scarce in the homestead. Respect for men was thrown away as women became heads of households and generated cash to meet family expenses.

Overall, the narrative traces accelerating extractive pressure on the watershed as energies diverted from life in the lowlands to settling and cultivating in the highlands. Forest and grasslands clearly gave way to bush. But as Fairhead & Leach (1998) have documented, natural succession cycles of forests and bush are complicated. In the six African countries they studied, scientists vastly overestimated deforestation extents. Treating a forest of four decades ago, or even a century or millennium ago, as a baseline of natural forest ignores effects of climate and lags in vegetation response. These are certainly relevant in this landscape. From a land perspective, the land change arc represents a progression that is probably unique in time and will never be replicated.

As for power relations, 1995-2014 was tumultuous. Three decades ago, Talle (1987) observed Maasai women losing their autonomy as "heads of ***houses.***" She saw inequality in male-female relations due to men seizing control over new market-based livestock production. She also observed just a few people cultivating and only in areas where there were intertribal marriages. According to *intasati,* these characterizations are no longer relevant. In the narrative arc, those years represented the rising action period leading to transformation. Since Talle's fieldwork, women in Empurputia have assumed men's role as "heads of house***holds****"* as men disappear from the family scene. All women were actively engaged in generating income to feed children and pay bills with cultivation, small business, and even selling cows. They said they were grateful to be relieved of the physical labour associated with dragging materials from the forest to construct traditional houses and mending them with dung on dark rainy nights. Today women's activities appeared to extend beyond the house. In their new productive role, their gaze was also fixed on the farm plot, market, and school.

Chapter 5 examines trends in resource use more closely with rigorous mixed methods.

Chapter 5: Gender dimensions of forest use

There appears little reason to expect gender differences in intrinsic worth,
but instrumentally differences can arise between men and women in their use of forests.
These …can make for gender differences in stakes in conservation.
(Agarwal 2010:31-32)

5.1 Summary

Chapter 4 quantified land change on broad spatial and temporal scales. It analyzed perceptions of older women and traced the historical presence of *Iloitai* from 1976 to 2014. Now, with a basic grasp of factors shaping both men and women's orientations to the land, the thesis can become finer in focus.

This chapter explores gender dimensions of resource use in Empurputia today. It studies the forest's intrinsic value, how people use plants in a wide array of use categories, and how they perceive change in resource availability. Triangulated methods uncover gendered ethno-biological practices that are nuanced, contextual, and new to the literature. Gender differences take front stage as a primary influence on forest use in recent decades.

5.2 Introduction

This chapter uses gender to study the culture/environment intersect (Figure 1.1) It is not a standard approach to studying forest use. Most ethno-botanical studies do not employ research designs that account for heterogeneity within study populations. Between 1981 and 2004, less than 5% of studies in core ethno-biology journals examined gender variations (Pfeiffer & Butz 2005). Most followed sampling techniques that did not account for cultural non-homogeneity and interviewed only men or older people. It is very likely in patriarchal indigenous contexts such as Loita, where men serve as the gatekeepers for research access, that women's traditional knowledge and use of plants is overlooked. Gender-biased research can promote gender-imbalanced stereotypes of resource use. One example is the notion that male elders are the most knowledgeable about plants but in Africa this is not always the case (Bonnard & Scherr 1992; Fortman & Nabane 1992; Geissler et al. 2002; Kiringe 2005). Generalizations about gendered collection and use of forest products around the globe are being challenged (Sunderland et al. 2014).

Gender analysis of forest use requires more than disaggregating by sex. As demonstrated in Chapter 4, even among the *intasati*, life experiences and resource use were differentiated by age, wealth, and personal circumstances. To recall, their orientations to the forest for *olpul*, fertility blessings, and house building were different and changed with livelihood shift. Maleness and femaleness are not homogenous variables in Maasai culture because they are inextricably linked to age, marital status, and other social factors (Hodgson 2001). Gender is socially constructed in Maasailand, as it is elsewhere, and attributes such as division of labour can vary between households and over time (Llewelyn-Davies 1981; Rocheleau et al. 1996; Wangui 2008). In African forests, women's activities are known to be linked to gender relations (Leach 1994). As Chapter 2 explained, gender is a relational term in Maasai culture so gender analysis is

necessarily a study of men as much as women (Talle 1988). Other factors to consider are spatial mobility and temporal effects like dry seasons (Agarwal 2000; Fortmann 1996). Gender analyses open to these influences can provide insights into drivers of change in social variables such as intra-household dynamics, perceptions of biophysical and cultural change, and complementarities of gendered forest use that might otherwise be overlooked. Chapter 4 results showed how intra-household gender relations are relevant in this landscape but they have not received a lot of research attention (Brockington 2001).

This study uses people's perceptions to explore these complexities. Perceptions unveil worldviews, indigenous practices, and cultural norms that can support conservation objectives such as sacred forests (Sheridan & Nyamweru 2008; Ramakrishnan et al. 1998). Perceptions can also impede conservation success (Agrawal & Gibson 1999), as with lions in Maasai areas (Goldman et al. 2010), and they can also improve resilience (Berkes et al. 2000) among pastoralists (Niamir-Fuller 1998). Among Maasai, people's memories can present methodological problems since the gendered concept of time is male age-grade based and is not based on the western calendar (Chieni & Spencer 1993; Spencer 1993). Chapter 3 explained how these challenges are addressed.

In this chapter, the qualitative and quantitative results about forest use are examined in relationship to Chapter 4 so that "specificity around gender relations is coupled with attention to ecological specificity, including attention to diversity in the resources available." (Leach & Green 1997:353) Because biodiversity has not been fully inventoried in Loita, there are only a few studies on plant associations and utilization to compare with present results. Botanical work in the 1990s established the prevalent vegetative associations in the drought-resistant cedar montane forests of Loita hills (Bussmann 2002) and the impacts of exploitative use of specific plants (Maundu et al. 2001). The paucity of gender data has left it to the present study to investigate the coupling of gender with plant specificities using empirical methods.

5.3 Methods

The study used every quantitative and qualitative tool in Chapter 3 to explore gendered forest use: household survey, transect walks [118], semi-structured interviews of key informants and gendered self-help groups, oral histories, participatory mapping, event calendar, and constant participant observation and note-taking.

All methods sought equal representation of men and women so the data could be disaggregated by sex for gender analysis. This goal was not met exactly with some methods such as transect-walks that were discontinued when no new data was collected (saturation). The number of

[118] Transect walks, also called 'narrative walks' (Jerneck & Olsson 2013), were casual meanderings in the forest for 50 m. This informal method differed from formal transects conducted by Maundu et al. (2001) who walked along 20 km transect lines and surveyed plants in 50 m X 50 m quadrats. The present method followed informants for 50 m into forest spaces they said they commonly used in the dense forest and on the forest edge.

women was slightly higher in transect walks and key informant interviews. This was considered acceptable given research constraints.

This research is more about gleaning insights into gender dimensions from mixed methods than seeking indisputable conclusions about gender differences in survey-like fashion. Gender analysis in this study refers to examining data collected with practical, locally-relevant methods to unfold new insights. This ground-up approach differs from the gender analyses of checklists, toolkits, indices, and other standardized processes aimed at mainstreaming gender into development practices (African Development Bank Group 2009; FAO 2012; Malapit et al. 2015; USAID 2016; WCS 2015; WWF Nepal 2015). The present findings aim to contribute to the success of those efforts.

The research questions for this chapter emanate from the theoretical intersection of gender and environment (Figure 1.1):

- How do people value and use the forest?
- Where do people go for the resources they need? Have the places changed?
- What plants do people collect? For what purpose?
- Has the availability of preferred plants changed? Why?

5.3.1 Forest and plant use

The answers people gave to questions about why they value the forest and the plants they used produced qualitative data that was categorized. The categories were analyzed using Fisher's Exact Probability Test.

The Fisher's Exact Probability Test was applied because it was considered more accurate than the parametric Pearson's Chi Square Test in finding relationships between categorical variables in small samples when the expected values for cells were less than five (Bernard 2013; McDonald 2014). Fisher's Test was very helpful in analyzing this study's dataset because the goal was to uncover patterns and generate evidence-based guidelines for deeper gender analysis and not to make conclusive statements for generalizing beyond this population. Statistical help was obtained through a Yale University/UCL Student Exchange which facilitated collaboration with students at the Yale Department of Statistics who helped with selecting appropriate statistical tools based on correct assumptions about the research methods and dataset. At a significance level of $p<.05$, the probability of making a Type I error (rejecting the null hypothesis when it is true) is 5% or 1 in 20. Although the small sample size and nature of the data precluded more sophisticated statistical testing, consistent patterns did emerge in the findings. The patterns suggest results were robust and potential Type I errors did not affect the consistency in their interpretations.

After consulting with faculty at Yale School of Forestry and Environmental Studies about forest transect methods, simple walks with men and women into the forest were considered appropriate for this research. Transect walks 50 m into the forest produced qualitative data about how plants were used. They also defined gendered spatial use of the forest and confirmed household survey results about preferred plants, particularly about the medicinal plant category.

A massive amount of qualitative data was generated in 54 audio-recorded hours of semi-structured interviews of key informants (12 males and 20 females), two male and two female self-help groups (22 males and 20 females), and a forest committee (5 men and 1 female). The key informants were government officials, male age-group leaders, male spiritual leaders, men who held leadership positions in the LCE, women who held leadership positions in school or church committees and women's groups, women songstresses, female forest committee member, and elderly people who lived a long time in the study area. Three months of concentrated work after the field work were required for research assistants to transcribe the audio-recordings in Maa into 162 single-spaced pages of transcripts in English.

Training in *Nvivo* 10 for Windows software was needed to organize and code transcripts and 104 pages of field notes about forest use interviews. Though *Nvivo* skills were costly and time-consuming to acquire, they were essential for querying text. There were several phases of qualitative data analysis: (1) Reading the entire body of data several times using an inductive approach to finding answers to the research questions. Text was highlighted and assigned 356 *a priori* preliminary codes (Miles & Huberman 1994; Saldaña 2013). The *in vivo* text (Bazeley & Jackson 2013), events for the event calendar, and demographic data were also noted in this open coding process (Strauss & Corbin 1998). (2) Electronic coding of text using 110 first order codes collapsed from the unwieldy 356 codes. (3) Using visualization tools (word frequency counts, word clouds, tree maps) to seek patterns and create more refined and focused codes (Charmaz 2002). Qualitative content was finally coded to 216 second order nodes contained within 14 first order nodes (Appendix 5).

5.3.2 Spatial and temporal dimensions

Participatory mapping and transect walks improved understanding of spatially gendered landscape use.

Participatory resource mapping was conducted first. It generated a rudimentary understanding of how people used the area for resources. Using descriptive statistics, gendered spatial activity profiles were developed with answers to "Where do you (personally) go for the things you need?"

A participatory method using Google maps layered a temporal dimension over the resource maps. Using familiar schools and homes to guide them, gendered self-help groups oriented themselves easily on the Google maps and positioned markers on the spaces they used today and in the past for the commonly used plants in the survey. To further qualify gendered resource use, individuals were asked why the places they went had changed.

Perceptions of the future status of plants were measured in projection scenarios ("If there are 10 today, how many will there be in 2050 or when your youngest grandchild is about your age)?" Manipulatives (beans, pebbles) were used to quantify perceptions. The nonparametric Fisher's Exact Probability Test tested for gender differences.

5.4 Results

This section describes how people use and value the forest, where they find resources, and how resource availability has changed.

5.4.1. Gender and the main value of the forest

In answer to the open-ended question "What is the forest good for?" most people said the forest brings rain (*keyau entim encan*) (Table 5.1). There were many gender differences. More women mentioned medicinal plants, firewood, dry season grazing, and building materials. More men mentioned air and soils.

Table 5.1 Open-ended responses to "What is the forest good for?" X gender (N=60)

	Frequency and percent of mentions							
	Men N=30		**Women N=30**		**Total sample**		**Fisher's test**	
Value of forest	**Mentions**	**%**	**Mentions**	**%**	**Mentions**	**%**	**P value**	**P**
Brings rain	22	31.4	23	23.2	45	26.6	.9999	>.05
Building materials	14	20.0	26	26.3	40	23.7	.0021	<.05*
Dry season grazing	11	15.7	25	25.3	36	21.3	.0004	<.05*
Medicinal plants	4	5.7	12	12.1	16	9.5	.0391	<.05*
Firewood	0	0	10	10.1	10	6.0	.0008	<.05*
Air, soils	7	10.0	0	0	7	4.1	.0105	<.05*
Water	6	8.6	1	1	7	4.1	.1027	>.05
Other[a]	6	8.6	2	2	8	4.7	.2542	>.05
Total	70	100	99	100	169	100		

[a]Other values included scenic beauty, shade, and tourism.

For an emic understanding of rain, this value was discussed in interviews of key informants, gendered groups, and in women's songs. Rain's value extended beyond the practical. It had intrinsic value to their spiritual life and to a sense of belonging as much as to their survival:

> *The reason why Maasai view the forest as a spiritual place is because they believe this forest is what gives them rain.* MFC-NFE- 43
>
> *The importance of the forest is that it brings rain. Other people move here because it rains here. Even when it is not raining in other places, it is raining here.* FWG-NFE-42
>
> *Aeooyiayio. We belong to the highland which pulls the clouds* (Phrase from women's forest song). FKI-NFE-48

Educated English-speaking elders asserted that this local understanding of trees bringing rain was based on knowledge from lived experience. They refuted the idea that the knowledge source was exposure to climate change narratives of conservation development, a paradigm operating in many other settings (Brockington & Duffy 2011). *"There has been no environmental education that has reached the people living here as of yet. They just know the forest attracts rain because they see it,"* insisted one elder (MFC-SE-45). Indeed, one un-schooled woman (FKI-NFE-55)

mentioned "*The blowing wind forces clouds to come over the forest and it rains. I learned this from my old fathers*." When household informants were asked to describe the process of bringing rain, their answers were consistent with that explanation:

> *The forest is tall with long trees which blow a lot of wind. The trees blow wind and can attract a lot of clouds when they are moving. Our forest hills are high so they attract a lot of rain.* MFC-NFE-42

> *When there is a cloud in the sky this forest pulls it and it rains here. It's these trees that pull the rain.* FWG-NFE-40

Such explanations bring to mind the scholarly debate among climate scientists and physicists about forests serving as biotic pumps of atmospheric pressure that draw in moist air and how localized forest loss can change climate from wet to arid (Makarieva & Gorshkov 2007; Sheil & Murdiyarso 2009). The potential role of Loita Forest in such a mechanism is discussed further in Chapter 7.

Many women expressed anxieties about rain on behalf of children and linked less rain to men's destructive forest activities:

> *What will disturb me most if the forest is destroyed is because of my children who I have given birth to. You know this forest is what brings us rain. The trees hold the clouds. Life depends on it.* FWG-NFE-48

> *For us women we only stay at home and we don't go anywhere. When we herd we see the places where there were trees and now they are no longer there. It is us women who suffer because we have no other place to go. So we sit down and ask ourselves "Don't these men see it is no longer raining because they have finished all the oltarakua trees in the forest? Now drought has come and it is about to finish us.* FKI-NFE-50

Such perceptions abour rain posit a forest: family (*entim:olmarei*) schema among women. Many other findings support this schema:

- Women's greater knowledge of forest plants to treat children's illnesses (Section 5.4.3)
- Women moved to the forest to be married and start a family (Section 6.4.1)
- Women cultivated on the forest edge to feed children (Sections 4.4.3.2, 5.4.2.1)
- Women are responsible for fuelwood, water (Section 5.4.2.1.4-5.4.2.1.5) and house-building (until today) (5.4.2.1.3)
- Women's forest songs are about children and medicinal plants (Section 6.4.3.1)
- Women referred to herbs in the forest used for contraception and pregnancy (Sections 4.4.2.2, 5.4.3)

For men, cows and income were the main value of rain. This suggests a forest: cattle (*entim: inkishu*) schema:

> *Twenty years ago, when the forest was intact there was a lot of rain here. Nowadays it rains once, it goes away. We don't have long rains anymore. Now cows are dying, income is less. Cows are our bank. If there is good grass I can make good money. This year I don't think I will*

get money. My big cows are very thin. I can sell that black one at 50,000 if it is fat. But now I can't sell it for 30,000. MKI-HE-42

The reason why I don't give out this forest to other people is because it has rain. When people destroy this forest we don't get rain. When we don't get rain we don't get grass for cows. MKI-NFE-80

These gendered schemata mirror those in a popular Maasai legend (Appendix 4) about women losing authority over cows because they cared more about children (Burton & Kirk 1979; Hodgson 2000; Llewellyn-Davies 1978). As explained later in the Discussion, it is premature to suggest these schemata align with conceptual male/female dichotomies of culture/nature (Llewellyn-Davies 1981; Ortner 1974; Strathern 1981) and public/domestic (Rosaldo 1974). Of greater interest to this study is using gender to uncover the range of social dimensions related to environment, not to fuel reductionist dichotomies. Indeed, micro-level household dynamics may not fit into stereotypical gendered orientations and may be more pertinent to livelihood than such polarities. Anomalies to such polarities are found in forest activities and specific plant use in this chapter and in roles and decision making in Chapter 6. They are discussed even further in Chapter 7.

5.4.2 Gender and forest-related activities

Broadly speaking, forest activities related to people's age and gender (Table 5.2) and reflected the age/gender organisation of Maasai culture (Section 2.3.4). Young children went to the forest to play and eat fruits, older boys mainly herded, the girls mainly collected firewood, and moran mainly went to eat meat and drink herbal soup. The main activities of male elders appeared to vary widely whereas women's activities were centered on firewood and building materials. Going to the forest for herding, honey, and firewood was gendered across age groups, only older men went for ceremonies and to protect the forest, and collecting herbs and building materials were the domains of mature men and women.

A finer gender analysis showed men going to the forest mainly for herding, ceremonies, and medicinal herbs and women going, again, mainly for firewood and building materials (Table 5.3).

Men and women's perceptions were in alignment as to women's use of the forest for firewood and as to men and women's use for medicinal plants. But there were interesting discrepancies in how they perceived each other's forest activities. The statistically most significant differences were that (a) more women than men perceived women going to the forest for building materials (a primary value of the forest) (b) more women than men perceived elders going for herding purposes (consistent with women's more frequent mentions of dry season grazing as a main value of the forest) and (c) more men than women said women go for ceremonies and vice versa. These differences among primary users of the forest advance ideas about gender roles in transformation. Changes from the past were voiced often:

Table 5.2 Gender/age analysis of open-ended responses to "What are the main reasons people go to the forest today?" X people who go to the forest (N=60)

	Main reasons they go to forest (Percent of total mentions for group)									
People who go to forest	**Play, and eat fruits**	**Herd**	**Honey**	**Eat meat, drink soup**	**Attend ceremony**	**Herbs for medicine**	**Firewood**	**Building materials**	**Protect forest**	**Other[a]**
Child	85.7	8.6								5.7
Boy	13.1	50.5	20.6	4.7						11.1
Girl				10.4[b]			77.9			11.7
Moran				87.1[b]		5.6				7.3
Elder		27.5	6.4	9.2	18.3	20.2		8.3	8.3	1.8
Woman						9.6	51.8	28.9		9.7
Spiritual					88.6 [c]					11.4

[a] This category includes various reasons comprising less than 5% of the total mentions for the group.
[b] Girls of pre-circumcision age sometimes accompanied moran for *olpul* (Section 4.4.2.2) though informants said this practice is waning.
[c] *Olorip olassar*, a male age group ceremony, was frequently mentioned.

Table 5.3 Gender analysis of open-ended responses to "What are the main reasons male elders and women go to the forest?" (N=60 household informants)

		Frequency and percent of mentions							
Group of people who go to forest	**Main reason they go to forest**	**Men N=30**		**Women N=30**		**Total sample N=60**		**Fisher's test**	
		Mentions	**% men**	**Mentions**	**% women**	**Mentions**	**% total**	**P value**	**P**
Male elders	Herd	9	16.1	21	39.6	30	27.5	.0041	<.05*
	Medicinal	12	21.4	10	18.9	22	20.2	.7892	>.05
	Ceremonial	5	8.9	15	28.3	20	18.3	.0127	<.05*
	Eat meat	7	12.5	3	5.7	10	9.2	.2989	>.05
	Protect forest	8	14.3	1	1.9	9	8.3	.0256	<.05*
	Building Materials	8	14.3	1	1.9	9	8.3	.0256	<.05*
	Honey	7	12.5			7	6.4	.0105	<.05*
	Play enkeshei			2	3.8	2	1.8	.4915	>.05
	Total	56	100	53	100	109	100		
Women	Firewood	29	52.7	30	50.8	59	51.8	1.0000	>.05
	Building materials	8	14.5	25	42.4	33	29.0	.00002	<.05*
	Ceremonial	10	18.2	1	1.7	11	9.6	.0055	<.05*
	Medicinal	5	9.1	2	3.4	7	6.1	.4238	>.05
	Other	3	5.5	1	1.7	4	3.5	.6119	>.05
	Total	55	100	59	100	114	100		

In Loita men and women have their own duties but life is changing. The household can have a discussion together and agree on duties to be shared. A man or woman can do every duty. Before women and men were not together. Women were left behind. But now women are participating in all duties. MKI-SE-42

My mother was traditional. She just went for firewood and water, no crops, she didn't have to inject the cows, and they ate and drank what was there. Life is harder today for women. They carry more loads without help. Men have lost track and left most responsibilities to women. Women have heavier duties now—paying for children in school, the shamba, herd cows, herd goats, household management, caring for children, finding food for cows, planting. They must go to market but still the work is heavy at home. FKI-HE-45

These reflections support the narrative arc of transforming gender relations and women's expanding work load posited in Chapter 4. Clearly, forest activities were clearly no longer static gendered realms.

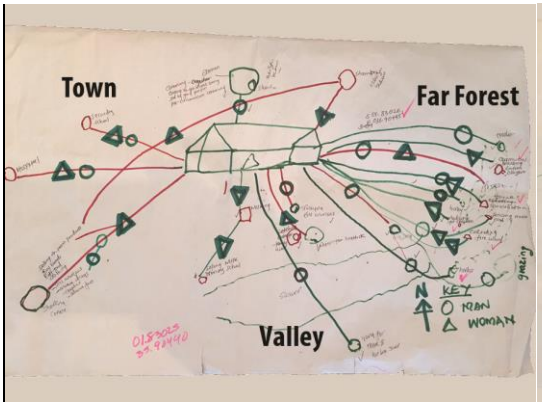
It will be interesting to recall the finding in Table 5.2 that men were considered the medicinal plant collectors because data presented later in this chapter indicate the contrary.

5.4.2.1 Gender and spatial dimensions of forest activities

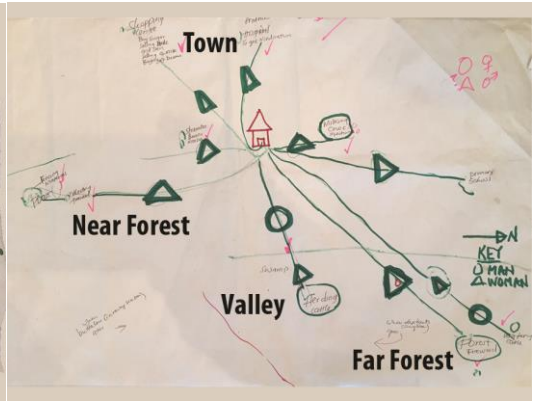
In the household survey, 99% of informants said men and women use different places in the forest for what they need. Participatory resource maps unveiled consistent patterns of spatially gendered landscape use (Figure 5.1). They also confirmed household findings that age, intra-household dynamics, exposure to women's group development initiatives, distance, wildlife conflict, and changes in gendered roles were all influences on how people used the forest.

Figure 5.1 Gendered participatory sketch maps in response to "Where do you go for the things you need?" (N=4, husband and first wife in two households) [a]

Household A



Household B



[a]Spouses were asked to represent women's activities with triangles and men's activities with circles. Circles at the ends of lines signify destinations. Written words are notes recorded by research assistants.

Household A depicts the same landscape as Household B but with telling differences. Household A couple depicted a landscape utilized by both spouses and numerous shared activities. In Household B, the wife's workload was greater due to prolonged absences of her husband and,

when he was home, herding and watering cows were the only shared activities. In Household A, women's group trainings held at the local clinic were perceived as positive influences on intra-household dynamics. The timing of these trainings aligns with the narrative arc of exposition, rising action, and transformation in Chapter 4:

> *Before we had no power. Men despised women. We feared our husbands. You could not ask him anything when he was in the cow pen. So, you just waited until he came to the house. Today things have changed. When I had four children* [119] *I attended women's empowerment workshops (maendeleo ya wanawake). We were taught by women from Kajiado. I learned togetherness in a family and ownership so I can make my own shamba so that if my child needs a pen I can buy it as a mother. Now I can tell him, wherever he is, to come discuss with me. I give him tea and we discuss. Now men and women share responsibilities. Today women also do herding because children are in school and men are going to their daily activities.* FKI-NFE-48

This woman clearly perceived herself as having more agency than in the past. The extent to which trainings and new livelihood roles were empowering is discussed in Chapter 7.

Figure 5.2 is a composite of spatial and quantitative information in the participatory resource maps (Appendix 6). It illustrates landscape use differentiated by gender and place. In support of Chapter 4 findings about women's increasing workload, women mentioned more activities than men and about twice as often. In addition to activities mentioned in Tables 5.2 and 5.3, in the resource maps women were also getting building materials for fencing livestock pens as well as herding, watering, injecting, and spraying livestock-- activities in the livestock domain one might assume belonged to men.

Men's activities in the Far Forest were more diverse and more frequent than women's which mirrored the survey findings. Women reported a wider variety of activities in the Valley and at home. In resource mapping, women said their fear of wildlife [120] influenced where they herded and went for firewood. In a men's group interview, gendered spatial forest use was explained this way:

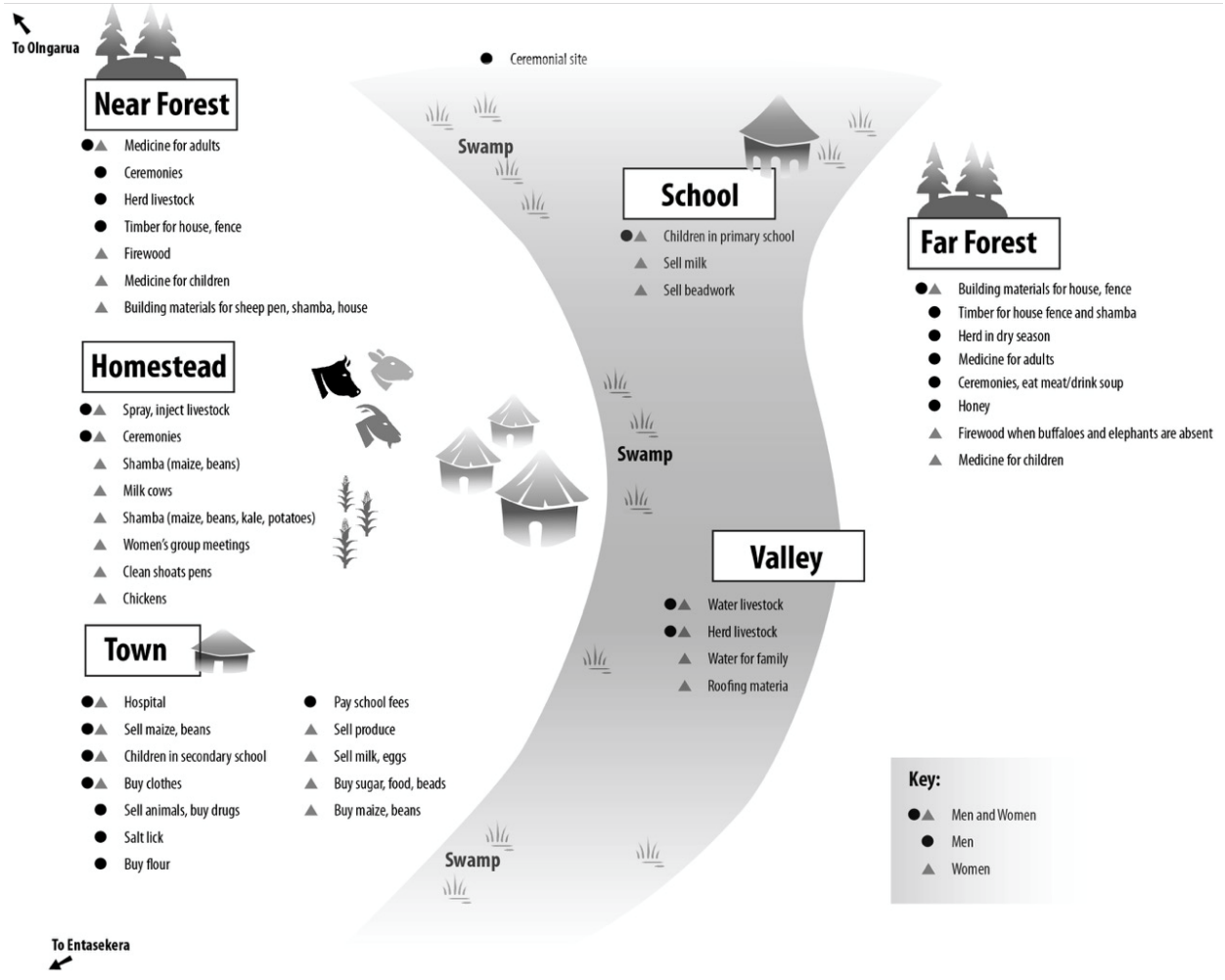
> *A man goes to the forest to look for honey and he also does herding deeper into the forest. When he finds someone destroying the middle of the forest then he is the one who sees it a long distance from home. A woman can't see since she is just around home. Women fear to go deep into the forest.* MMG-NFE-32

Activities rarely reported by men or by women and those reported by both in resource maps were analyzed further for their consonance with findings of other methods. What follows is an integrated analysis of what mixed methods brought to light in the aggregate.

[119] In the 1990s, approximately.

[120] During field work, there were six attacks by African buffaloes in the study area. It was observed that when women walked through deep forest on their way home from market they stopped and said a silent prayer of thanks to *enkai* after they emerged safely on the other side.

Figure 5.2 Composite map of gendered forest-related activity in response to "Where do you go for the things you need?" (N=14, husbands and first wives in seven households)



5.4.2.1.1 Medicinal use

Everyone relied on the forest for medicines. Indeed, the Maa word for tree and medicine are the same-- *olcani*. Data confirmed *Iloitai* perceived their forest as a hospital though, like other Maasai (Kiringe 2006; Sindiga 1994), many also sought remedies at local clinics. What the resource maps and transects revealed was that only women went to the forest for medicines for children, supporting women's forest: family schema. This finding refines the cruder indications in the household survey (Tables 5.2 and 5.3) that men were the ones mainly associated with collecting medicinal plants. In women's songs, medicinal plants for children were core to their identity:

> *We are women from the forest of Loita where grass is not sold* [121]*, the highland where elube* [122] *sing until morning, and colobus monkeys announce the dawn. We boil olmisigiyioi* [123] *for children of Loita so that they can grow and practice our culture using oloirien.*[124] *Oleparmunyo* [125] *is the medicine for colds. I compare it to a hospital.* FKI-NFE-45

> *We live in the forest with mist. We are from the highland which pulls clouds. I took my child to the hospital and there was no medicine I wanted. My husband doesn't know how to read the instructions and neither do I.* FKI-NFE-50

Men used forest medicines to treat cows, supporting the forest: livestock schema:

> *The reason why I moved here is because it was a good place for cows. I had many cows, about 100. The forest was big and it was thick. All tree species were here. There were many trees we used as hospitals for people including those we used as medicine for cows. In this forest we give medicinal herbs to cows. We are still using those herbs up to now.* MKI-NFE-80

Maasai ethno-veterinary knowledge is considered well developed but only 6% of informants in a Kajiado study said women could detect livestock diseases (Ole-Miaron 2003). Perhaps the percentage is higher today based on present findings that women are more involved in livestock production now.

5.4.2.1.2 Ceremonial use

Men used the forest more for ceremonies. They used the Near and Far forests for age group ceremonies associated with trees and meat eating such as *olngesher* [126] and to pray for rain. There were places only men were allowed:

> *Yes, there are spiritual places in the forest where only men go. There is something called olpiron which men go and get and use it to make fire for the boys during eunoto. Men also collect the white ochre (enturoto) which is used in such ceremonies. At the start of circumcision and selection of an age set (ilporori) it is only the men who go to such spiritual places. Women don't go.* MFC-SSI-NFE-64

> *Oloibon have rules about the places where there is the white ochre (enturoto). No one else should go near because it is what the Laibon and moran use at enkipaata when they start a new age group and head of age group is selected. There are also trees which oloibon uses to get the charms (intasimi) from the roots of trees. So there are places in the forest when oloibon does not want people to go near because of the trees which he uses as charms.* MFC-SSI-PE-48

Women's blessings (*inkamulak oo nkituaak*) associated with the forest increased their fertility (forest: family schema):

---

[121] A reference to communal land tenure when the song was written in the 1990s.
[122] The white-browed coucal bird (*Centropus superciliosus*) (Mol 1996).
[123] *Rhus natalensis* (Bussmann et al. 2006, Maundu et al. 2001).
[124] *Olea europaea* ssp. *africana* (Bussmann et al. 2006, Maundu et al. 2001).
[125] *Toddalia asiatica* (Bussmann et al. 2006, Maundu et al. 2001).
[126] A meat-eating ceremony around a table made of fresh twigs. It is for moran when they become junior elders and the taboo of not eating meat seen by women is erased (Mol 1996; Spencer 1988).

> *We do women blessing for fertility and we also bless women to get good behavior. When a woman abuses a man sometimes there is an outbreak of abortions and the woman will be punished by the age group. They get charms from me from the forest for blessing the woman who did the physical abuse. In the case of outbreak of diseases, like brucellosis, women can begin to abort and I will give charms. Ceremonial acts are still performed in Loita but not the same percentage as before.* MKI-NFE-80

> *In the past, we used the forest for women's blessing. Maasai were scared when women were miscarrying and they decided to bless women so they are clean. We passed through oreteti in the forest while they poured alcohol and mixture of water and milk.* FWG-PE-45

Everyone said forest ceremonies had declined. In *Nvivo* content analysis, references to 'change/ceremonies' outnumbered all others in the change category (Appendix 5).

> *It is true that there are fewer ceremonies in the forest today than 10-20 yrs ago. Most ceremonies in the forest were performed by the oloiboni. Some loibons have left that culture. Then common ceremonies were:*
> - *Women's blessing in the forest. It was the men who did the blessing.*
> - *When the rain delayed there was sheep sacrifice and olasar[127] in the forest so it can rain.*
> - *Slaughtering of oxen. Ilmongi lonkulalen[128] is not there today. Olkiteng loo lbaa[129] is still there among a few people but it is not common as it used to be.*
> - *There was eating of meat and drinking of soup by moran in the forest. It is rare today because moran have become few. In the past men did not eat meat inside the house but today they do. Enturuj[130] was when women saw the meat at home and men could not eat that meat.*
> - *During circumcision, there was going to the forest for oloirien ilatimi[131] and oreteti irpironito[132].* MMG-SE-34

Everyone attributed the decline in ceremonies to development (*maendeleo*). Development meant church (*kanisa*), education (*esukuul*), and the need for cash (*empisai*). Church and the diminished influence of the Chief Laibon were perceived as dominant drivers:

> *The last fertility blessing was in Ilkerin 10 years ago. Before women did not stay that long without blessings. The people are leaving their culture. Development and Christianity and education is coming to change the way of life. Kanisa is the main reason people no longer go to the forest for ceremonies.* MKI-NFE-80

[127] A sacrificial fire usually made with sweet-smelling leaves of *oloirien* to burn the left -overs of a sacrificed animal.
[128] A meat-eating ceremony called Ox of the Earplugs (Mol 1996) described by Spencer (1988) as the first forest feast of young moran.
[129] A ceremony called Ox of the Wounds, a cleansing ceremony for male elders when their oldest child nears circumcision. The ox is slaughtered between two trees of *oloirien.*
[130] A cultural taboo. Its aim was to keep warriors out of the house and prevent them from disrupting the normal distribution of food by the mother.
[131] A branch of *oloirien* is planted at the entrance of a house where a boy or girl being circumcised lives.
[132] A stick of *oreteti* broken to symbolically open up a new circumcision period for boys.

> *Today the ceremonies are fewer because people have become Christians and go to church. What brought the change is development. Churches changed our attitude about traditional rituals. If you are told to take your child to loibon you will not agree because you know the only true way is God.* FKI-NFE-45

> *In the past 10-20 years everything started changing. What brought all the changes is schooling and the church. Before every action that was undertaken in the forest the Chief Laibon was the one who gave direction. He was the one who advised on which trees would be used such as oreteti during women's blessing.*MMG-SE-34

Women differed in their perceptions of declining fertility blessings. According to the few educated women, the decline was due to family planning and education:

> *Family planning caused the decline in fertility blessings. Now women use pills and medicines from the clinic, even without the knowledge of their husbands. Condom use is rare. Women have learned the importance of education and have fewer children so they can meet children's needs including fees for education. Most men don't help wives bring up children.* FKI-HE-37

Less educated and less wealthy women said their time was better spent producing food and income than in ceremonies:

> *I don't have time for ceremonies anymore. I need to be here and protect my shamba from wild animals. I want to participate in things where I get something. It's shameful to go to a ceremony and come back with nothing.* FKI-NFE-50

> *Women today see that olamal*[133] *has no benefit. When we stay at olamal or women's blessing for several months it is time wasted. We come home and find shamba not planted, children left alone, and calves rained on in manyata house. Instead of going to women's blessing we prefer to go to sokoni (market) to do business.* FWG-NFE-38

Men were more likely than women to say women went to forest ceremonies today (Table 5.3). This could reflect men holding to memories of traditional ways from the past when fertility blessings were more common, as the event calendar reflected (Appendix 1). Though ceremonies for men were also diminished, it appears the male age group structure was still strong enough to keep men going in the forest to celebrate with rituals whereas forest ceremonies for the women had been subsumed by economic imperatives-- a reality perceived by more women than men.

Age/gender organisation was a big factor in ceremonies. According to *intasati*, young people lacked knowledge of rituals. They depended on older people to show them.

> *Young people don't know ceremonies of circumcision, slaughtering oxen, and women's blessings. They look to old people for direction. For slaughtering, the old men give the young men direction. On circumcision, it's the father who tells the boy children, not the mother. The reason why I followed this son of mine here is because I am his father and he told me come here because*

[133] *Olamal* means delegation (Mol 1996). In this context, it refers to a peaceful delegation of women who collect goods and materials from households in preparation for a women's fertility blessing. It can take up to a month to complete (Kipuri 1990). The blessing is led by male elders so women can become more fertile (Ole Sankan 1971).

> *I am a beginner and show me how to perform the ceremonies. For the women blessings, old women show the young women what to expect.* FKI-NFE-77

That widows served the roles of their late husbands in passing down knowledge of rituals to children was further evidence of heterogeneity in women's forest relationships.

5.4.2.1.3 Building materials

Most informants (88.3%) said only men build new houses today. This was in stark contrast to the 98.3% who said it was the exclusive role of women just 10-20 years ago and the *intasati* of Chapter 4 who pulled materials home from the forest like prisoners decades before. Talle (1987) also said only women were building houses in Loita in 1975-76. Today men use durable timber. In the past women made mud/dung *manyata* houses with one center post and lighter wooden poles. Older women were grateful to be relieved of the burden:

> *In the past, I made Maasai manyata houses (enkaji emodie). We used cow dung and posts we planted ourselves without men. My son constructed this new house because I don't know how. Now men construct houses that do not rain on you and the calves. You don't wake up in rain and go out in the night to collect cow dung in the dark and climb on top and plaster. No more plastering for women. It is men who remove the houses from the forest. Now when you are married you are brought there with the new house of timber already constructed for you with roof of iron sheet or grass. When you get a good house which has been planted for you, has life not become good?* FKI-NFE-83

Resource mapping helped explain the findings that more women than men perceived building materials as a main value of the forest (Table 5.1), more people said it was women who went to the forest for building materials (Table 5.2), and more women than men said it was women who collected such materials (Table 5.3). Men utilized the Far Forest and Near Forest for heavy timber for new cedar houses and stockade fences whereas women used them for lighter building materials. That woman valued the forest more for building materials and perceived themselves in the forest more often for building materials was a result of the high frequency of their activity and the type of materials they were collecting, i.e., women were going for lighter less durable materials for the constant repair that sheep pens, fences, and traditional houses required. This was supported by the 61.7% of household informants who said it was only women who repaired traditional houses today.

5.4.2.1.4 Energy

Firewood collecting in the Near and Far Forests was the exclusive role of women according to all research methods. Factors determining where they went included presence of wildlife (buffaloes, elephants), time limitations, and changes in the availability of preferred trees (Section 5.4.4.2). On average in the dry season, women went for firewood five times a week and carried five total backs of firewood in a week. In the not dry season, they went an average of 2.7 times per week and carried 2.6 backs of wood. Women said they needed more firewood in dry season due to less milk and more cooking.

5.4.2.1.5 Water

Only women went to collect water for the family along the swamp edge. In dry season, they walked about an hour nine times per week to collect an average of 25 litres of water each trip. In not dry season they walked about 40 minutes three times a week. The biggest challenge, mentioned by 66% of women, was going for water more often than in the past because of the increase in washing and cooking. All men and 17% of women (who were *de facto* household heads) had main responsibility for watering the herd in the swamp Valley.

5.4.2.1.6 Livestock and cultivation

These activities are forest-related because 82.8% of men grazed in the forest in the dry season (62.1% mostly in Far Forest, 20.7% mostly in Near Forest), typical farm plots were clearings on the forest edge, and fencing materials for stockades and cultivated plots were forest canopy trees *(oltarakua, olpiripiri).*

Most household informants (76.7%) said their livelihood depended on both cultivation and livestock. Gender overlap in livestock activities was high around the homestead and in the Valley (Figure 5.2). All women engaged in spraying, injecting, and deworming animals around the homestead. Women also herded and watered livestock in the Valley.

All men and 96.7% of women said they had their own maize and bean plots. Men's plots averaged 4.2 acres and women's plots averaged 1.5 acres. Women farmed other vegetables such as beans, collards, spinach, and kale. Large and small livestock products that men never reported such as milk and hides were customarily under women's control (Grandin 1988; Talle & Pálsson 1990) as well as chickens and eggs. Most (94%) informants said the reason they farmed crops was to sell them and feed the family. Women perceived the change in livelihood as both burdensome (particularly the need to farm and herd when children were in school and men were away) but also an opportunity to raise their status as income-earners by selling vegetables. This dynamic is known as the 'virtuous spiral' (Mayoux 2002) or 'breadwinner effect' (Goldman & Little 2015) in which social capital is raised in households where women accumulate income.

> *We grew up when women were very down. But God has brought change. Before women were despised. They despised themselves. Today if you are not regarded as an important person then you take it by force. You cultivate and sell the produce to settle expenses even without the husband being there, such as buying children's clothing and paying school fees. We have become important people in society because we cultivate and do business so we don't need to depend on the husband.* FWG-NFE-35

> *Life has become hard. Children go to school and leave me at home with a lot of work collecting firewood, water, and herding while carrying my baby. In the last year everyone is thinking of how to expand their shamba and make it big. The woman has duties so she can pay for food. Women are herding but it was only children and their father who herded before.* FWG-NFE-42

Most men acknowledged women's contributions:

How I used to get income for my family was not shambas. I would take my cows on foot to sell in Nairobi to buy maize flour and sugar. If the family slept hungry while I was still on the way, they drank blood. Or they could slaughter a cow. But today we cultivate. We see the soil has importance like cows. We go looking for daily bread with our women. Now it's easier to get things for the family since the man is not the only one to be depended on. MKI-NFE-48

Today women look after the shamba and they do herding because all the children are in school. Even though women no longer construct houses they do the herding of cows, goats, and sheep and the shamba. It is hard for her to collect firewood and do the cooking also. MKI-PE-34

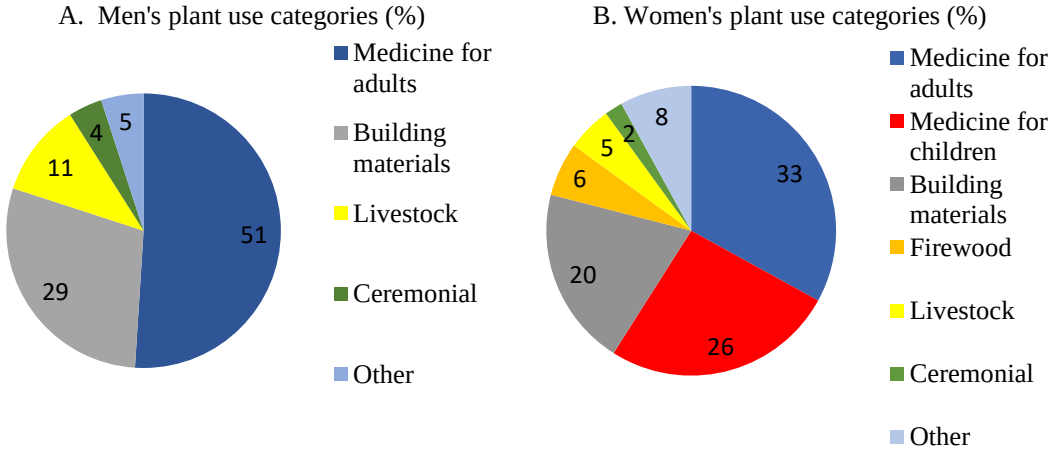
These mixed methods showed that women today are engaged in forest-related activities other than the traditional ones *intasati* described decades ago. Reflecting changing times, many activities overlapped (herding) or complemented (cultivating, medicinal plants, building materials). Getting firewood and water remained deeply gendered.

5.4.3 Gender and plant use

On transect walks, women reported a wider variety of uses for plants than men did (Figure 5.3). Women mentioned uses for 50 different plants a total of 101 times, compared to men's 41 different plants mentioned 72 times. Most plants mentioned by both men and women fell into the medicinal plants category (44 out of 63 total plants or 69.8% of plants had medicinal uses).[134] Indigenous and botanical names of transect walk plants and their uses appear in Appendix 7.

Women explained 16 different medicinal uses compared to men's 12. All women collected plants for children's and adult illnesses (17 and 22 different plants respectively). Men collected only for treating adults (23 different plants). Children's medicines treated diarrhea, coughs,

Figure 5.3 Gender analysis of plants men and women mentioned on transect walks X plant use categories (N=7 men and 9 women)



[134] An earlier study reported that 90 out of 250 or only 36% of plants collected on transects in Loita were for medicinal use (Maundu et al. 2001). Different vegetation zones and varying collection methods concentrating on useful plants or on complete flora have accounted for discrepancies in ethno- botanical data in this region (Bussmann et al. 2006). These earlier studies also lacked a gender focus.

parasites, malaria,[135] and personal hygiene. In the adult treatment category, women collected plants most often for pregnancy/birthing. Men collected most often for adult stomach problems. Other adult ailments commonly treated with forest plants were joint/muscle pain, stomach pain, and respiratory illnesses. Men mentioned treating venereal diseases and open wounds more than women. Finally, women mentioned trees they used for energy but men never did, and men mentioned trees for livestock twice as much as women.

What follows are plants household informants mentioned often and said they preferred in each use category. A complete list of all plants mentioned in households and transects appears in Appendix 8.

5.4.3.1. Preferred medicinal plants: *oleparmunyo, olkonyil*

In the household survey, *oleparmunyo* was the most preferred medicinal plant to use (Table 5.4). Women used it to treat children's colds, men to treat malaria, and everyone used it to treat adult respiratory illnesses. Women mentioned it more often as a preferred plant probably because they collected it for both children and adults. Inconsistencies in perceptions of who collected it reflected gender overlap in use of this popular plant (Table 5.5).

Gendered medicinal use was evident in another popular plant, *olkonyil.* It was more preferred by men who used it in herbal soups for venereal diseases [136] and to improve strength. In an old report on Maasai herbal medicines (Kajiado Office of the District Commissioner 1951), *olkonyil* was listed as a stimulant and digestive but there was no mention of venereal disease, suggesting its more modern-day application. This plant was among a list of 14 forest plants that men said women never used today. Along with *enkoriri*, another plant on the same list, men said its specific use was to treat gonorrhea.

On the heterogeneity of women plant users, we recall the influences of age and the changing culture on *olkonyil* use in Chapter 4. According to the youngest *entasat,* it was used as a contraceptive during forest *olpul*:

> *We drank herbs in olpul—olkonyil, osokonoi, enkoriri. When you drank them you could not get pregnant. About 10 roots were boiled and stored and in the morning moran and their girls drank it. When Maasai drink this herb they no longer sire children. It kills the eggs of both men and women.* FKI-NFE-59

An elder confirmed this and attributed the recent rise in young girl pregnancies to the passing of its use in *olpul*:

[135] Informants attributed a wide variety of maladies to malaria, in people as well as cows, suggesting a meaning of general malaise in the absence of more specific diagnosis.
[136] A relatively high percentage of sexually transmitted infections in Loita has been attributed to lack of awareness due to gender inequities and educational disparities (Pakdaman & Azadgoli 2014). Locals said prevalence is decreasing because of medicines from the health clinic.

Table 5.4 Gender analysis of open-ended responses to "What plants do you prefer to use most?" X use category (N=60 household informants)

Use Category	Number of plants mentioned	Preferred plants		Number of mentions Men N=30	Women N=30	Total N=60	Fisher's test p value	P
Medicinal	25	Most preferred	*oleparmunyo*	22	30	52	.0045	<.05*
		Preferred	*olkonyil*	16	3	19	.0006	<.05*
Ceremonial	19	Most preferred	*oloirien*	27	24	51	.4716	>.05
		Preferred	*oreteti*	17	6	23	.0072	<.05*
			olmisigiyioi	8	7	15	1	>.05
Build house	15	Most preferred	*oltarakua*	30	30	60	1	>.05
		Preferred	*olpiripiri*	29	30	59	1	>.05
Build fence	30	Most preferred	*olamuriaki*	7	19	26	.0037	<.05*
			oltarakua	12	0	12	.0003	<.05*
		Preferred	*oloirien*	5	8	13	.5322	>.05
Energy	15	Most preferred	*oloirien*	30	30	60	1	>.05
		Preferred	*ololiondoi*	7	7	14	1	>.05
			olpiron	7	5	12	.7480	>.05
Fodder in dry season (trees)	31	Most preferred	*oloirien*	17	9	26	.0672	>.05
			olgilai	13	12	25	1	>.05
		Preferred	*oloirien*	7	12	19	.2668	>.05
Fodder in not dry season (grasses)	12	Most preferred	*orperesi wouas*	15	9	24	.1871	>.05
		Preferred	*olmakutian*	9	5	14	.3603	>.05
			esere	5	9	14	.3603	>.05

> *Of course, a man cannot have fertile sperm drinking that soup of olkonyil. It is very strong, very bitter, and it makes your urine red. Girls know that soup will make them abort. It is taboo in Maasai culture to abort. They do it in secret. In the old days, no girls got pregnant. Today young warriors are impregnating young girls because they are not like the traditional warriors who took that soup in the forest.* MKI-SE-45

For women, whether treating children's colds, coping with pregnancy/births, or influencing fertility, medicinal herbs from the forest had forest: family connotations. Birth control medicines dispensed by the clinic replaced the need for contraceptive/abortive herbs from the forest among educated women but *orkonyil* and *oleparmunyo* were still perceived by older less educated women as a hospital in songs and interviews:

> *The medicine we Maasai use as our hospital is the forest herbs. When people drink oleparmunyo and olkonyil they are much better than those given to patients in the hospital*. FKI-NFE-50

Table 5.5 Gender analysis of "Who collects the most preferred plant most of the time in your household, the man, the woman, or both?" X use category (N=60 household informants)

	Who collects the most preferred plant most of the time (% of men and women responding)							
	"The man"		"The woman"		"Both the man and the woman"		Fisher's test[a]	
Use category Preferred plant	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**p value**	**P**
Medicinal *oleparmunyo*	83.3	16.7	3.3	13.3	13.3	70.0	.0000003	<.05*
Ceremonial *oloirien*	46.6	3.3	16.6	93.3	36.7	3.3	.000000001	<.05*
Build house *oltarakua*	93.3	76.7	3.3	3.3	3.3	20.0	.1027	>.05
Build fence *olamuriaki, oltarakua*	100	93.3		6.7			.2457	>.05
Energy *oloirien*			100	100			1	>.05
Fodder in dry season *oloirien, olgilai*	96.7	93.3	0	0	3.3	6.7	.6186	>.05
Fodder in not dry season *orperesi wouas*	100	96.7	0	3.3	0	0	1	>.05

[a]The Freeman-Halton (Freeman & Halton 1951) form of the Fisher Exact Probability Test was performed for 2 rows X 3 columns contingency tables.

> *Oleparmunyo is the medicine for colds. I compare it to a hospital.* (Phrase from women's forest song) FKI-NFE-50

Orkonyil is considered threatened locally due to medicinal overharvesting (Maundu et al. 2001).

5.4.3.2 Preferred ceremonial trees: *oloirien, oreteti (Ficus thonningii)*

Oloirien was most preferred by everyone. It is one of four holy trees in Maasai culture (Mol 1996).[137] The gender inconsistencies in who collected it were likely due to overlapping roles in traditional ceremonies held near home. [138] In transects, men said they collected *oloirien* for *olkiteng loo lbaa* [139] held in the Far Forest and for circumcisions at home. An *entasat* recalled

[137] The other holy trees are *oreteti, oseki (Cordia ovalis quarensis)*, and *olngaboli (Ficus sycamorus)*. Three trees (*oloirien, oreteti, oseki*) have been accounted for in Loita Forest by this study and others (Maundu et al. 2001).

[138] For example, the *oloirien olatim (*a branch of *oloirien* planted outside the home of the boy or girl to be circumcised) may be collected by a man but is usually placed by a woman. A mother would collect it if the father was absent. It is also used as beds for boys and girls being circumcised. In participant observation of a boy's pre-circumcision ritual, both men and women were observed placing *oloirien, oloseki, and olmisigiyioi* in front of the cow pen for the boy to walk around four times when it was two days before the event.

[139] The Ox of the Wounds ceremony for men. (See Footnote 129)

that before she was circumcised the forest was called *oloirien* and its leaves were used in circumcision ceremonies, women's blessings, and the male ritual *olkine loo mbenek*.[140]

Both *oloirien* and *oreteti* were important to the Chief Laibon:

> *Oloirien is the special tree for celebrating female blessing. Another blessing using oloirien is when you slaughter a fat ox. A man sits next to oloirien with another man. Two elders bless the meats and they eat it from the right side of the ox. Then he is graduated to a senior elder. You cannot perform circumcision without this ceremony. In fertility blessings, we remove the bark of oreteti. We divide the strings of bark according to the number of women so every woman has a piece and she wears the strings and is blessed for getting children*.[141] MKI-NFE-80

Men mentioned *oreteti* for ceremonies significantly more than women which mirrored men's dominance in the realm of ceremonies. Elders lead fertility blessings around the *oreteti* tree and male diviners made medicine for women's fertility from its red inner bark to symbolize menstrual blood (Fratkin 2012). Women also used *oreteti* in rituals. In a pre-circumcision ritual, a woman was observed weaving strings of *oreteti* into a necklace for the boy after his head was shaved and covered with red ochre by his mother. Complementary roles in conducting ceremonies have been documented (Kipury 1989). Knowles (1993) challenged suggestions that women's roles are subordinate in ceremonies other than circumcisions, having observed that *Iloitai* women in the 1980's were integral to ritual processes and their roles (building structures, debating ritual procedures, and brewing beer) were intertwined with men's.

For women, these two ceremonial trees have strong relationships with family (forest:family schema) either in their own fertility or raising children.

5.4.3.3 Preferred construction trees: *oltarakua, olpiripiri (Podocarpus falcatus), olamuriaki (Carissa edulis)*

For building houses, durable *oltarakua* and *olpiripiri* [142] timber were the overwhelming favorites for everyone. Confirming Chapter 4 results that house building materials and roles have changed, men were clearly the ones getting timber out of the forest to build houses and fences. Some women were still getting pole wood out of the forest to maintain old *manyata* houses and outbuildings. On transect walks, women spoke of five different trees for such needs today: *erisa* (a vine used to tie poles together), *olmusakua* (a shrub for poles), *olgilai* (to make the center post

[140] This Goat of Leaves ceremony was described as when a man leans on a tree and another comes to the forest to feed him. It is celebrated when a moran has been initiated and shares the brisket of a goat slaughtered in the forest (Mol 1996).

[141] It is interesting to note the Chief Laibon did not mention use of the *osinantei* tree that his father reportedly used at a fertility blessing he led in 1976 on the forest edge (Mol 1978). Each woman (876 total) was adorned with a wreath made of the leaves of this forest tree. *Osinantei* was not among the 26 ceremonial plants mentioned by household informants but its gendered use for birthing/pregnancy were reported in transect walks.

[142] *Olpiripiri* became a popular tree in the 1990s when *Iloitai* started building schools. More than a decade ago it was considered a likely candidate for overexploitation (Maundu et al. 2001).

of the house), *osinoni* (to hold mud between poles), and *olcartuyian* (to make posts). This small number contrasts with the 20 different trees *intasati* mentioned for building houses in the past. For building fences, men preferred the heavy *oltarakua* more than women probably due to the labour required and the more permanent fences men built for their *shamba*s and cow pens, in contrast to women's smaller *shamba*s and small stock enclosures. Women clearly preferred the lighter *olamuriaki,* a thorny evergreen shrub. On transects, women also mentioned *olgirigiri* which can be grown from seed and forms a natural fence that reportedly even elephants and snakes cannot penetrate.

Women had family household uses for *oltarakua* and *olpiripiri*, e.g., for stimulating milk production in women who had recently given birth and for treating children's colds and diarrhea. Men and women mentioned *olamuriaki* for treating venereal disease and joint and muscle pain.

Everyone was concerned about the over exploitation of these two highly valued timber trees:

> *Today it is oltarakua that is good for constructing houses. Constructions have become many. Before we used branches to fence bomas. Today a boma is not good until it is made of oltarakua. The same with houses. This is what is finishing the oltarakua.* FWG-PE-35

> *Twenty years ago you could not come here from town because of wildlife-- elephants, lions, buffalo, and leopards. Now it is open to destruction. People from Loita do timber business here. They get power saws in town and sell timber to men in Olmesutie and Ilkerin. It is people from Loita who are removing the timbers of oltarakua and olpiripiri from this forest.* MKI-SE-45

As characteristic trees of Loita's dry upland canopy forest, this pressure on these timber species is likely contributing to forest loss in Loita Forest (-7%) and in Empurputia (-18%) as quantified in the period 1994-2014 (Tables 4.2 and 4.3). According to the IUCN Red List of Threatened species (IUCN 2017), it is likely that localized declines in *oltarakua* due to over-use and deforestation will lead to threatened global status for this species. Botanists consider both *oltarakua* and *olpiripiri* to be severely threatened in Loita Forest (Maundu et al. 2001).

5.4.3.4 Preferred energy tree: *oloirien*

Only women collected *oloirien* for firewood. Everyone said it was their preferred fuel wood because it doesn't smoke much, its smoke smells sweet, it lights easily, and it burns a long time. Women endear themselves to husbands when they burn it (Maundu et al. 2001). In transects, women shared its many other uses---to treat children's colds, to wash out their stomachs after giving birth, [143] and to clean calabashes (gourds) that hold milk—all having strong forest: family connotations. It was also preferred by both men and women in the household survey for fencing and dry season fodder for cows.

Like *oltarakua,* references to *oloirien* were always in terms of high demand and scarcity:

> *Oloirien is the best for fire. We bypass all the other trees for oloirien.* FWG-PE-35

[143] This is a literal translation from Maa referring to expelling afterbirth and cleansing the uterus.

> *Oloirien is an important tree for Maasai. In places where there is oloirien women don't use any other tree for firewood. This is because it lights well and has good smell. It's a species that will get finished soon and we don't like that. It's also a traditional ceremonial tree so you can't tell people to stop using it.* MMG-SE-49

Fuel wood is typically collected as dry dead wood. But women were observed taking live *oloirien* which is against verbal forest rules. The combined demand for these favorite species-*oloirien*, *oltarakua*, and *olpiripiri*-- is notable because they once formed dominant vegetation associations at high elevations in Loita (Bussmann 2002). Selective removal of species comprising the dominant forest association could account for much of the recent forest loss. According to the World Agroforestry Center (2017), *oloirien* is an anti-malarial tree threatened with extinction due to timber overexploitation. Locally, it is considered severely threatened due to overuse as firewood and pole wood (Maundu et al. 2001).

5.4.3.5 Preferred fodder for cows: *oloirien, olgilai (Teclea nobilis), olperesi wouas (Themeda triandra), esere (Typha domingensis*)[144]

Leaves of two forest trees –*oloirien* and *olgilai*-- were the most preferred for feeding cows in dry season. They were collected for fodder almost exclusively by men, supporting the forest: livestock schema. The demand was extremely high for these preferred species with the most uses in the study (10 different uses for *olgilai* and 8 for *oloirien*). Using all mixed methods, men used them for fodder in dry season, various ceremonial rituals, fencing, firewood, and to treat various illnesses such as HIV,[145] venereal disease, brucellosis, colds, and cow mucous.

In not dry season, people preferred *orperesi wouas* on the forest edge and Valley and *esere* in the swamp itself. Like building materials and firewood, people spoke about their scarcity:

> *The reason why we moved here 10 years ago is because grasses such as esere and olmakutian never got finished. Cows had plenty of it and during dry season they could graze in the forest. But today grass gets finished.* MKI-PE-48

> *In the past, esere grass in the swamp was big, it was dense, it was taller than the tallest man around. You could not see someone inside it. Cows were still few then. They ate grass from the edge of the swamp and didn't go into the middle where the water was. Now they graze in the swamp even during rainy season since they can't get enough grass on the edge. Hunger forces them to go into the middle of the swamp even if there is water. Now they are eating all the grasses and the swamp is dry.* MKI-NFE-46

These qualitative findings about changes in swamp grasses reinforce geospatial findings of Chapter 4 between 1995 and 2014 when hydrophytic vegetation declined by 60% and *intasati* perceived *the water was killed.*

[144] The word *esere* was used in two ways, i.e., as a species of wetland grass and the swamp Valley itself. Informants were asked to clarify its meaning when there was doubt.

[145] Coast (2006) observed that uneducated non-Swahili speaking Maasai may refer to illnesses causing significant weight loss as HIV.

5.4.4 Gender and perceived forest change

Mixed methods for studying change included (a) the household survey which asked if and how the forest was different (b) projection scenarios to quantify change (b) semi-structured interviews of self-help groups using Google maps to identify spatial extents of changing land use and (c) semi-structured interviews of key informants asked direct questions about change drivers. There were discernible gender dimensions of perceived proximate causes, or immediate human actions (Geist & Lambin 2002) driving forest change.

5.4.4.1 Perceptions of drivers of forest change

Recalling years before the 1995-2014 period, people spoke of abundant trees and wildlife, and water in the swamp. *Intasati* her-stories related fears of the tall, dark, and thick forest where people rarely went. Elders estimated 75% of the forest remains today (25% loss) which compares with the 18% loss of dense forest in Empurputia since 1995. Household informants (97%) confirmed the forest was very different 20 years ago. Their explanations of why the changes were happening centered on immediate drivers---timber business, roads, population, and cultivation— most of which were associated with changes in men's forest activities such as construction. Women's influence was mentioned in relationship to specific plants such as *oloirien.*

> *In the past people were not using the forest to construct. There were no modern houses and there was no business. Today the forest is a source of income. People are eating the forest. They are using it as something they get profit from. Men are making timber business out of it. They come destroy the forest with power saws and sell timber to other people in Loita*. MFC-NFE-64

> *Construction of good roads is finishing our forest. All trees are cut. Our forest will be no more. It will encourage people to sell timber in faraway places.* FWG-NFE-39

> *Because of population increase that is what forced us to settle here in this forest (osopuko). The people were few and the rain was big and the grass grew a lot. Cows were the first priority for Maasai.* MFC-NFE-56

> *Cultivation is destroying the forest since we are clearing forest for shambas by burning down trees. The trees have migrated to run away from Maasai.* MKI-SE-45

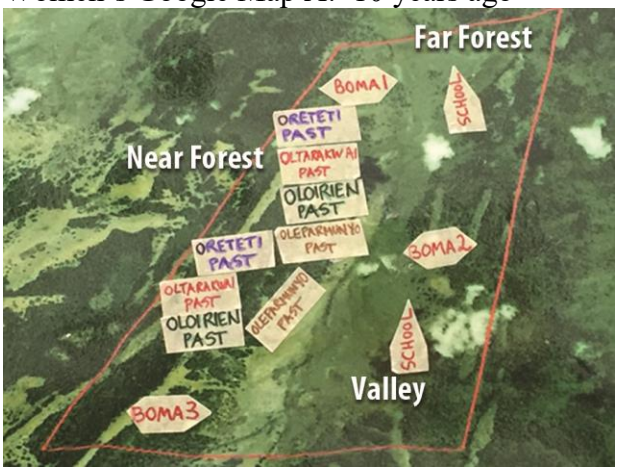
5.4.4.2 Perceptions of availability of preferred plants

Most (95%) household informants said the places they went for preferred plants changed in the last 10 years. Gender patterns were very evident in participatory Google maps (Figures 5.4-5.5).

Ten years ago, women used only the Near Forest for *oloirien, oltarakua, oreteti,* and *oleparmunyo*. Today they make the long journey across the Valley to find *oloirien* (mostly for firewood) and *oltarakua* (mostly for medicinal purposes in pregnancy and birthing) in the Far Forest. For preferred fodder plants (*olgilai, orperesi wouas),* women chose not to position markers on the Google maps, supporting the gendered use and collection of these specific plants mostly by men (Table 5.5) and the forest: livestock schema.

Figure 5.4 Participatory Google maps of temporal and spatial change where women go to find preferred plants (N= 20 women, average age=42)

Women's Google Map A: 10 years ago



Women's Google Map B: Today

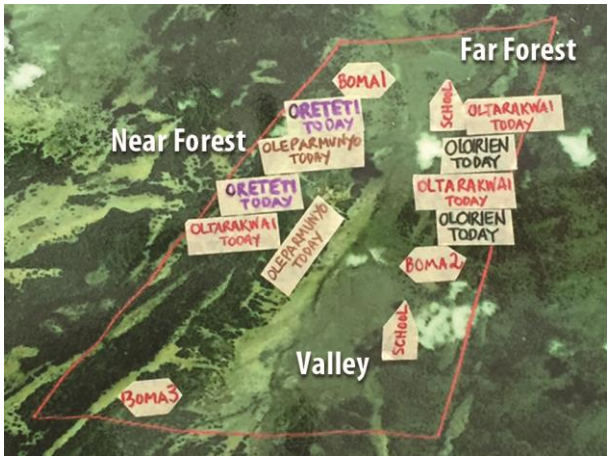
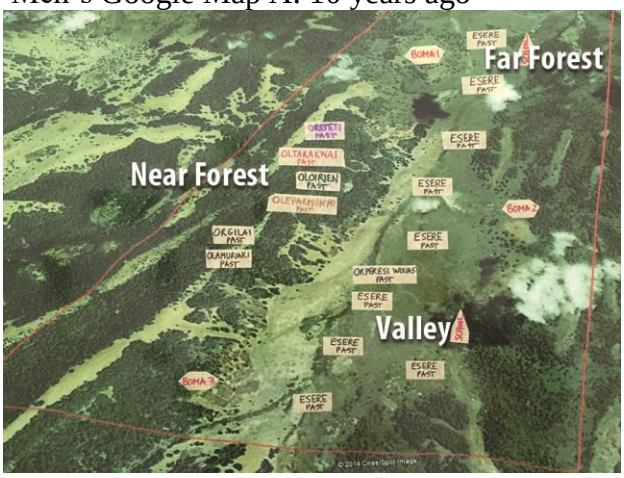
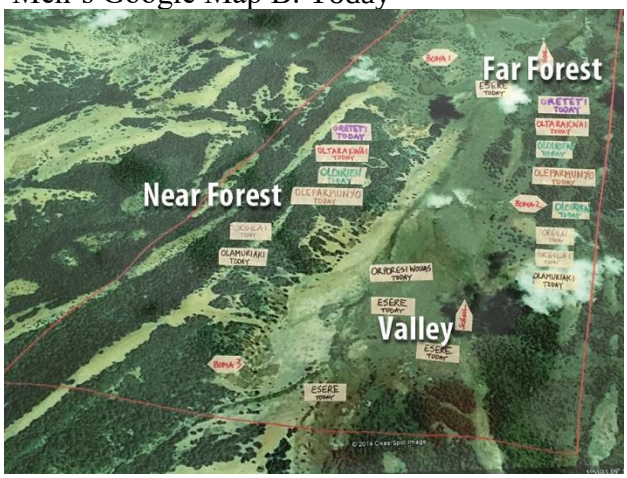


Figure 5.5 Participatory Google maps of temporal and spatial change where men go to find preferred plants (N=22 men, average age=45)

Men's Google Map A: 10 years ago



Men's Google Map B: Today

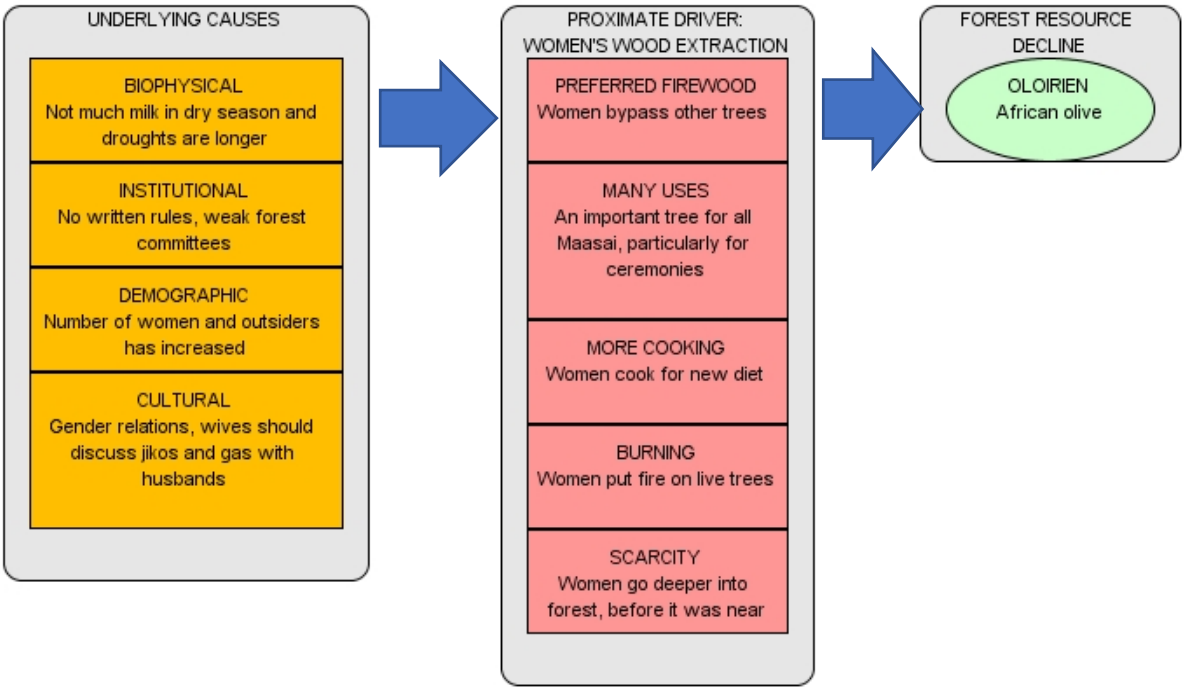


Like women, men used the Far Forest more today. Ten years ago, they depended on the Near Forest exclusively for *oloirien, oltarakua, oreteti, oleparmunyo, olamuriaki,* and *orgilai*. The loss of the fodder grass *esere* in the swamp was dramatic and aligned with land change results for hydrophytic vegetation in Chapter 4 (Table 4.3).

5.4.4.2.1 *Oloirien*: "A small house of trees" (*enkaji kiti oo ilkeek*)

Everyone attributed the decline of *oloirien* to women's firewood use. Perceptions of the underlying causes and proximate drivers of its decline are presented in Figure 5.6.

Figure 5.6 Perceptions of gender dimensions of *oloirien* decline in 1995-2014 period (after Geist & Lambin 2002)



Its decline has been underway for decades. Earlier plant surveys reported dominant *Olea* plant associations in Loita Forest depending on altitude (Bussmann et al. 2002; Maundu et al. 2001). In the 1980's, Knowles (1993) said *oloirien* was common in the open savannah woodlands below the forest near Ilkerin but by the late 1990s it had been exterminated there due to overexploitation (Maundu et al. 2001). Today it is considered scarce. Informants referred to it with an *in vivo* description-- a small house of trees (*enkaji kiti oo ilkeek*)— and most (97.5%) said women walked farther today to find it:

> *Oloirien is an important tree for Maasai. Unfortunately, it is among the species that we know will get finished because of its many uses. Oloirien is a small house of trees compared to others in the forest. Today they are fewer. It is a species that will get finished. We don't like that*. MMG-NFE-49

> *Compared to 10-20 years ago, we go farther for firewood. The oloirien has gotten finished in the forest near our homes. So, you have to go far to get it since it's the most preferred wood for fire*. *We bypass other trees for oloirien.* FWG-NFE-35

Not only was there a need for more firewood because of more cooking, but there were more women in Empurputia because resident families were growing and outsiders were arriving:

> *Cooking depends on firewood. Cooking was not much in the past because we only cooked blood. When a woman went for firewood it would last two weeks. It was near because people were few and giving birth was small.* FKI-NFE-50

> *Oloirien is finishing. People have become many. The kids we gave birth to are now women who are married. The number of women who use it has increased. And people have moved to this place, people who didn't live here before.* MKI-NFE-48

> *Women go far for oloirien because children today don't like taking milk. They like only food from the shops which requires cooking.* FKI-HE-37

Women were faulted for burning live *oloirien.* Lack of knowledge, forest rules, and gender relations were implicated:

> *Women are very involved in forest destruction. They are burning live oloirien for firewood. The Forest Committee should make written rules and educate them about using dry branches or even leaves and cow dung in the jikos.* FWG-HE-37

> *The oloirien will be finished because women are putting fire on live oloirien instead of cutting. I try to teach them. I tell them please don't burn, please cut, because chances of growing again are high. When you burn, they will get finished.* MKI-SE-68

> *Women should discuss with husbands to buy a jiko and gas*[146] *so they stop going for oloirien*. FWG-SSI-NFE-48

One educated elder spoke of a root cause-- more prolonged droughts:

> *In the dry seasons, which are more prolonged now more women are in the forest getting firewood because animals are away. Also, in the dry season there is not much milk and they are cooking other foods.* MKI-HE-64

Projection scenarios were a quantitative complement to interviews. Household informants were asked "If there are 10 of *oloirien* in the forest now, how many will there be in 2050 (or when your youngest grandchild is your age)?" Everyone thought less than 10% would remain for firewood. Women were much more pessimistic than men about the future availability of *oloirien* for ceremonies (N=60; Wilcoxon Mann Whitney Test $p<.0001185$) and fodder (N=60; Wilcoxon Mann Whitney Test $p<.01097$) (Appendix 9). Compared to all other preferred trees, men's and women's worst predictions were for *oloirien* because women used it for firewood.

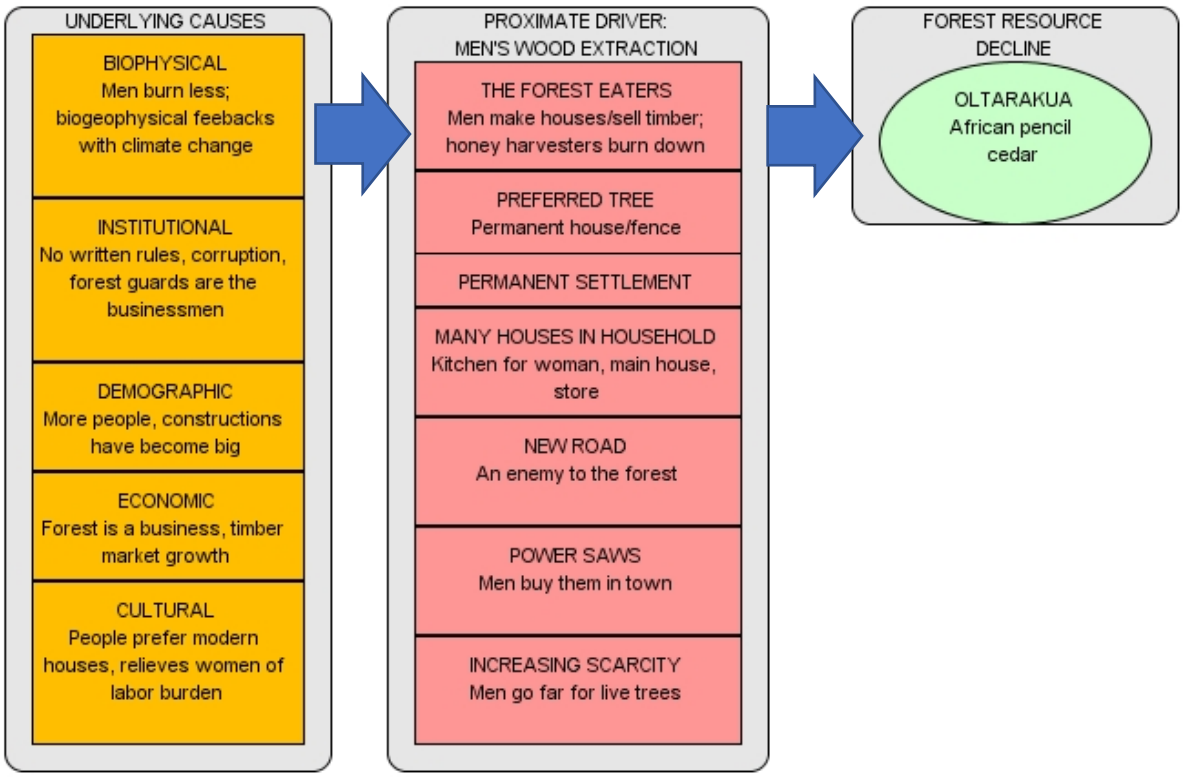
People were not inclined to plant *oloirien* trees. When asked if people planted trees in Loita, most (84.7%) said "No." When probed, most (90%) felt the forest was full of trees that grow themselves. Similarly, Maundu et al. (2001) reported that in community meetings in the 1990's, most people did not see the importance of growing trees.

[146] There were no *jiko* stoves in the study area. In addition to gender relations around household finances, there are issues of cost, lack of infrastructure, and distance that make gas *jiko* stoves unrealistic for most Loita women. A *jiko* can be purchased at the Entasekera shopping center for $40, but a gas refill is about $60 and requires several hours of car travel to Narok.

5.4.4.2.2 *Oltarakua*: "We men are the forest eaters." *(iyiook ilewa ilainosak lentim*)

Everyone attributed the decline of *oltarakua* to men's building and timber enterprises. Perceptions of the underlying causes and proximate drivers of its decline are in Figure 5.7.

Figure 5.7 Perceptions of gender dimensions of *oltarakua* decline in 1995-2014 period (after Geist & Lambin 2002)



The main reason for cedar's decline was men's over-exploitation for constructing modern houses and getting income from timber. Along with *oloirien*, *oltarakua* once defined the co-dominant *Juniperus/Olea* plant association of Loita Forest at high altitudes (Bussmann 2002, Maundu et al. 2001). Today men travelled farther to find it:

> *When people started constructing the new model of houses the oltarakua was near and you could find dry ones. Today you don't get dry ones and the live ones are far away.* MMG-PE-34

Everyone blamed men:

> *In the past people were not using the forest for construction. There were no modern houses and there was no business. Today the forest is a source of income. Men are eating it, using it for profit. We are the forest eaters. Men sell timber and they are the ones capable of stealing it at night. Women are not enemies of the forest like men since they can't go to the forest for oltarakua timber. The only time women destroy the forest is when they get firewood.* MFC-SE-64

Common subthemes of the timber business were corruption and weak governance:

> *Everyday oltarakua is going. They say there are forest guards but every day people transport timber. If you give them money you are allowed. The policeman is given money and the oltarakua is going away. The guards who are said to be protecting the forest are the businessmen who are finishing the forest.* FFC-NFE-43

> *The government DO, Chief and Police know that if this Forest Committee strengthens they will lack something to eat. Because when you want timber you go to them and you ignore the forest committee. When you report to them about violators they don't act because people have already passed through them. Those bad things will continue until this committee gets power.* MFC-NFE-64

Men and women perceived the new road and outsiders as threats:[147]

> *When the roads become good and bring power we see that as an enemy to our forest. People will be constructing houses, the poor and the rich, and they will cut and destroy forest and sell oltarakua.* MKI-NFE-48

> *Good roads and electricity will make all other tribes come to this place and take our forest. They know the benefit of selling oltarakua.* FWG-NFE-38

> *Construction of a good road will finish our forest. It will encourage people sell oltarakua and olpiripiri in faraway places. If people are already selling timber with our bad road, what will happen when the road is good?* FWG-NFE-39

People also viewed men's honey harvesting for cash as another cause. In participant observation, charred trunks of *oltarakua* were evident in the deep forest. They were attributed to male honey harvesters who lit fires to smoke out bees and collect honey.[148]

In projection scenarios, when people were asked "If there are 10 *oltarakua* now, how many will there be in 2050 (or when your youngest grandchild is your age?)" people were about as pessimistic as they were for *oloirien.* They said about 10% would be left. There were no gender differences in this projection.

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[147] In 2014, the new Narok road to Entasekera through Narosura was under construction. Power poles and cables were lying in deep ditches on the road side. By 2015, the road had been improved and some poles had been erected near Narok but power had not been connected. By 2017, many poles had toppled down due to poor installation (not deep enough) and power to schools had not been connected. This development evolved out of the government's 2013 election pledge to provide a laptop for every child in primary school.

[148] Informants explained *oltarakua* is preferred by bees because it is dense, warm and has holes where they can settle. To get honey, men (a) burn down the *oltarakua* if it is too difficult to cut the tree down or (b) cut the tree down and light a fire to smoke out the bees. Either way, the fire can get out of control. Secondary succession was observed in an area where such a fire had occurred decades ago. In the past, hunter/gatherers known as *Iltorobo* collected honey in Loita Forest but their impact on *oltarakua* was considered minimal (Maundu et al. 2001).

5.4.4.2.3 *Oleparmunyo:* "I compare it to a hospital." *(sipitali ake aitanyanyukie oleparmunyo)*

Like *oloirien*, women mentioned use of this plant more often than men and had more pessimistic opinions than men (N=60; Wilcoxon Mann Whitney Test p<.00000866) about its future (Appendix 9):

> *Oleparmunyo is still near in the forest but it is getting dry and dying because we use the roots to boil. When you cut the root of a tree it dries up. People from outside are taking oleparmunyo* [149] *to their homes and selling it*. FWG-NFE-42

> *Oleparmunyo is not under any threat because there are still many. It is a big house of trees. Its use is not much. You only cut a small root. You don't cut the whole tree. The only way it would be destroyed would be if the whole forest was destroyed.* MMG-S-NFE-49

5.4.4.2.4 *Orperesi wouas, esere*: "The grasses are no longer there." (*metii inkujit*)

There was a 20% decline in grasslands in Empurputia between 1995 and 2014. The disappearance of swamp grass was the most drastic relative loss in geospatial analyses and in Google maps. Interviews confirmed the GPS ground truthing evidence that tall *esere* swamp grasses once thrived in the Valley, and had been erroneously classified as forest in a global dataset on forest loss between 2000 and 2012 (Section 4.4.1):

> *The swamp grass was tall. It was tall as trees. When cows came it became small. Today the population is big, people have settled, so the water has gone down. There is no way to protect the swamp especially during dry season because you cannot stand up and stop cows from grazing on the swamp grass.* MKI-NFE-48

Unlike *intasati*, who understood the drying of the swamp in terms of a God-driven lightning event during El Niño rains, most men and women blamed the disappearing *esere* and *orperesi wouas* on overgrazing:

> *The swamp is dry now because cows ate all the grass and stepped on the swamp and exposed it to the sun*. MKI-NFE-46

> *The reason why there is no more water in the swamp is because cows have stepped on it. The ground became hard. The water cannot come up to the surface. For the orperesi wouas it's because of the overgrazing that it finished just like other grasses. If the number of cows reduces the grass will grow.* MKI-SE-42

> *The cows are increasing in Empurputia. They are grazing in the swamp and they step on it. In the past, the cows were few and grazed on the edge. There was a time you could not cross it.* FWG-NFE-55

One elder explained the loss dynamics in terms of the forest's integral relationship to rain discussed in the beginning of this chapter:

[149] *Oleparmunyo* is known in East Africa as a treatment for malaria (Dharani & Yenesew 2010; Orwa et al. 2008).

> *The reason why the swamp is dry is because of forest destruction along water sources. When trees are cut, the swamp is exposed to sun. Otherwise the forest would provide shade to water sources and water would come up again. If we come together and decide not to let cows get in the swamp and we protect the forest, it will rain*. MMG-NFE-42

The story of local changes in land cover and plants in Empurputia is unique because it is located along a swamp on the edge of deep forest. Underlying drivers and biophysical dynamics in this changing water tower have broad implications for the region. Aligned as these changes are with gender, they call for a gender-nuanced approach to development (Leach 2016) in this location.

5.5 Discussion

Overall, results indicated that men and women used the forest differently from each other and also from the past. They collected different plants for different purposes from different places. They were also not homogenous groups of forest users. Resource use was differentiated by age, wealth, marital status, and intra-household dynamics. The boundaries between traditional gender roles were becoming fluid out of economic necessity and more duties were falling to wives, including earning income.

The "methodological pluralism" (Doolittle 2015) of the chapter yielded insights into gender linkages. They channeled the widely diverging scales of satellite imagery and *intasati* her-stories of Chapter 4 into a more convergent and finer tuned understanding of environmental change. Rigorous cross checking between Landsat images, key informants, household surveys, participatory resource mapping, gendered focus groups, committee meetings, projection scenarios, and participant observation produced consistencies about the changing landscape and daily lives of men and women.

The methods helped uncover phenomena that confirmed the 1995-2014 transformation. Results in this period challenged stereotypical gender domains, provoked ideas about associations between local understandings of rain and biotic atmospheric pump hypotheses (Sheil &Murdiyarso 2009), and supported arguments about feedback loops between land cover, surface albedo, and rainfall (Charney 1975).

5.5.1 Expanding the narrative arc

Between 1995 and 2014, land change patterns reversed direction. Trends could not be quantified before 1976 but, based on historical literature (Lamprey & Waller 1990; Waller 1988), any changes from 1900 to 1976 were probably less acute in Loita Forest than in the tsetse-affected lowlands below. At this point in the investigation, we can say that the results suggest that by 2014 the showpiece forest of the 1950s (Talbot 1960) had been transformed into (a) less dense forest, grassland, and swamp along with more bush (b) fewer preferred tree species that once formed dominant plant associations and defined forest composition (c) a disappearing swamp due to overgrazing and forest loss.

There were obvious gender links to forest change. Forest activities that were gendered and sustainable in the past, such as women collecting *oloirien* for firewood, were having negative effects as resources became scarce and women burned live trees in the deep forest, a place they feared to go in the past. There were also gendered roles that reversed. Women no longer built

houses sustainably out of pole wood because men made durable houses of *oltarakua* they felled with power saws. Men's timber trade was facilitated by corruption and the new road arriving from Narok to bring electricity to schools. Informants predicted a dismal future for these species but lacked rules and institutions to govern behavior and knowledge about sustainable use or forest regeneration.

5.5.2 Reconsidering schemas and stereotypes

The forest brings rain (*keyau entim enchan*) was the main value of the forest. At first glance, cultural schemata (Bernard 2011) rising out of this value aligned with male/female dualities (Ortner 1974; Rosaldo 1974) and popular Maasai myths about livelihood roles (Kipuri 1983) (Appendix 4). To women, living without forest meant no rain and was threatening to children first and foremost= forest: family schema. For men, the main concern was cows and income= forest: livestock schema. Women's forest: family schema appeared everywhere, e.g., in the reason they moved to the forest, what they collected, and their livelihood activities. For men, the forest: livestock schema was in dry season grazing in the Far Forest, burning forest for pasture, clearing forest for cultivation income, herbs for livestock illnesses, timber, and traditional forest ceremonies where women were excluded or the meat would spoil.

But gendered roles were in flux across multiple forest use categories. Gender overlap was high in livestock activities as 100% of women said they herded and watered animals in addition to spraying, injecting, and/or deworming. Resource maps showed them constructing fences and pens for livestock (forest: livestock). Even though women no longer built new houses because men had assumed the role (forest: family), they valued the forest more than men for construction purposes. Men were the forest eaters because of *oltarakua* and *olpiripiri* timber exploitation, but women were considered the main agents of losing the highly desirable and threatened *oloirien*, everyone's preferred species across multiple use categories. Spatial analyses showed women traveling to the Far Forest today which was men's domain in the past.

The forest was not used for ceremonies like it was in the past, even though men said women still went and vice versa. As Leach (1994) points out, such inconsistencies can be a methodological challenge in ethnography when people align the past with current circumstances and ignore the change in their lives today. The contrast from the past was more pronounced for men who held on to the ideas of forest ceremonies that signaled their progression in the culture. From the perspective of women, the forest: family schema around fertility blessings was more easily discarded. They had been exposed to family planning and time in *olamal* was wasted time they could be spending in their *shamba*.

The popular characterization of men as having the most knowledge about forest medicines was refuted by the pharmacopeia of herbal medicines under the gender lens. This finding has implications for health, sustainable use, and economic opportunity. As warned by Pfeiffer & Butz (2005) and Sunderland et al. (2014), had the study followed a gender-blind approach, and proceeded on the assumption that men were the experts, the intra-cultural variation in medicinal plant use would have been completely lost. Medicinal plant use has been documented by Maasai scholars before (Bussmann 2006; Fratkin 1996; Kårehed & Odhult 1997; Kiringe 2005; Maundu et al. 2001; Ongugo et al. 2011) but gender was not a focus. Most informants perceived men as

the herbal medicine gatherers, perhaps because of men's widespread spatial use of the forest, as the mapping results indicated. Another factor could be men were older (mean age= 44 years) than women (mean age= 33 years) and on average men lived in Empurputia about 10 years longer than women. Also, because most women moved there to be married, they may have perceived the men as having more familiarity with local plants. But the data show that women valued the forest more for its medicinal value and women were the only ones collecting such plants to treat both children and adults. Sex disaggregation revealed medicinal use categories for children and pregnancy/birthing would have been overlooked otherwise and the most plants were in those categories. Even though men never mentioned getting plants to treat children, they did collect *osokonoi* and *oligilai* to clean women's stomachs after giving birth and *osinantei* to give strength to pregnant women (forest: family schema).

Finally, assumptions about stereotypical gender domains of forest use could impact the success of development initiatives. Projects that distract women away from home could affect their new roles as income earners and *de facto* household heads and further exacerbate labour inequity. Men and women both have differentiated knowledge about medicinal plants such as antimalarial *oloirien, oleparmunyo,* and *olgilai* (Bussmann et al. 2006; Dharani & Yenesew 2010) and many others that may have commercial value. Initiatives aimed at threatened canopy trees should recognize the changes in gendered roles in construction and, based on spatial analyses and projection scenarios, appreciate how the scarcity of key resources affects men and women differently. Livelihood roles and landscape utilization in the 1995-2014 transformation period all have gender dimensions that no longer follow stereotypical patterns.

5.5.3 Positing linkages with biogeophysical systems

The results foster questions about the role of gender in the biogeophysical relationships between forests and the hydrosphere in semi-arid landscapes. Such questions could bolster conservation interest in Loita Forest as a water tower and key biodiversity area in the Eastern Afromontane Hotspot (CEPF 2012). Anthropogenic land change in Loita Forest has many gender dimensions-- from men settling where cows can be close to the forest, clearing forest for men's ever larger maize plots and women's vegetables for income, choosing modern cedar houses made by men instead of traditional *manyata* huts made by women, men selling timber with the help of corrupt male-dominated institutions, and relying on women to continue furnishing preferred fuel wood from live trees.

The qualitative data uncovered a cultural schema (*keyau entim enchan)* that links people's main value of the forest with biophysical systems operating in the region. The idea that *the trees blow wind which attracts the clouds* was repeated in interviews and women's songs with little variation. The premise that forests attract rain is debated by climate scientists and physicists studying biophysical forest/wind/rain relationships (Angelini et al. 2010; Makarieva et al. 2013a; Makarieva et al. 2013b; Meesters et al. 2007; Spracklen et al. 2012). A new hypothesis suggests this indigenous knowledge is accurate since forests serve as biotic pumps of atmospheric pressure that draw in moist air (Makarieva & Gorshkov 2007; Sheil & Murdiyarso 2009). Also, in line with the Charney (1975) hypothesis, it is possible that impacts of grazing, fire, and agriculture combined with climate-related vegetation decline in the forest have increased surface albedo and induced local feedback loops affecting atmospheric lift, cloud formation, and rain

fall. Such feedbacks have already been quantified in African semi-arid landscapes (Hanan, Prihokdo, & Williams 2009). Land change scientists maintain that the patchiness of forest extents combined with logging and changes in hydrosphere resemble 'cryptic' forest impoverishment where forest degradation may not be reflected in deforestation mapping because forest cover is not eliminated (Nepstad et al. 1999; Turner et al. 2007). Perhaps Loita Forest decline feeds into an overall impoverishment of forest ecological systems on a larger scale. Because local forests might influence how much, when, and where rain falls according to these hypotheses, these gendered activities could be proximate drivers affecting rainfall over the area and therefore the hydrology in Empurputia. If local-scale case studies reveal more realistic land change dynamics than cross-national statistical analyses (Geist & Lambin 2001), then what is happening in Empurputia has much wider implications, not the least of which is the disappearance of small wetlands across Kenya (Ashley et al. 2004; Chapman et al. 2001).

Political ecology can be useful in reframing simplistic narratives about overpopulation driving resource scarcity and exceeding biogeophysical boundaries (Rockström et al. 2009). The informants in this study mentioned overpopulation frequently and it is a main topic in popular neo-Malthusian (Malthus 1888) explanations of land degradation. As Mehta (2010:5) warns:

> *Fixation with overpopulation ignores focusing attention on more crucial aspects such as how power is distributed in society, unequal gender, caste and ethnic discrimination, … tenure arrangements, ecological degradation and so on.*"

So far in this thesis, results indicate that overpopulation is just one factor among many. These include the underlying economics of marginalized people living with resource scarcity, biogeophysical feedbacks, and policies driving insecure land tenure, corruption, and weakening of local institutions. From a feminist political ecology perspective, the findings demonstrate there are political and socio-economic drivers of forest use and they all have gender dimensions.

Chapter 6 searches for the gender dimensions of livelihood shift and decision-making at the household and community levels.

Chapter 6: Gender dimensions of livelihood shift and forest decision-making

As the story of development continues
and the rigid Maasai stereotypes of "being Maasai" persist,
Maasai men and women are both finding ways to negotiate the disjunctures between images and realities, between "tradition" and "modernity."
(Hodgson 2001: 269)

6.1. Summary

Previous chapters differentiated land cover and forest use using the gender lens. This chapter incorporates livelihood shift and forest decision making into those results. Its ethnographic thickness unveils gender complexities in pastoralist and agricultural production systems where women's contributions have not been made empirically visible. It finds places where women are change agents in their community. The Discussion section further expands the narrative arc, challenges stereotypes of gendered relationships with livestock, and posits new pathways to gender-inclusive decision-making.

6.2. Introduction

Men and women figure prominently in agro-pastoralist Maasai livelihood strategies but there are few empirical studies aimed squarely at power relations and gender differences in labour division and resource use (Brockington 2001; Wangui 2008).

Most research on gender and environment in Africa has been in the agriculture and agro-forestry sectors (Fortmann et al. 1997; Leach 1994; Thomas-Slayter & Rocheleau 1995a). Studies have highlighted the unsuccessful development outcomes that result from ignoring social factors in African pastoral areas (Buhl 2005; Dietz 1987; Kettel 1992) including in Maasailand (Bedelian 2014; Fratkin 2001; Goldman et al. 2010; Henry 1977; Hodgson 2000; Homewood et al. 2009b; Homewood & Rodgers 1991; McCabe et al. 1992). The lack of empirical evidence for gender/environment linkages limits progress toward equitable stakeholder participation in key biodiversity areas such as Loita Forest. Ignoring gender dimensions of livelihood shift, and perceiving a community as a homogenous set of resource users, can promote gender-blind practices that undermine the targets of human and environmental development.

As scholars of commons and community-based resource management assert, stakeholders and rural communities take on new meaning when one unpicks all their demographic, temporal, spatial, and institutional variations (Agarwal 2010a; Agrawal & Gibson 1999; Colfer 2005; Kellert et al. 2000; Leach 1994; Leach & Fairhead 2001; Ostrom 1999; Robbins 2000; Western & Wright 1994). Heterogeneity in life circumstances also influences intra-household dynamics and deserves research attention (Brockington 2001). This study uses gender and its intersection with age—the age/gender organisation of Maasai culture which determines social status—to study power relations affecting household and community decisions related to forest use.

Gender inequities among Maasai people are painfully obvious under a spotlight on decision-making. Traditional male-dominated institutions remain entrenched in Maasai communities

while Kenya forest management authorities are devolving power to localities and mandating gender equity quotas under the new Constitution (Kenya 2010a). In Loita, women's marginalization invites questions about how representative forest decisions by customary institutions can become.

There is evidence that tropical forest cover is enhanced when users organise themselves (Persha et al. 2011), forest commons deteriorate when local governance institutions are weak (Ostrom 1999), and men and women are affected differently by forest degradation (Agarwal 2010). Indeed, *Iloitai* success in staving off external pressures to privatize the forest has been attributed to mobilizing their customary (patriarchal) institutions (Zaal et al. 2012). Because women's engagement in forest decisions can improve effectiveness and reduce conflicts (Agarwal 2009, 2010b; Westermann et al. 2005), implications for food security among African pastoralists cannot be underestimated (Njuki & Sanginga 2013).

6.3 Methods

Data sources were the household survey, semi-structured interviews of key informants and gendered self-help groups, oral histories, event calendar, and constant participant observation. All methods aimed for equal representation of men and women so data could be sex-disaggregated for gender analysis.

The study used a grounded approach to exploring gender dimensions in livelihood and decision-making. Spatial and financial dimensions aligned closely with the Sustainable Livelihood Framework and gender adaptations for the development sector (Carney 1998; Meinzen-Dick et al. 2011; Scoones 2009). Further refinement was necessary for power relations, division of labour, and cultural and temporal factors relevant in the Maasai context. As demonstrated in earlier chapters, there are complex temporal aspects to tracing temporal change in the Maasai context. For livelihood change, the local event calendar helped frame the progression toward cultivation. For forest decision-making, the references were the tumultuous period of legal threats to forest access in the 1990s that everyone remembered in detail and possible subdivision.

To respond to the call for more detailed ethnographies about power in pastoralist households (Brockington 2001), long interviews of husbands and wives were conducted separately and participant observation was continuous while camped in a Maasai homestead. Social scientists assert that realities are hidden when the smallest unit of analysis is households, a unitary rather than collective model is assumed, and only household heads are questioned (Agarwal 1997; Doss & Meinzen-Dick 2015; Guyer & Peters 1987). In this study, husbands and wives were interviewed and they were observed throughout their daily lives for months.

Statistics help was obtained through a Yale University/University College London Student Exchange which facilitated collaboration with students at the Yale Department of Statistics who helped select appropriate nonparametric statistical tests (Fisher's Exact Probability Test; McNemar's Test; Wilcoxon Mann Whitney Test; Binomial Test) based on assumptions about methods and the dataset. (See Section 5.3.1.)

This chapter addresses these research questions that emerge from the culture/livelihood and culture/decision making intersects (Figure 1.1):

- Why, when, and where did livelihood shift take place? How did it align with changes in land cover? How do people participate in decision-making in the household? Has it changed?
- What are important land and forest issues facing the community? How do people participate in decision-making about the forest? Has it changed?

6.4 Results

This section describes the characteristics of livelihood shift and how it aligns in time with land change and forest decision-making processes.

6.4.1 Gender and livelihood shift

We started cultivating because we needed a co-wife for the cow. (kiyieyieu enkaini ena kiteng) MKI-SE-64

Strategies to pay expenses changed in the past two decades. Pastoralism was still dominant but less so than before because of the significant shift toward cash crop cultivation (Table 6.1). In Maasailand, cropping accounted for as much as 50% of income for cultivating households in the same period, depending on water availability (Homewood et al. 2009b). In the study area on the forest edge, with more rain than in semi-arid lowlands, livestock and rain-fed cultivation were the main sources of income today for 63% and 27% of informants, respectively. In the past, 92% of income was from livestock. Cultivation typically required clearing forest edge for plots and deeper forest for fencing materials.

Gender analysis uncovered the story of the shift, revealing men's rising engagement in cultivation and casual work for income (Figure 6.1). To women, cultivation persisted over time because of their small vegetable gardens feeding children (forest: family). For economic and cultural reasons (Jacobs 1975; Ole Sankan 1971; Talle 1988; Waller 1999), in the past men didn't perceive cultivation as worthwhile. This husband had condemned it:

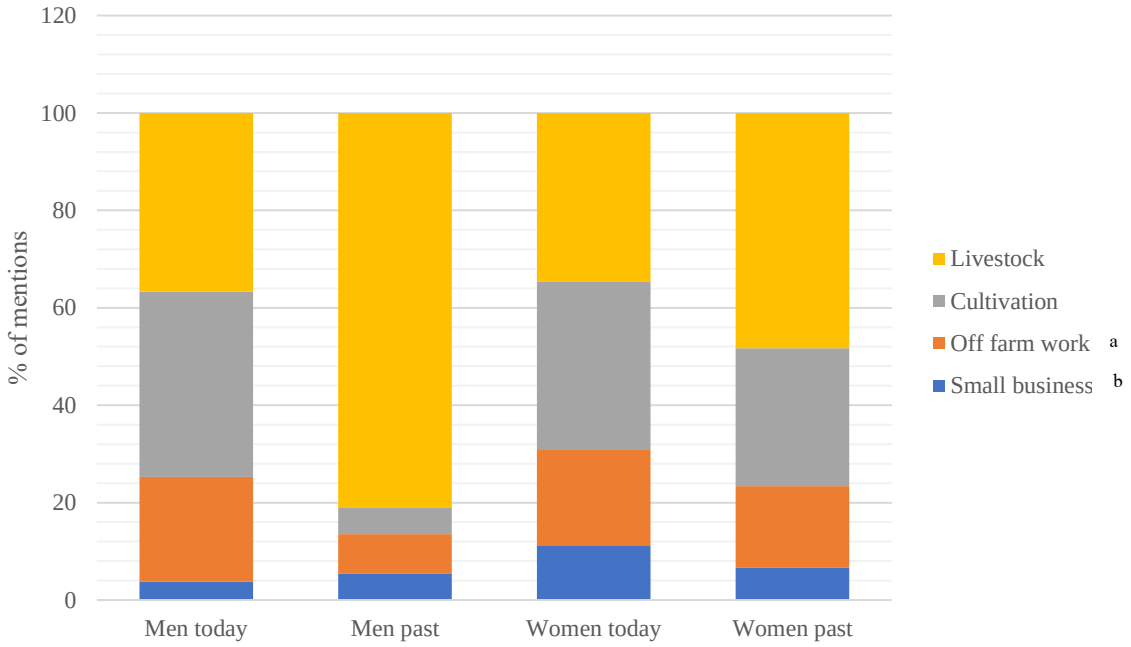
> *When I was weeding my garden, my husband said "You are doing nothing. Go look after my cows." When he found me cooking vegetables he said "Pour them out. What is this disgrace you are bringing by eating leaves?" I put the pot on top of the roof of the manyata house so that when he was not there I could get it and cook. I ate it and I gave it to children.* FKI-NFE-59

Drought was the most frequently mentioned challenge to livelihood. In the past, the biggest challenges were drought (49%), predation (lion, leopard, hyena) (31%); and diseases (17%). Today the list was longer and included drought (32%), overgrazing and less pasture due to overpopulation and settlement (25%), lack of herders due to children in school (21%), predation (hyena), and diseases (9%). The underlying reasons for cropping are well documented in studies of livelihood diversification in Maasailand (Fratkin 2013; McCabe 2003; McCabe et al. 2010; Trench et al. 2009) but gender considerations are not. Scholarly interest is building, however (Brockington 2001, Hodgson 2000, Wangui 2008).

Table 6.1 Open-ended responses to "What is the main way your family pays for what it needs today and 10-20 years ago?" (N=60)

	Today		Past		McNemar's test
Main way	**Mentions**	**%**	**Mentions**	**%**	**P value**
Livestock	38	63.3	55	91.7	.000217
Cultivation	16	26.7	1	1.6	.000001
Off-farm/casual work	6	10.0	4	6.7	.000001
Total	60	100	60	100	

Figure 6.1 Gender analysis of open-ended responses to "What are three ways your family pays for what it needs today and 10-20 years ago?" (N=60)



[a] Examples for men were building houses, digging and fencing *shamba*s, security, tour guide, and driver. Examples for women were washing clothes and weeding.
[b] Examples for men were selling veterinary drugs. Examples for women were selling vegetables, sugar, milk/ghee, and grinding maize.

Male key informants viewed the shift to cultivation in terms of saving cows and income. "Raid the soil rather than cattle" is a popular saying referring to the traditional role of moran to raid cows (ILIDP 2012). These elders remembered the shift driven by drought, exposure to outsiders, and helping cows:

> *We started cultivating because we needed a co-wife for the cow. A man takes a second wife because just one cannot do all the milking, take care of calves and sheep and children, weed, and go for firewood and water*. MKI-SE-64

> *The cows were not enough because of change in weather. Iloitai started moving outside and interacted with Kikuyu, Kalenjin, Somalia and guys from Tanzania who worked in the maize fields. They saw the change and wanted it for income.* MKI-SE-35

Women remembered the shift from the standpoint of food:

> *I had a small shamba and grew beans and potatoes and maize. Men didn't think it was a good idea. Then they ate and the whole house got food. When the men got satisfied they said, "This woman has tried, let's wake up" and they dug a big shamba.* FWG-NFE-42

Most household informants (54%) remembered livelihood changing between 1995 and 2004 (Table 6.2). This represents a lag of at least a decade compared to Tanzanian Maasai in Ngorongoro District who started small gardens in the 1970s and expanded into large farms in the 1980s (McCabe et al. 2010). In that study, as in this one, a push factor was not enough food and milk and a pull factor was avoiding selling cows for food. In both places, agro-pastoralism and commercial maize plots followed women's small vegetable gardens:

> *People on this side of Loita were very slow to embrace cultivation. Anybody cultivating when I arrived in 1991 had a very small garden. No one had a big shamba. It was still very forested and wild animals were much nearer.* MKI-SE-46

> *Twenty years ago, shambas here were very small because the forest was dense. Women were the ones who worked in them. It's the men who have big shambas today.* FWG-NFE-42

Table 6.2 Open ended responses to "When did livelihood change start?" X age groups (N=60)

Age	1979–1984		1985–1994		1995–2004		2005–2014		Total	
group	Mentions	%	Mentions	%	Mentions	%	Mentions	%	Mentions	%
20-29			2	20.0	7	70.0	1	10.0	10	17.6
30-39			1	5.3	15	78.9	3	15.8	19	33.3
40+	1	3.6	18	64.3	9	32.1			28	49.1
Total	1	1.8	21	36.8	31	54.4	4	14.0	57	100

By 1995-2004, most individuals had their own plots (Table 6.3). By 1998, small scale farms and commercial animal husbandry were a must for survival (Voshaar 1998). This period followed drought in 1993/1994 [150]and 1995/1996 (Ojwang et al. 2010, UNDP 2004). Older people remembered livelihood change and starting their own small gardens a decade earlier.[151]

[150] In 1993 there was famine and without access to forested highlands in the northern and eastern parts of Loita "all the cattle in Loita might have died and the people with them" (Voshaar 1998: 107).

[151] When Talle (1988) did her field work in Morijo in the Loita hills in 1979-1981, only a few women engaged in small scale cultivation. Knowles (1993) reported no cultivation in the Ilkerin lowlands in the 1980s and mentioned the women cultivating in Morijo were Kikuyu wives who were more interested in agriculture. These differences point to unique timing of the shifts depending on variabilities even within Loita. In lowlands surrounding nearby Maasai Mara, small scale plots expanded up to 1998 as a land tenure strategy and then decreased by 2004 after lands had been titled and secured (Thompson et al. 2009).

Table 6.3 Responses to "When did you personally start cultivating?" X age groups (N=59)

	1985-1994		1995-2004		2005-2014		Total	
Age group Coast	**Mentions**	**% of group**	**Mentions**	**% of group**	**Mentions**	**% of group**	**Mentions**	**%**
20–29			7	46.7	8	53.3	15	25.4
30–39	3	14.3	10	47.6	8	38.1	21	35.6
40 and over	14	60.9	9	39.1			23	39.0
Total	17	28.8	26	44.1	16	27.1	59	100

> *I started cultivating when Irompoi were not circumcised.* [152] *They were just small boys. I went to manyata when I was cultivating. I left my shamba and I was taken with morans to the manyata. When Irompoi became junior elders my shamba became big.*[153] FWG-NFE-42

> *The people who started cultivating big shambas were Ilkishili because they were the ones who gave birth more than any other age group and they grew up without cows so they decided to cultivate because people said the soil had a lot of food.*[154] FKI-NFE-77

Older people remembered the drought of 1983/84 when there was food aid and no rain for a year. It was one of most severe droughts in Kenya's modern history causing widespread loss of human life, wild animals, and livestock (Ojwang' et al. 2010). *Iloitai* were aware of the expansion of wheat farms into former grazing areas in Narok around that same time [155] (Serneels et al. 2001; Voshaar 1998) and it was also when Tanzanian Maasai (McCabe 2010) were expanding their plots to avoid selling livestock and to eat -- for the same reasons as *Iloitai* a decade later. The progressive increase in cropping from the 1980s to 1990s also confirms findings in nearby Olkiramatian at the base of the Nguruman escarpment and Loita Forest (Coast 2002).

Most respondents (65%) permanently settled in Empurputia during those same years—18% in the 1980s and 47% in the 1990s. Men's reasons for the move were significantly different from women's. All men moved for grazing (forest: livestock) and 23% also mentioned cultivation. Most women (59%) and no men said they moved to marry (forest: family).

The 1980s also coincided with development sponsored by the first non-governmental organisation (ILIDP) in Loita [156] which everyone credited with learning how to cultivate:

[152] *Irompoi* circumcisions started in 1995.
[153] *Irompoi* moran graduated to junior elders in a 2005 *eunoto* ceremony.
[154] *Ilkishili* circumcisions started in 1980. Droughts were widespread in 1974-76, 1980-81, 1983-85, 1987, 1992-1993, 1995-96 (Huho & Mugalavai 2010). *Ilkishili* would have had families to provide for in the 1990s after *eunoto* in 1987.
[155] Large scale wheat farming was encouraged in Maasailand by the government but Loita elders rejected the idea because it favored individuals not the community (Voshaar 1998).
[156] ILIDP was funded in the 1970s by the Catholic Diocese of Ngong and a Dutch Catholic agency (now CORDAID). Its founders saw it as 'part of the ladder' (Voshaar1998), a reference to a Maasai legend of climbing out of the valley to reach grass (Ole Sankan 1971). It aimed to alleviate poverty through infrastructure (dams, roads, boreholes, and air strip), animal husbandry, group ranches, clinics, education, and domestic training for women. In the 1980s, it was managed by locals focused on agriculture, crossbreeding, and women's empowerment. Evidence of its waning influence is its failed attempt in 2015

> *We were trained at Ilkerin to cultivate. We saw videos. Agriculture experts taught us the best seeds to plant and how to hold a jembe and train oxen. Before we went to Tanzania and Narok to buy maize but there was good in our soil here and we didn't know it. We saw the soil had importance, like cows.* MKI-NFE-48

There were "field day" competitions:

> *I went to the first field day at Ilkerin. Everybody went. People brought two or three maize cobs and made them stand to be seen. We showed our beans, pumpkins, and tobacco. We were given a hoe. When you had the biggest maize cob, you were given a panga or jembe. There was also beadwork and the best lady was given a prize.* FKI-NFE-59

Tractors were hired-in around 1995:

> *When I was small they didn't till the land with tractors because they believed the forest would be displaced. In the 1990s people were told not to make shambas more than 2 acres. The big cultivation started when the first tractor came to Entasekera.*[157] *This November, you will see 20 tractors coming from Mau and Narok.* FKI-SE-38

Family expenses changed. Comparing relative proportions of expenses, main items in the past were food, clothing, and drugs for cows (Figure 6.2). Today they were school fees, food, and clothing. Higher prices for everything were "push" pressures to adopt the "co-wife for the cow."

Unlike the past, households today depended more on women's income-generating capacity. Women's sources of income and intra-household cooperation varied from house to house:

> *Women contribute more today than before. We both share family expenses. Women have their own chickens and goats and do cultivation. For the expenses that have not been paid, the husband sells cows.* FWG-NFE-35

> *Women cultivate shamba and do business so that we can get things like sugar to sell. The money you get feeds your children and pays school fees. Men contribute very little toward the schooling of a child. Some men don't contribute anything. Women are the reason why children remain in school.* FWG-NFE-42

> *Before it was only the husband selling livestock to pay for school fees. At the moment, I can pay school fees through my businesses and livestock I bought for myself with our women's group.* FWG-NFE-35

Spouses obtained income differently (Figure 6.3). For women, the sources were more diverse and different from the past. For men, livestock was the consistent means. Husbands were the biggest source of women's personal funds in the past but not one wife said she relied on her

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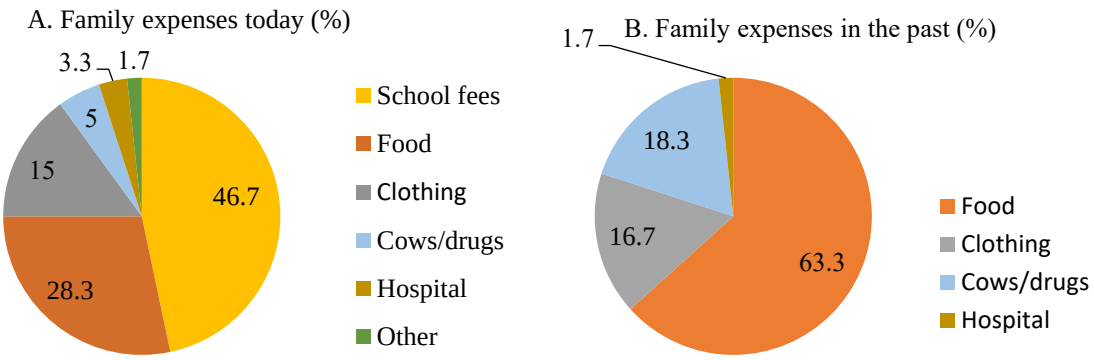
to move forward with a forest protection effort for which funding had already been secured. The community blocked it because they felt insufficiently involved in the planning.

[157] According to local literature, there was no agricultural machinery in Loita in 1994 and the biggest piece of equipment was an ox-plow (Maundu et al. 2001).

Figure 6.2 Comparison of family expenses today and 10-20 years ago (N=60)



husband today. Husbands' off farm wages do not contribute much to Maasai household expenses (Coast 2001; Keane et al. 2016). Women depended much more on cultivation than men. Not relying on husbands because of alcohol and absence was a common complaint:

> *Ten years ago, women depended completely on husbands. Today we must contribute economically to the welfare of the family because men take alcohol and abandon their responsibilities. Women do business and we can spend money without consulting our husbands. This was not done in the past.* FKI--NFE-25

> *Life for the woman has become hard. She is responsible for the children, cows, shamba, and she goes to do manual work so that she can bring food for the children. Before it was the man who bought clothes for the wife. Today women buy clothes for the husband. Where is the husband? He just loiters drinking alcohol.* FWG-SSI-NFE-42

> *I have given birth to 5 children. If my husband is away loitering I will look for ways for my children to get food even without my husband. If it is paying for education of children and school fees I will try my best until I get it, even with manual work.* FKI-NFE-40

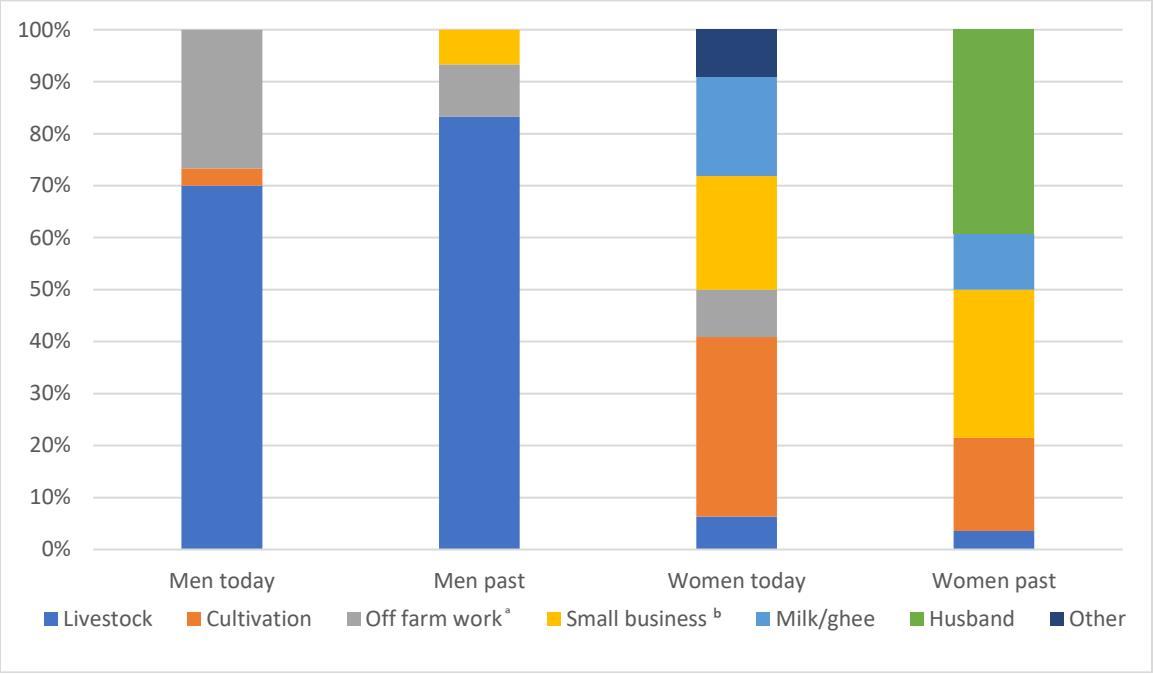
Spouses also spent personal income differently (Figure 6.4). School fees were a main expense-- a big change from the past for everyone. Men's personal source of paying for school fees and hospital bills was livestock and for women it was cultivation. Some spouses discussed how bills were paid and other women said men were reluctant to sell cows:

> *The man receives income from selling cows and the woman from selling farm produce. All decisions on how it should be spent are made by the man but today husband and wife consult each other on how income is used, especially in payment of school fees.*MKI-NFE-48

> *Men like cows more. They think if they sell one cow their cows will be finished. They will choose to die in a local clinic rather than sell a cow to go for treatment in the hospital.* FKI-SE-38

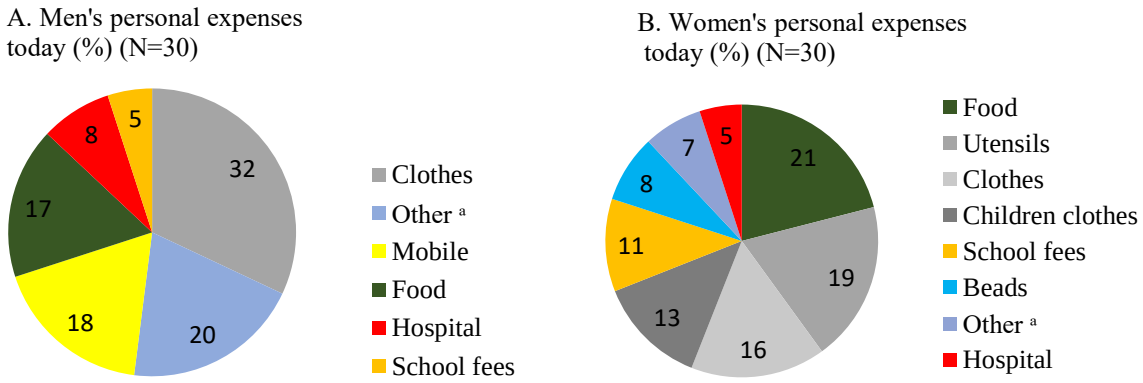
With increasing commoditization, men resist selling cows for school fees because they said prices are low. More women than men said school fees and food were their main expenses.

Figure 6.3 Gender analysis of open-ended responses to "What is the main way you get personal income for your personal needs today and 10-20 years ago?" (N=60)



[a] Examples for men were building houses, fencing bomas, digging *shamba*s, tourism, security. Examples for women were washing clothes, plastering houses, sewing dresses.
[b] Examples for men were harvesting and selling honey. Examples for women were selling firewood, chickens/eggs, vegetables, sugar, and merry-go-round.

Figure 6.4 Gender analyses of open-ended responses to "What is your main personal expense that you pay for?" (N=60)



[a] Men: batteries, radio, torch, snuff, and veterinary drugs. Women: women's group donations and garden.

Men don't feel the need for education. They wonder "If I sell the cow where is my profit?" Children who go to school might not come back or they become disrespectful. Men are afraid of selling cows and ending up in poverty. Even today there are men who eat fruits and bark to not sell cows. MKI-SE-54

Gender differences in spending a hypothetical gift of $50[158] mirrored patterns just described. More men would expand their *shamba*s to avoid selling cows. More women would start a business (selling vegetables, goats, sheep, sugar, utensils, beadwork [159]) to pay for food and school fees.

6.4.2 Gender and livelihood activities

Life is changing. A man and a woman can do every duty (kegira doi enkop aibelekenya etaa kiriamari ake ilewa onkituak aas eramatare) MKI-SE-42

6.4.2.1 Livestock production

An overview of prevalent themes in livestock production is presented in Table 6.4.

As mentioned in Chapter 5, a Maasai legend (Appendix 4) explains why women have no control over livestock and are dependent on men. Women lost control over cattle long ago because their children were more important to them. They could not be trusted with cows because they might exploit them by over milking to feed children and compromise the health of calves (Talle 1990). This theme is also familiar among settled Fulani pastoralists where milking is a man's domain and women might take a surplus to sell (Waters-Bayer 1986).

Maasai women's livestock role has been characterized as "subordinate and yet not wholly subdued" (Spencer 1988:21) because men dominate production and sales while women retain rights over milk and caring for small stock. Intensely gendered livestock duties persisted in the study but they also varied depending on spousal relationships. In general, women's subordination was still in place even though their livestock labour had increased. But, as discussed later (Section 6.4.2.4), there were also confident entrepreneurial women advancing into the livestock economy to achieve financial autonomy.

Traditionally, Maasai women spent less time than men and children on livestock activities. Children did most (92%) of the herding which demands more labour than any other in livestock production (Grandin et al. 1991). Recently, role reversal has been reported in rain-fed agro-ecological Kajiado South where *Ilkisongo* Maasai women contributed more hours of labour to livestock production than men as children went to school, sedentarization and cropping increased, and pasture distance decreased (Reid et al. 2004; Wangui 2008). Shrinking numbers of adults per homestead (Coast 2002) also increased women's labour, along with men seeking

[158] In June 2014, the US Dollar to Kenyan Shilling exchange rate was 1 USD=87.6443 KES.

[159] In the 1970s, women's handcrafts were a successful business for ILIDP and women used the proceeds to pay school fees (Kronenberg 1986) and buy food for the family (Knowles 1993). In the study area today, market access was poor but women were quick to take advantage of opportunities to sell beadwork to occasional tourists and researchers.

Table 6.4 Prevalent themes in gender dimensions of livestock production 1976-2014

Theme	Rising action (1976–1995)	Transformation (1995–2014)
Land cover	Healthy ecosystem; grasslands remain at 32% land cover; men burn a lot for pasture.[a]	21% loss in grassland; 60% loss in grasses in swamp attributed in part to overgrazing; 18% loss in dense forest; 147% gain in bush; men burn less for pasture.
Livelihood strategy	Specialised pastoralism; 92% say livestock was main income; forest is drought refuge.	Agro-pastoralism; 63% say livestock is main household income; 70% of men and 0% of women say livestock is main personal income.
Market distance	Men travel a week on foot to get cows to market.	Men sell cows locally; new road intensifies market for livestock; some women participate in market as buyers and sellers of mostly small stock.
Milking	Women's domain; main food source; 11% of women's income.	Women's domain; low milk offtake from drought, poor grasses, and weak Sahiwal bloodlines; people take less milk; 20% of women's income.
Herd composition	Mostly zebu cows; some small stock.	Commoditization and smaller herds with more small stock undermine women's milk domain.
Spatial	82% graze in forest valley and swamp in dry season.	Overgrazing and increase in population drive 62% to Far Forest for grazing; poor *de facto* women household heads let cows graze alone.
Livestock ownership	Women owned nothing except "the food in the fire."	High asset disparity in livestock assets (.18 of 1.00); 50% of women own and can sell livestock but mostly chickens; 7% own and can sell milk cows; educated women are agents of change in livestock ownership in merry-go-round groups; a woman bought and sold a cow to pay for daughter's school fees.
Labor division	Children do 92% of herding. (Grandin et al. 1991)	Women do all livestock duties when men absent and children in school.
Land tenure	Communal; legal threats to forest access in mid 1990s.	Communal; expecting change in land tenure that will restrict herd movement and size.
Decision-making	Women perceived as children with no decision- making power over livestock.	Men consult wives about disposition of cows; more women serve as *de facto* household heads making livestock decisions because of men's absence and alcohol abuse.
Food security	1983 no rain for a year, food aid; 1993 drought and famine.	Milk, meat, maize, vegetables; women also cook food from shops that children prefer today,
Financial	Women completely dependent on men.	Men reluctant to sell cows; women sell milk and small stock to pay household expenses.

[a] Due to differences in image quality between 1976 and the other years, 1976 land cover totals were used only for comparing relative extents, not for calculating percent change. (See Section 4.3.1.2)

work, finding loans, and making school arrangements away from home (Kipuri 1990). In Empurputia, all 30 women in the household survey engaged in aspects of livestock production other than milking and caring for small stock—herding, spraying, injecting, deworming, tagging, taking cows to water or salt, slaughtering, butchering and/or buying and selling livestock. Five women were herd owners and had main responsibility for everything. Four of these five women were *de facto* household heads who were widowed, separated, or divorced.

In interviews, everyone said women had more livestock duties today because of children in school, changes in cultural views about education, and men's absence. In some households, labour was considered equitable by both spouses. In others, these new duties were a burden:

> *The children have all gone to school. When the man goes for work, I do the herding. It's the man who herds when I go for firewood and water. Ten years ago, men and women never herded. Then Maasai didn't like school. Only the children of the wife (entiki) who was not loved by the husband went to school. Those of the wife (enkirotet) who was loved never went to school.* FKI-NFE-48

> *Before a man might have 10 children and only one in school. So the man could go look for the daily bread and the women stay at home. But today when the man is gone the women don't stay at home because they do the herding of cows, goats and sheep and look after the shamba. The children who once gave her a rest have all gone to school.* MFC-NFE-32

Men's alcohol abuse and absences were prevalent themes in women's increased workload:

> *Life for the woman is harder Men have become wanderers and stupid because of alcohol. She is the one responsible for cows, children and shamba. She also goes to do manual work to bring food for the children. Where is the man? Just loitering and drinking alcohol for a month in a club.* FWG-NFE-42

> *Because of clubs, men take alcohol and that money could have educated or fed children. Cows are sold to get alcohol so family property goes down. The husband drinks, goes home, has sex, forcing women to have more kids when there is not enough to feed the ones she has. Alcohol kills men and leaves children with no father.* FKI-SE-35

Everyone said pasture distance had increased in the past 10 years. Most herd owners (62%) went to the distant Far Forest in dry season but in the past most (72%) grazed in the swamp Valley close by. Women with herding responsibility believed grazing in the forest was dangerous because of wild animals [160] so they hired help, relied on others, or let cows graze unsupervised—a risky strategy due to predation but it was observed often. Increased pasture distance for women contrasts with findings in Kajiado where women's livestock activity increased with *decreased* pasture distance. The difference is notable because (a) land remains communal in Loita unlike Kajiado and (b) the women's activity that increased in Kajiado was gathering fodder and not herding (Wangui 2003). In Loita, increased pasture distance was more related to overgrazing from increased population, bigger herds, and outsiders staking claims to land in anticipation of subdivision:

> *We moved permanently to Empurputia when dry season grasses such as ormagutian, esere, and olopikidongoi did not get finished easily. Cows had plenty of it and they could also graze in the forest. Places to graze have changed due to overpopulation because people have settled in the places that were the stores for cows to graze. Because of overgrazing today many cows die during the dry season because they don't get enough pasture.* MKI-NFE-47

> *Empurputia has changed a lot because it is overpopulated. The swamp has dried due to overgrazing in dry and rainy seasons. People are penetrating into the forest with cultivation so the grasses are getting finished and there is no place to graze cows due to overpopulation.* MMG-NFE-48

[160] Three human deaths from wildlife and several human attacks, mostly by buffaloes, were recorded during field work.

Larger herds were also a factor. The polarized difference in herd size for 'medium and high wealth' and 'low wealth' households was striking-- an increasing trend since the 1980s (Bekure 1991; Zaal & Dietz 1999). Wealthier households owned 62% of all cows in the study area (Table 6.5). Wealthy men's herds accounted for the significant increase in cows over time, with proportionally more cows than small stock. Smaller herds with proportionally more small stock owned by people with less capacity for accumulating and selling cows in urban areas is a subsistence drought resilience "small stock strategy" (Grandin et al. 1991, Western & Manzolillo-Nightingale 2004). Keeping small stock to pay school fees was new:

> *There was no keeping of sheep and goats here before. Due to education, we are forced to keep them so that we can get money by selling goats and sheep to pay school fees.* FWG-NFE-48

Table 6.5. Cows owned[a] today X wealth rank (N=30 households)

	Low (N=24)					**Medium and high (N=6)**				
Cows owned today	**Mean**	**Median**	**SD**	**Total**	**% in area**	**Mean**	**Median**	**SD**	**Total**	**% in area**
Cows	26.9	22	20.39	781	38.4	174	74	274.47	1253	61.6

[a] Number of cows owned was asked two different times for verification. If there was a discrepancy, the interviewer probed for accuracy. There was no attempt to differentiate between cows present or temporarily allocated elsewhere.

Herd composition related to milking-- a gendered activity in women's domain. Lactating cows comprised 30% of herds in low wealth households. This was about the same as reported by deLeeuw et al. (1991) and much higher than the 12% in higher wealth commercial herds managed for market. Most cows (77%) were Sahiwal/Zebu mix [161] and the rest (23%) were Zebu. This is a shift from 10-20 years ago, when all households had Zebu, a breed more adapted to drought (Western and Finch 1986) and disease (Rege 2001) in semi-arid dry lands (Homewood& Rodgers 1991). More Zebu than Sahiwal-hybrids in the past was also documented in Kajiado (deLeeuw et al. 1991). The change toward hybrids reflects market pressure to breed higher yielding meat/ milk breeds (Trail and Gregory 1981) despite their low drought and disease resistance (Degen et al. 2001; Nkedianye et al. 2011). The Sahiwal bloodlines were considered weak in local herds but men probably liked referring to their cows as Sahiwal because of their reputation as milk/meat producers that sold for higher prices.

6.4.2.2 Milk and chickens

The gendered domain of milk did not change from the past. Women milked and sold milk/ghee. The money was still considered theirs (Grandin 1988; Kipuri 1990; Talle & Pálsson 1990; Wangui 2008). Selling milk increased in importance as a source of women's income (Figure

[161] Informants said Sahiwal/Zebu cows descended from ILIDP's cross-breeding effort to market exotic meat/milk cattle breeds but it was discontinued due to cost and survival risk (Kronenberg 1986; Knowles 1993). Stronger Sahiwal bloodlines would cost more money and require acaricide dipping (at a cost of $28/cow today) because of less resistance to tick-borne East Coast Fever. Less expensive upgrading of sheep and goats was embraced more enthusiastically. Today a purebred Sahiwal could be purchased for $691-$1085 compared to $296-$592 for a Zebu.

6.3), a trend noted elsewhere among Maa-speaking pastoralists (Brockington 2001). How they used it also changed, reflecting greater dependence on women to meet family needs, especially school fees:

> *Milk has new uses it didn't have before. Today we sell milk and ghee to buy children books and soap.* FWG-NFE-35

> *Today we boil milk to make ghee and we sell it and milk to buy books for children who are in school because women also pay school fees for children.* FWG-NFE-38

Over half (57%) of women sold surplus milk. Milk sales were influenced by low productivity as discussed below, poor market access, and/or prolonged drought as no one sold milk in dry season. Women spoke of less milk and drought in the same breath:

> *Now there is more drought than before. Before there was no dying of cows like there is now. We never took black tea without milk like we do today. Then we had more cows, more rain, and more milk.* FWG-NFE-48

The average number of cows milked per household was 7.3 cows (range 2-20). Average daily milk amount collected per woman in wet season was 3.9 litres, significantly more than 1.7 litres in dry season. Women said milk offtake in wet season was enough for their families, but it was low compared with other accounts in Maasailand (de Leeuw et al 1991; Grandin 1988; Lindell 2013; Nyariki et al. 2009; Trail and Gregory 1981). Even though most informants (77%) said their cows were Sahiwal/Zebu, the amount of Sahiwal in bloodlines was low. Unexamined factors could also apply, e.g., milking strategies favoring calves, cow's age and health, watering frequency, and distance to water and pasture.

Less nutritious highland grasses, compounded by less burning in forests [162] to generate new pasture, were probably involved in low milk offtake as well as poor immunity to disease. Key informants said there was less protein, calcium, and phosphorous in highland grasses than in the lower-lying rangelands. Poor grass in the highlands was a common complaint:

> *My sheep are dying from starvation because the grass here is not fertile and there is rinderpest. When the cows from the rangelands arrive here, they are weak from drought. If it rains, they will not survive the way back to the plains for the good grass.* MKI-SE-42

> *In the past, it was the love for cows which stopped people from settling in this forest. The forest was not good for cows because it was cold, there were wild animals, and grasses were not as good as in the savanna olpurkel (oloiparak).* MFC-NFE-56
> *The tall elephant grass here cuts cows tongues and there is a lot of it in the forest. When cows come here in drought they lose teeth. Usually you can tell a cow's age by its teeth but not here because of cows eating elephant grass. In the cold forest, they must eat more. In the rangelands, the grass is better and cows breed better.* MKI-SE-42

[162] See burning for grass before 1976 (Sections 4.4.2.1 and 4.4.2.2) and its relationship to dense forest gain and regeneration of *Juniperus procera* in 1976-1995 (Sections 4.4.3.1 and 4.4.3.2) compared to relatively less burning, dense forest loss, and bush gain in 1995-2014 (Section 4.4.4.1).

Change in diet was also a factor. Brockington (2001) found that more milk and fewer vegetables were consumed in households where women didn't sell a lot of milk. But 15 years later, the locals in this study ate maize (*ugali*) and vegetables every day and took milk mostly in tea:

> *We no longer drink the milk we used to drink. We no longer drink the blood we used to drink. It has come the time when people try to eat a balanced diet and all food is bought.* MWG-NFE-48

> *We no longer use milk like before. Children don't like it. It's only potatoes, maize, rice, beans that are food.* FWG-NFE-42

About half (47%) of the women said they raised chickens, a nontraditional source of food and income. In the past, Maasai held to cultural beliefs that associated chickens and eggs with poor people and only women and uncircumcised boys ate them (Muthiani et al. 2011). Free range indigenous chickens require minimal supplementation (Kitalyi 1998) and have become a source of food security and supplementary income for some Maasai today (Munyasi 2012; Njuki & Sanginga 2013).

6.4.2.3 Intra-household asset disparity

Gender asset disparity results were impressive (Table 6.6).

Assets are physical or financial goods with productive value. As indicators of wealth, they represent the ability to sustain livelihood, generate income, and reduce vulnerability to economic shocks such as environmental disasters, illnesses, deaths, or divorce. For female pastoralists, threats to securing rights to livestock assets include commercialization and lack of access to assets in general including livestock health, marketing, and extension services (Kristjanson et al. 2010).

Because households are the typical unit of asset analysis, intra-household dynamics affecting how assets are allocated are usually ignored. There are rich descriptive accounts of intra-household power dynamics among Maasai men and women (Talle 1988; Spencer 1988; Llewelyn-Davies 1981), including domestic violence and women's empowerment (Goldman & Little 2015; Smith 2015). But empirical data on gendered asset allocation in pastoralist households is lacking (Kristjanson et al. 2010; Njuki & Mburu 2013; Sanginga et al. 2013). To the investigator's knowledge, this study is the first attempt to empirically examine gender and household asset allocation among Maasai exclusively.

The focus was typically livestock, farm equipment, and consumer durables that contributed to agro-pastoral activities of both men and women. Gendered access to land, housing, and financial instruments also merits study but it was not examined due to time constraints and complex arrangements in polygynous marriages and communal land tenure.

Table 6.6. Gender asset disparity calculations based on asset indices with weight and age adjustments (adapted from Njuki et al. 2013) (N=60)

Asset	**Weight of asset**	**Adjustment for age[a]**			**Asset index total**		**Asset disparity**
Livestock		Calves	Heifers	Bull/cows/oxen	Men	Women	
Cattle	10	X 0.4	X 0.8	X 1	7742	1372	
Donkey	10				320	200	
Sheep/goat	3				4875	666	
Chicken	1				120	144	
Subtotal					13057	2382	0.18
Domestic							
Cell phone	3				78	60	
Television	4				8		
Radio	2				34	22	
Torch	1				30	27	
Transportation							
Car/truck	160				160		
Bicycle	6				6		
Motorcycle	48				240	96	
Productive							
Tractor	100				100		
Generator	12				12		
Solar panel	12				96		
Ox plow	4				52	4	
Garden tools	1				30	25	
Subtotal					846	234	0.28
Grand total					13903	2616	0.19

[a]Informants were not probed for specific ages of livestock because of challenges with measuring time and concern about interview fatigue. In Njuki et al. (2013), calves were less than 3, heifers and immature males 3-7, and bulls and cows were more than 7 years old. Those age groups were applied to asset valuations.

The measuring instrument was a revised version of the Bill and Melinda Gates Foundation (2010) index for evaluating agriculture development programs (Njuki et al. 2013). It was further adapted for the local context so that items foreign to the study area were deleted (refrigerators, sewing machines, pigs, horses) and relevant ones were added (torches, donkeys, solar panels).

The gender asset disparity value for livestock (calculated as the ratio of the sum of women's assets to the sum of men's assets) was only 0.18 (2382/13057) and much lower than the development target of 0.75 used as an example by Njuki et al. (2011). Women owned significantly fewer animals than men, particularly cows. Assets without wide gender disparities were donkeys and chickens. Chickens were the only assets women owned more of than men.

Disparity for non-livestock assets was 0.28 (234/846), another significant gender difference. The most disparity was for highly valued assets such as cars, trucks, motorcycles, and tractors compared to less valued items such as cell phones, torches, and garden tools which women were more likely to own.

The overall gender asset disparity (livestock plus non-livestock) was 0.19 (2616/13903), a significant difference. The disparity is accentuated even more under the gender lens, as explained below.

6.4.2.4 Intra-household decision-making about livestock

Because of the interest in women's income-generating activities related to the forest, this study probed further into livestock ownership. In Maasailand, several people may have rights to one animal, cows owned may reside elsewhere, rights change with a male's age and family circumstance, and a woman may milk animals she doesn't own. Among women, ownership does not equate with decision-making power because of the difference between (a) animals they own and can decide to sell and (b) those they consider theirs but cannot sell without a husband's (or son's) permission. This difference is distinguished in Maa by *aitore* (to rule or command) versus *aitodol* (to show or in name only) (Llewelyn Davies 1981; Talle 1987 and 1988).[163]An example is women's usufruct rights to *aitodol* cows allotted to them at marriage for lifetime and to pass on to sons but which they cannot sell, slaughter, gift, or dispose of.

Several factors were considered: type of ownership, animal species, personal assets, wealth status, means of acquisition, age, and group membership. In general, women's decision-making power was very low but better than in the 1970s-1980s when husbands ruled over all animals passing through their gates, even those a wife purchased or received as gifts (Spencer 1988; Talle 1987).

First, women's decision-making power differed by animal species (Figure 6.5). It was lowest for cattle and highest for poultry and small stock. Six women (20%) owned milk cows but only two (7%) could sell them.

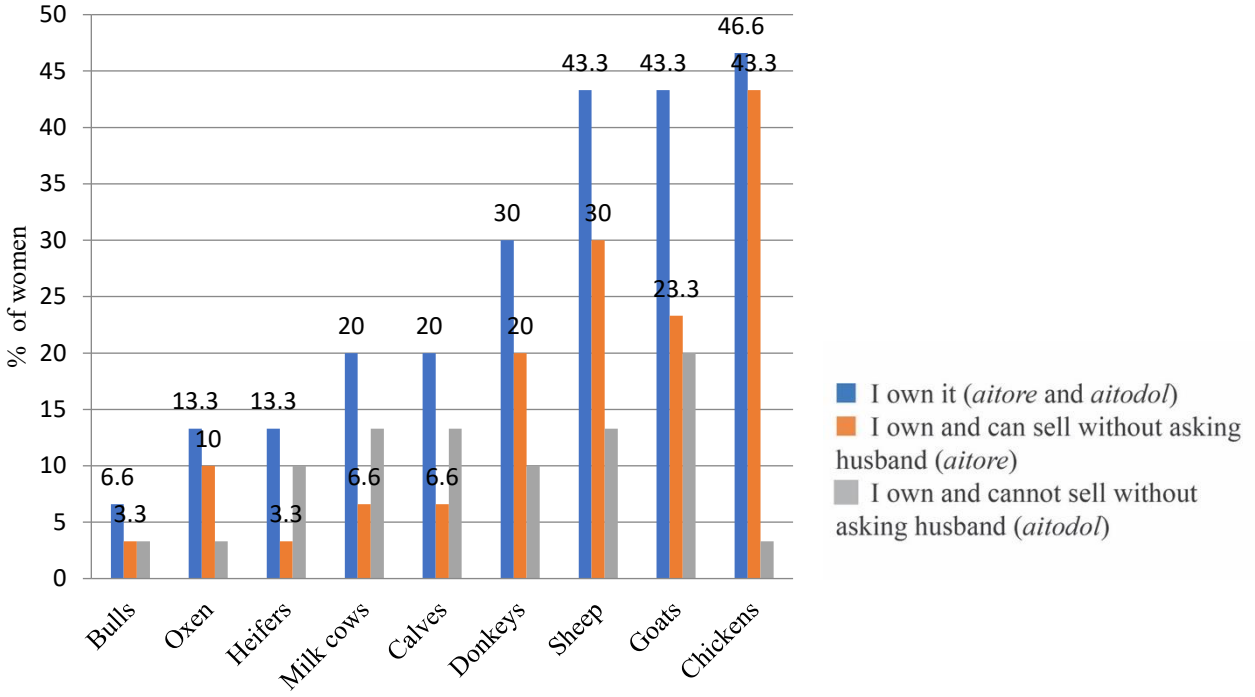
Second, the 15 women who could sell livestock also had more domestic assets. This relationship has been reported elsewhere (Njuki & Mburu 2013) but present results were skewed by one unusual, educated, medium wealth, female household head with many assets. Wealth status was not significant since only three women were not low wealth.

Third, how women acquired the livestock they could sell differed by animal (Figure 6.6). Eight of the nine milk cows women could sell were inherited and only one was purchased.[164] This

[163] Knowles (1993) and Talle (1988) warn against strict interpretation of *aitore* as ownership extending to other commodities including women as property.

[164] Marriage was not mentioned as a source of acquiring cows that women could sell. Marrying complexities were clear in this exchange with a junior elder:
JE: To marry I will need 7 cows for her family and 100,000 for shukas, beer, sugar, tobacco. Then I will give her 10 cows.
JE: Can she sell her cows?
JE: Only if I agree. If you have more than one wife, giving cows to sell can reduce conflict because wife one might want to sell a cow for her boy's schooling and wife two might want a cow for her girl. MPO-SE-30

Figure 6.5 Decision-making power over species of *aitore* and *aitodol* livestock women said they owned (N=30)



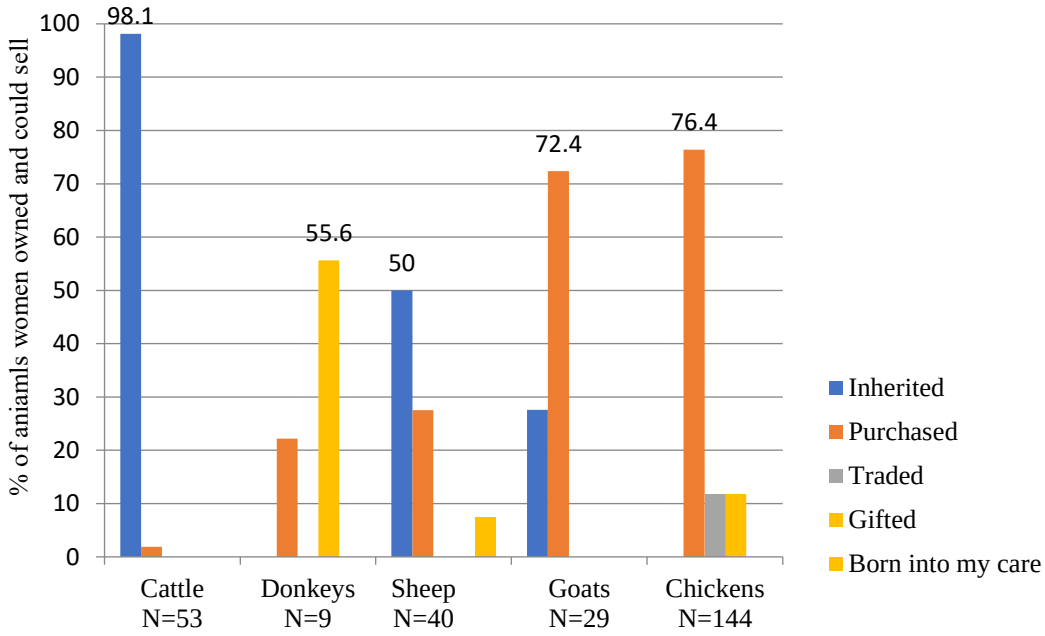
contrasts with Njuki & Mburu (2013) who found that most women-owned livestock in Kenya was purchased. However, they studied not only pastoralists and pastoralists have strict cultural dictates over ways of accumulating cows. Also, women's market access was better in that study.

Fourth, to examine age differences, an extra group of 10 young women (ages 20-24) was combined with the young wives (ages 20-29) in the household sample, and then compared with older women (ages 30-50) who were not heads of households. Not one young wife owned a cow (*aitore* or *aitodol*). Only three owned livestock other than chickens they could sell, a significant difference from older women (ages 30-50). Older women had experienced marked changes from the past in livestock decision-making:

> *In the herd today there are livestock which women buy for themselves. Before women were seen like children. We were not involved in any decisions. Now we are involved in issues of our family and we are consulted in selling livestock. We talk before selling cows and we can suggest cows to be sold.* FKI-NFE-59

> *In the past a husband would come with business men. They entered the cow pen to sell cows and you didn't know what was happening. If you asked, "Why are you selling that cow?" he said "It is not a must for a woman to know." Today we must discuss first and agree because I also have power to decide.* FKI-NFE-40

Figure 6.6 Means of acquiring *aitore* livestock women said they owned and could sell (N=15)



Women attributed the change in livestock decision-making to education and empowerment training in women's groups:

> *In the past, women could not sell cows they owned. Because of education we are empowered in business and can get our own money and go to market and buy and sell. In the past when you were married it was just by name you owned a cow. Your husband would take that cow in the night and you would not see a coin from it.* FWG-SE-40

> *We are trying to be together with our husbands so that we will not be behind because it was driving us back. We woke up and brought conflicts about cows and sending children to school to our husbands. Now we discuss.* FKI-NFE-40

Most cases (60%) of decision-making power over animals were women who were leaders in women's groups and school or church committees. The three cases of women selling *aitore* cows they owned were women's group leaders. These small sample findings support results from other countries about the positive relationship between livestock assets and women's groups-- a form of social capital where networking takes place and information is shared (Kumar & Quisumbing 2010; Njuki & Mburu 2013). When asked what kind of women buy and sell cows, education and good spousal relations surfaced again:

> *If women are educated they can do businesses. Then husbands involve them in decisions and their relationship is good. They cooperate*. FWG-SE-38

> *They must have good relationship between wife and husband and cooperate. They must be hard working, do extra jobs, and run businesses to pay school fees.* FWG-SE-40

In 2014, a unique woman's group formed in Loita that enabled its 10 members to purchase livestock in a "merry-go-round" or "table banking" micro-funding arrangement.[165] Other merry-go-rounds existed but were not as successful. Membership requirements in the new group were $9 to register with Narok County, monthly dues of $25, the ability to read, write and talk in meetings, and have children in school. Most were formally educated, had their own sources of income, had attended women's empowerment trainings, and had supportive husbands[166] who helped with membership dues. These are characteristics shared with women change agents elsewhere in the developing world (Meola 2013). In this financial arrangement, $20 of each $25 dues payment went to a different member each month for an investment of her choosing[167], including large livestock. The balance generated funds for group investments such as a steer purchased for $140 and sold for $260. The profits paid for ending traditional female circumcision[168], loans to keep girls in school[169], and addressing the trend of taking girls out of school to be circumcised and married at earlier ages.[170] Clearly, the impacts of a merry-go-round could be transformative:

> *Before it was only the husband selling livestock and paying school fees. We have a women's group which is not for politics but for merry-go-round. Now I can pay school fees through business and I own livestock which I bought myself. It is the only way to get women livestock. Now we can take our children to boarding school. It has really helped us.* FWG-NFE-35

Gendered livestock decision -making was in transition. Half the women in the study owned and could sell animals. But in *aitore* cow ownership there was little difference from the past:

> *There is still the issue of selling cows. It is not given to women. Women are not valued by men. They still take women to be like children who cannot make decisions.* FKI-SE-38

Disturbing trends relating to men's domination over cows-- prolonged absences, alcohol abuse, and higher bride prices which are more prevalent among poorer Maasai and considered the "commoditization of women" (Kipuri 1990) -- were intensifying women's vulnerability:

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[165] There is a distinction in micro-financing between micro-credit and micro-savings or micro-funding groups (Fisher & Sriram 2002). Micro-savings groups are more complex and give more financial autonomy.

[166] In a baraza organized by this group in 2016, each husband donated $100.

[167] In a group of 10 members, one woman could realize $200 in a month. Examples of their purchases included: a young male steer ($100) to fatten and sell; iron sheets ($100) (14 sheets make a roof for a traditional house); buying maize at $18/90 kg sack in September and selling it for $30 in February; and school fees (about $80/year for primary day, $200/year for primary boarding, and $380/year for secondary boarding).

[168] The group facilitates Alternative Rites of Passage (AROP) events for girls which celebrate becoming a woman but without cutting. It maintains that 70% of Loita girls still undergo traditional clitoridectomy.

[169] A mother received a $70 loan at an interest rate of $1 per $10.

[170] The trend toward earlier marriage has been documented in Maasai ethnography (Talle 1988) and demography (Coast 2001, 2006). It is attributed to livelihood insecurity, parental fears about pregnancy before circumcision, and mistrust in education to get girls out of poverty (Archambault 2011).

> *Marrying girls and dowries is a business now. One father started negotiating at $20,000 and 25 cows. The normal dowry is 5 cows and $500 for blankets, shukas and honey.* MKI-SE-54

> *Today girls are circumcised when they are still young. Before a girl would be as big as her mother. When we went with moran to the forest we slept but not together and we were big girls whose breasts lay like our mothers. Today the male goat who follows her has become greedy. Even a small girl like that one. In her, God has put a child. Greediness has entered the world.* FKI-NFE-75

Considering persistent patriarchy, the merry-go-round movement represented a cultural revolution in Loita. Such groups are also operating with the help of NGOs in northern Tanzania but requirements such as husband's permission and depending on others to fill their duties while they trade livestock are difficult for women there to meet (Hodgson 2011). Likewise, few women qualified for membership in Empurputia and so far, only one *aitore* cow had been purchased by a woman—to sell and pay her daughter's school fees.

6.4.2.5 Cultivation activities

Gender dimensions of cultivation are presented in Table 6.7.

Cultivation activity was concentrated on the forest edge where people cleared plots with axes or chain saws to increase distance from trees where crop-raiding baboons lived. Nearly everyone (97%) cultivated. This was a higher percentage than other parts of Maasailand with rain-fed cropping (Coast 2002; Homewood et al. 2009) and reflected more favorable hydrology in highlands along with fewer opportunities for diversifying income. Fewer people (62%) cultivated 10-20
years ago, when the average size of a *shamba*[171] was 1.1 acres.The gender difference in plot size is significant today but not in the past. (Table 6.8) Men's plots (4.2 acres) today are about triple the size of women's plots (1.5 acres) and men were planning for even larger ones:

> *For us men of Empurputia we are busy extending our shambas so that they can be as big as 10 acres. We are not planning on how to protect trees.* MMG-NFE-48

Most men (63%) and women (69%) said they worked in all cultivation activities. Many (73%) hired Tanzanian labourers occasionally. The few men with large plots (more than 4 acres) hired tractors but most people held *oira* events where friends helped prepare soil with a *jembe* or ox plow in exchange for a meal of freshly slaughtered goat meat. The women who did not engage in all the activities said men were the ones who cleared land, chased wildlife away, erected fences, and paid for seeds. This aligns with findings that both genders are involved in cultivation in Maasailand, women are as or more involved in planting and harvesting than men in agro-ecological zones (Wangui 2003), and men tend to do more clearing (Rutten 1992).[172]

[171] Locals used the word *shamba* to signify a cleared and cultivated plot. It is a loanword from Kiswahili (Mol 1996). Women sometimes referred to their smaller garden as *enkurma enkioni* meaning garden behind the house or *embostani* from Swahili.

[172] Labour hours were not quantified but due to men's absences women probably spent more hours in cropping activities. Literature indicates that if food production includes growing, processing, and preparing food, women in developing countries may provide 60-80% of labour worldwide but those

Table 6.7 Prevalent themes in gender dimensions of cultivation 1976-2014

Theme	Rising action (1976–1995)	Transformation (1995–2014)
Land cover	Healthy ecosystem; forest was biggest land cover; grasslands remained at 32% land cover.[a]	18% loss in dense forest; 147% gain in bush; 21% loss in grassland; 60% loss in wetland grasses; changes in local hydrology and water catchment.
Livelihood shift	2% say cultivation was main source of household income; no men and 18% of women say it was a main source of personal income.	27% say cultivation is main source of household income; 3% of men and 38% of women say it is a main source of personal income.
Average size of farm plot	Men=1.2 acres Women=1.0 acres	Men=4.2 acres Women=1.5 acres
Time frame	Women had small gardens in 1970s; men put cultural aversion to digging aside and cleared larger plots when *Irompoi* were moran in mid 1990s.	Men hired tractors for their large plots in 1995; women still using hand tools.
Purpose of cultivation	Men=Co-wife for the cow Women=Feed children	Men=Clothes, batteries, cow medicine, mobile Women= Food, kitchen items, clothes, school fees
Assets	Women completely dependent on men.	High asset disparity (0.28 on 1.00 scale) favoring men in non-livestock assets including farm tools.
Land tenure	Communal; legal threats to forest access in mid 1990s.	Expecting change in land tenure that will limit *shamba* size; title deeds will be in men's name.
Decision-making	Women perceived as children with no decision- making authority.	Men may consult wives about *shamba* labor, maize store key, spending crop income.
Food security	1983 no rain for a year, food aid; 1993 drought and famine.	Milk, meat, maize, vegetables; women also cook food from shops that children prefer today.
Financial	Women completely dependent on men.	83% say women are the crop sellers; women receive 24% of household crop income.

[a] Due to differences in image quality between 1976 and the other years, 1976 land cover totals were used only for comparing relative extents, not for calculating percent change. (See Section 4.3.1.2)

Table 6.8. Gender analysis of "What is the size of your *shamba* today and 10–20 years ago?" [a] (Today N=56; Past N=43)

	Average size of *shamba* (in acres)		Wilcoxon test
	Men	Women	P value
Today	4.2	1.5	.000002317
Past	1.2	1.0	.4237

[a] *Shamba* size was asked two different times for verification. When there was a discrepancy, the interviewer probed for accuracy. (For the past, younger informants were asked to remember the size of their mother's or father's plot.) To be certain of the metric, the investigator measured what people considered to be an acre (roughly 4000 m²). People did not measure in hectares (2.47 acres).

There was a dual purpose for cultivating—income and to feed the family (Table 6.9). Ninety-five percent of those who cultivated also sold crops, which is a very high percentage compared to

studies did not account for labour complementarity with men (Doss 2014). In Kenya, it is estimated that 74% of small agriculture holdings are managed by women with no spousal involvement (Thomas-Slayter et al. 1995b).

Table 6.9. Gender analysis of closed-ended responses to "What is the main purpose of your *shamba* today and your family's *shamba* 10-20 years ago?" (Today N=56, The past N=43)

	Men				Women			
	Today		Past		Today		Past	
Main purpose of *shamba*	**Mentions**	**%**	**Mentions**	**%**	**Mentions**	**%**	**Mentions**	**%**
Feed family only	3	10	20	86.9			6	27.3
Sell crops & feed family	27	90	3	13.1	28	100	16	72.7
Total	30	100	23	100	28	100	22	100

Table 6.10. Gender analysis of open-ended responses to "Who in the family sells the main crops and collects the money today?" N=60)

	Men		Women		Total	
Who sells crops and collects money	**Mentions**	**%**	**Mentions**	**%**	**Mentions**	**%**
The man	8	26.7			8	13.3
The women	22	73.3	28	93.3	50	83.3
No one			2	6.7	2	3.4
Total	30	100	30		60	100

nearby Maasai Mara where jobs are better because of tourism (Thompson et al. 2009). The notable change from the past was that men were more involved in selling crops today than in the past. The change was not as dramatic among women who had been growing vegetables for decades.

More people perceived women as the sellers of crops (Table 6.10) perhaps because they did it more often. Women traveled on foot three hours to the weekly market in Entasekera but sales of men's large maize harvests could be transacted with a buyer at one time in the field. Women were eager to go to market on Mondays but permission from husbands and arrangements for children and livestock were necessary beforehand.

Like ownership of cows, the crop growing, selling, and income were highly gender differentiated. Their main crops and growing strategies were also different. Most men (90%) said their main crop was maize—the most commercially valuable crop. Fewer women said their main crop was maize (54%). Beans (32%), potatoes (11%) and other vegetables (onions/kale/cabbage) (3%) were also women's main crops. Women liked to get a head start on planting beans in their small gardens at the onset of short rains in December, sell in February, and plant again when long rains arrived and men started planting.

Almost 90% of main crop income[173] was maize with men averaging over three times women's maize income ($296 and $90 per year, respectively). This is not surprising based on plot size

[173] Income was calculated as monies received by cultivators including those whose crops failed, thereby lowering mean income. No attempt was made to deduct crop inputs and calculate net profit. Sale prices at time of field work were: (1) maize= $2-$3/ bucket, $7-$15/sack; 1 acre can yield 10 sacks of maize (2) beans=$0.80/kg (3) potatoes and kale/cabbage= $0.50/kg (4) onions=$1/kg.

disparity. Women did not keep all income they collected for maize. Eighty-three percent perceived women as the maize sellers but only 43% kept all the money from maize they sold. Monies from less valuable main crops were retained exclusively by women but the proceeds comprised less than 2% of all main crop household income. More women than men kept their main bean crop income but men got more cash because they dominated the few large and lucrative bean harvests. Male domination of income persisted for all (not only main) crops. Like main crops, men realized four times as much money as women from subsidiary crops ($285 and $74, respectively). The largest maize and bean sales were kept by men. In all, women realized about 24% of the household's total crop income.

When women's income was added to men's, household crop income was larger in this study than that reported for rain-fed agriculture in lower-lying rangelands (Thompson et al. 2009; Nkedianye et al. 2009). Results were similar to places where rainfall and environmental conditions were comparable, such as Simanjiro, Tanzania (Sachedina & Trench 2009). Variations in Maasai crop income have been attributed to many factors (Trench et al. 2009; McCabe 2003) but effects of gender and intra-household dynamics remain largely unaccounted for. In this study, crop income would have been about 20% less without women's contributions. If women's crops that fed the family were accounted for, their contribution would have been even higher.

Crop failure rate was 16%, comparable to upland areas in Tanzania (Trench et al. 2009) and much lower than in more arid and lower Mara (Thompson et al. 2009). It was interesting to note that crop failures were reported only by men. Whereas 30% of men reported their crops could not be taken to market due to damage from buffaloes, bushbucks, insect pests, or low yield, no women reported any failures of the crops they cultivated for sale, perhaps because of the closer proximity of their smaller plots to their houses. The highest crop failures were reported by 41% of men for beans (41%), then maize (27%) and potatoes (24%).

6.4.2.6 Cultivation and intra-household decision-making

Compared to livestock decisions, cultivation decisions were less patriarchal and more variable by household. Mutual dependence and spousal cooperation were mentioned often in interviews:

> *Today in our household we help each other. The wife has her shamba and can go do business so the cows can be saved*. FKI-PE-22

> *Today we do cultivation. We all go looking for our daily bread with our women. The man and cows are not the only ones to be depended on.* MMG-NFE-48

An example of the variability within and between households was the matter of who kept the key to the maize store—the main source of crop income: [174]

> *If a woman holds the key it is because of discussion, trust, convenience, or how many wives there are. If they can discuss together, the man might trust her to not give out maize to her friends*

[174] In a rapid assessment of 10 households, 6 wives and 4 husbands kept the key to the maize store.

without his knowledge. Or the man might not be around. Or if he has many wives, he might hold the key so they do not see him favoring one wife. MKI-SE-45

Women's crop income was frequently mentioned in a *Nvivo* content analysis of their references to development (*maendeleo*, in Swahili) and women's empowerment (*maendeleo ya wanawake* in Swahili and *enkitudupunoto* in Maa). Women perceived their new role as income earners as a major improvement in their social status:

Today if you are not regarded as an important person then you can take it by force. You can cultivate and sell produce to settle expenses even without the husband being there, such as buying children clothing and paying school fees. We have become important people in society because we cultivate and do business. We don't depend on husband. With business, I can do everything. FWG-NFE-35

In northern Tanzania, Goldman and Little (2015) have demonstrated the breadwinner effect in women's agency in decision making about children's schooling, healthcare, and marriage. In Loita, cultivation's alignment with women's empowerment originated with the first African Project Leader of ILIDP who coordinated women's groups across Loita (Voshaar 1998). Women remembered him taking their groups to Field Days and trainings in cultivation, nutrition, and financing. Out of those groups evolved the merry-go-round groups:

We were among the first women groups to be chosen in time of Ilkerin Project. Ole Sonkoi introduced women's groups and we praised him to build a school for us. We took our cultivation to agricultural shows and got pangas and jembes. It opened our eyes. Now we have moved a step forward with the merry-go-round. FKI-NFE-48

Women's groups followed the politics and were more formal in the past. Today the actions have changed. We have started the merry-go-round. It has taken us another step. Without depending on men, we construct shambas for each other. FWG-NFE-50

However empowered women perceived themselves to be with their new cultivation role, they were keeping only 25% of total crop income, they were providing free labour, and their smaller gardens were feeding children and paying the school fees. Though less significant than with livestock, patriarchal control was real:

Women have their small shamba. When they sell, they use the money to pay school fees. Since women have become informed, men allow them to own their own shamba. MMG-NFE-46

Today the man receives income from selling cows and the woman from selling farm produce. All decisions on how it should be spent are made by the man. But today husband and wife can also consult each other on how income is used, especially in paying school fees. MKI-NFE-48

6.4.3 Gender and forest decision-making

This house of Maasai is a woman oppressor. (amuu ore enkaji ormasani naa olaironyani lenkitok) MKI-NFE-45

Gender dimensions of forest decision-making appear in Table 6.11.

Table 6.11 Prevalent themes in gender dimensions of forest decision-making 1976-2015

Theme	**Rising action (1976-1995)**	**Transformation (1995-2014)**
Elders	*Ilnyangusi, Iseuri*	*Iseuri, Ilkitoip*
Land	Healthy ecosystem; natural succession.	18% dense forest loss; 147% bush gain; 21% grassland loss; 60% wetland vegetation loss
Decision-makers	*No group made rules since forest destruction was not big. We had the Laibon and chiefs.*	Laibon influence waning; LCE not functional; female government chief in Loita; female Member of Parliament represents Narok County; two women on FC.
Power relations	Women kneel/offer grass/milk breasts to speak in men's meetings (*enkanyit*).	Educated women and widows stand and speak in meetings; some men insist women don't have power over trees because they lack power over cows
Main forest issues	Elders avert legal threat to communal tenure	No written rules; no consensus on subdivision; corruption; men taking *oltarakua* and *olpiripiri* timber; women burning live *oloirien;* outsiders settling in forest.
Main values of forest	Men= pasture, ceremonies Women= pole wood, medicines, fuelwood, *olpul*	Men and women= rain, pasture, building materials Women=medicines, fuelwood
Women's agency	Elders say women's forest songs were powerful.	Men see no acceptable ways for women to voice forest views; men appointed women to FC who sang forest songs in the past; young women see school/church/FC as best venues for them.
Forest rules	Customary (verbal) rules rarely broken.	Verbal rules broken; no enforcement; forest guards are the businessmen; no written rules.

In the past, power relations in community decision-making were compelling because of norms surrounding respect (*enkanyit*). [175] In women's debased status, they kneeled, offered grass, and milked their breasts to avoid being beaten while speaking in meetings with men present:

> *Women respected men very much because they feared them. They were seen as children and did not return the mouth. They feared to look at men. If a woman woke up [176] and spoke she would be beaten or cursed.* FKI-NFE-73

> *Women were below men. If a woman woke up and spoke in a meeting she stood in the direction of the sun so she was not in the upward position or a man would die. She got grass from the ground to be her engudi. [177] A man had to stand with her so she did not stand alone. If the men would not let her speak, she milked her breasts and the men would say "Let's give her a chance now that she has milked her breasts." This happened 15-20 years ago. Today a woman can stand and speak in front of men. We have become equal both men and women.* MKI-NFE-48

> *Women had to kneel and take grass to give their views. They were not allowed to look down on men because man is the head and the woman is the neck. In 2009 a local Maasai chief called a*

[175] Demonstrations of mutual respect or *enkanyit* connote ethical behavior, honor, and obedience in gender relations and age set organisation (Hodgson 2001; Llewelyn-Davies 1981; Mol 1996 and 1972; Talle 1988).
[176] Waking up is a reference to standing and speaking up. Only three women were observed standing up to speak in community meetings during field work—two widows and one government official.
[177] A man's herding stick (Mol 1996 and 1972).

> *meeting. The District Officer was a Kikuyu woman. The chief asked her to sit and offer grass when she introduced herself.* MKI-SE-64

Cultural change in decision-making at the community level has been slow in Loita. In 2013, 30 people spoke at a meeting of over 1000 *Iloitai* to greet a new government leader. Only two speakers were Maasai women-- an elderly widow who spoke about educating girls and a female Member of Parliament who spoke about forest protection. The government official represented a more dramatic cultural change than the widow. As a lawyer and Narok County's Women's Representative, she champions gender equity in all corners of governance under the new Kenya Constitution. The widow's message was nevertheless courageous because of persistent gender inequity in schooling in Loita (ILIDP 2009). Maasai widows who are past child-bearing age are considered to have seniority and decision-making powers as heads of households. They are freer from patriarchal control than younger women (Goldman & Little 2015; Talle 1988):

> *I can see women given a small chance to speak in meetings today but not like men. They must properly arrange themselves and their words before they speak. The old women are more secure to speak. But the young ones need to speak because they feel the oppression the most.* FKI-SE-47

According to this Loita leader, women were considered powerless in meetings:

> *Women don't have opportunities to speak their views in meetings today. They just gossip with each other.* MKI-NFE-45

In the past, women's agency in the forest songs (described below) was considered creative and effective— but it was mediated by elders who made the decisions. Today, women remain marginalized from traditional institutional structures overseeing the forest. In newer structures emanating from development—church, school, and women's groups-- they are more visible but the modern threats to their forest-dependent livelihood are way beyond their sphere of influence.

6.4.3.1 Forest tenure and women's forest songs

Starting in the 1990s, Loita leaders were front stage for two contentious decades as they confronted legal threats to their communal forest tenure.[178] The main actors in Loita-- elders, elites, and decision-making institutions-- are still present today but some have lost their influence, such as the Chief Laibon (Section 2.3.6). In total, 17 different organisations, mostly external to Loita, became involved (Karanja et al. 2002). Women were excluded from decision-making about the controversy because of cultural taboos against speaking directly to men. But men recognized women's agency on the margins in the form of songs encouraging them to save the forest:

> *Their singing was very painful. When leaders listened to women singing their songs about the importance of the forest they were overcome. Everyone became afraid because they felt the truth had been told in those songs.* MMG-NFE-32

[178] See Section 2.3.6 and Appendix 1 for events surrounding NCC attempts to gazette Loita Forest for tourism and timber.

I remember very well the reason women started singing those songs. It was because of rumors the forest would be taken. They told leaders and the Loibon not to allow the forest to be taken. The songs had a lot of power. I give them 8 out of 10. MFE-NFE-64

Older women remembered the timing of the songs in terms of male age sets, ILIDP, and a fertility blessing:

I remember women singing those forest songs before Irompoi were circumcised when they were just starting Ilkerin. [179] FWG-NFE-42

The first forest song I sang was at Ilkerin a year after the Olorte women's blessing.[180] *I wrote it. We asked leaders not to give out the forest because our children were young.* FKI-NFE-48

The quote above recalls women's forest: family schema. Using *Nvivo* content analysis software to examine the forest protection songs of 10 women who sang in the 1990s, references to children/family (34%) and medicines (26%) were more frequent forest values than livestock (19%) or rain/clouds/mist (15%). The forest: family schema is prominent in this forest song:

We are from the Loita Forest where grass is not sold
The highland where elube sing until morning and colobus monkeys tell time
Bless me, wish me good luck because I am just a lady who comes to sing
And I will only say those things which are true
God forbid I will not abuse the name of men of Loita because I am standing in front of them
I was born in the blue orgilai where I grew up since I was a small child
We boil ormisigiyioi for children and give them oloirien to embrace the culture
Oleparmunyo is the medicine for their colds
I can only compare it to a hospital
There is olotoroniki and orkonyil and pay attention to orkitolosua
The medicine for our muran when they go to slaughter oxen in the forest
If the dark forest inside is sold, cows will cry since their stomachs will be empty
Finally, we have finished the song
We say goodbye to all
Don't give away the forest where morning comes slowly. FKI-NFE-45

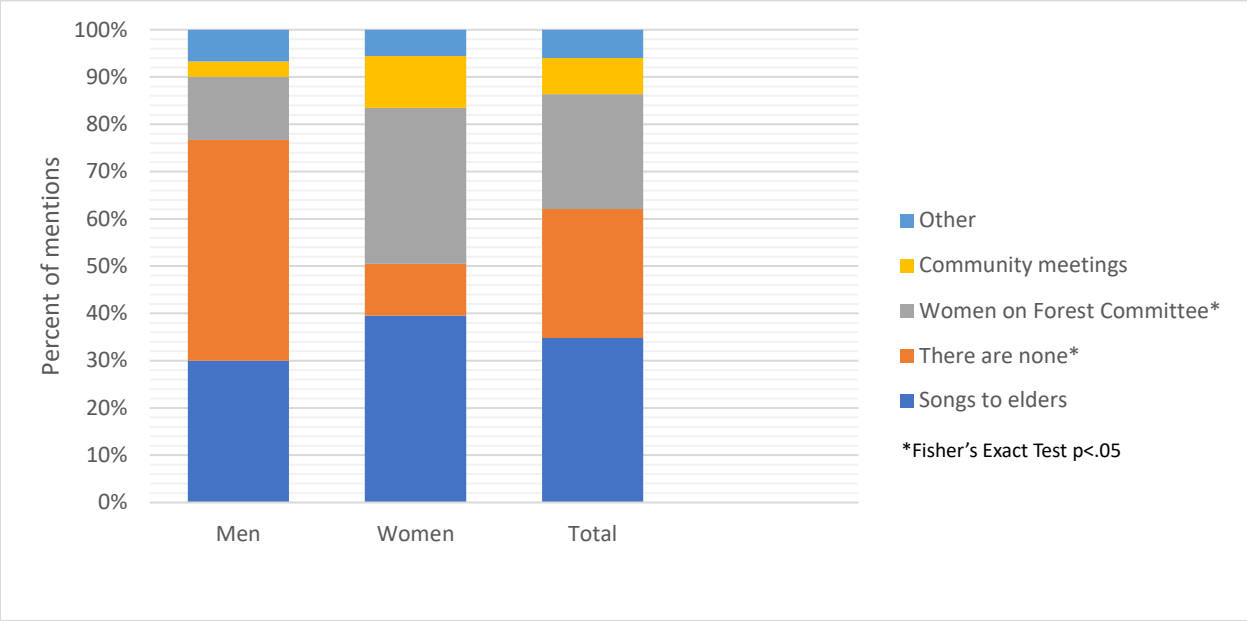
This song's orientation to family contrasts with what is considered to have been men's main motivation to assert communal forest tenure in this conflict, i.e., not to protect biodiversity but to save cows and livelihood (Kronenberg Garcia 2015). This educated woman expressed men's forest: livestock schema in the conflict most succinctly:

The reason there is a forest today is because our elders decided to protect it because they are pastoralists and their cows go to the forest to survive on the leaves when it is dry. FKI-HE-38

When asked about acceptable ways women can voice their views today, the most frequent (34.8%) was "songs to elders" (Figure 6.7). (Women's forest protection songs were a relic of the past, but people were remembering them as acceptable.) Gender analysis helped uncover the

[179] *Irompoi* circumcisions and ILIDP Field Days were in early to mid-1990s..
[180] The Olorte blessing took place in 1995.

Figure 6.7 Gender analysis of open-ended responses to "What are acceptable ways women can voice their views about the forest?" (N=30 men and 30 women)



power dynamics underlying this response. More women (33.3%) than men (13.3%) said women's forest views were voiced by women on the FC. More men (46.7%) than women (11.1%) said there were no ways women can voice their views about the forest today. Clearly, men viewed women on the FC as powerless:

> *Today women don't have a way they can voice their views about the forest. In the past, they used songs.* MMG-NFE-32

Age differences were apparent among women. Younger women listed more opportunities to voice their views today—like forest committees and school and church meetings-- in contrast to older women who remembered the power of their forest songs and taboos about speaking to men:

> *Young men and women should have representatives on the forest committee to raise the views of youth about the forest. We can form a group in churches and plant trees. Youth can attend all community meetings and become active and replace the elders and teach the community the importance of the forest.*FKI-SE-24

> *Women did not have courage to stand in meeting. We feared men. We raised our views about the forest with songs. The Iseuri leaders liked them.*[181] *When they returned to Narok they said "The children* [182] *from Loita said this in songs."* FWG-NFE-38

> *We did not voice our views. We did not stand in front of men in barazas because we did not go to barazas where men were. Women could not pass close to men in a meeting. Back then there were*

[181] *Iseuri* were the governing age set with authority in 1980s to early 2000s (Kronenberg Garcia 2015).
[182] Older elders in this study often referred to women as children.

> *no leaders to voice our views to. The first leader we got was Ole Sonkoi at Ilkerin.*[183] FKI-NFE-58

The age differences about speaking were also observed in Tanzania where, in a discussion about women's group meetings, an old woman commented "They are run by young people who talk very fast, so we old people cannot understand and participate." (Hodgson 2011: 189-190) Age differences were further examined by oversampling young women (10 who were 20-24 years old), combining their responses with the young women in the household survey (8 who were 20-29 years old), and comparing this young group with older women in the survey (22 who were 30-65 years old). Compared to older women, significantly more younger women mentioned more contemporary venues where they could voice their views such as church and school committees (N=40; Fisher's Exact Probability Test p<.013021) and Forest Committee (N=40; Fisher's Exact Probability Test p<.001541).

6.4.3.2 Forest Committee (FC) and forest rules

Gender differences in FC participation were highly significant. Most informants (75%) said the FC was the group that organised meetings about forest issues, primarily about timber harvest and new settlement locations. It was not a formal organisation. Meetings were not regular, there were no dues, and the group was not registered with the government. Twenty members had been appointed by the LCE in June 2014 and only two were women. More educated women were highly critical of this under representation and tokenism:

> *In Kenya when you make a committee a third must be women.* [184] *But men will have the smallest number of women represented. For the Forest Committee, they said "Go find a lady and get another one to keep her company." Those two are only actors. They are not there to share anything.* FWG-SE-38

A woman committee member thought her forest songs in the past were instrumental in her appointment:

> *We were elected by the men. I don't know why I am a member. I was just called and told to bring my i.d. and they told me I am in the Forest Committee. Our women's group used to go and sing and I was a leader so maybe that is what they saw in me. I think they just appointed us to fill the requirement that women are represented. I come to the meetings and I go without talking. They don't give us a chance. For sure these men will continue oppressing us because they don't want women in this committee.* FFC-NFE-43

Women's membership was grudgingly accepted by male members but women were considered lacking in power to be effective:

> *Today women are together with men in this committee. But 20 years ago women were not asked*

[183] Ole Sonkoi was *Iseuri* age set and lead the Ilkerin Project from 1985-1997. (See Section 6.4.2.6.)
[184] Chapter 7 Article 81 (b) of the 2010 Kenya Constitution calls for 'representatives in elective bodies to meet a gender equity constitutional requirement that no more than 2/3 of members are from either gender.' (Kenya 2010a)

anything. They were not even asked if cows should be moved. They were told. They were only concerned with house issues. MFC-NFE-40

Nowadays in everything we do men and women are almost equal. The reason why we put them behind on this committee is because they are not enemies of the forest like us. It's men like us who bring trucks for timber and if you try to stop them they will fight you. MFC-NFE-56

Maasai women have no power. When one man tells another he should not cut trees he will listen. He will not listen to a woman. MMG-NFE-32

The persistent patriarchal control based on cattle ownership was reflected best by this elder:

Maasai women don't have power over cows. If they don't have that power, then why the forest? Women don't have one tree they can say "Leave it. Don't cut it down." MMG-NFE-45

Men were more likely to attend forest meetings (N=60, Fisher's Exact Probability Test p=.001603) and also speak (N=60; Fisher's Exact Probability Test p=.00893). Sixty seven percent of men attended meetings and all spoke, compared to 23% of women and only three who spoke. Two were women's group leaders.

More men said they participated in making forest rules (N=60, Fisher's Exact Probability Test p=.00000000000938). Only one woman did. Most people (95%) said forest rules were verbal and not written. Forest rules frequently mentioned were: (a) no cutting live trees (49%) (b) no burning (11%) (c) no killing wild animals (11%) (d) no selling timber (9%) and (e) no cutting trees near water sources (6%). According to 87% of household informants, forest rules were broken more now than 10 years ago but no one could name an example of a consequence given to a rule-breaker by the FC or the LCE.[185] Everyone complained about corruption and the illegal taking of live timber:

The Forest Committee and leaders are not making us happy. They are allowing people from Morijo and Tiamanangien [186] to take timber from Empurputia to build their houses and fence their plots. FWG-NFE-38

I don't trust KWS [187] and MPs. Timber stealers give them money. We need to train our own people to take care of the forest. MFC-NFE-64

If you want 20 oltarakuai or olpiripiri timbers for fencing which cost $20 the DO will ask you for $50.[188] So you go to the forest to take more to make up for that payment. The KWS fights with the DO and his police for the money. The DO wants the forest under him. KWS says it is responsible

[185] Informants remembered three cases of enforcement in the past decade, but none by the FC or LCE. KWS fined a truck driver ferrying cedar posts to Narok in the night, a youth took a similar offender to the DC, and the DO fined a man caught harvesting *olosesiai*, a medicinal herb.
[186] Loita sub-locations.
[187] In 2013, 32 KWS rangers were dismissed because of poaching (Ole Kaelo, Chief Executive Officer of Kenya Wildlife Conservancies Association, personal communication August 19, 2014).
[188] It was reported that a lorry pays the DO $30 to allow it to pass. A lorry might contain 500 timbers (three *oltarakua* or *olpiripiri* trees).

for the forest. You are paying DO, KWS, and police. They demand bribes even for deadwood. So you will use the forest too because everyone else does. It's going away anyway. MPO-SE-42

Women's group members faulted corruption for their under-representation on the committee:

Women say they are few on the committee because the men want to take the timber. Even the police are all men. When they find a person with oltarakuai they let him go. Isn't there business going on? They are given money. Women don't go to cut oltarakuai in the forest. It's the men. There are few women in the committee because of business so men can destroy the forest. They just leave us just sitting. WKI-NFE-43

Men are still oppressing us. It is not right that only a few women are in the Forest Committee because we can speak and we also can't be bribed. But for them they can be bribed. That is oppression because it is required that more of us are in that committee. WKI-NFE-50

The FC and merry-go-round group members generated five written forest rules in a gender-integrated meeting (Table 6.12). Their priority was timber and cutting live trees. Women also felt strongly about the composition of the committee. This unsolicited comment further strengthened women's forest: children schema:

Women have the feeling that tomorrow's generation belongs to them. They have the feeling for educating children and sending the message to the Forest Committee that we must preserve the forest for tomorrow's generation. FWG-SE-40

Table 6.12 Forest rules proposed by Forest Committee (N=8) and Women's Group (N=6)

Forest Committee	**Women's Group**
1. Stop the commercial timber business.	1. People should go through Forest Committee for timber.
	2. Forest Committee should be trained experts.
	3. Forest Committee should be 50% women.
2. Women should not burn live *oloirien*. Use *jiko*s or gas stoves instead.	4. Women should collect only fallen branches of *oloirien* or use cow dung in *jiko*s.
3. Men should not burn or cut down live trees.	5. Stop cutting live trees in forest.
4. Men should use only dry *oltarakuai* and plant new ones.	
5. Men should use trees other than *olpiripiri* for construction.	

After fieldwork, the two groups continued meeting, discussed action plans, and registered a community-based organisation called *Ilchoreta l'entim oloitai* (Friends of Loita Forest) to involve people in forest rule-making and tree nurseries. They also established in their by-laws that 50% of their members should be women. A similar transformation resulted from combining male and female natural resource forums with the help of Maasai NGOs in northern Tanzania because it helped women "to become accustomed to standing in front of men, speaking and being heard!" (Goldman & Little 2015:772).

6.4.3.3 Loita Council of Elders (LCE) and subdivision

For the last two decades, governance and decision-making power in Loita has been shifting away from traditional chiefs and the Chief Laibon. The spiritual influence of the latter, as the indigenous custodian and caretaker of Loita Forest, was used to fight the government for the forest in the 1990s (Maundu et al. 2001; Zaal & Ole Siloma 2006). Not long ago, *Iloitai* said the Chief Laibon had the final word in forest decisions (Obare 2003) perhaps due to recent memories of his vital role in the 1990s conflict (Karanja et al. 2002; Kronenberg Garcia 2015). Today locals said his influence had waned with acceptance of churches and schools but LCE continued to consult him on forest matters and elders still spoke of his magical powers:

> *Twenty years ago, there was no group which made rules about the forest since forest destruction was not big. We had the Laibon and the chiefs. The rules of the Laibon sometimes came in dreams. He foretold events which would happen. Maasai of that time listened to him. He spoke of things that were there and if people researched it they would see they were there. The Laibon foresaw the coming of a snake. After a few years, the road was made*. MFC-NFE-42

Locals perceived the new locus of forest governance as the LCE. It is characterized as "the most powerful institution in Loita" (Karanja et al. 2002:15; Zaal and Ole Siloma 2006:7)[189] Once a loose entity of elders, it was organised by ILIDP leaders to provide a link with the community. During fieldwork in 2014, it consisted of 86 male age group leaders, clan chiefs, village committee leaders, youth leaders, church and project representatives, governmental chiefs and assistant chiefs, MCA, Loita Ward Administrator, DO, and DC. The FC members among its ranks advised it on forest issues. Locals viewed the amalgam of traditional and government leaders as a source of power and a testimony to the adaptability of Maasai to position themselves in confronting new challenges (Kariuki et al. 2016; Obare 2003; Zaal & Ole Siloma 2006) with a neo-African governance institution (Ole Siloma & Zaal 2005). Power within the organisation was concentrated among ruling male age-sets from which women are excluded in Maasai culture.

Three LCE elders thought women might be considered members but there was no consistency in the individuals they mentioned and the women they named were unaware of it. Their exclusion was attributed to traditional Maasai culture:

> *There are no women on the Council of Elders because it was formed when the culture was traditional. It was formed by elderly men who regarded women as those who stayed at home and had no say on community issues. Still it is made up of those men. They decide on the secrets of the community and they don't want the secrets to be known. They are hidden, deep rooted issues, like the forest, traditional ceremonies, and land conflicts. Women would not know how to go about it. Maybe some elderly women who have stayed long in the community and women leaders who have been empowered could sit on the Council of Elders. But I don't think the men would allow it.* FKI-SE-45

[189] This characterization may be somewhat exaggerated because LCE was divided throughout the forest conflict (Kronenberg Garcia 2015) and during this field work. From 2014 to the time of writing, LCE did not meet as a group. It had split into two factions over perceived political agendas, land tenure, and officer terms. Meetings led by rivaling leaders are held separately. In 2015 the split groups attended a gathering to declare their opposing views about a forest project.

> *We don't have women on the Council of Elders in Loita. It is a body of leaders, like me. I am an age group chief. We don't have age groups for ladies. That is why.* MKI-SE-29

One educated woman insisted she was a LCE member although no elders had mentioned her name. Her opinions affirmed the heterogeneity of *Iloitai* women about decision-making:

> *I am the only woman on the Council of Elders. I am a leader. A leader must have good character and be a role model so when you speak people will listen. If I tell you to take your child to school, my children must be in school too. You must be courageous and not fear to speak in front of men. Men believe women cannot speak before them. I know I am not a child. I know I can do what a man does. I finished Form 4 and when you go to school you learn this.* FKI-SE-40

Subdividing Loita, including the forest, was a hot topic of discussion in the community.[190] In interviews and focus groups, people assumed the LCE would make the decision with input from the community. In households, 82% were against it. For men, the biggest reasons were grazing (forest: livestock schema) and outsiders:

> *Subdivision is not a good idea. It will bring a lot of problems. Cows will lack places to graze. It will bring intruders and tribes from outside Loita who will destroy the forest. The forest will be finished. They will cut down trees in the places they have been given. There will be drought because this forest is what brings us rain.* MMG-NFE-48

> *I am against land demarcation. When the land is divided, we will have no place to graze. Hatred and a terrible famine will come. There will be no cows (metii enkiteng.). People will be enemies. Maasai can't survive without cows and they are not the best in cultivation.* MKI-NFE-80

Even *Iloitai* from outside the study area were considered intruders. Empurputia elders were frequently in meetings about land disputes over outsiders cultivating and claiming the forest edge in anticipation of subdivision:

> *I called for a public baraza to stop a man from Olngarua from building a home near my shamba. He wanted to take over this forest and start cultivating and finish this forest so I refused him to settle there*. MKI-SE-42

> *People are coming here from the rangelands in Ilkerin, Morijo, Olmesutie and Olorte to cultivate so when Loita is demarcated it is theirs.* MKI-SE-35

> *People are migrating here because of cultivation. It's not because of cows anymore. Empurputia is a rescue for many things. Even if the long rainy season is small we still get maize despite the heat.*MKI-NFE-48

Women were more anxious than men about effects of subdivision on families (forest: family schema) (Table 6.13) (N=49; Fisher's Exact Probability Test p=03253). This fear was likely

[190] At the time of writing, LCE had not reached consensus on subdivision. In 2012, it invited an ILRI researcher to present the pros and cons of group ranches, private parcels, and conservancies.

Table 6.13 Gender analysis of open-ended responses to "Why did you say subdivision is a bad idea?" (N= 49)

Reasons against subdivision	Men (N=24)		Women (N=25)		Total		Fisher's test	
	Mentions	%	Mentions	%	Mentions	%	P value	P
Less grazing/cows will not move/fewer cows	23	44.2	17	30.4	40	37.0	.16462	>.05
Lose culture/selling to intruders and other tribes	10	19.2	7	12.5	17	15.7	.43036	>.05
Forest destroyed/ timber harvest and cultivation/less rain	6	11.5	8	14.3	14	13.0	.44643	>.05
Family issues/men sell and children get nothing/congestion	1	1.9	8	14.3	9	8.3	.03253	<.05*
People will sell land	5	9.6	4	7.1	9	8.3	.73861	>.05
No firewood or construction material	1	1.9	6	10.7	7	6.5	.06886	>.05
Plots too small to cultivate	2	3.8	5	8.9	7	6.5	.439748	<.05
Fighting over boundaries	4	7.7	1	1.8	5	4.7	.19359	>.05
Total	52	100	56	100	108	100		

fueled by news about Maasailand that had been subdivided (Bedelian & Ogutu; Campbell et al. 2005; Rutten 1992), the fact that single, separated and divorced women were excluded from land ownership (Kipuri 1991), and that, among women and youth, costs were perceived as outweighing the benefits (Mwangi 2005):

> *We in the Maa community, we give birth to many children. If the land is subdivided there will be congestion because all the family will live in a small place together. It will increase conflicts between family members because I might have five sons who must share the small land together and it will not be enough.* FWG-NFE-42

> *Subdivision is a bad idea. The young generation will not get a place to live. It will affect the women because it will bring conflicts to our families. The husbands will take the title deeds and sell the land to get money to use for drinking alcohol and leave their children without land. It will make us fight with them.* FKI-NFE-50

Anxieties were likely intensified by the privatization process in nearby Maasai Mara where women were excluded from decision-making, lacked direct access to payments, and held titles only through inheritance (Bedelian 2014). A male key informant had observed in Kajiado and Narok that Maasai men threatened wives with not paying school fees if they interfered with land registration. In Empurputia, people expected women would participate in the subdivision decision with songs and speaking in community meetings:

> *Many people don't want subdivision. They will stand up and say no in barazas. Whenever there is a function for politicians, women can sing. They can also sing to Council of Elders.* MKI-SE-42

In contrast, one educated woman who believed she was a member of LCE supported subdivision and saw economic opportunities and security for determined women:

> *Subdivision is a good idea. When a family gets a title deed the woman can get a loan if the man's ideas fail because he is disorganised. The woman can get a small shop and have security. Without a title, she can be told to move. In Empurputia maybe the women don't know that if the man tries to sell, the woman can go to the Ministry of Land in Narok and block it. When you are determined, you just do it*. FKI-SE-40

A minority (11%) of people considered subdivision a positive step. Even fewer (7%) could see both sides—a view called the 'pastoralist paradox' (Fernández-Giménez 2002) which recognizes the imperative of privatizing communal land into secure separate parcels while hoping for continued movement with cows by negotiating with neighbors. As this wealthy LCE leader acknowledged:

> *The people who will decide are the LCE. We are discussing it now. You will be able to develop your land, nothing will hold you back. Cows will not have diseases since your shamba will be fenced and no other cows will enter. But rich people will have to buy grass from people with few cows. Up to now grass is free. If you are poor and you sell land you will lose*.[191] MKI-NFE-45

To most men, subdivision meant no cows and insecurity:

> *Life is easier with cows. To demarcate and sell livestock a man won't know where to go or how to survive. To have land for grazing cows you have money. If I have 50 acres and sell 10 I can buy a car but I will remain without land to graze my cows. With land to have cows you have a permanent thing for life.* MKI-SE-42

For everyone considering subdivision, the threat to pastoralism was much more acute than threats from outsiders or forest destruction from timber harvest and cultivation (Table 6.13). Obviously, since dry season grazing was located in the forest, response categories overlapped and were not discrete variables. Of greater interest was how saving cows and grazing mirrored the root of the forest conflict in the 1990s. The common underlying fear in both cases was losing access to grazing and not resource management, forest conservation, biological diversity, or preserving indigenous culture– though the successful argument in the 1990s was presented from these standpoints for the benefit of conservation allies.[192] Such 'positionings' (Hodgson 2011) are still relevant and could be exploited again to confront the privatizing of Loita Forest.[193]

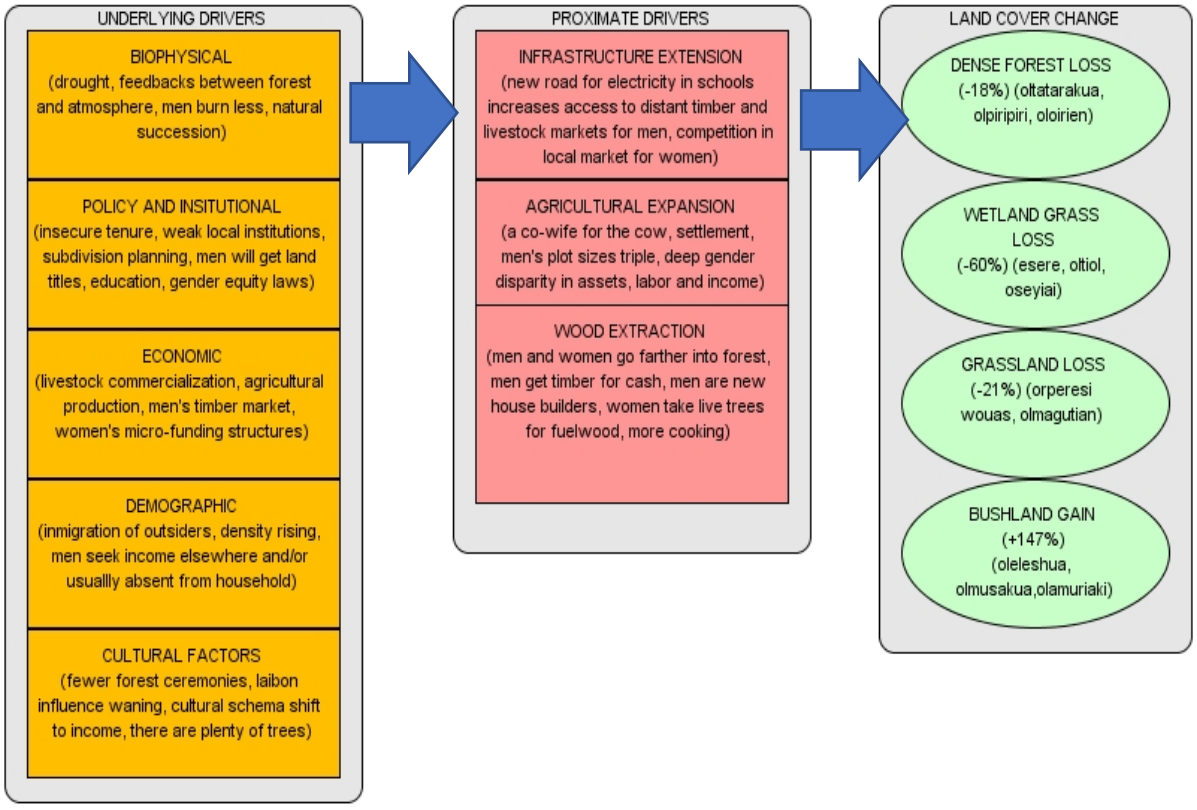
[191] In "selling wealth to buy poverty" people sell land for cash but are left with nothing to sustain livestock and must live in smaller plots and/or depend on others (Rutten 1992).
[192] EAWLS, IUCN, KENGO, KENRIK, KIFCON, KWS and WRI were among conservation stakeholders in the conflict in the 1990s (Karanja et al. 2002; Obare 2003).
[193] LCE participants in a forest planning workshop positioned community forest ownership based on iconic species (e.g., lion, elephant) that are rarely or never found in the forest today (Westervelt 2012).

In general, concerns about forest tenure were consistent through time. To men, the forest meant security for cows, then and now. Women were predictably anxious about their children's wellbeing, first and foremost, but their views about opportunities in decision-making varied more today depending on age and education. Both land change and decision-making differences were dramatic between 1976-1995 and 1995-2014 but, as for overall progress toward gender inclusiveness, change was real only in the relative sense.

6.5 Discussion

This chapter expands our understanding of drivers of land change (Figure 6.8). It builds out the narrative arc so that it encompasses the roles of men and women in pursuing livelihood and community decision- making. Land cover and livelihood shifts define 1995-2014 as transformational but their dramatic rate of transformation was not mirrored by the grudging incrementalism toward change in power relations. However, this discussion cautions against using that trend to represent contemporary intra-household dynamics because they are highly variable and female change agents are gaining momentum.

Figure 6.8 Gender dimensions of the proximate and underlying drivers of land cover change (after Geist & Lambin 2002)



6.5.1 Further expanding the narrative arc

Gender, livelihood shift, and environment were all linked. Synchronicities among the change drivers-- drought, *a co-wife for the cow*, food security, development (ILIDP), and insecure land tenure-- converged into a funnel of people and cows migrating up to the highlands where forest change was inevitable. Main incentives for the move were gendered and reinforced the schemata of earlier chapters-- men to save cows (forest: livestock), and women to marry and start families (forest: family).

The highland environmental conditions favored two growing seasons/year for women to grow vegetables. Witnessing what the soil could produce, men dismissed their cultural aversion to digging and eventually tripled the size of maize plots to turn land into cash and "raid the soil rather than cattle." But the highland grasses were less nutritious, and combined with longer droughts, weakening Sahiwal blood lines, and men's decisions about herd composition favoring drought resistance and commercial sale, there was less surplus milk for women to sell even though they depended on it more to pay expenses.

Other factors affecting women in these spatial and economic shifts were greater reliance on their free labour and income-earning capacity- mainly to feed, clothe, and educate children. In men's increasing absence from home, some women assumed all of men's livestock maintenance responsibilities and their *shamba* labour usurped the time they once spent going to women's blessings in the forest. The pattern of women seeking income to pay for things men once provided confirms other findings in Maasailand (Brockington 2001) and elsewhere that women's income is more likely than men's income to increase food security and educate children (Agarwal 1994; Duflo & Udry 2004; Kennedy & Peters 1992; Smith 2003).

Women perceived their new role as income earners as an improvement in their social status despite acknowledging the inequities in labour, access to resources (0.19 total asset disparity), plot size (1.5 vs. 4.2 acres), and share of household income (25% of crop income). It is only in comparisons with the past that the extent of cultural change is evident.

These gender linkages are an important contribution to the field of knowledge because of the paucity of empirical data on Maasai women's growing role as income earners. We are aware their livelihood assets are starkly gendered (Hodgson 1999; Njuki & Sanginga 2013) and women's access to resources makes land productive and reduces poverty (Agarwal 1994; Quisumbing et al. 1995; Meinzen-Dick et al. 2011). Now, with the present data, specific areas of disparity and opportunity have an empirical basis with which to move gender-inclusive programs forward.

6.5.2 A revolutionary link to livestock ownership

The cases of women owning and selling *aitore* livestock and of husbands relinquishing livestock maintenance responsibilities to wives are a major cultural shift from the days when women were treated as children and *would not see a coin* from a cow. Overall, household livestock decision-making was not as gender-inclusive as cultivation but change agents known as women's merry-go-round (micro-savings) groups are considered leaders in the community. These women had

successfully infiltrated the male-dominated livestock economy. Their numbers were few but they represented a bold step away from the past in the buying, selling, and making profit with livestock. Considering the average woman's livestock asset disparity (0.18) and the dark history of women's subordination, this development is revolutionary from a cultural standpoint.

At first glance, this phenomenon appears to mirror "the making of female Maasai pastoralists" (Wangui 2008: 365) among *Ilkisongo* Maasai in Kajiado County. A closer look reveals stark differences from Loita in drivers and livestock activities based on land privatization policies, conservation development, and zero-grazing methods. However, the cumulative effects of constrained resource access, settlement, and children in school, are having the same gendered effects of expanding women's duties in livestock production.

The role of women's groups in livestock ownership has been reported elsewhere (Bedelian 2014, Njuki & Mburu 2013). However, Loita was unlike nearby Mara, where conservancies established merry-go-rounds to facilitate their own programs in renewable energy, tourism, and environmental education. In remote Loita Forest, where market access was poor, the women are self-organising to grow their money for the well-being of their families and the community, particularly to keep Loita girls in school. In the highland forest which brings rain (*keyau enetim enchan*), they can take advantage of their 'virtuous spiral' (Mayoux 2002) in generating crop income and step across the gendered threshold into the livestock economy.

The merry-go-rounds reflected the heterogeneity of *Iloitai* women. All merry-go-round members were not typical women for the area. Some were educated, not poor, and held leadership positions in school and church groups. They often turned up as outliers when searching for gender patterns. Some husbands paid the membership dues and assisted wives in market negotiations. In those households, the 'breadwinner effect' (Goldman and Little 2015) was operating. Accumulating assets built social capital with positive effects on intra-household decision-making.

Without a gender lens, these atypical women would have been amalgamated into a homogenous whole and remained invisible along with the other women with livestock decision-making authority, such as widows and wives with absent husbands. To build on the Discussion in Chapter 5, these examples feed even stronger cautions about stereotypical male/female dichotomies of gender/environment relationships (forest: livestock and forest: family schemas). Most importantly, their income-generating and decision-making authorities are variations that could determine the success of community-based forest initiatives, such as the Friends of Loita Forest.

6.5.3 Positing gender-inclusive pathways

The dramatic parallel shifts in resource use and land cover have obvious implications for the ecology and tenure of Loita Forest. Unabated and gendered demand for canopy trees, combined with drought, less burning, and the economic drivers of cultivation and timber harvest without regulation or enforcement, may have permanently altered the natural succession cycle of the highland *Juniperus-Olea* forest association and its ecological services, especially water catchment. Looking to commons scholars and experiences of conservation interventions aimed

at averting "tragedy of the commons" scenarios in community forests, it is in forest rules and community participation in decision-making where promising pathways emerge.

The lack of forest rules and enforcement, patriarchal decision-making, and lethargy about sustainable use (*there are plenty of trees*) have gender implications. House building is now the domain of men, fuelwood is the domain of women, cultivation and livestock activities impacting the land are evolving into the domains of both, and women decision-makers are becoming visible. In 2015, a local forest committee joined forces with a merry-go-round group to register a CBO called *Ilchoreta l'entim oloitai* (Friends of Loita Forest) to work in local villages to develop written forest rules (including rules against women taking live *oloirien*). Just as households and women's groups are the locations of revolutionary progress in livelihood decision-making, gender-inclusive forest decision-making is slowly appearing in village committees. Findings indicated that younger people may be more drawn to such new endeavors than to elder-dominated traditional institutions from which they feel marginalized.

Mothers bemoaned the sense of powerlessness among their young adult children. More anxious than men about impending subdivision, they feared an insecure future for young people because of elders holding title deeds to small pieces of land that could not support families. Educated women were more likely to view land privatization positively because they understood the economic opportunities and women's legal property rights. Such differentiations based on gender, age, and wealth have also been noted in views about the subdivision of failed group ranches in Kajiado County (Archambault 2014). Women's main concerns in both studies were family-oriented (congestion, income, infighting, lack of title). However, a much higher percentage of *Iloitai* men and women (82%) viewed subdivision negatively. Successful land reform in Loita will need to avoid appeals to the mythical homogenous community (Agrawal & Gibson 1999) and address gender dimensions of space, income, and legal rights.

Decades have passed since *Iloitai* women sang songs to voice their anxieties about the forest. Maasai women's songs were an essential part of community life then (Kipuri 1983), "the best expressions of women's hope and fears" (Grimshaw 1995:33), and they proved powerful in influence over elders' decisions. Older women's insistence that songs are still influential support assertions that customary institutions still have a role, though a weakening one, in protecting pastoralist women's land rights (Flintan 2010). Today women's forest songs might dwell less on medicines (forest: family) and more on title deeds, equitable resource access, and the crops and cows they own that depend on rain.

Chapter 7 synthesizes the findings of previous chapters.

Chapter 7: Discussion

Society-environment relations are notoriously hard to analyze: ultimately, one is trying to study everything (De Sherbinin et al. 2007). The task is made harder still in a semi-arid pastoralist rangeland system, subject to biophysical and socio-political conditions which are highly variable through space and time (Homewood 2008).
(Homewood et al. 2009a: 21)

7.1 Introduction

This thesis holds that improving knowledge about culture/environment linkages enhances our understanding of land change. It argues that human actions affecting the environment are results of decisions influenced by a complex amalgam of factors that include gender—a factor that has not received much attention in studies of pastoralist land use or drivers of remotely sensed land change. This chapter collapses the results of Chapters 4-6 into a new gender-inclusive narrative about land change in Maasailand. It identifies areas where linkages remain muddy due to some methodological hurdles and the complexities in natural systems that still elude interdisciplinary scientists. Finally, it offers guidelines to gender-inclusive forest initiatives in Maasailand based on empirically-based patterns.

To recall the thesis title— "a co-wife for the cow"—the new narrative extends the metaphor about men adopting cultivation to save cows to include the significance of changing gender roles in preserving livelihood. The collective results of all data chapters lead to this conclusion. They show gender roles adapting, especially the rising economic dependence on women in all aspects of livelihood and wellbeing, not only in cultivation. Gender dimensions define Maasai culture. Their transformations are what ensure survival.

Conceptually, the triangulated methods found gender dimensions at the intersections of culture, livelihood, and environment (Figure 1.1). From the perspective of gender theory and sociology (Wharton 2011; Chafetz 2006), gendered self-concepts changed over time and gender relations and roles changed with livelihood shift. From the perspective of feminist anthropology, the findings challenged static gendered stereotypes. They found gray areas that men and women occupy between domestic and public domains—and they also varied between households.

This chapter explains how the findings confirm, challenge, and advance the study of human ecology. The results confirm variabilities in pastoralist drylands and add gender dimensions to the mix. They challenge a negative trajectory for Maasai women's social status and present an empirical basis for a more positive trend. The evidence confirms assertions that gender is constantly being reconstructed as men and women rework their power relations when production systems change (Lorber 1994, Moore 1997). In human ecology, it advances the state of knowledge about gender and environment, forest use and land change, and remote sensing praxis.

7.2 A new narrative incorporating gender into the natural system

Geospatial findings indicate that Loita's dry season refuge has been constantly changing since 1976. Mixed methods reveal ways that environment and culture aligned in three periods of time from 1976 to 2014. Out of that story of change emerged a narrative arc.

The chapter takes a straightforward approach to dealing with the scale disparity in linking satellite images to life inside people houses. It traces land change beside the most salient gender dimensions and then follows them chronologically. Land change comparisons with the early period were limited by the absence of geospatial data before 1976 but the lack of quantitative detail was balanced by the ethnographic richness of her-stories. The her-stories established the baseline of rigid gender relations from which transformations could be traced.

Land change and all its methodological issues will be discussed first before moving on to gender linkages.

7.2.1 A degrading forest ecosystem: Compelling, challenging, and cautious findings

Quantitative land cover change was anticipated based on pilot work, botanical evidence (Bussmann 2002, Maundu et al. 2001) and natural forest succession. But 18% dense forest loss (with 147% bush gain) in Empurputia and 7% dense forest loss (with 80% bush gain) in Loita Forest overall are remarkable in comparison with each other and the global and tropical forest loss rates (Hansen et al. 2013, Keenan et al. 2015). The findings contrast with IUCN's descriptions of 3% forest gain in Loita within a similar period (IUCN 2005) and forest gain nationwide at an annual rate of 0.1% (from 6.01% forest cover in 2000 to 7.46% in 2015) (Kenya 2016). Such discrepancies might be partially, though not wholly, accounted for by different definitions of forest (e.g., when forest includes bush, plantation, or exotic trees) which affects valuations of forest change and ecosystem services (Bellot et al. 2014, Tropek et al. 2014). Such issues have important policy implications, as in the case of Kenya's "forest" gain assessment as the KFS works toward its target of 10% from 7% forest cover by 2030 (Kenya 2016).

The data are inconsistent with oft-cited narratives about Loita Forest as one of the last indigenous forests in Kenya undisturbed by change (Blomley et al. 2007, Muchugu 2015, Ole Riamit et al. 2010, Zaal & Adano 2012). They support designations of the Loita Forest area as an endangered ecosystem (Kenya 2015, KWS 2017), a key biodiversity area worthy of protection (BirdLife International 2017), and a water tower of national importance (Kenya 2015). The data should fuel interventions to restore the resource base for rain and watershed protection. Biotic pump hypotheses about forests near bodies of water attracting rain (Hesslerova & Pokomy 2010, Makarieva & Gorshkov 2007, Sheil & Murdiyarso 2009) could focus Kenya's reforestation efforts in Loita, but cautions about planting non-indigenous trees are warranted.[194] This atmospheric pump dynamic is reflected in local understandings of how the forest brings rain— the forest's highest ranked value-- which is said to be passed down through generations. As an" island in a desert" (Bussmann 2002), however, Loita's function as a biotic pump is

[194] In 2016, people representing Magadi Soda Company interests in Kajiado County met with *Iloitai* elders to propose planting exotic bamboo trees in Loita because less water was reaching Magadi Lake from the Olasur River that flows through Empurputia. No projects have developed, as of this writing.

probably insignificant alone and will need to work in concert with other Kenya reforestation efforts to improve regional climate conditions.

The characterization of Loita Forest as a degrading ecosystem requires discussion. Degradation or decline is appropriate because natural vegetation could possibly regenerate [195] in contrast with deforestation and complete and permanent tree removal (Hosunuma et al. 2012). In the scholarly debate about defining degradation in pastoralist ecosystems, this study takes both ecocentric and human-centric points of view (Reid 2012) and highlights the destructive impacts of underlying drivers on both ecology and livelihood. For example, the degradation of wetlands driven by proximate drivers exacerbated by persistent drought, resulted in a 60% loss of wetland vegetation that cows and people depend on along with elephants and hippos rarely seen today.

As for drivers of change, the compelling remotely sensed patterns of degradation in wetland, forest and grassland suggest that is where the underlying drivers lie. The most potent underlying driver was abiotic, i.e. repeated and persistent drought. The beginning of the transformation period coincided with the cumulative effect of droughts driving settlement and clearing for rain-fed agriculture in the forested highland. Operating at the same time were national trends of increasing population, a growing market economy, and education mandates. Regionally, there was diminishing land and resources, the threat of losing communal tenure, and weakening power of traditional institutions. These root causes drove the local ones, i.e., increasing competition for water and pasture along with settlement, cultivation, overgrazing, timber extraction, lack of rules, and less fire. Confirming the work of Geist and Lambin (2001), the local drivers worked synergistically toward forest degradation and cycled back to the underlying driver of resource scarcity. According to Charney (1975), they contributed to feedback loops between land cover and rainfall. Furthermore, such synergies operating in forests may have negative global climate effects (Bonan et al. 2008), underscoring the role of climate as the main underlying driver of cultural and environmental change in this location.

These synergies and feed-backs in Loita are complex. They are also unique in Kenya because of one characteristic-- communal land tenure. Should land become privatized and the forest is incorporated into the regional timber and charcoal economy due to weaknesses of traditional rules and institutions, the current pace of land change will accelerate and forest degradation could progress to deforestation. Popular narrative about a Loita community "able to de facto exclude outsiders from appropriating the resources (with) effective indigenous conservation institutions" (Blomley et al. 2007) is outdated. The ominous impact of these change drivers left unchecked is mirrored in informants' majority opinion against land privatization and their dire projections about the availability of trees they depend on. The evidence that these projections are gendered point to women's important role in forest-decision-making.

[195] A good example is regeneration of African pencil cedar (*oltarakua*), the preferred tree for construction. Fire is an instrumental force in the regeneration cycle of this tree and its associated vegetation in East African montane forests (Bussmann 2001). After a fire, cedar along with herbaceous pioneers and broad-leaved species become established. Cedar can become dominant if it establishes closed canopy and out competes other tree species. The cedar association was once dominant at high altitudes in Loita Forest (Maundu et al. 2001). Also see Footnote 7 for the difference between degradation and deforestation.

An important finding from the research methods is that ground-truthing and people's recollections about swamp grasses (*so tall you could not see the elephants*) are what led to recognizing the satellite signature for hydrophytic vegetation. These findings challenge data generated by a global gaze approach to geospatial forest loss analysis. The global gaze (Hansen et al 2013) couldn't see the defining change for the study area location. This finding confirms that thematic map accuracy with labour-intensive ground-truthing is necessary if place-based studies are to improve geospatial projections of wider scale land change (Lambin et al. 2003). This recommendation is especially pertinent to small wetlands because they are difficult to detect with satellites (Mwita 2013) and are degrading in East Africa (Ashley et al. 2004, Chapman et al. 2001).

There are several cautions in characterizing Loita Forest and Empurputia as degraded ecosystems.

First, there is the historical baseline. This study was limited by the 1976 satellite image because its low quality could not establish a basis for calculating percent change for 1976-1995 and 1976-2014 with confidence. Although percent change could be measured quantitatively only for 1995-2014, the rich qualitative data from the 1970s lent confidence to observations that dramatic changes were taking place in the 1995-2014 period compared to 1976-1995.

Secondly, there is the difference between temporary decline and permanent loss. For example, because natural succession cycles of forests are complex and can be complicated by climate effects and time lags in vegetation response (Fairhead & Leach 1998), the influence of climate shocks such as multi-year droughts on wetland plants and canopy tree species could have more permanent effects than human activities. At the time of writing, the area is facing another year of failed long rains. The extent to which climate is driving irreversible vegetation loss, particularly in the wetlands, deserves more research focus.

The third caution is the extent to which the 1995 baseline could have represented an anthropogenic savannah ecosystem (Fairhead & Leach 1998) such that positive as well as negative effects of human activities on land cover are relevant. Grassland decline and the alarming rate of bush encroachment after 1995 was probably influenced by less frequent and less intense fires for fresh grass growth as people started settling and cultivating, as described in interviews. Overgrazing and drought can also interact with less fire and favor bush encroachment in savannah ecosystems (van Langevelde et al. 2003) and fire has synergistic impacts with herbivores on maintaining woodland and grasslands in the Mara ecosystem (Dublin et al. 1990).

A final caution concerns land use vs. land cover. Landsat's limited capacity to clearly and consistently differentiate cultivated plots from dead or low vegetation in this forested landscape precluded quantitative measurements of cultivated land over time. Therefore, qualitative indications that clearing for cultivation was related to forest loss and bush encroachment could not be substantiated in quantitative measurements of land change. Land conversion for farming does have negative consequences on land cover and migratory wildlife in Maasai rangelands (Homewood et al. 2001, Sachedina & Trench 2009) and deserves attention in Loita highlands.

The narrative arc of linkages between land, livelihood, and cultural change is presented below.

7.2.2 Exposition (Before 1976): A showpiece forest, specialised pastoralism, and patriarchal control over land and culture

The back-drop for the land change story was the early days before 1976 when Loita's population density was low (4 people/km^2) and *Iloitai* were still migrating across the grassland-dominated landscape as specialized pastoralists. Linkages to the forest for both men and women were utilitarian and centered on grazing during droughts for men and construction materials, fuelwood, and medicinal herbs for women.

Men spoke often about abundant trees, water, and wildlife in the forest. Her-stories concentrated more on the labour associated with migrating-- all the moves women had to make, carrying small stock on their backs, and packing up the temporary skin houses *(ilngoborri*) they had to build with tree poles as men decided where to migrate in response to rain and inter-sectional cattle raiding. *Intasati* were the only women in the community who could describe the making of skin houses with forest materials and asserted they were the last generation to have the skills.

Women said they owned nothing except *the food in the fire,* they were treated like children and felt like prisoners. Their activities were completely male-dominated-- from being ordered to get construction materials and build houses and fences, told who and when to marry, and abused for disrespect and expressing their opinions. They faulted men for doing nothing to help them but their fear (*kaure*) of men was a matter of respect (*enkanyit*) they dared not test. If they wished to speak in meetings where men were, they kneeled and offered grass, stood in the direction of the sun with a man so men would not die, or milked their breasts as an offering of peace.

The forest was viewed as a showpiece that Maasai men had managed well by burning and grazing for the previous 50 years (Talbot 1960). It was considered remote and undisturbed due to the low population and people's fears about forest monsters (*naibor*) which kept them away. Women did not go far from home for fuelwood as demand was low and there was not much cooking for the milk, cow fat, and blood (*mpuko, inkipot*) diet. When there was not enough milk, women made tea for children with tree bark (*ormisigiyioi*).

Uncircumcised girls had a recreational relationship with the deep forest that only elderly *intasati* could describe in detail. A young girl could spend weeks or months in forest *olpul* taking meat (*inkiri*) and herbal soups (*motori*) with warriors before her father ordered her home to be circumcised and married off to a man of his choosing. In their vivid descriptions of the myriad forest herbs used in *olpul*, cultural shifts about sex and birth control emerged out of age-differentiated plant use. Younger *intasati* spoke of taking herbs (*olkonyil*) that *killed the eggs* of both men and women. This was confirmed by elders regarding the higher incidence of pregnancies today because warriors no longer take *olkonyil* in *olpul*. There were herbs to strengthen warriors for hunting buffaloes and lions (*olangunguai*) that girls were forbidden to take.

The striking contrast between gender relations in this portrait of time and other historical characterizations deserves discussion. Present findings suggest persistent patriarchy. But based

on pre-colonial records near the turn of the 20th century, Maasai women apparently enjoyed economic independence, freedom to travel long distances on trading trips unsupervised (Thomson 1885), individual property rights, and decision-making authority (Merker 1910). The change to becoming subordinate in the household economy (Spencer 1988) is attributed to British colonial rule (Hodgson 2000, 2001) following epidemics and famine, commoditization of livestock production, and the declining social status of the house (Talle 1988). *Intasati* her-stories challenge this historical progression because their lack of access to resources and opportunities were firmly embedded in *Iloitai* culture early in the century. When asked to trace women's power through the generations regarding traveling for trade, sharing views with men, marriage, work load, and money, older women indicated that today they have a little more control in their lives than their mothers. But they insisted their mothers had "*Zero. That is what is true. Zero*." When asked about their mothers getting permission to travel for trading or small business, a characteristic response was: "*Travel far to trade? That is not true. They couldn't even go to Entasekera."* FKI-NFE-59 [196]

A factor contributing to the ethnographic richness of this period was the feminist methodological approach. The *intasati* who the female researcher and assistant spent days with, in participant observation, interviews, and helping with chores, contrast sharply with Maasai (Samburu) female informants broadly characterized elsewhere as ignorant, unhelpful, listless, sour, and lacking warmth (Spencer 1965). Differences in time, Maasai sections, and gender of researchers may also have contributed.

Acknowledging the geographical and temporal disparities between the different historical portraits [197] of patriarchy, and the accounts of women traveling to trade with agriculturalists, present findings still suggest it would have been a very atypical traditional *Iloitai* woman who did not feel socially and economically marginalized before colonialism and livestock commoditization took hold. Present findings suggest not a decline in women's autonomy but a gentle incline that has been rising through time.

7.2.3 Rising Action (1976-1995): A healthy ecosystem, agro-pastoralism, and changing roles of forest and gender

Dense forest was increasing and *Iloitai* relationships with land were changing. This study finds links between dense forest increase, men burning for pasture in years up to 1960 (Talbot 1960), and the prevalent fires *intasati* said men set in the forest for safe pathways for people and cows to pass as they settled on the forest edge in this period. It is likely that successional forest growth after moderate burning, which has positive restorative impacts on soil and vegetation and controls parasites (Homewood 2008), was already underway on the onset of this period. Since cedar forest regenerates after fire and reaches 9 m in just 20 years (Bussmann 2001), this timing

[196] Brockington (2001) reports a case of itinerant saleswomen in Tanzania who represented a case of extreme hardship in one household and needed to travel far to an urban area to sell medicines for income in the 1980s and 90s.

[197] The historical works include field studies about life before 1976, e.g., Merker's (1910) work pertained to Tanganyika in 1895-1903, Hodgson's (2000) to Tanganyika in 1890-1940, Spencer's (1965) to Samburu in Kenya in 1957-1960 and Matapato in Kenya in 1976-1977, and Talle's (1988) to Kenya Maasailand in 1979-1981.

seems reasonable for a forest where cedar has been dominant (Maundu et al. 2001). Furthermore, the geospatial increase in hydrophytic vegetation in the study area may reflect optimal functioning of forest water catchment linked to increased rainfall that encouraged expansion of both wetland and forest by 1995.

This is when livelihood shift and permanent settlement in the forested dry season refuge started. Challenged by persistent and frequent drought, most notably in 1983/84 and 1993/94 (and again in 1995/1996) when there was famine and food aid, *Iloitai* headed toward the forest which brings rain (*keyau entim enchan)*. For centuries in the past, the forest served the role of saving cows in dry seasons, but with intensifying drought, more people (Kenya 1994), and insecure land tenure (Kronenberg Garcia 2015), the forest took on a new role as people permanently settled closer to its resources to establish farms and families. In the study area, they moved beyond the forest edge into a forested wetland. Rain-fed crops could grow there and cows could graze in the swamp valley where there was ample supply of water and grasses all year long. Elders considered it *a healthy ecosystem.*

When informants started moving to the study area in the 1980s and 90s, they started small-scale cultivation with hand tools. The primary reasons men and women moved there were different—men for grazing and women to start families. As for main drivers of livelihood shift, women spoke of it from the standpoint of food security. Indeed, the older women had already been leading this change, feeding their garden vegetables to children for a decade (and to the disdain of men with cultural aversions to digging) before men seriously embraced cultivation and started clearing their own maize plots supported by ILIDP trainings. Men viewed cultivating from the perspective of *a co-wife for the cow* to save cows from sale and to meet family expenses (mostly for food). In the beginning, the average size of a *shamba* was roughly the same for men and women (1.2 and 1.0 acres, respectively) and women did more selling than men did. Though funds generated from small-scale cultivation in this period were small, they comprised the major portion of women's meager contributions to the household economy and their own personal income—a significant development from the past. Nevertheless, they were still financially dependent on men.

Other reports about the timing of Loita's wide-scale adoption of cultivation appear to vary based on location in the highlands or the lower rangelands where there is less rain and cultivation proceeded later (Knowles 1993, Kronenberg Garcia 2015, Talle 1988). The timing also varied by age since older *Iseuri* and *Ilkitoip* men and women were the first to be trained in agricultural practices by the ILIDP development project in the 1980s and 1990s. Wealth factors could not be ascertained with certainty as most informants ranked as low wealth.

The nature of the progression—led by women's gardens (*enkurma enkioni*)—and the drivers of cropping activities are confirmed by other findings. In Ngorongoro District in Tanzania (the southern extension of the Loita hills), where cultivation was underway decades earlier than in Loita, there is evidence of the same progression from women's small vegetable gardens to larger maize plots dominated by male household heads (McCabe et al. 2010). The primary factors that pushed (food security) and pulled (maintaining pastoralism by not selling cows) cultivation were also the same. The motivation to farm for establishing land tenure has been noted elsewhere in

Loita (Kronenberg Garcia 2015) and Maasailand (Sachedina & Trench 2009) but it was not the primary driver in this period.

As before, women perceived themselves as powerless in the decision-making of men and the community. (To recall, to speak in meetings where men were, women had to kneel and offer grass, stand in the direction of the sun with a man so men would not die, or milk their breasts as a peace offering.) But, by the mid-1990's, a surprising role for women had emerged out of a legal challenge to forest tenure. Narok County government was poised to change the forest's legal status into a nature reserve for tourism purposes, wresting it from local control. Women sang creative songs to elders about the forest, mainly about its rain, grass, and medicinal herbs. *Iseuri* men today said it was those powerful songs of women that inspired them to persist in their legal battle which took a decade to resolve. So, by the onset of the next period, women were demonstrating their agency using customary means to protect their primary values of the forest—family well-being and medicinal herbs (forest: family schema).

7.2.4 Transformation (1995-2014): A whirlwind of converging and destructive drivers, role reversals, and merry-go-rounds

This is when direct and gendered impacts on the forest were most evident. The culture and land transformed at the same time. Empurputia experienced the same change dynamics as the entire forest only at a much-exaggerated rate-- 18% loss in dense forest, 147% gain in bushland, 20% loss of grassland, and 60% loss of wetland vegetation. Just as Loita Forest was once viewed as a showpiece of good management in the 1950s, today Empurputia is a model of the converging effects of change drivers— climate, cash economy, insecure land tenure, institutional change, and infrastructure development.

The most direct gender link with environmental change was house construction. Husbands and hired experts assumed women's housebuilding role. Men constructed new houses and fences of canopy trees (*oltarakua* and *olpiripiri*) they felled with power saws without regard for traditional forest rules. Everyone acknowledged that the old traditional *manyata* houses did not destroy the forest and the modern ones did, but women were grateful to be relieved of the never-ending labour to build and repair them. As cedar became scarce, men penetrated deeper forest to find it. Commercial timber selling was rampant and corruption pervaded local law enforcement. Driven by the cash value of a lorry-full of timber, *forest-eating* men hauled it out at night on the new road to Narosura without fear of being stopped by police. Men and women believed the new road, constructed by the government to bring power to schools, was finishing the forest and invited outsiders who were changing *Iloitai* culture. It was also bringing in women entrepreneurs from other tribes with trucks stocked full of vegetables and household items priced to undercut local women's prices on market day.

Women acknowledged their role in *forest-eating* by going deeper into the forest to find their preferred and increasing scarce fuelwood (*oloirien*) for cooking the new foods people liked. Their taking of live *oloirien* against forest rules had less impact than men's timber enterprises, but women's projection of its future was dire (10% left by 2050) and far worse than men's predictions since women had more familiarity with its availability.

Women's familiarity with the pharmacopeia of medicinal plants (*olcani*) also exceeded men's in terms of number of plants and their practical applications. This challenges characterizations (perpetuated even by local women) of elders as the ones who know most about forest medicines. Women are the sole collectors of medicinal plants for children. More numerous transects deeper into the forest could develop this finding further. Age effects would likely be apparent as young men no longer take certain herbs (e.g., *olkonyil*) in *olpul* and people rely more on the clinic today. Effects of medicinal plant harvest on forest cover were negligible though people expressed concern about commercial selling and overharvesting roots of *oleparmunyo,* a treatment for colds and malaria.

In the struggle against forest gazettement and their rejection of an IUCN conservation initiative (Zaal & Adano 2012), new groups organized themselves to intervene on the community's behalf (e.g., LNECT, CCL). The status of the forest today is attributed to traditional interventions and the linkage of old institutional arrangements with new ones. This supports the assertion that "protecting institutional diversity related to how diverse peoples cope with CPRs may be as important for our long-run survival as the protection of biological diversity" (Ostrom 1999:282).

Gender/environment linkages were central to livelihood shift. Cleared land for cultivation could not be measured geospatially but men said their maize plots more than tripled in size whereas women's gardens remained the same. Though women kept only 24% of the household crop sales for their own use, they perceived their new income-earning capacity as empowering because it helped them pay for food and school fees and other expenses men would not pay for. Cultivation decisions appeared more cooperative than livestock decisions in most households even though women were doing most of the *shamba* work in men's absence—a global trend referred to as "the feminization of farming" as men migrate to urban centers for work (Archambault & Zoomers 2015:3) (but in Loita more often due to loitering and alcohol). Women were also making more decisions about livestock herding, disposition, and maintenance which was unheard of in the past.

Drought, more people looking to establish themselves in advance of subdivision, and overgrazing were causing declines in grasses (*orperesi wouas, ormagutian, olopikidongoi)* and wetland vegetation (*esere, oltiol, oseyiai*) along with increasing pasture distance. Pasture distance, combined with the lower nutritional value of highland grasses and less burning for new grasses, were likely factors in low milk offtake. Women's traditional autonomy in the milk domain was still secure, but people depended less on milk for food than in the past and surplus milk was not as important for paying school fees as cultivation. The milk domain was simply not a lucrative income source in the highland forest.

Asset disparities were a valuable contribution to the knowledge base about gendered access to resources. When control over livestock-- based on ability to sell animals (*aitore* ownership) -- was accounted for, the 0.18 gender disparity was disturbingly low in comparison to the example of a pastoralist development target of 0.75 given by Njuki et al. (2011). What is notable about this finding is that many older women perceived this paltry level of access as a positive change from the past when they *would not see a coin* when men sold their (*aitodol*) cows. Today some women were not only consulted in disposing of livestock, they belonged to merry-go-round groups of entrepreneurs who controlled the buying and selling of cows to invest in their own

micro-funding enterprises. Their husbands even helped with monthly dues. Wealth and education were factors influencing membership in the merry-go-rounds, which has implications for forest institutions in this location and has been reported elsewhere (Coleman & Mwangi 2013).

Because of these new developments, this period is when women's forest: family schema became more nuanced as they directed their energies from domestic chores to generating income in the virtuous spiral earning them social status. Exceptions to the conceptual male/female polarities of culture/nature (Ortner 1974) and public/domestic (Rosaldo 1974) were appearing in livelihood and leadership authorities. The myth behind excluding women from cow ownership was left behind as they entered the livestock economy. The heterogeneity of women as a group became pronounced in this period based on education and wealth and age was still a powerful influence on livestock ownership, plant use, construction skills, and community decision-making.

The incongruity between women's oppressive daily routines and their perception of becoming empowered in this period is mystifying until it is compared with the past. Portrayals of Maasai women in the previous period as "less Maasai than men" (Llewellyn-Davies 1981:353), "at a loss" (Talle 1988:270), and losing their identity (Voshaar 1998) reinforce each other. In contrast, men today are more dependent on and, in some households, even express appreciation for the new "flexible complementarity" (Thomas Slayter et al. 1995c: 207) that women perceive as empowering. Some degree of flexibility is characteristic of pastoralist household production (Homewood 2008), and is usually differentiated by gender and age (Hodgson 2000). But the flexibility traced in this study is extreme compared to the past. There was a dramatic turnaround from the rigid role expectations of the past when men scorned women digging in the soil for food and beat them for speaking up. The new world order demands cash income from sources other than cows because it is impossible for poor families to sustain specialised pastoralism alone. So, women's free labour and income is the core of this new flexibility. Women's new activities replace what pastoralism can no longer provide—to be the *co-wife for the cow*. In their new role as provider of more than *the food in the fire*, they struggle to meet expenses with income from their vegetables (in plots smaller than men's and with only 25% of the household's crop income), milk/ghee (less available in drought and in forest highlands), small businesses (in markets dominated by competitive outsiders), and livestock (mostly chickens and small stock).

The boundaries of livelihood roles today are in flux to meet the demands of the day. Intra-household negotiations over labour, cows, crop income, the key to the maize store, *oira* events, etc. are common. Some men even financially support women in their enterprises. These findings highlight variability in gender relations within and between Maasai-households in this period and the family's increasing economic dependence on women. This paradigm of cultural adaptability is apparent in the intersecting spheres of inquiry (Figure 1.1). It is in the pastoralist livelihood that adopted rain-fed cropping despite gendered antipathies, in the rigid patriarchal order that embraced new power relations and livelihood roles, and in a new forest institution where gender equity is in the by-laws.

7.3 Concluding remarks

In rural Africa, there has been little empirical focus on the gender dimensions of resource access (Brockington 1991, Guyer 1991, Schroeder 1993, Thomas-Slayter & Rocheleau 1995a) and forest conservation (Coleman & Mwangi 2013, Leach 1994, Mai et al. 2011). Understanding gender heterogeneity is not typical of development in rural Africa in general (Warner et al. 1997) or of blueprint models for solving wicked conservation problems (Elmhirst & Resurreccion 2008). Recognizing that variables interact with gender, such as wealth, age, and marital status, is important in Kenya because they predict children's nutritional status (Kennedy & Peters 1992). Food security, household nutrition, and children's education increase when women have control over livestock (Kariuki et al. 2013; Kristjanson et al. 2010; Quisumbing et al. 1995; Quisumbing & McClafferty 2006). In Loita, multivariate linking of gender, age and education with gender relations, assets, and forest institutions can contribute to more sustainable pathways out of poverty.

The accelerated pace of forest change combined with anticipated subdivision calls for immediate gender-sensitive forest planning. Scholars warn about negative impacts of gender-blind development projects because they can restrict women's economic capacity by relegating income opportunities to static and subservient domestic domains (Leach 1994) and conservation projects have had gender-differentiated effects in in Maasailand (Keane et al. 2016; Bedelian & Ogutu 2017; Wangui 2008). Extending African women's stereotypical roles (as in earth mother myths and as sustainability saviours) to development projects will be counterproductive to ecological and economic sustainability (Leach 2016). Gender generalizations and ideologies have contributed to women's subordinate economic roles in agricultural (Boserup 2007) and pastoral (Hodgson 1999) societies in the past.

The present findings pertain to resource planning beyond Loita. The same categories of underlying drivers operate throughout Maasailand (Campbell et al. 2005; Homewood et al. 2001;Serneels & Lambin 2001), tropical regions (Lambin et al. 2003), and forests worldwide (Geist & Lambin 2002). As demonstrated under the gender lens, gender dimensions permeate the change dynamics at every turn. The ones relevant to Loita are:

1. Gendered resource exploitation is threatening the sustainable use of preferred canopy trees and the hydrological functions of the regional water tower. Some of these trees are already of local, regional, or global conservation concern and merit immediate focus (*oltarakua, olpiripiri, oloirien*).
2. Women are no longer the house builders.
3. Knowledge of the availability of forest trees is gendered. Women collect more medicinal plants.
4. Women's influence has expanded beyond the domestic and includes the public domain.
5. Historical stereotypes of patriarchal control are weakening. National gender equity policies are infiltrating decision-making. Local Maasai women hold positions of power in the national government and as government chiefs.
6. There are educated women who own cows to sell. Women are more engaged in livestock maintenance and make decisions about selling cows.
7. Women are not a homogenous group and intra-household power relations vary.

8. Households rely more heavily today on women's labour and income-earning capacity.
9. Women remain economically marginalized from the most lucrative enterprises, including maize production.
10. Innovative thinking and gender-inclusivity are found in women's merry-go-round groups, forest committees, and a newly registered forest CBO.

Despite the disparity in scales, local perceptions informed the remotely sensed land change analysis (Galvin et al. 2001, Homewood et al. 2001, Thompson et al. 2002). This was particularly true in identifying wetland loss and challenging global gaze forest change with confidence. Field verification and interviews were successful in detecting remotely sensed vegetation in small wetlands. But the failure to detect small scale agriculture was a major limitation to examining the link to forest change. The rapid conversion of natural forest cover to agriculture has been remotely sensed in Kenya's indigenous forests with more expensive and sensitive technology (Baldyga et al. 2008, Imbernon 1999, Pellikka et al. 2009) but gender linkages were not a focus of those studiues and remain unclear.

Women's identity is expanding beyond the house—since houses are no longer made by women with poles they once dragged from the forest like prisoners but by men who make money from timber. It is expanding beyond milking and small stock tied to their houses—since women are the decision-makers in the household when husbands are gone and children are in school. It is expanding beyond fuelwood and the *food in the fire* to the farm fields—since their free labour is vital to producing crops for income and they are the sellers on market day. It is expanding beyond fertility blessings in the forest and children at their feet to the school where they pay fees from their personal income, to local committees where they stand up and speak, and to women's groups where they invest in cows they own. But pervading all these advancements are persistent disparities that make their self-perceived empowerment a notion that is relative to the particular hardships of their individual pasts.

These findings update the scholarly back-and-forth about the declining status of the Maasai woman rooted in British colonialism, the dwindling autonomy of her house, and livestock commoditization (Hodgson 2000, Rigby 1992, Talle 1988). The summative pattern confirmed empirically in this study trends in another direction. The pattern was not linear nor did it characterize every aspect of women's lives. In its collective entirety, the trend follows a positive narrative arc culminating in cultural transformation paralleling land change. The land change was dramatic using percentage change from a 'baseline forest' as a metric. The cultural change was dramatic in comparison to the rigid role expectations of the 20th century. Where direct linkages were apparent, such as timber and dense forest loss, the gender lens was useful in understanding the nuances of the drivers and how forest initiatives might proceed. Closer relationships between gendered livelihood activities, natural succession, and biophysical feedbacks might emanate from finer geospatial analyses and more time in the field talking to men and women.

This study propels discourse about Maasai gender relations into the 21st century by unveiling cultural dimensions of remotely sensed land change. The results are timely for equitable forest planning in a community facing subdivision of their dry season refuge and water tower.

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Appendix 1: Local event calendar[1]

Year	Age group event	Other relevant event
1911	*Iltareto* age set formed	*Iltareto* were moran from 1911 to 1926.
1926	*Ilterito* age set formed	*Ilterito* were moran from 1926 to 1948.
1928		Loita Location becomes official administrative unit.
1929		British appoint Chief Laibon Senteu as political headman of Loita.
1930		Severe drought.
1934		Senteu dies; his son Simel becomes Chief Laibon.
1935		Severe drought; Native Reserve Ordinance Act places Native Reserve Forests
		under control of local native councils.
1938		Land in Maasai locations becomes Native Land held in trust by State.
1939	*Ilkalikal* circumcision group formed	
	(Right side *Ilnyang'usi* age set)	
1940		Outbreak of malaria.
1941		Year of locust.
1944		Morijo Loita school opens.
1945	*Eunoto* of *Ilkalikal*	National Parks Ordinance creates parks and reserves in Maasailand
		alienating large areas from Maasai.
1946	*Ilkamaniki* circumcision group formed	British DC Narok Major Grant killed in Loita cattle market by a Maasai moran of *inkidongi* clan
	(Left side of *Ilnyang'usi* age set)	who was later hanged. This year known locally as *olari otarieki olmusungui*
		or "The year a European was killed."
1947		Two groups of *Ilnyang'usi* age set fight at Loisiusiu Narok.
1952	*Ilterekeyiani (Ilkiramat)circumcision* group formed	
	(Right side of *Iseuri* age set)	
1954		First Mau Mau leader from Narok killed.
1955		Kone ole Senteu becomes first PA Chief in Loita and in 1956 a Loita councillor.

1956		Compulsory education in the whole district; Narok primary boarding standard 1-8 started; Mau Mau defeated.
1957	*Eunoto* of *Ilkamaniki*	Saint Mary's Primary School, second primary boarding school in Narok.
1961	*Ilmauya/Iltiyiogoni* circumcision group formed	Masikonde primary school opened in Narok town; drought; food aid.
	(Left side of *Iseuri* age set)	Keekorok Lodge opened in Maasai Mara; Maasai Mara National Reserve gazetted.
1963		Kenya independence from Britain; Jomo Kenyatta first Prime Minister.
1967	*Eunoto* of *Ilmauya*	Drought.
1968	*Ilkiseeyia* circumcision group formed	Land Adjudication Act and Land (Group Representatives) Act
	(Right hand of *Ilkitoip* age set)	faciliated creation and governance of group ranches for collective cattle breeding.
1970		Violence between Loita and Kisongo because of raiding cows; Ilnyangusi Loita man killed in Kipelian for his cows;
		Manyata created in Kipelian to fight back Kisongo.
1970		Loitans started resisting government attempts to issue individual title deeds in this decade; Llewelyn-Davies, PhD student at Harvard, begins field work among *ilkindongi* clan in Loita;
		Cordaid funds development for Loita.
1972		Drought for four years; ILIDP established by Catholic Diocese of Ngong.
1973		Kamorora Group Ranch established on border with Kajiado below forest to prevent Philip Leakey's plan for a lodge;
		Kone ole Senteu retires as PA Chief.
1974		Woman’s blessing; eclipse of sun all day.
1975	*Irandai* circumcision group formed	
	(Left side of *Ilkitoip* age set)	
1977		Ilkerin woman's fertility blessing; *mzungu* woman got pregnant with girl child named Neloita by local women.
1978		Kenyatta dies, Moi assumes Presidency, first identification cards were issued locally.
1979		Talle, PhD student at University of Stockholm, starts main field work in Morijo Loita and Kajiado District.
1980	*Ilkishili* circumcision group formed	
	(Right side of *Ilkisaruni* age set)	

1981		Loitans took over management of ILIDP from Franz Daniel; Loitans reject commercial wheat farming at about same time;
		Knowles, PhD student at University of Durham, starts field work in Ilkerin.
1982		Charles Nchocho and Steven Oloitipit tried to overtake Moi government but were squashed by Moi's General Mulinge the Chief of Armed Forces.
		Nyonyokie Kanunka campsite (Loita Hills Camp) established inside the forest by Purko Maasai.
1983		Drought; official opening of cattle dip at Ilkerin by Chairman of NCC; Moi encourages group ranches to subdivide.
1984	*Enkipaata Ilkishili*	Boundaries for proposed forest nature reserve demarcated by NCC.
1984		Many cows died in Loita, no rain at all; KWS reports aerial and land survey done by KWS officials.
1985		Charles Sonkoi is Ilkerin Project Director from 1985 to 1997.
1986		Kamorora Group Ranch leased to Stein; Narok District Commissioner announces all group ranches dissolved.
1987	*Eunoto* of *Ilkishili*	
1989	*Ilmejooli* circumcision group formed	
	(Left side of *Ilkisaruni* age set)	
1990		Most of current residents in Empurputia settle permanently on forest edge in this decade.
1992		Moi reelected; LNECT established; Loitans hired lawyer to challenge forest gazettement by NCC; KIFCON commissioned aerial photography and forest vegetation map for forest
		management plan for Loita community.
1993		Long drought; food aid; press statement by 28 Loita Maasai elders led by the Chief Laibon in the Kenya Times & the Daily Nation protesting the gazettement; KIFCON donates Land Rover to LNECT;
		NCC resolves in its Development Plan to convert forest into a nature reserve and requests Registrar of Companies to deregister LNECT;
		KENGO argues Kenya is obliged to protect forest's cultural and biological signficance.
1994		Drought; letter from Loita elders to the President of Kenya highlighting their problems with NCC; LNECT is registered and headed by Chief Laibon.
		LNECT filed suit in court against NCC; Chief Laibon Mokompo addresses Intergovernmental Committee on the Convention on Biological Diversity.

1995	*Irompoi* circumcision group formed	El Nino rains; Olorte women's blessing; Loita Community Ethnobotany Project initiated under UNESCO People and Plants Initiative, implemented by ILIDP;
	(Right side of *Ilmeshuki* age set)	field days start at ILIDP.
1996		Ilkerin primary boarding school started.
1998		Loitans told Stein (Kamorora Group Ranch) to open up his camp for grazing, everyone had to give Stein one calf;
		forest case was heard in the High Court on March 9th and was adjourned indefinitely; IUCN project starts as the Loita Integrated Conservation and Management Project for
		participatory forest management planning.
1999		Ilkerin Project Director Charles Ole Sonkoi dies.
2001		Severe drought 2000-2001; Loita Forest used as drought refuge for the wide region; Loitans suffer from hunger; food aid.
		Obare, Masters degree student from McGill University, starts field work in Entasekera.
2002		Kibaki defeats Moi for Presidency; NCC abandons plans to gazette forest with out of court settlement;
		forest remains ungazetted Trust Land.
2004		Long drought; Ilkerin women's blessing; IUCN returns to complete project, conflict with community results in death of moran.
2005	*Eunoto* of *Irompoi*	IUCN aborts plan for project.
2005	*Ilkinyaku/Ilmeshuki/Iltumsika* circumcision	Drought; most cows in Loita grazed in forest.
	group established (Left side of *Ilmeshuki* age set)	
2006		Drought; Loita High School opens in Entasekera.
2007		Kronenberg Garcia, PhD student at Leiden University, starts main field work in Loita.
2008	*Enkipaata Ilkinyaku/Ilmeshuki/Iltumsika*	Official initiation ceremony of group occurred three years after circumcisions started.
2008	*Irompoi* manyata of feathered headress	
2009		Drought.
2010	*Emanyata oo lorikan* for *Ilkishili*	
	and *Ilmejooli (Ilbuluka),*	Age group chief Ole Maine addressed Prime Minister Odinga at this ceremony.
	receive name of age set (*Ilkisaruni*)	

2010		Olorte women's blessing, Kimai Entepesi did blessing; Tanzania Mt. Lanka earthquake caused tremors that lasted a month in Loita;
		new Kenya Constitution approved.
2011		LCE hosts Loita Community Natural Resource Planning Workshop facilitated byVirginia Tech graduate school students Ole Sonkoi and Westervelt.
2012		Westervelt, PhD student at University College London, starts field work in Loita.
2012	*Eunoto* of *Ilkinyaku/Ilmeshuki/Iltumsika*	
2013		Kenyatta/Ruto elected; new Governor, Senator and Women's MP address 1000 *Iloitai* in Ilkerin; 32 KWS rangers fired for poaching;
		elders appoint 18 men and 2 women to Entasekera/Empurputia Forest Committee.
2014		Women's merry go round group starts purchasing and selling large and small livestock for AROP program.
2015		Community rejects ILIDP forest protection project funded by Swedish donors.

[1] The main sources for age group events were: Galaty (1992), Kronenberg Garcia (2015), Mol (1978, 1996), OIMLC (2014), Spencer (1988) and key informants.

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Appendix 2: Household (*olmarei*) survey form

Interviewer name	Household ID	Introduction read	Permission granted	Month	Day	Year	GPS Lat	GPS Long	Start time	Stop time

Informant and household characteristics

Name		*Household head*	*Gender*	*Marital status*	*Age*	*Birth yr*	*Age group*

Sang for who (F only)	*Nearest events to birth year*	*Identity card birth year*

Wealth rank	*Walls made of*	*Roof made of*	*Years lived in Loita/study area*	*Did you move to study area (List reason)*

Highest education completed						*Livelihood main occupation*	*Leadership role today (List)*	*Leadership role in past (List)*
None	*Some primary*	*All primary*	*Some sec*	*All sec*	*Higher ed*			

Do your personally own (how many)											
Car	*Bicycle*	*Piki*	*Mobile*	*Tv*	*Radio*	*Torch*	*Generator*	*Solar panel*	*Ox plow*	*Tractor*	*Hoes, garden tools*
Breeding bulls	*Steers*	*Lactating cows*	*Heifers*	*Calves*	*Total cows here and elsewhere*		*Sheep*	*Goats*	*Donkeys*	*Chickens*	*Other assets*

(Female only) For each animal: Can you sell it without asking husband? Can you sell it but need to ask husband? Can your husband sell it but only with your permission?	*(Female only) For each animal: How did you get it? Born into herd/flock? Purchased? Inherited? Gifts? In-kind payment or traded?*

Do you personally pay people to work for you? If yes, what do they do?

Total dependents in olmarei	*Number of your wives*	*Number of your children*

Do you have a shamba?	*Total acres of shamba here and elsewhere*	*Rainfed or Irrigated*

How long does it take for you to walk to	*Entasekera market*	*Other market place*	*Elementary school*	*High school*	*Clinic*	*Off farm work*

Water for herd (not dry season)	*46.Water for herd (dry season)*

Livelihood analysis

Are you responsible for grazing the herd?	*This year*	*In the past (10-20 years ago)*

Is the place where you graze cattle different now than it was 10 years ago? Why?

Where do your cattle go in dry season and drought?				
What breeds make up most of herd?				
How many cows in herd here and elsewhere?				
How many sheep?				
How many goats?				
Biggest challenges to herding and grazing cattle?				
Other than grazing and watering and vetting the herd, do you have other responsibilities for livestock?				
What are the responsibilities?				
How many cows lost to drought/disease in two biggest droughts in last 20 years? What years (using event calendar)?	*YEAR*	*NUMBER*	*YEAR*	*NUMBER*
Do you experience wildlife conflict? Explain.				
.How many livestock lost to predators in two worst years in last 20 years? What years (using event calendar)? What predators?	*YEAR*	*NUMBER*	*YEAR*	*NUMBER*
When an animal dies what happens to the meat, hide, skins?				
Biggest challenges to health and safety of herd?				
Do you build or repair houses in your olmarei?				
Who constructs the houses in olmarei?				
Who repairs the houses in olmarei?				
Who repairs?				
Who decides what materials to use?				
Who collects materials?				
Who pays for materials?				
Where do they get the paid materials?				
Biggest challenges to building and repairing houses?				
Are you responsible for milking				

What do you use milk for?
How many cows do you milk each day?
How many cups (show)? of milk does you olmarei require each day to live well??
How many cups of milk does your herd give your olmarei (in dry season)per day
Where do you get milk in dry season?
Biggest challenges to getting milk?
Are you responsible for collecting firewood?
Do you go more frequently now than you did in past? Why?
How many times each week do you go to collect firewood (not dry season)?
How many backs of firewood do you collect in a week (not dry season)?
How many times each week do you go to collect firewood (dry season)?
How many backs of firewood do you collect in a week (dry season)?
Biggest challenges to collecting firewood?
Are you responsible for collecting water?
How many times each week do you collect water (not dry season)
Where do you go (not dry season)?
How many litres (show) do you carry each time (not dry season)?
How many times each week do you collect water (dry season)?
Where do you go (dry season?)
How many litres do you carry each time (dry season)?
Biggest challenges to collecting water?
Livelihood diversification, income and expenses
Is the way that people provide for their families different today than in the past?

If yes, what year did the change start to happen (use event calendar)?								
What are 3 ways your olmarei pays for what it needs (rank order)?	*1.*				*1.*			
	2.				*2.*			
	3.				*3.*			
Biggest challenges to getting what olmarei needs for a good life?								
Who sold or traded livestock or livestock products in your olmarei?	*Live-stock*	*Milk ghee*	*Hides parts*	*Other (List)*	*Live-stock*	*Milk ghee*	*Hides parts*	*Other (list)*
Are expenses different today than in the past? How?								
What are 3 main expenses of your olmarei? (rank order)	*1.*				*1.*			
	2.				*2.*			
	3.				*3.*			
What are 3 ways you get personal income for your personal needs? (rank order)	*1.*				*1.*			
	2.				*2.*			
	3.				*3.*			
What are 3 personal expenses that you pay for? (rank order)	*1.*				*1.*			
	2.				*2.*			
	3.				*3.*			
Do you cultivate, personally?								
What year did you personally start cultivating (using event calendar)?								
What is the size of your shamba in acres?								
What is the main purpose of your shamba?								
What are your personal cultivation responsibilities?	*Decide what to grow/Decide where to put shamba/Clear land/Get fencing material/Fencing/Weeding/ Weeding/Pay for seeds and plants/*							

			Planting/Keep pests and predators away/Sell crop/Collect money/Spend money		
Main crops this year (rank order)	*Sell where*	*Who sells*	*Who gets income*	*Used income for*	*Informant's yearly crop income*
1.					
2.					
3.					
Biggest challenges to cultivating?					
If you got very lucky and were given a million KES this year, what would you spend it on?					
What future do you see for your grandsons, how will they survive, will they do well in life?					
What future do you see for your granddaughters, how will they survive, will they do well in life?					
Compared to 10-20 year ago, is life easier, or harder, or the same to survive in Loita? Why?					
Forest resource use					
What is the forest good for?					
What are the main reasons these people go to the forest			*This year*	*10-20 years ago*	
Children					
Boys, herders					
Moran					
Elders					
Girls					
Women					
Spiritual leaders					
Outsiders (describe timber, tourism, etc)					
Others (describe)					

When you were a child, was the forest different? How?

Today do men and women go to different locations in the forest for what they need?

Forest use	*Priority species (rank order)*	*Collected mostly by men or women or both*	*Place where people get it has changed from 10-20 years ago (yes or no)*	*Number today*	*Number 10-20 years ago up to 40 years ago*	*Number in 2050*
Energy Firewood	*1.*			*10*		
	2.			*10*		
	3.			*10*		
Construct house	*1.*			*10*		
	2.			*10*		
	3.			*10*		
Construct fence	*1.*			*10*		
	2.			*10*		
	3.			*10*		
Livestock Food	*1.*			*10*		
	2.			*10*		
	3.			*10*		
Medicine	*1.*			*10*		
	2.			*10*		
	3.			*10*		
Ceremonies, rituals	*1.*			*10*		
	2.			*10*		
	3.			*10*		

Other (describe)	*1.*	*10*
	2.	*10*
	3.	*10*

Forest decision-making

If you want to know more about the plants and animals in the forest, who are the best people in Loita to ask (free list 3 names)?
Is there a group of people who organize meetings about the forest and make decisions about the forest? Who?
Do you attend those meetings? If no, why not?
If yes, do you stand and speak your views?
Is subdivision a good idea? Why or why not?
What are recognized ways women can voice their views about the forest?
Are there written rules about the forest? What are they?
Are there verbal rules about the forest? What are they?
Do you participate in making rules about the forest? If no, why not?
If yes, do you stand and speak your views?
Have you ever notifed anyone of a rule being broken?
Compared to 20 years ago, are forest rules broken more or less often today?

This concludes our interview. Thank you for your time. Do you have any questions you would like to ask us? If you have any questions about the interview, this is my mobile number. ***Stop Time***

Olmarei Dependents

Household ID	*Date*		*Interviewer*		*Number of houses in olmarei*		
HH Head	*Sex*	*Estimated age/birth year/age group*	*Relation to HH Head*	*Education completed*	*Main occupation*	*Present most days Yes or No*	*Other*
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

Appendix 3: Satellite image sources and spectral resolutions

Date	Sensor	Spacecraft	WRS Path	WRS Row	Pixel resolution	Number of bands	Format	Projection
12/2/1976	MSS	Landsat 2	181	061	Reflective (60m)	4	GEOTIFF	UTM Zone 37 WGS1984
6/2/1995	TM	Landsat 5	169	061	Reflective (30m)	6	GEOTIFF	UTM Zone 36 WGS 1984
25/1/2014	N/A	Landsat 8	169	061	Reflective (30m) Thermal (30m)	8	GEOTIFF	UTM Zone 36 WGS 1984

Appendix 4: Local song and story and Maasai legend

A. *Entasat* song praising moran at *olpul* in Loita Forest

We sang to Ilkiseyia, the name they used when they were still morans. Ilkitoip was the name they were blessed with. I sang this to Ilkiseyia moran:
It is time to go to the forest for olpul
The leader is Kirongosi ole Shuma with a ring
He is brave and he killed a buffalo in the forest of ilgilai Naimina Enkiyio
This forest which has orkirenyi, olcartuyian
We have celebrated three times
We have celebrated in murja which has stinging nettles
We have celebrated in the dam of tonou
We have celebrated in oloitokitok[198] *waiting for Siria to come holding the horn of an oxen*
We take our colored oxen to the big forest. FKI-NFE-59

B. *Entasat* story about moran bravery

Once upon a time cows migrated and wild animals came with them. One wild animal picked a calf to take care of, gave it grass, and it became the biggest ox. When the wild animal went to sleep it tied the ox on its legs. Then moran found the ox sleeping in the forest, cut the ropes, and took it away. When the wild animal woke up it followed the footprints, found where the ox had urinated and sang "Here is the urine of my ox. I want my colored ox." It followed the footprints, found its dung, and sang "Here is the dung of my ox. I want my colored ox." It followed the footprints and found where the moran had slaughtered it in the forest and left the intestine waste. It sang "Here is the intestine waste of my ox. I want my beautiful ox." The moran gave it the legs of the ox. It sang "I don't want the legs. I want my beautiful ox." The moran threw it a liver because they thought it was a female. It sang "I don't want the meat for women. I want my beautiful ox." Moran put their spears in the fire and went trembling with their spears to kill it. Then the wild animal was finished and they stayed in the forest to eat it. FKI-NFE-59

C. Maasai legend

Long ago wild animals used to be women's cattle. Then, one morning before the cattle were taken out to graze, a cow was slaughtered. Soon the cattle started moving away to graze by themselves and wandered off. One woman told one of the children to go and drive the cattle back before they went too far. When the child's mother heard this, she said: "Oh, no, my child is not going until he has eaten the kidney." It followed that whenever a child was asked to go, his mother forbade him to go until he had had a bite of the meat. This went on until all the cattle, sheep and goats wandered away into the bush and got lost. When all the children had eaten the meat, they tried to bring the cattle back, but they found that they had all gone wild. And so that is how it came about that women lost their cattle. They then went and lived with the men who had all along taken good care of their cattle. This is why up to this very day, all the cattle belong to the men and women simply wait for the men to provide for them. (Kipuri 1983: 32)

[198] This ceremonial site is identified in Figure 5.2 (Chapter 5).

Appendix 5: Most frequent codes used in *Nvivo* analysis of qualitative data

First order nodes (>30references)	Frequent second order nodes (>10 references)	Number of references
Change in life		167
	Change/ceremonies	27
	Change/climate	19
	Change/cultivation	13
	Change/decision making	21
	Change/firewood	11
	Change/food	13
	Change/herding grazing	25
	Change/houses	18
	Change/swamp	18
	Change/women speak	16
Driver of change		145
	Driver/church	17
	Driver/cultivation	11
	Driver/development	18
	Driver/education	32
	Driver/population increase	19
	Driver/settlement	18
Economics		42
	Economics/women pay	13
Events		54
Future		88
	Future/forest rules	54
	Future/timber	17
Governance/decision making		114
	Governance/elders	20
	Governance/corruption	14
	Governance/forest committee	39
	Governance/national government	19
Methods/participant observation		58
Plant		139
Power		147
	Power/women speak	25
	Power/women's empowerment	10
	Power/women's group	13
Powerlessness		109
	Powerlessness/decision making	17
	Powerlessness/despised	19
	Powerlessness/no representation	17
	Powerlessness/cannot speak	10
Rules		54
Schema		32
Stories songs		36
Subdivision		144
	Subdivision/children	13
	Subdivision/cows	20
	Subdivision/decision making	21
	Subdivision/sell land	17

Appendix 6: Gender spatial analysis of forest-related activity profiles in response to "Where do you go for the things you need?" (N=14, husbands and first wives in seven households)

Place	Forest-related activity profile					
	Men-only		Women-only		Both	
Far Forest	1. Medicine for adults 2. Ceremonies, eat meat/drink soup 3. Timber for house, fence, *shamba* 4. Herd in dry season 5. Honey	4 3 8 4 2	1. Firewood (when no buffaloes, elephants) 2. Medicine for children (when no buffaloes, elephants)	6 4	1. Building materials for fence 2. Building materials for house	1 1
Total=33		21		10		2
Near Forest	1. Male ceremonies (*orngesher* age set, pray for rain, rituals) 2. Herd cows 3. Timber for house, fence	 3 2 2	1. Firewood 2. Medicine for children 3. Building materials for sheep pen 4. Building materials for *shamba* 5. Construction poles for house	4 2 2 1 1	1. Medicine for adults	4
Total=21		7		10		4
Valley			1. Water for family 2. Sell beads at school 3. Sell milk at school 4. Roofing material	6 2 2 1	1. Water livestock 2. Herd cows 3. Children at school	10 6 4
Total=31				11		20
Homestead on forest edge	1. *Shamba* (maize and beans)	5	1. Milk cows 2. *Shamba* (maize, beans, kale, potatoes) 3. Women's group meetings 4. Clean/fence pens for shoats 5. Chickens	7 7 5 4 2	1. Spraying animals 2. Injecting animals 3. Ceremonies	6 6 3
Total=45		5		25		15
Town	1. Sell animals 2. Buy animal drugs and pesticides 3. Salt lick 4. Pay school fees 5. Buy flour	2 2 1 1 1	1. Sell kale potatoes 2. Sell milk 3. Buy sugar 4. Sell hides skins 5. Buy maize beans 6. Sell chickens eggs 7. Buy beads 8. Buy food	5 4 3 2 2 2 1 1	1. Hospital 2. Sell maize and beans 3. Children at school 4. Buy clothes	9 4 2 2
Total=44		7		20		17
174	Total mentions	40	Total mentions	76	Total mentions	48

Appendix 7: Plants and their uses reported by men and women on transect walks [a]

Indigenous name used by informants[1]	Scientific name[2]	Men	Women	Plant use and preparation according to informants
1. emasaligi			X	Birthing/Squeeze liquid into cut of umbilical cord when baby born
2. ematasia	*Clausena anisata* (Mol 1996)		X	Personal hygiene (fragrance)
2. ematasia	*Clausena anisata* (Mol 1996)		X	Mattress in traditional houses
2. ematasia	*Clausena anisata* (Mol 1996)		X	Cushion for back of woman when she carries firewood
3. encani enkashe	*Turraea mombasana* (Mol 1996)	X	X	Stomach problems, diarrhea, bile/ Dry leaves, swallow
3. encani enkashe	*Turraea mombasana* (Mol 1996)	X		Fodder/Dry season
4. endalati ekutuk	*Ehreta cymosa* (Dharani 2011, Mol 1996)	X	X	Tool/Handle for hoe to dig soil, axe
4. endalati ekutuk	*Ehreta cymosa* (Dharani 2011, Mol 1996)		X	Tool/Ox and donkey harness
5. endalati ekutuk	*Ehreta cymosa* (Dharani 2011, Mol 1996)	X		Tool/Rub two sticks to make fire if there is no *oltarakwai*
5. endalati ekutuk	*Ehreta cymosa* (Dharani 2011, Mol 1996)		X	Firewood
6. enkaimurunyai			X	Birthing/Leaves, wash mother
6. enkaimurunyai			X	Ceremony/Branches, leaves make table for meat at boy's circumcision
7. enkarioi			X	Pregnancy/Roots, boil, mix with 2 spoons of cow fat. Makes baby sit well
8. enkoieniki			X	Stomach problems, bile/Roots, boil, makes you vomit
8. enkoieniki			X	Children's skin diseases/Leaves, boil, vaporize, wash skin
9. entamijioi			X	Food/Leaves, boil
9. entamijioi			X	Joint and muscle pain, brucellosis/ Roots, boil
10. entangashe		X		Stomach problems/Bark, boil or mix with meat
11. entulelei	*Solanum incanum* (Dharani 2011, Mol 1996)		X	Children's cold, sore throat/Boil, inhale vapor
11. entulelei	*Solanum incanum* (Dharani 2011, Mol 1996)		X	Colds, coughs/Roots, chew and swallow saliva
12. entulele entim	*Solanum incanum* (Dharani 2011, Mol 1996)	X		Wounds, bleeding/Leaves
13. erisa			X	House construction/Vine, rope in traditional house, tie poles to center post
13. erisa		X		Food/Tea

14. olaikuji			X	Stomach problems/Roots, boil
14. olaikuji			X	Colds, coughs/Roots, boil
15. olamuriaki or *enkaimuriaki*[2]	*Carissa edulis* (Dharani & Yenesaw 2010, Mol 1996)	X	X	Venereal disease/Roots, boil in meat soup
15. olamuriaki or *enkaimuriaki*	*Carissa edulis* (Dharani & Yenesaw 2010, Mol 1996)	X	X	Joint and muscle pain, backache/ Roots, boil with herbs in soup
16. olaimurunyai	*Maytenus undata* (Mol 1996)	X		Stomach problems/Boil with meat for soup
16. olaimurunyai	*Maytenus undata* (Mol 1996)	X		Joint and muscle pain, brucellosis/ Roots, boil
17. olarioi			X	Firewood
17. olarioi		X		Stomach problems, acid/Bark, boil, add sugar to tea
18. olarioi		X	X	Joint and muscle pain, backache/ Bark, roots, boil, drink with tea and milk
18. olarioi			X	Birthing, pregnancy/Roots, boil, to wash out stomach after delivery, also if fetus is having problems during pregnancy
19. olcartuyian aibor	*Grumilea lauracea* (Mol 1996) (for *olcartuyian*)	X	X	House construction/Women use in traditional houses
19. olcartuyian aibor	*Grumilea lauracea* (Mol 1996) (for *olcartuyian*)	X		Fence construction
20. olcartuyian orok	*Grumilea lauracea* (Mol 1996) (for *olcartuyian*)		X	House construction/ Women, use in traditional houses
20. olcartuyian orok	*Grumilea lauracea* (Mol 1996) (for *olcartuyian*)	X	X	Fence construction
20. olcartuyian orok	*Grumilea lauracea* (Mol 1996)		X	Tool/Stick to look after shoats
21. oledat	*Trimeria sp*. (Parker 2004)		X	Children's malaria/Roots, boil, make soup
21. oledat	*Trimeria sp*. (Parker 2004)	X		Colds, coughs, sore throat/Roots, boil in meat soup
21. oledat	*Trimeria sp*. (Parker 2004)	X		Joint and muscle pain, backache/ Roots, boil, make soup
22. olenyowaitie			X	Veterinary/Branch, warm in fire, massage teats of cow with it for milk
23. oleparmunyo	*Toddalia asiatica* (Dharani & Yesesew 2010)	X		Malaria
23. oleparmunyo	*Toddalia asiatica* (Dharani & Yesesew 2010)		X	Children's colds/Roots, boil, inhale vapor; Fruits, chew
23. oleparmunyo	*Toddalia asiatica* (Dharani & Yesesew 2010)	X	X	Colds, coughs, pneumonia/Skin of roots , boil, mix with meat; Fruits, chew
24. oleturot			X	Birthing/Leaves, to wash mother when baby girl born.
25. olgilai	*Teclea nobilis* (Mol 1996)		X	House construction/Center post in house

25. olgilai	*Teclea nobilis* (Mol 1996)	X		Veterinary/Leaves, feed to cow with mucous
25. olgilai	*Teclea nobilis* (Mol 1996)		X	Dental hygiene
26. olgilai	*Teclea nobilis* (Mol 1996)	X		Venereal disease/Roots, boil in soup; Bark, into hot ghee or sheep fat (*Osokonoi* is best, but this is #2)
26. olgilai	*Teclea nobilis* (Mol 1996)	X	X	Fodder/In drought; women take branches to cows in drought. .
26. olgilai	*Teclea nobilis* (Mol 1996)	X		Coughs, colds, pneumonia/Roots, boil
26. olgilai	*Teclea nobilis* (Mol 1996)	X	X	Birthing/ Bark, roots, mix with fat, cleans stomach of woman when she gives birth
26. olgilai	*Teclea nobilis* (Mol 1996)	X	X	Fence construction
26. olgilai	*Teclea nobilis* (Mol 1996)		X	Joint and muscle pain, backache/Skin of roots, put in cow fat, boil, sieve
27. olgirgiri	*Acacia brevispica* (Dharani 2011, Mol 1996)		X	Birthing, pregnancy/Roots, boil
27. olgirgiri	*Acacia brevispica* (Dharani 2011, Mol 1996)		X	Construct fence/Seeds grow into natural fence, elephants and snakes do not pass
28. olgumi	*Vangueria acutiloba* (Mol 1996)	X		Construct fence
28. olgumi or *engume*	*Vangueria acutiloba* (Mol 1996)	X	X	Tools/Spoon for mixing porridge, makes *olkipire* to stir moran soup
29. olkinyei	*Euclea divinorum* (Mol 1996)	X		Veterinary/Bark, boil, mix with salt for cow dewormer
29. olkinyei	*Euclea divinorum* (Mol 1996)		X	Malaria/Roots, mix with water
30. olkinyei	*Euclea divinorum* (Mol 1996)		X	Pregnancy/Leaves, boil, gives child immunity to women's diseases before birth, give in 3rd trimester to induce vomiting and clean stomach
30. olkirenye	*Olinia usambarensis* (Mol 1996)		X	Colds, coughs/Leaves, boil
31. olkirsarngatuny	*Crossandra nilotica* (Mol 1996)		X	Children's cough, colds/Bark, boil
32. olkonyil	*Rhamnus prinoides* (Mol 1996)	X		Strength for adults (soup)/Roots, boil in soup with meat, multivitamin
32. olkonyil	*Rhamnus prinoides (Mol 1996)*	X		Venereal disease/Roots, boil in soup
32. olkonyil	*Rhamnus prinoides* (Mol 1996)	X		Joint and muscle pain, backache/Bark or roots, boil with meat
32. olkonyil	*Rhamnus prinoides* (Mol 1996)	X		Colds, coughs/Bark or roots, boil with meat
33. olmorogi or *emorogi*	*Dovyalis abyssinica* (Dharani 2011, Mol 1996)		X	Strength for adults (soup)/Build bones

33. olmorogi or *emorogi*	*Dovyalis abyssinica* (Dharani 2011, Mol 1996)		X	Children's diarrhea/Roots, boil
33. olmorogi or *emorogi*	*Dovyalis abyssinica* (Dharani 2011, Mol 1996)		X	Children's colds/Bark, boil, mix with milk
33. olmorogi or *emorogi*	*Dovyalis abyssinica* (Dharani 2011, Mol 1996)		X	Stomach problems/Roots, boil, to clean blood and kidneys and remove dirt in body
33. olmorogi or *emorogi*	*Dovyalis abyssinica* (Dharani 2011, Mol 1996)		X	Eyesight/Fruits help you see
33. olmorogi or *emorogi*	*Dovyalis abyssinica* (Dharani 2011, Mol 1996)	X	X	Joint and muscle pain, brucellosis/ Roots, boil, mix with meat in soup
34. olmorokorionko		X		Veterinary, diarrhea of sheep/Bark in water
35. olmuliloi		X		Stomach problems, digestion/Bark, dry, mix with tea
35. olmuliloi		X		Strength for adults (soup)/Stems, boil with meat
36. olmusakuaa	*Veronia uniflora* Hutch (Mol 1996)	X		Wounds, bleeding
36. olmusakuaa	*Veronia uniflora* Hutch (Mol 1996)		X	Birthing/Clean mother and baby when born
36. olmusakuaa	*Veronia uniflora* Hutch (Mol 1996)		X	Children's personal hygiene/Tissue paper
36. olmusakuaa	*Veronia uniflora* Hutch (Mol 1996)	X		Ceremony/Construction of table/Traditional table for moran eating meat.
37. olmusakuaa	*Veronia uniflora* Hutch (Mol 1996)		X	House construction/Women, use in traditional houses
38. olodonganayioi			X	Fodder/Dry season.
38. olodonganayioi			X	Children's strength/Bark, boil
39. ologumati	*Microglossa pyrifolia, Veronia brachycalyx* (Dharani 2011) *Aquaria salicifolia* (Mol 1996)		X	Joints and muscle pain, brucellosis/ Roots, boil
39. ologumati	*Microglossa pyrifolia, Veronia brachycalyx* (Dharani 2011) *Aquaria salicifolia* (Mol 1996)		X	Malaria/Leaves, crush and mix with water, makes you vomit out malaria
39. ologumati	*Microglossa pyrifolia, Veronia brachycalyx* (Dharani 2011) *Aquaria salicifolia* (Mol 1996)	X		Parasites/Leaves, crush, mix with water, dewormer
39. ologumati	*Microglossa pyrifolia, Veronia brachycalyx* (Dharani 2011) *Aquaria salicifolia* (Mol 1996)		X	Joint and muscle pain
40. oloiapiyap		X		Stomach problems, digestion/stems, mix with water

41. oloirien	*Olea europaea ssp. africana* (Dharani 2011) *Olea africana* (Mol 1996) (also spelled *olorien* in Mol 1996)	X		Ceremony/Branch (*olatim*) goes next to door of house of circumcised boy or girl
41. oloirien	*Olea europaea ssp. africana* (Dharani 2011) *Olea africana* (Mol 1996) (also spelled *olorien* in Mol 1996)		X	Children's colds/Bark, mix with oleparmunyo, boil
41. oloirien	*Olea europaea ssp. africana* (Dharani 2011) *Olea africana* (Mol 1996) (also spelled *olorien* in Mol 1996)		X	Birthing/Bark, leaves, boil, make porridge, to wash stomach after delivery
41. oloirien	*Olea europaea ssp. africana* (Dharani 2011) *Olea africana* (Mol 1996) (also spelled *olorien* in Mol 1996)		X	Tools/Clean calabash
41. oloirien	*Olea europaea ssp. africana* (Dharani 2011) *Olea africana* (Mol 1996) (also spelled *olorien* in Mol 1996)	X		Ceremony/For *orkiteng lorbaa*, male age ritual, slaughter ox, eat with good men
41. oloirien	*Olea europaea ssp. africana* (Dharani 2011) *Olea africana* (Mol 1996) (also spelled *olorien* in Mol 1996)		X	Firewood/Drywood scarce here
42. oloiyaipase			X	Children's strength/Roots, boil, child grows quickly
43. ololiondoi	*Olea welwitschii* (Mol 1996)		X	Firewood
44. olosida	*Hypoestes aristata, Justicia betonica* (Mol 1996)		X	Children's stomach problems/Roots, boil.
44. olosida			X	Typhoid/Roots, boil
45. olosiki		X		Beehives
45. olosiki			X	Veterinary/Bark, add water and salt, for small stock not suckling.
46. olpiripiri	*Podocarpus falcatus* (Dharani 2011) *Podocarpus gracilior* (Mol 1996)	X		Stomach problems
46. olpiripiri	*Podocarpus falcatus* (Dharani 2011) *Podocarpus gracilior* (Mol 1996)	X		House construction, timber
46. olpiripiri	*Podocarpus falcatus* (Dharani 2011)	X		Construction salt trough

	Podocarpus gracilior (Mol 1996)			
46. olpiripiri	*Podocarpus falcatus* (Dharani 2011) *Podocarpus gracilior* (Mol 1996)		X	Children's colds/Bark, boil
46. olpiripiri	*Podocarpus falcatus* (Dharani 2011) *Podocarpus gracilior* (Mol 1996)		X	Children's diarrhea Bark, let sit in water and get concentrated.
47. olpiron	*Buddleia polystachya*, *Nuxia congesta* (Mol 1996)	X		Fence construction
47. olpiron	*Buddleia polystachya*, *Nuxia congesta* (Mol 1996)		X	Firewood
48. oltarakua	*Juniperus procera* (Dharani 2011, Mol 1996)		X	Birthing, pregnancy
48. oltarakua	*Juniperus procera* (Dharani 2011, Mol 1996)	X		House construction
48. oltarakua	*Juniperus procera* (Dharani 2011, Mol 1996)	X		Fence construction
49. oltarara	*Acacia abyssinica* (Mol 1996)	X		Stomach problems/Bark or roots, mix with meats, boil
49. oltarara	*Acacia abyssinica* (Mol 1996)		X	Birthing, pregnancy/Bark, boil, and make porridge with maize for woman who just delivered to clean her stomach
50. onyalugai			X	Malaria/Roots, boil
51. oreteti	*Ficus thonningii* (Dharani 2011) *Ficus natalensis* (Mol 1996)		X	Tool/Branch, cleans calabash
52. ormakutukut			X	Children's strength, immunity/Burn stem, mix ashes with fat
52. ormakutukut			X	Stomach problems, diarrhea/Roots, boil
53. ormeta			X	Tools/Sweep house
54. ormoliloi		X	X	Strength for adults (soup)/Bark, boil with meat in soup
54. ormoliloi			X	Birthing, pregnancy/Boil and mix with fat
55. osanankururi or *esanankur*	*Scutia myrtina* (Dharani 2011, Mol 1996)	X		Skin diseases/Stems, boil in soup
55. osanankururi or *esanankur*	*Scutia myrtina* (Dharani 2011, Mol 1996)	X		Strength for moran (soup)/Adds blood, multivitamin
55. osanankururi or *esanankur*	*Scutia myrtina* (Dharani 2011, Mol 1996)		X	Children's strength/Roots, mix with milk
55. osanankururi or *esanankur*	*Scutia myrtina* (Dharani 2011, Mol 1996)	X		Tools/Used for slaughtering cow
56. oseketeki	*Myrsine africana* (Mol 1996)	X	X	Parasites, dewormer/Seeds, crush and boil
56.oseketeki	*Myrsine africana* (Mol 1996)		X	Children's parasites, dewormer/Fruits, crush and mix with fat, boil
57. osenetoi			X	Stomach problems

				Dry leaves, in tea. Makes you vomit or have light stools.
58. osikaoi		X	X	Joint and muscle pain, brucellosis Roots, boil, drink every day.
59. osinantei	*Podocarpus milanjianus* (Mol 1996) also *Podocarpus latifolius*		X	Children's diarrhea/Roots, boil, mix with milk
59. osinantei	*Podocarpus milanjianus* (Mol 1996) also *Podocarpus latifolius*	X		Stomach problems, diarrhea/Roots, boil, mix with milk
60. osinantei	*Podocarpus milanjianus* (Mol 1996) also *Podocarpus latifolius*	X		Birthing, pregnancy/Roots, boil, strength for pregnant woman.
61. osinoni	*Lippia javonica* (Dharani 2011, Mol 1996)		X	House construction/Holds mud between poles
61. osisian		X		Chicken pox/Boil and inhale vapor
62. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)	X		Malaria/Bark, boil, mix with fat
62. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)	X	X	Stomach problems, diarrhea, bile/ Bark, boil with fat. Inn bark, mix with cow or sheep fat after circumcision to wash stomach
63. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)	X		Venereal disease
63. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)	X	X	Birthing/Scrape inside bark, mix with fat, boil, cool, sieve and drink, to clean inside of stomach after woman gives birth
63. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)		X	Food/Fruits
63. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)		X	Children's colds/Bark, boil
63. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)		X	Colds, coughs/Bark, mix with water or boil
63. osokonoi	*Warbugia ugandensis* (Dharani &Yenesaw 2010, Mol 1996)	X	X	Dental hygiene/Toothbrush

[a] Absolute linkages between the indigenous, English and scientific names of plants were not possible due to the lack of botanical vouchers. Maa names may describe morphological parts of the same plant, and different scientific names may have the same Maa name (R.W. Bussmann, personal communication, January 14, 2015). Indigenous names were crosschecked with Bussmann et al. (2006), Maundu et al. (2001) and others but absolute linkages to scientific and English names were beyond the scope of this study.

Appendix 8: List of plants mentioned in household survey and transect walks [a]

Indigenous name used by informants[1]	Botanical name[2]	Indigenous name used by informants[1]	Botanical name[2]
ekamurunyai		*olkonyil*	Rhamnus prinoides (Mol 1996)
ematasia	Clausena anisata (Maundu & Tengnäs 2005, Mol 1996)	*olmagutian*	Grass which grows in wet places (Mol 1996)
emorogi/olmorogi	Dovyalis abyssinica (Dharani 2011, Mol 1996)	*olmakutukut*	
emunus olingusil		*olmisigiyioi*	Rhus natalensis (Maundu & Tengnäs 2005)
emurua		*olmorogi*	Dovyalis abyssinica (Dharani 2011, Maundu & Tengnäs 2005, Mol 1996)
enaimurui		*olmorokorionko*	
encani enkashe	Turraea mombasana (Mol 1996)	*olmuliloi*	
encani/olcani orok		*olmusakuaa*	Solanecio mannii (Maundu & Tengnäs 2005) Veronia uniflora Hutch (Mol 1996)
encasunyian		*olmusanduko*	
endalati ekutuk	Ehreta cymosa (Dharani 2011, Maundu & Tengnäs 2005, Mol 1996)	*olobobo*	
enkaimurunyai			
enkarioi		*olodonganayioi*	
enkigiri		*ologumati*	Microglossa pyrifolia, Veronia brachycalyx (Dharani 2011) Aquaria salicifolia (Mol 1996)
enkoieniki			
enoimurua		*oloiapiyap*	
entamijioi		*oloiborkipa*	
entangashe		*oloilalei*	
entulelei/endulelei	Solanum incanum (Dharani 2011, Mol 1996)	*oloirien*	Olea europaea ssp. africana (Dharani 2011) Olea africana (Mol 1996) (also spelled *olorien* in Mol 1996)

enyalungai		*oloisugi*	Zanthoxylum usambarense (Maundu & Tengnäs 2005)
erashe		*oloiyaipase*	
erisa		*olokodandai*	
esere	Bulrush (Mol 1996), (according to Mwita et al. 2013 Typha domingensis is common in small wetlands in Kenya)	*ololiondoi*	Olea capensis (Maundu & Tengnäs 2005) Olea welwitschii (Mol 1996)
esumpukiai		*olomunishoi*	
ilkiloriti		*olonini*	
irpironito		*olopikidongoi*	
kilakiolker		*olopito*	
lekikiuni		*oloseki*	
oikireji		*olosesiai*	Osyris lanceolata (Maundu & Tengnäs 2005)
okitolosua		*olosida*	Hypoestes aristata, Justicia betonica (Mol 1996)
oladardar		*olosiki*	
olagumati		*olpiripiri or ormusanduku*	Podocarpus falcatus (Dharani 2011, Maundu & Tengnäs 2005)Podocarpus gracilior (Mol 1996)
olaimurunyai	Dovyalis macrocalyx, Maytenus senegalensis (Maundu & Tengnäs 2005) Maytenus undata (Mol 1996)	*olpiron*	Nuxia congesta (Maundu & Tengnäs 2005), Buddleia polystachya, (Mol 1996)
olaiyakuji	Rubus apetalus (Maundu & Tengnäs 2005)	*oltarakua*	Juniperus procera (Maundu & Tengnäs 2005)
olamuriaki	Carissa edulis (Dharani & Yenesaw 2010, Maundu & Tengnäs 2005, Mol 1996)	*oltarara*	Acacia abyssinica (Mol 1996)
olangurua		*oltiasimpol*	
olarioi	Cassiopourea malosana (Maundu & Tengnäs 2005)	*oltiol*	Papyrus (Sonkoi pers. comm), (according to Mwita et al. 2013 Cyperus papyrus is common in small wetlands in Kenya)
olarisi		*oltopisianoi*	
olcartuyian	Diospyros abyssinica (Maundu & Tengnäs 2005) Grumilea lauracea (Mol 1996	*olturuj*	
olcasunyian		*omasei*	
oledardar		*onyalugai*	

oledat	Trimeria sp.(Parker 2004)	*onyalungai*	
olekikun		*oreteti*	Ficus thonningii (Dharani 2011, Maundu & Tengnäs 2005) Ficus natalensis (Mol 1996)
olenyowaitie		*orkiloreti*	
oleparmunyo	Toddalia asiatica (Dharani & Yesesew 2010)	*orkitolosua*	
olerai	Acacia xanthophloea, Faidherbia albida (Maundu & Tengnäs 2005)	*orkonyola*	
oleturot		*ormeta*	
olgeriantus		*ormoliloi*	
		ormongi	
olgilai	Teclea nobilis (Mol 1996)	*ormuso*	
olgirgiri	Acacia brevispica (Dharani 2011, Mol 1996)	*orpalakai*	
		orperelongo	Albizia amara (Maundu & Tengnäs 2005)
olgumi/engume	Vangueria acutiloba (Mol 1996)	*orperesi onyokie*	
oliosikawoi		*orperesi wouas*	Themeda triandra (Mol 1996)
olkinyei	Euclea divinorum (Maundu & Tengnäs 2005, Mol 1996)	*osanangururi/ esanankur*	Scutia myrtina (Dharani 2011, Maundu & Tengnäs 2005, Mol 1996)
		oseketeki	Myrsine africana (Maundu & Tengnäs 2005, Mol 1996)
olkirenye	Olinia usambarensis (Mol 1996)	*oseki*	Cordia monoica (Maundu & Tengnäs 2005)
		osenetoi	
olkirsarngatuny	Crossandra nilotica (Mol 1996)	*osenetoi*	
olkokola	Rhamnus staddo (Maundu & Tengnäs 2005)	*osentu (oleleshua)*	Tarchonanthus camphoratus (Mol 1996)

[a] Absolute linkages between the indigenous, English and scientific names of plants were not possible due to the lack of botanical vouchers. Maa names can describe morphological parts of the same plant, and different scientific names may have the same Maa name (R.W. Bussmann, personal communication, January 14, 2015). Indigenous names were crosschecked with Bussmann et al. (2006), Maundu et al. (2001) and others but absolute linkages to scientific and English names were beyond the scope of this study.

Appendix 9: Gender analysis of projection scenarios about preferred plant availability in response to "If there are 10 today, how many will there be in 2050 (or when your youngest grandchild is your age now)?" (N=30 men and 30 women)

Preferred plants	Prediction for 2050			P value Wilcoxon Test	p
	Men	Women	Total		
oloirien/ceremonial	2.37	.78	1.58	.0001185	<.05*
oloirien/fodder	2.29	.88	1.59	.01097	<.05*
oloirien/firewood	.73	.90	.82	.15	>.05
oltarakua/building	.90	.86	.88	.90	>.05
oleparmunyo/medicinal	4.18	2.20	3.19	.00000866	<.05*
oreteti/ceremonial	3.66	2.40	3.03	.5361	>.05
olamuriaki/fencing	3.00	2.00	2.50	.42	>.05
olgilai/fodder	1.77	0.88	1.32	.9554	>.05
orperesi wouas/fodder	3.80	3.55	3.68	.5344	>.05