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LAND, LABOR, AND GENDER RELATIONS:
THE CHAGGA HOMEGARDEN AGROFORESTRY SYSTEM
OF MT. KILIMANJARO, TANZANIA

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LAND, LABOR, AND GENDER RELATIONS: THE CHAGGA HOMEGARDENS OF MT. KILIMANJARO, TANZANIA

By

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ABSTRACT

LAND, LABOR, AND GENDER RELATIONS:
THE CHAGGA HOMEGARDENS OF MT. KILIMANJARO, TANZANIA

By

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The case of Mt. Kilimanjaro extends theories of population, environment, land, and labor relations. It illustrates how, in the current context, even while land is scarce, labor too can be in shortage. This context includes economic changes brought on by economic reforms, increasing needs for cash, declining terms of trade for farmers, pressures toward diversification of income and non-farm activities, out-migration, a shrinking land base, declining soil fertility, and degradation of natural resources, both on- and off-farm. The gendered division of labor, the age- and gender-differentiated character of out-migration, and the inter-dependence of productive and reproductive activities are central to these processes, which result in a continual squeeze on farmers' labor and capital resources. While the case of Kilimanjaro is unique in terms of particular cultural, historical, and ecological circumstances, these same processes are occurring in other rural locations. Theories of land and labor relations in rural economies cannot continue to neglect the trend towards de-agrarianization and diversification of income, even while agriculture remains of critical necessity for rural households' sustenance, nor can they neglect the centrality of gender relations for understanding differentiation within rural households, and labor constraints in particular. This study used a farming systems approach and qualitative methods to explore the dynamics of gender, land, and labor relations in relation to the Chagga homegarden agroforestry system.

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1 Introduction

Farmers on Mt. Kilimanjaro, Tanzania, are being squeezed—squeezed literally, as farm sizes shrink, and also metaphorically as constraints are everywhere tightening. They are struggling to find the time to accomplish all that needs to be done to maintain their households and they are suffering through periods of food and cash scarcity, forced to make trade-offs between necessities. They expect little relief from outside, as the entire nation is enduring an economic and social crisis—a crisis that might be called acute, if it were not also chronic.

This study examines the constraints faced by Chagga farmers related to their distinctive agricultural system, called the Chagga homegarden, or *kihamba* (plural *vihamba*). I argue that while land is scarce on Kilimanjaro, labor is also in shortage, contrary to theoretical expectations. The paradox of simultaneous labor and land scarcity on Kilimanjaro can only be explained by understanding that population pressure is mediated by complex and gendered land and labor relations, as well as by externally-originating economic forces which result in declining terms of trade for farmers and help to drive non-farm enterprises and out-migration. These national and international economic processes are described below, followed by background on the local context.

1.1 National and International Context

Many of the political-economic changes faced by farmers in Lyasongoro are rooted in national and international processes, though how they play out may vary in different regions of Tanzania. In the last two decades, these interrelated processes have included structural adjustment policies (SAPs), an opening of the economy to capitalist

penetration, declining terms of trade for farmers, and land reform. The former two processes increase farmers' dependence on and need for cash, while the third trend makes this cash less obtainable via agricultural enterprises. Land reform in Tanzania has occurred in a context of market liberalization, resulting in "pressure towards individualization of land tenure" (Forster and Maghimbi 1999, xx).

The conditions imposed by the International Monetary Fund (IMF) to implement economic reforms, begun in 1986, included "devaluation of the currency, imposition of a wage freeze, abolition of price controls, increase of (agricultural) producer prices, increase of interest rates, removal of import controls, and restraints on government expenditure" (Meena 1991, 170). Mbilinyi argues that while large farms benefit from SAPs, real wages and crop incomes have declined, hurting already disadvantaged sectors such as small- and middle-scale farmers (Mbilinyi 1997, 354-355). Also, the institution of cost-sharing in social services such as health and education has strained already scarce household cash resources and has disproportionately hurt women and children (Meena 1991, 177-181; Mbilinyi 1997, 355; Koda 1995, 142). Forster and Maghimbi (1999, xviii-xix) contend that even initial assessments of growth in the overall economy were probably over-optimistic.

In light of these analyses by scholars from Tanzania and abroad, the claims of a recent World Bank publication are disturbing, to say the least. In diametrical opposition to published reports, the World Bank claims credit for allegedly reducing rural poverty through impressive growth rates. The report goes on to acknowledge problems of increased inequity and decline in social sectors such as health and education, but still maintains:

> These problems cannot be solved by increased per capita income alone. But sustained growth in the economy gives Tanzania some breathing room to begin addressing these problems in the social sectors. Solving them will add to the growth potential of the economy and will contribute directly to improved welfare and an improved distribution of income (World Bank 1999, 5).

The notion of SAPs creating "breathing room" is incompatible with the economic squeeze faced by farmers on Kilimanjaro, exacerbated by these very policies. The World Bank's stubborn perpetuation of refuted claims such as these is thus an example of the international ideological context contributing to the social and economic crisis in Tanzania.

The economic and social changes shaped by SAPs are also linked with environmental impacts in Tanzania. SAPs were linked to increased rates of deforestation and soil erosion (Sankhayan 1995; Temu and Mamiro 1995; Bagachwa *et al.* 1995).

> In Tanzania, rates of soil erosion and deforestation have been affected by structural adjustment to the extent that it has increased the cost of fertiliser and the reduced availability of credit with which to buy it; changed the erosive/non-erosive balance in the cropping pattern and increased timber extraction, through internal and external market liberalisation; and reduced spending on afforestation (Bagachwa *et al.* 1995, 8).

The environmental impacts of structural adjustment reforms have been difficult to measure, since other factors simultaneously contribute to the same trends. However, analysts agree that small farmers tend to be hurt more by structural adjustment policies and by land degradation, while commercial ventures benefit from market advantages in less sustainable forms of cropping and timber production (Bagachwa *et al.* 1995, 9). Research in the Kilimanjaro region specifically has supported the conclusion that SAPs have contributed to expansion of farming to more sensitive soils (Temu and Mamiro 1995, 51) and to increased cash crop production "either at the expense of food crops or through the clearing of more forest lands" (Sankhayan 1995, 13).

In addition to and related to economic reforms, this study also occurs in a context of de-agrarianisation and diversification of rural livelihoods throughout sub-Saharan Africa. Traditional models of rural development and of population-environment relations ignore the diversity of income sources and employment that rural Africans have long utilized (Clay *et al.* 1996, 13). Indeed, Bryceson suggests that "the question is why people continue to engage in agricultural activities at all" and her answer includes the high cost of purchased food, drastic cutbacks in social services, and attachment to cultural agrarian values (Bryceson 1997, 9). All this is not to say that agriculture is no longer important.

> Those engaged in income diversification retain their identity as farmers since that is their fallback and one of their most vital economic activities in terms of household self-provisioning. In other words, they are still subsistence farmers in the last instance (Bryceson 1997, 10).

However, evidence suggests that rural Africans increasingly depend on non-agricultural rural employment as well. Unfortunately, the assumption that most rural Africans are strictly agrarian persists in misguided development policies (Bryceson 1997, 11). The present study helps to refute this myth by illustrating the existence and importance of diverse income sources and migration for rural Tanzanians on Kilimanjaro.

These economic, social, and ideological factors and processes occurring at national and international levels set the context for this study. However, as should become clearer in the discussion below, they do not form a static backdrop for the social and ecological changes on Kilimanjaro, but rather interact with local cultural, social, and ecological factors. For example, Howard and Millard, in a study of childhood malnutrition, argue that ideologies of development and modernism have taken a particularly strong hold on Kilimanjaro. A traditional cultural stigma on poverty in

combination with increasingly tight household constraints has exacerbated the reportedly increasing social and economic polarization of the wealthy and the poor (Howard and Millard 1997, 12). This study will explore a different set of processes related to changes in the farming system, holding these larger processes in mind.

1.2 Lyasongoro, Kilimanjaro Region

1.2.1 Physical Geography

Mt. Kilimanjaro is in northern Tanzania near the border with Kenya at about 3°S latitude and 37°E longitude (Figure 1). The village of Lyasongoro is located on the southeast slopes of Mt. Kilimanjaro in Marangu Ward, Moshi Rural District, Kilimanjaro Region (Figure 2). The village is long and narrow, running from 1500-1900 m.a.s.l. (5000-6200 ft). It follows a ridge occupied by the main road to the Kilimanjaro National Park (KINAPA) and bordered by two river valleys (Figure 3). The uppermost border of the village is adjacent to the forest reserve and park gate. The natural springs in the village and the two rivers bordering it, the Moonja and the Una, are the main sources of water, not only for Lyasongoro but also for zones lower in altitude, which receive water from rivers and from traditional irrigation ditches (Figure 4). Lyasongoro residents also benefit from piped water provided by the national park and obtained from a spring near the park gate.

Meteorological data from a station at nearby Marangu School recorded annual rainfalls ranging from about 1450 to 1850mm (57 to 73 in), with an average rainfall of

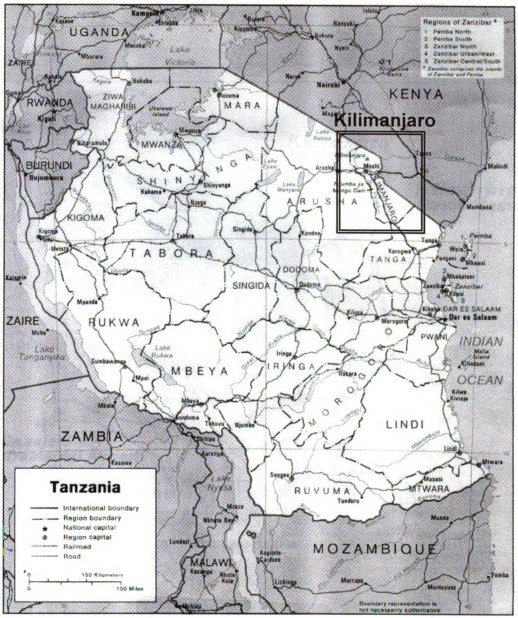

Figure 1. Map of Tanzania (detail: Kilimanjaro Region).

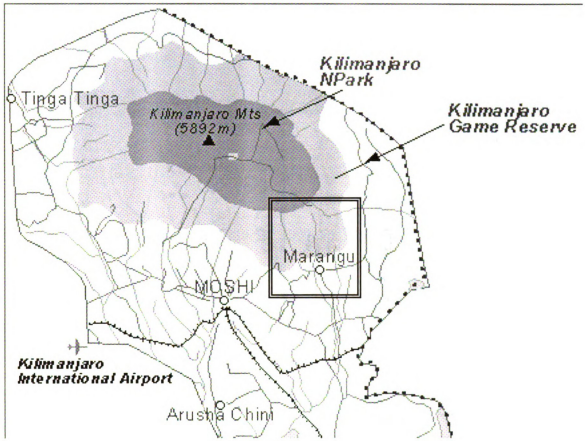

Figure 2. Map of northwestern Kilimanjaro Region.

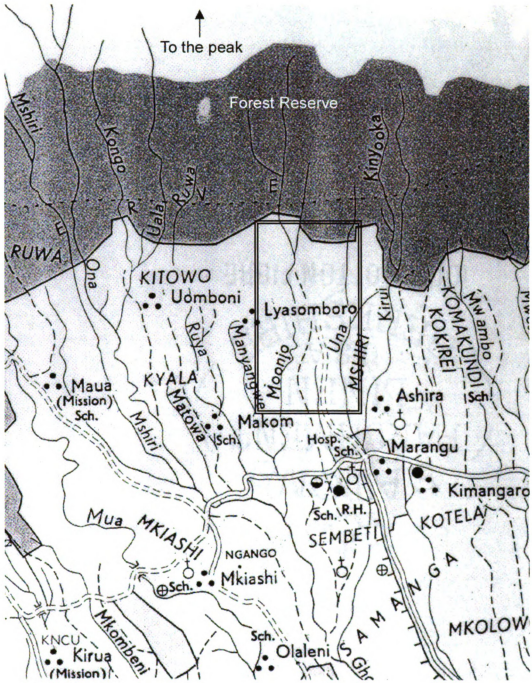

Figure 3. Map of Lyasongoro[a] and Marangu.

[a] Lyasongoro was formerly known as Lyasomboro. Some people (especially elders) still call it by this name.

Figure 4. River in the Kilimanjaro landscape.

1625mm (64 in) (Anderson 1982, 11). Rainfall is bimodal, concentrated from March to May and October to December (O'Kting'ati and Kessy 1991, 72). Temperatures vary between about 19° - 25°C (66° - 77°F) in the region, with wide variations between day and night temperatures (Anderson 1982, 8). Lyasongoro is significantly colder than the middle and lower altitudinal zones of the mountain, resulting in much slower crop growth; for example, the maize growing season in Lyasongoro lasts over seven months, compared to three months in the lowlands.

It has been said that Kilimanjaro exhibits a "complexity of geology, topography, climate, and vegetation which is probably unmatched elsewhere in Tanzania" (Anderson 1982, 1). Specifically, the soils between Marangu and Lyasongoro, known as the Marangu Series, are characterized as moderately to steeply sloping, very stony, dark brown sandy loams over basalt or analcitite (Anderson 1982, 72 and map of "Soils: South and East Kilimanjaro"). The parent materials of soils on Kilimanjaro are mostly basic igneous rock, which tends to produce soils higher in moisture equivalents, nitrogen content, and cation exchange capacity than acidic rock, accounting for the relatively fertile soils on Kilimanjaro (Anderson 1982, 31; O'Kting'ati and Kessy 1991, 72). Relevant to Lyasongoro, "With the lower temperatures at higher altitudes, production of organic matter tends to be greater than its decomposition and so the soils tend to be high in organic matter" (Anderson 1982, 9). This contributes to favorable soil physical properties, such as porosity, which help to reduce erosion. However, the soil is considered relatively shallow, pointing to the need for continued attention to soil erosion prevention (Anderson 1982, 111). While soil fertility is currently declining on Kilimanjaro, as will be explained in the analysis below, the plentiful rainfall and

relatively fertile soils account for the long history of permanent agriculture in the high-potential coffee-banana belt of Kilimanjaro.

1.2.2 Social Geography

Population densities on Mt. Kilimanjaro are extraordinarily high for a rural region. According to the most recent national census conducted in 1988, the average population density in the immediate vicinity of the mountain was 264 people per km^2 *arable* land ($684/mi^2$), but densities as high as 650-1000 people per km^2 have been reported. Population in the region more than tripled between 1948 and 1988 (Gamassa 1991, 1). In Moshi Rural District, average density in 1988 was reported as 220 people per km^2 ($570/mi^2$), the highest density of the three rural districts of Mt. Kilimanjaro (Gamassa 1991, 5). Probably due to out-migration, Moshi Rural had the lowest population growth rate of the districts in the region: 1% as compared to the regional average of 2.1% (Gamassa 1991, 3-4).

In Lyasongoro, farmers reported farm sizes ranging from ¼ to 5 acres at the most, with many in the range of 1-3 acres per household. A study published in 1985 found an average farm size of 0.495 ha (1.22 acres) and an average household size of 8.5 people (O'Kting'ati 1985, ii, 92). The number of laboring adults averaged 4.8 per farm or 9.7 per hectare (O'Kting'ati 1985, iii). Another study found an average homegarden size of 0.68 ha, ranging from 0.2 to 1.2 ha and an average household size of 9.9 people (Fernandes *et al.* 1984, 82). Households on Kilimanjaro tend to be markedly dispersed in distribution. Village centers usually represent locations of stores and institutional buildings, such as schools, churches, and town offices, not concentrations of households. In Lyasongoro, the local institutions include the Lyasongoro Primary School (Figure 5), the Lyasongoro

Figure 5. Lyasongoro institutions.

Lutheran Church, the town office, and the Kilimanjaro Forest Reserve and National Park, known locally as "KINAPA." Neighboring villages house secondary schools and Catholic churches. The major occupations available to non-migratory residents of the village include farming, store-keeping, guiding or portering for tourists visiting to climb the mountain, and other businesses catering to tourists. A variety of other income-generating activities include beer-brewing, butchering, tailoring, marketing agricultural products, and tree and flower nurseries.

Mt. Kilimanjaro has long been important to Tanzania for its coffee production, coffee being the largest source of foreign exchange in Tanzania (estimated at 40% in 1979 (O'Kting'ati and Kessy 1991, 71)). Smallholders on Kilimanjaro contributed 30% of the nation's mild-arabica coffee in 1985-86 (O'Kting'ati and Kessy 1991, 72). Between 1900 and 1960, much of the land on Kilimanjaro was appropriated by European colonists for large coffee estates, by missionaries, or by the national government for forest reserves. The forest reserve above and the coffee estates below restricted the area available for expansion by smallholders (Gamassa 1991, 7). A similar and perhaps more severe situation of land appropriation and squeezing of Tanzanian smallholder farmers obtained on Mt. Meru near Arusha (Spear 1997, 90). The famed Kilimanjaro Native Cooperative Union (KNCU), formed in 1932, enabled Chagga farmers to enter the coffee market against the resistance of colonial settlers (von Clemm 1964, 100).

The Kilimanjaro Forest Reserve gazetted by the British colonial government in 1921 occupies 1078.8 km^2 (Lema 1997, 105). The Kilimanjaro National Park was established in 1973 and constitutes 756 km^2 of the combined forest reserve and national park. The 1900m countour forms the lower boundary of the forest reserve and national

park (Fernandes *et al.* 1984, 74) and the upper boundary of Lyasongoro. Harvesting of live wood in the reserve was banned in 1984 due to over-exploitation (Gamassa 1991, 8).

1.3 Chagga Homegarden Agroforestry System

The Chagga homegarden agroforestry system is the predominant agricultural system in the high-potential zone from mid- to high-elevation on the southern and eastern slopes of Mt. Kilimanjaro (the "banana belt"). It is an extremely intensive farming system that has evolved over the last 200 years (O'Kting'ati and Kessy 1991, 76). The study of the ecology and sociology of homegardens worldwide is still in its early stages. This system is an exemplary model of a homegarden system.

In general, homegardens are tropical multi-story agroforestry systems, but this category encompasses a wide range of forms throughout the tropics. The following description serves as a good working definition:

> ...a piece of land with definite boundaries, usually near a house, occupying an area generally between 0.5 and 2.0 ha, species rich, usually woody perennials dominant, stratified, resembling natural forest structure (Gliessman 1990, 161-162).

Other characteristics of tropical homegardens include spatial and temporal complexity, continuous groundcover and production in some form throughout the year, and a wide variety of human use functions (Fernandes and Nair 1986, 280-281). They tend to arise in regions of high population density (Fernandes and Nair 1986). Homegardens vary tremendously, both between and within types. They may be established from bare soil or by gradual replacement of natural forest. They have been described as requiring low management intensity (Perera and Rajapakse 1991; Wojtkowski 1993) or intimate management (Michon *et al.* 1983; Fernandes *et al.* 1984). There are contradictions in the literature on homegarden efficiency, similarity of species composition across geographic

regions, spatial pattern or lack thereof, and whether homegardens are continually modified or not (Wojtkowski 1993, 215). For example, while Chagga farmers reported the labor intensivity and strictures of their homegarden system, many homegardens in southeast Asia reportedly require very low labor inputs relative to production with flexible calendars (Torquebiau 1992, 197). Both the complexity of homegardens and lack of appreciation for their productive and ecological potential have led to a lack of study, both empirical and theoretical.

Fernandes *et al.* (1984) and O'Kting'ati *et al.* (1984) provide detailed descriptions of the Chagga homegardens and of the plant species contained in them, respectively. Due to the great diversity of crop types and plant uses, I will provide only a general description drawn from my field research and will refer the reader to these sources for greater detail. The livestock component of the Chagga homegardens includes stall-fed cattle (traditional, modern, and cross-bred varieties), goats, chickens, ducks, and other minor livestock. Major crops include coffee, bananas, maize, beans, cocoyams, cassava, potatoes, sugar cane, squash, and other vegetables and fruits. Fodder grass is an important component of the homegardens, as will become clear below. Tree-climbing lianas (vines) producing fruits or vegetables constitute another homegarden component.

Trees and shrubs are critical to the homegarden system. In addition to coffee and bananas, trees are used for fuelwood, fodder, building material, livestock bedding, fruit, shade, soil improvement, beekeeping, medicine, beer-brewing ingredients, banana tree props, and other uses. An inventory of plant species in the homegardens found a total of 100 plant species (53 tree species, 29 food crops, 21 non-woody plants of economic value, and 8 weed species) on 30 farms (O'Kting'ati *et al.* 1984, 177). My inventory of

plant species on two of the farms in this study found 37 and 23 tree species, respectively. The Chagga homegardens usually have three or four vertical strata, from the herbaceous layer to intermediate layers of coffee and fruit trees to the upper canopy stratum (Lyimo *et al.* 1999, xix).

The composition of the Chagga homegardens varies across the mountain, depending on altitude, soils, rainfall, and local preferences. In Lyasongoro, the colder temperatures and less fertile soils result in slower growth. Root crops grow well and some farmers are attempting to grow temperate fruit trees (such as apples) and flowers (such as roses). Figures 6 and 7 illustrate the vertical strata and horizontal arrangement of the homegardens.

With this introduction to the national, regional, and local context of this study in terms of political-economic, social, and ecological factors, I now turn to the literature that frames this study of gender, land, and labor relations on Kilimanjaro.

2 Literature Review

Various models have been proposed to explain the relationship between labor and land, that is, between changes in population density and environmental conditions. Here I review a select sample of classical and contemporary models that especially influenced my research approach and analysis. Traditional models have assumed a straightforward causal relationship between population pressure and environmental degradation. However, recent literature, especially in the last decade, has begun to complicate this relationship. While several models counter Thomas Malthus's assertion that population growth necessarily results in environmental degradation, fewer consider that populations and households are not homogeneous in terms of access to land. Fewer still examine

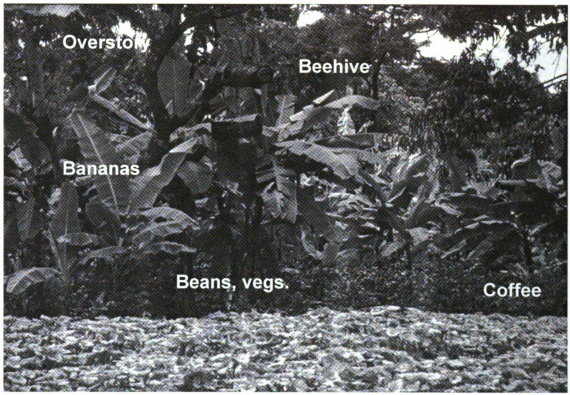

Figure 6. Chagga homegarden vertical strata.

Figure 7. Chagga homegarden spatial arrangement.

differential labor responsibilities at the sub-household level, where gender relations can be seen to interact with land and labor relations, as well as with ecological factors, producing bi-directional environmental and social dynamics. Assumptions, predictions, and emphases of these various models are summarized for cross-comparison in Figures 8, 9, and 10. By extending these theories of population and environment relations and incorporating perspectives on gender, households, and environment, I develop the conceptual framework for this study.

Before proceeding, attention is required to the question of what is meant by "scarcity," particularly of labor, land, and other resources. Often, the term is used as if scarcities are objective, isolable, and quantifiable facts, mechanically linked to changes in population size, much the way environmental degradation has been assumed by some to be a "natural" result of population growth. Most of the population-environment models discussed below refute the naturalization of this assumption. However, none make explicit that scarcity itself is an outcome of multiple social ecological relations encompassing technology, ideology, and ecology, among other relations. For example, the literature on the social construction of needs suggests that this dimension of scarcity, for one, is not universal (e.g. Cheal 1996).

These relations are contingent on particular temporal and spatial scales. Seasonal scarcity is just one well-known example. Furthermore, scarcity is usually predicated on the imposition and naturalization of temporal/spatial boundaries. This becomes obvious when we consider extreme cases, such as the vast quantities of grain left unconsumed in the U.S. while farmers on Kilimanjaro struggle to collect enough fodder to feed their cattle. However, these boundaries are often taken for granted, even at the local level, and

Model	Population	Labor/Land Ratio	Land Base
1. Malthus	Increases exponentially	Increases	Degraded
2. Boserup	Increases	Increases	Maintained
3. Geertz	Increases	Increases	Maintained
4. Machakos	Increases	Increases	Improved
5.a. Labor-led intensification	Increases	Increases	Degraded
5.b. Capital-led intensification	Increases	Increases	Maintained or improved, both on- and off-farm
6. Political Ecology	May increase, but may be less relevant than power relations	May increase, but may be due to inequitable access to land or migration	Variable with context, but may occur under rising, declining, or no population pressure
7. Depopulation	Decreases	Decreases	Degraded
8. Collins	Increases, but patterns of migration and inequitable access to land critical	Both land and labor scarce, may decrease	Degraded

Figure 8. Population-environment models in comparison: population, land/labor ratio, and land base.

Model	Agricultural Technology	Capital Inputs[b]	Agricultural Prod./Area	Agricultural Prod./Person
1. Malthus	Static	-	Declines	Declines
2. Boserup	Innovations	-	Intensifies with increased innovation and labor/land ratio	More likely to decline than increase
3. Geertz	Highly labor-intensive innovations (involution)	None	Intensifies	Marginally declines
4. Machakos	Introduced and indigenous agricultural and social innovations	Yes, both inputs and quasi-fixed capital	Intensifies	Increased
5.a. Labor-led intensification	Marginal modifications	None	Intensification, followed by declining productivity	Declines
5.b. Capital-led intensification	Innovations	Yes, whether inputs or quasi-fixed capital	Intensifies	Maintained
6. Political Ecology	Variable, but may be innovations in technology and social institutions	Variable with context	Variable with context	Variable with context
7. Depopulation	Insufficient labor to implement appropriate technologies	-	Declines	Declines
8. Collins	Innovations, but may be insufficient labor to implement appropriate technologies	Variable	Declines	Declines

Figure 9. Population-environment models in comparison: agricultural technology, capital inputs, and production per area and per person.

[b] Defined by Clay *et al.* (1996, 10) as nonlabor inputs such as fertilizer or organic matter and "quasi-fixed capital" such as soil conservation structures, which may be purchased or produced.

Model	Standards of Living	Carrying Capacity	Key Factors
1. Malthus	Decline until misery promotes population control	Constant	Natural population increase
2. Boserup	Improve	Variable	Innovation
3. Geertz	Gradually decline	Variable	Involution (agricultural and social system able to absorb excess labor)
4. Machakos	Improve	Variable	Imported innovations, external markets, institutional context
5.a. Labor-led intensification	Decline	Variable, within narrow limits	Lack of capital inputs, only labor added
5.b. Capital-led intensification	Improve	Variable	Capital inputs to maintain soil fertility, not just labor; income diversification
6. Political Ecology	Variable	Variable	Historical and political-economic context, non-homogeneous population, local knowledge and innovations
7. Depopulation	Decline	No simple linear relation between population and degradation	Labor for degradation-ameliorating practices
8. Collins	Decline	No simple linear relation between population and degradation	Migration patterns, off-farm income, gendered relations of labor

Figure 10. Population-environment models in comparison: standards of living, carrying capacity, and key factors.

the spatial/temporal distribution of scarcity too often goes unquestioned. With this caveat, I continue to use the terms land and labor scarcity, but with the reminder that in this study, as well as in the models discussed below, scarcity should not be uncritically understood as a given, but rather as produced by particular material/ideological relations contingent on spatial and temporal scales.

2.1 Population, Environment, Land, and Labor Models

2.1.1 Thomas Malthus: Population Growth and Environmental Degradation

The model of population-environment relations proposed by Thomas Malthus in 1798 (Malthus 1959) continues to be influential today. In short, the Malthusian model holds that the propensity for human populations to increase rapidly, at geometric rates, while the land base sustains only incremental, arithemetical increases in food production results in land scarcity and resource abuse. Environmental degradation and starvation ensue until population size decreases to a sustainable size (Malthus 1959, 5).

Critics of the Malthusian model (including those cited below) argue that it exaggerates and over-simplifies the link between population increase and environmental degradation. Factors such as technology, culture, and mode of production can intervene to modify, slow, or reverse environmental degradation. Kilimanjaro is a case in point. Despite high population growth rates over many decades, Chagga farmers not only survived, but prospered relative to Tanzanian farmers in less-densely settled regions due to their elaborate farming system and the favorable coffee market.

2.1.2 Ester Boserup: Agrarian Change Under Population Pressure

In 1965, Ester Boserup proposed a model of population-environment relations that sharply countered the Malthusian model. In Boserup's model, population increase is an independent variable that serves to stimulate agricultural innovation in the form of intensification of the cropping system. As Tiffen *et al.* wrote, "Boserup differed from Malthus in seeing the adoption of new technologies as *impelled* by population growth and made feasible by additional labour" (Tiffen *et al.* 1994, 264). Higher population densities are thus maintained on the same land area via intensification and increased total production, resulting in lower output per unit labor but in higher standards of living compared to more sparse populations (Boserup 1993, 11, 36). In this model, rather than necessarily resulting in degradation of the land base, population increase leads to productive permanent agriculture, with a general progression from under-utilization of land for agriculture to swidden cropping to permanent cropping to intercropping (Boserup 1993, 15-16).

Boserup's model is clearly applicable to the case of Kilimanjaro, where land scarcity is believed to have motivated the development of the intensive homegarden agroforestry system. However, Boserup treats intercropping as the most intensive form of agriculture, as the peak of agricultural innovation. This model does not address further intensification in the form of vertical stratification, year-round production, agroforestry systems, or homegardens. Hence, my original research question was formulated to ask how processes of innovation and intensification operate in an already highly complex and intensified farming system.

2.1.3 Clifford Geertz: Agricultural Involution

Like Boserup, Clifford Geertz (1966, 77-78, 80-81) also proposed a model in which natural population increase results in agricultural intensification as a response to land scarcity. However, Geertz's model was based on highly intensive rice paddy production in an already densely populated region of Java. This led him to emphasize labor surplus alongside land scarcity, together which stimulated labor-intensive innovations that could absorb excess labor and marginally increase production to sustain the growing population, but at an ever-declining standard of living. He called this process agricultural involution. As in Boserup's model, degradation of the land base is not an inevitable result of population increase in Geertz's model.

Geertz's model is an important extension of Boserup's, addressing an instance of intensification of an already intensive agricultural system, resulting in declining, rather than rising, standards of living with population increase. However, the marginal production gains, albeit with diminishing returns, from labor-led intensification that were possible in the case of rice paddy production in Java may not be applicable to all agricultural systems. Whether labor-led intensification might be possible in the Chagga homegardens is an unanswered question, since labor is not in excess, as will be seen below.

2.1.4 The Case of Machakos

Tiffen *et al.* (1994, 13) provide a model that runs directly counter to the Malthusian suggestion that population increase leads to environmental degradation. In a longitudinal study of dryland farming in Machakos District, Kenya, the authors found that population increase at rates as high as 3% per annum (Tiffen *et al.* 1994, 261)

resulted in agricultural intensification. This was due in large part to an increased labor supply, among other factors such as invention and introduction of new technology and market factors (Tiffen *et al.* 1994, 262-265). As the authors write:

> It is argued in this study that the growth of population, working conjointly through an increase in the labour force and the growth of markets, has driven agricultural intensification on the smallholdings, and that this intensification has characteristically taken the form of investments in sustainable technologies and management (Tiffen *et al.* 1994, 28).

Both agricultural productivity and environmental sustainability improved as a consequence.

The authors differ from Malthus in their emphasis on the variable sociopolitical and institutional contexts of population change. For example, they compare the contemporary context, which is more conducive to self-determination, with that of colonial times when labor for soil conservation projects was coerced and local resistance resulted in only partially successful conservation (Tiffen *et al.* 1994, 178, 256). Further, they argue that their study refutes the neo-Malthusian notion of a population carrying capacity.

> There has long been a belief that a given agro-ecological zone has a population-supporting capacity which cannot be exceeded without environmental degradation.... The dangers of exceeding this 'scientifically' assessed carrying capacity are used to justify government intervention to regulate land use. It is clear that agricultural output per unit of land varies according to agro-ecological zone if technology, crop mixes and capital investment are held constant. However, rising population density combined with access to new knowledge means that these things do not stay constant; rising population density facilitates access to new markets, new knowledge and new technologies (Tiffen *et al.* 1994, 14-15).

They also contrast their model with that of Boserup:

> [Our study] makes apparent the importance of two factors given little attention by Boserup: the external market and inflows of new ideas from external sources, both of which reinforced the impetus which population growth gave to local technology generation (Tiffen *et al.* 1994, 267).

A parallel can be drawn between the communal soil conservation activities in Machakos and the elaborate system of traditional irrigation ditches which route water from the upper slopes to the middle and lower slopes on Kilimanjaro. These waterways still exist and continue to be maintained on a group labor basis, but many are now in disrepair or have dried up (Lyimo *et al.* 1999, 106). As predicted by this model, insufficient labor may be one cause of this decline.

2.1.5 Models of Intensification

Building on Boserup's model of agricultural intensification, Clay *et al.* (1996, 10), among others, delineate two broad pathways of intensification of production in response to population increase and land scarcity. These are termed "capital-led intensification" (nonlabor inputs such as fertilizer or organic matter and "quasi-fixed capital" such as soil conservation structures—these may be purchased or produced) and "labor-led intensification" (only labor added to "crop more densely, weed and harvest more assiduously, etc.") (Clay *et al.* 1996, 10, 57).

The authors argue that the labor-led path to intensification is often not environmentally sustainable, and they particularly single out the East African tropical highlands with heavy rainfall and steep slopes (Clay *et al.* 1996, 11, 58). They claim that without some capital-led intensification, especially application of fertilizer, intensifying production will likely lead to degradation of the land base (Clay *et al.* 1996, 85). The predictions of this model contrast with the Geertzian model in which labor alone results in marginal but sustainable intensification. It would apply best where the limiting factor of production is soil fertility, where productivity levels are already close to maximum

sustainable yields, and where the relevant management techniques for increasing production are capital-led.

However, the definitions of capital-led and labor-led intensification used by Clay *et al.* are problematic in that so-called capital-led strategies are defined to include quasi-fixed capital, such as soil conservation structures, that can be produced using labor. Hence, the distinction confuses any comparison of strategies requiring cash versus labor versus both, and confers unwarranted strength to the argument that sustainable agriculture necessitates cash cropping and chemical inputs. The definitions also ignore the potential for what might be termed "knowledge-led" strategies, such as the innovative technologies that were important in the Machakos case and the crop combinations or other system-specific knowledge that allow vertical stratification and intensification in the traditional Chagga homegardens.

2.1.6 Political Ecology

Another type of approach to demographic and environmental change has been labeled political ecology by Piers Blaikie and Harold Brookfield (1987). It "combines the concerns of ecology and a broadly defined political economy. Together this encompasses the constantly shifting dialectic between society and land-based resources, and also within classes and groups within society itself" (Blaikie and Brookfield 1987, 17). Political ecology is an umbrella term for analytical approaches which share these concerns; which also include the historical, political, and economic context in analysis; and which place the land manager at "center stage" of analysis (Blaikie and Brookfield 1987, 239).

The implication of this approach for population-environment relations is that "population" cannot be treated as a single, independent causal variable (Sage 1994, 39) and populations themselves cannot be treated as homogeneous, since power relations among groups are central to social-environmental dynamics. In the political ecology approach, land scarcity may be the result of unequal access to land or migration patterns, not only natural population increase. Production problems and environmental degradation may be due to unequal access to capital and resources, not only land scarcity. Depending on the local context, land scarcity and labor surplus may stimulate innovations by farmers, whether by intensifying production or by creating local institutions or social-political mechanisms to cope with constraints. These may be what I have termed knowledge-led strategies, or innovations in management techniques within an intimately understood indigenous knowledge system. For example, Chagga farmers' knowledge of crop associations appropriate to light/shade requirements and to local soils constitutes knowledge which can lead to intensification of agricultural production. These innovations may or may not reverse or ameliorate environmental degradation, depending on the particularities of the local, regional, national, and global political contexts.

2.1.7 Depopulation and Environmental Degradation

With the exception of political ecology, the preceding models of population and environment relations assume a growing population and a labor surplus. However, patterns of rural to urban migration and the impact of HIV/AIDS on rural agricultural populations, particularly in sub-Saharan Africa and parts of Asia, demand that greater empirical and theoretical attention be paid to the relationship between depopulation and environmental conditions.

Blaikie and Brookfield (1987, 34) argue that environmental degradation can be a result of declining population, particularly when labor required to maintain conservation structures in sensitive systems is no longer available. Likewise, a study of rural villages in Oaxaca, Mexico, found that national structural adjustments led to increasing semi-proletarianization and urban migration, resulting in depopulation of the region. With insufficient labor to maintain elaborate terracing systems, depopulation led to a decrease in per capita food resources (García-Barrios and García-Barrios 1990, 1569; see also MacDonald *et al.* 2000). These findings regarding depopulation are relevant to the current situation on Kilimanjaro where, although population density remains high, labor is scarce and is a factor contributing to resource degradation and poverty.

2.1.8 Jane Collins: Simultaneous Land and Labor Scarcity

Finally, of all the models of population, environment, land, and labor relations, only the analysis developed by Jane Collins explicitly addresses the possibility of *simultaneous* land and labor scarcity. Collins argues that land scarcity does not necessarily translate into labor surplus at the household level and may, in fact, lead to labor scarcity when coinciding with other political economic factors. She explains:

> While land scarcity and labor scarcity might appear to be in contradiction, they actually may occur together. First, land scarcity may arise from processes of land transfer and encroachment as well as demographic growth. Secondly, whatever the cause of land scarcity, the downward pressure it exerts on household income may force productive members into other activities, or to leave rural areas permanently. There is no guarantee that demographic growth and rural exodus will balance one another in the end. The latter depends on a complex of factors including the availability and reliability of alternative work, the skills such work requires and the possibilities of acquiring them, the recruitment and employment practices of industries involved, cultural definitions and expectations of work, and a range of market forces (Collins 1987, 22).

Thus, unequal access to land, off-farm sources of income, patterns of rural to urban migration, and various local and extra-local political economic factors must be taken into consideration.

Furthermore, in her research in the Peruvian highlands, Collins found that the convergence of land and labor scarcity frequently led to environmental degradation, which in turn led to even greater demands on household labor.

> The need to participate in these diverse activities is frequently related to a diminishing land base or to declining terms of trade. This dynamic may lead to problems of labor scarcity. Labor scarcity may, in turn, lead to patterns of poor resource management, thus creating a vicious circle of impoverishment. As natural-resource quality declines, families must struggle even harder to maintain constant levels of income. In consequence, still more labor may be drawn away from the farm (Collins 1987, 33).

In contrast to this analysis, the models of Boserup, Geertz, and Tiffen *et al.*, address cases where land scarcity does *not* result in environmental degradation because sufficient labor is available for sustainable intensification of agricultural production. While Collins finds that population growth may lead to environmental degradation, this is far from a simple or necessary outcome, but rather is mediated by complex relations of land, labor, migration, and ecology in interaction with the political economic context—particularly the declining terms of trade faced by so many small farmers worldwide.

The prediction that agricultural production will intensify given land scarcity is premised on what Collins calls the myth of labor surplus. She traces this myth to the period of the 1960s and 1970s when:

> Given the high rates of population growth in developing nations, it seemed inconceivable that complex interrelationships between population growth and population movement could give rise to regionally and temporally specific problems of labor scarcity (Collins 1987, 26).

What is absent from many traditional population-environment models is an understanding of the importance of off-farm activities and household reproduction activities, in addition to agricultural production, when assessing labor availability.

> In view of the frequent assumption that labor is the resource most freely available to small farmers in developing nations, the questions raised in this chapter may seem to contradict some of our basic intuitions about the nature of rural poverty. Yet a careful reading of the available literature reveals that the crises of reproduction increasingly experienced by rural households in many parts of the world involve a complex relationship between declining terms of trade, intensification of production, and migration and off-farm labor. As producers attempt to maintain constant levels of income and to allocate labor between new and old forms of economic activity, ecological decline is not an uncommon result (Collins 1987, 20).

This analysis implies that labor-intensive strategies for rural development may be inappropriate in such contexts, which may be increasingly relevant given declining terms of trade and increasing diversification of activities for small farmers worldwide.

In addition to patterns of migration and off-farm activities, Collins highlights the labor required for household reproduction as key for conceptualizing simultaneous land and labor scarcity (Collins 1987, 24). All three of these processes are gender- and age-differentiated in ways specific to local or regional contexts and in sub-Saharan Africa (as in most of the world (Deere and León de Leal 1981, 339)) women are typically responsible for household reproductive labor. In the context of a declining land base and environmental degradation, more labor is required to meet the same level of subsistence for household reproduction. These subsistence activities typically depend not only on the farm plot itself, but also on natural resources available off-farm in common areas, such as water, fuelwood, fodder, and medicinals. While the gender division of labor in rural contexts varies, where women are responsible for household reproductive activities these have tended to be ignored in past economic analyses (Mbilinyi 1997, 326). Traditional

economic analyses that take household reproduction for granted have perpetuated the myth of labor surplus and have distorted understanding of population-environment relations and simultaneous land and labor scarcity.

Of the eight models of population-environment relations above, only the model described by Collins accounts for the simultaneous land and labor scarcity existing on Mt. Kilimanjaro today. To the best of Collins's knowledge and mine, no other literature explicitly addresses even the possibility of simultaneous land and labor scarcity. This study of Kilimanjaro therefore provides an empirical case of this under-examined dynamic. It also provides a theoretical extension of Collins's model by focusing more explicitly on the gender relations of labor at the household level and the implications of these for simultaneous land and labor scarcity and for social-environmental interactions. Collins's model implies, though does not spell out, the importance of the gender and age organization of household labor, off-farm labor, and migration. These prove critical for understanding the situation on Kilimanjaro. The literature on gender, environment, and development, which begins with women's experiences as environmental and household managers, thus intersects with Collins' model. I review this literature in the next section as a basis for understanding the role of gender in population, environment, land, and labor relations on Kilimanjaro.

2.2 Gender, Agriculture, Environment, and Household

Academic awareness of the importance of gender in theorizing processes in less-industrialized countries began with Boserup in the field of gender and agriculture, particularly the gendered division of labor. Boserup's work began to be expanded in the 1970s by socialist feminist analyses of agriculture, which tended to be highly structural

critiques of capitalist agriculture and the exploitation of women's reproductive and productive labor (e.g. Deere and León de Leal 1981; Beneria and Sen 1981). These developments coincided with attention to "women in development" more generally and, in the 1980s, were followed by growing awareness of the significance of gender in relation to environmental/natural resource issues.

Both early socialist feminist analyses of agriculture and the early gender and environment literature rested on assumptions of a clear productive/reproductive divide. Much of the early gender and environment literature contrasted with the socialist feminist literature in its lack of a structural analysis, material emphasis, or strong empirical basis. It also tended to portray women as victims of environmental degradation rather than agents of environmental change and natural resource management in their own right. However, its emphasis on the reproductive sphere did eventually bring to light the gendered character and importance of activities such as fuelwood, water, and fodder management. Factoring the ecological and labor dynamics of these activities into Collins's model of labor and land scarcity forms the core theoretical framework developed and applied in this study.

Furthermore, the gender-environment field is diverse and more recent scholarship has made strides in theoretical rigor. Rocheleau *et al.* identify six major schools of feminist thought on the environment: ecofeminist, environmentalist, feminist poststructuralist, feminist environmentalist (after Agarwal 1991, 10-11), socialist feminist, and feminist political ecological (their own perspective) (Rocheleau *et al.* 1996, 3-4). Of these schools, this study is most strongly informed by the latter three, which tend

to be more applicable to the context of less-industrialized countries and which emphasize the material basis of the gender-environment relation.

Incorporating gender into development theory dramatically altered analyses of poverty, land, labor, and productive/reproductive relations. It did so first and foremost by exploding the myth of the homogeneous household, previously assumed to be the appropriate unit of social and economic analysis. Gender analysis implies attending to intra-household relations and sub-household dynamics in addition to household level processes, which is the approach taken in this study. Speaking of the Tanzanian context, Koda's (1995, 149-150) work illustrates that this is requisite not only to understand the heterogeneity of Tanzanian households, but also the dynamism and flexibility of intra-household, gender, and age relations.

Given that current changes in household relations are closely linked to the context of economic reform and social and economic crisis outlined above, a review of the literature on gender, agriculture, and structural adjustment in Tanzania is called for. Mbilinyi (1997) and Meena (1991) offer complementary analyses which illustrate how important a gendered perspective is to understanding household economy.

Meena shows how each of the conditions imposed by the IMF (devaluation, wage freezes, end of price controls, increase of producer prices and interest rates, removal of import controls, and cuts in government expenditures) failed to consider that effects would not be equitable for all producers, particularly given the gender division of labor and differential access to credit, land, and other resources (Meena 1991, 170). Rather, "the IMF package has been totally gender blind; i.e., women seem to be absent from the

reform measures" (Meena 1991, 186). The burdens of reform measures have therefore tended to fall more heavily on women. Currency devaluation is one case in point:

> Devaluation has been eroding the real wages of both rural population and urban population alike. When devaluation erodes the real income of peasants, there is a tendency for the male population to migrate to urban areas to seek wage employment. But even if wage employment is available to a significant proportion of the population, wages alone do not enable wage earners to subsist. The female adult population that remains in the rural sector often increases its workload, not only in order to fend for the family, but also to subsidize the wage earner in the urban area (Meena 1991, 170).

Cuts in government expenditures in social sectors also weigh more heavily on women and children. Meena argues that SAPs exacerbated already existing crises in education and health (Meena 1991, 177-179). For example, in the health sector:

> The IMF recommended that the community should take a greater role in the provision of its own health services. This recommendation was made at a time when the real income of the people had deteriorated and the state had already invested in infrastructure for health services (Meena 1991, 177).

Meena argues that women's health intersects with the high demands on women's labor, also exacerbated by the economic crisis, and points out the absurdity of reducing investment in "nonproductive" sectors such as health for the sake of productivity when productivity in the Tanzanian context (particularly in agriculture) is so dependent on human labor power (Meena 1991, 179).

Mbilinyi, focusing on gender and agriculture, likewise argues that tendencies to homogenize households, large- and small-scale agriculture, and gender, ethnic, race, and nationality differences, result in distorted analyses of structural adjustment policies. She finds that SAPs "ultimately favour the foreign-owned, large-scale sector, and benefit men more than women" (Mbilinyi 1997, 317-318). Having documented the increased use of women's labor in large-scale commercial agriculture under SAPs, Mbilinyi laments the "blinkered focus on 'indigenous' peasant 'households'" by donors, the government, and

researchers in Tanzania, a myopia which is again rooted in outdated assumptions of homogeneous households (Mbilinyi 1997, 332). Hence, the absence of analysis of dynamic and complex gender relations in the discourse surrounding SAPs actually serves to exacerbate gender and class inequities in the agricultural sector. Although this research does, for better or worse, focus on "'indigenous' peasant 'households,'" the use of a gender analysis which takes into account the heterogeneity and changing dynamics of households in the context of economic crisis helps to problematize the assumptions of development and economic reform discourse.

3 Research Questions, Design, and Methods

3.1 Research Questions

Initially, my research question was formulated as follows: How do the processes of innovation and intensification, first predicted by Ester Boserup (1965) and Clifford Geertz (1966), play out in an already highly complex and intensified homegarden agroforestry system, in an already extremely densely populated region?

When labor turned out to not be in surplus, and therefore intensification of production to not be occurring, this question was modified to focus on innovations or techniques to minimize or halt the decline of production and maximize the efficiency of labor. The paradox of how labor and land could be simultaneously scarce became a new research question, with gender, migration, and the gender division of labor as central variables. This paradox can only be explained by understanding that population pressure is mediated by complex and gendered land and labor relations, as well as by external economic forces which encourage off-farm enterprises and out-migration.

3.2 Research Design and Methods

The framework used primarily to inform the choice of methods in this study was farming systems methodology. A farming systems approach encouraged viewing Chagga farm households through as wide-angled a lens as possible (e.g. Bawden 1995). Each component of the household and community economy, culture, and biophysical environment was considered to be potentially relevant to the others. Studying the farming system as a whole also more closely approximates the farmers' own perspective and highlights systemic issues such as labor or cash flow constraints, household relations, and cultural practices which might influence the farming system. The multiple types of agricultural components, agronomic strategies, and household livelihood strategies of typical Chagga farmers made a systemic approach especially appropriate and necessary for understanding relationships among complex, inter-dependent factors. Farming systems methodology also provided a framework for integrating social and ecological data, by incorporating both "hard systems" and "soft systems", as well as farmers' subjective experience (Bawden 1995, 14).

Thus, the Chagga system was studied from the perspective of the farmers themselves. This approach is compatible with feminist and participatory research approaches, which advocate beginning with the subjective experience and expressed priorities of research participants and building from there to an integrated, social theoretical interpretation. Drawing on feminist approaches to research, Chagga women's experiences were valued and explicit attention was paid to household gender relations and cultural gender dynamics.

This methodological framework implied the use of primarily qualitative methods, in particular repeated, open-ended interviews, walking tours of farms, and participant observation. Formal interviews were conducted with an opportunistic sample of ten households in Lyasongoro, comprising twelve individual interviewees: ten women ranging in age from 18 to about 60 and two men in their 50s or 60s. The sample was skewed towards female interviewees and female-headed households (whether de jure or de facto) due to my gender and expectations that I would want to learn about women's issues. This over-sampling was an advantage rather than a disadvantage, as constraints faced by women did become a central concern of the study. Two group interviews were conducted, an initial one to ascertain the characteristics of the village and invite farmers to participate in the research and another with a village women's business enterprise group. Interviews were conducted and transcribed in Swahili and field notes were taken in both Swahili and English. Additional ethnographic data were collected through participant observation and casual conversations. I resided in a village five kilometers from Lyasongoro and gathered field notes on experiences there and in other neighboring villages. An ecological inventory was conducted on two of the farms. I lived on Kilimanjaro intermittently from March through July 1999. Time conducting research in the field totaled approximately three months.

Due to the complexity of the Chagga homegardens, farm tours and participant observation proved very valuable for gaining experiential knowledge through daily encounters with different farms, farmers, locales, and weather. For example, farmers may not consider specific non-crop plants worth mentioning, but upon encountering them will elaborate their uses or their interactions with other plants. Farmers may have so many

species of trees that they will recall them all only on a farm tour, not in an interview. The labor-intensiveness or significance of a particular farm management operation might only be apparent when encountered in season.

The research was originally conceived as an exploratory study. As such, the scope of research topics was initially broader than the period of research in the field could support for in-depth study. The topics included in this paper represent a subset of the issues addressed in the exploratory phase of the study. The initial broad approach provided an overview of significant issues and the repeated, in-depth interviews provided rich, narrative qualitative data. However, the small sample size of both interviewees (twelve) and villages (one, with some comparison based on secondary literature and visiting other villages) and the choice of an opportunistic rather than statistical sampling approach strictly limit the generalizability of this study. The scale at which primary data were obtained is restricted to the village, household, and individual levels, thus limiting the extent to which these processes can be linked to zonal, regional, national, and global processes. I chose the village of Lyasongoro because of its accessibility and because it is adjacent to the forest reserve. I wished to explore the relationships between the reserve and the village.

All interviews were conducted in Swahili without an interpreter. Swahili is not the first language of either the respondents nor myself, but proved adequate for discussion of most issues related to the agricultural system, household livelihood strategies, and social and ecological change. Most formal interviews were tape-recorded or else notes and quotations were recorded by hand. These data were transcribed to electronic text files for coding and analysis. The major data analysis tool was Atlas/ti® textual analysis software,

which was used both during and after field research to organize and code field notes and transcribed interviews. This software is designed to support inductive, iterative research in the tradition of grounded theory (Corbin and Strauss 1990). Microsoft Access database software was used to record mostly numeric household demographic and farming data.

The approach taken to interpretation of the data from this study prioritizes farmers' own perceptions, accounts, and narratives regarding their world and their lives and experiences. I take these accounts as valuable and meaningful regardless of whether there can be or have been verified as "factual." Therefore, throughout the study I will commonly use phrases such as "reportedly" or "the farmers reported" to indicate that the analysis is based on the statements of farmers themselves, supplemented by field observations and secondary data. Quotations used within this document are translated to English based on meaningful, rather than literal, translation. However, the literal transcription in Swahili is provided in the endnotes. Interviewer's dialogue is provided in brackets and notes are provided in parentheses. Because Swahili has a gender-neutral pronoun, this is variably translated as feminine, masculine, or neutral, depending on the context.

4 Results and Analysis

4.1 Overview

The social and environmental changes seen on Mt. Kilimanjaro in the last twenty years are exceedingly complex. They are influenced not only by a large number of factors at the local level, but also by the regional, national, and international political-economic context. Some important developments at these wider scales, such as declining terms of

trade for farmers and economic reforms, were addressed in the Introduction (Section 1.1). These larger trends should be borne in mind even while I turn here to one set of critical, inter-related trends particular to Kilimanjaro.

The dynamics of and evidence for these trends will be discussed in detail below, but first I will briefly articulate the overall argument. First, the average size of *kihamba* plots on the mountain is declining. This is due primarily to land tenure patterns (that is, the culturally normative practice of bequeathing a portion of *kihamba* land to each son) in conjunction with population increase. A simple model of population-environment relations might predict that land scarcity would lead to labor-led agricultural intensification in order to increase productivity on smaller plots of land. However, in addition to small plots, economic forces are driving local Chaggas, especially youth and men, out of farming and into other types of enterprises and/or off the mountain to seek livelihoods elsewhere. As foremost among these forces, I would highlight declining terms of trade for farmers and increasing household needs for cash, both of which have been linked to changes brought about by structural adjustment programs (Mbilinyi 1995; Meena 1991). Due to these dual processes of out-migration and diversification of household strategies to include off-farm enterprises, household agricultural labor has become scarce. Therefore, both land and labor are limiting factors and labor cannot be expected to easily compensate for land scarcity through intensification of production (Figure 11).

These critical trends concern not only land in crop production, but also the on- and off-farm natural resources necessary for household reproduction (Figure 12). Fodder for stall-fed cattle is particularly critical in this regard, due to the importance of cattle

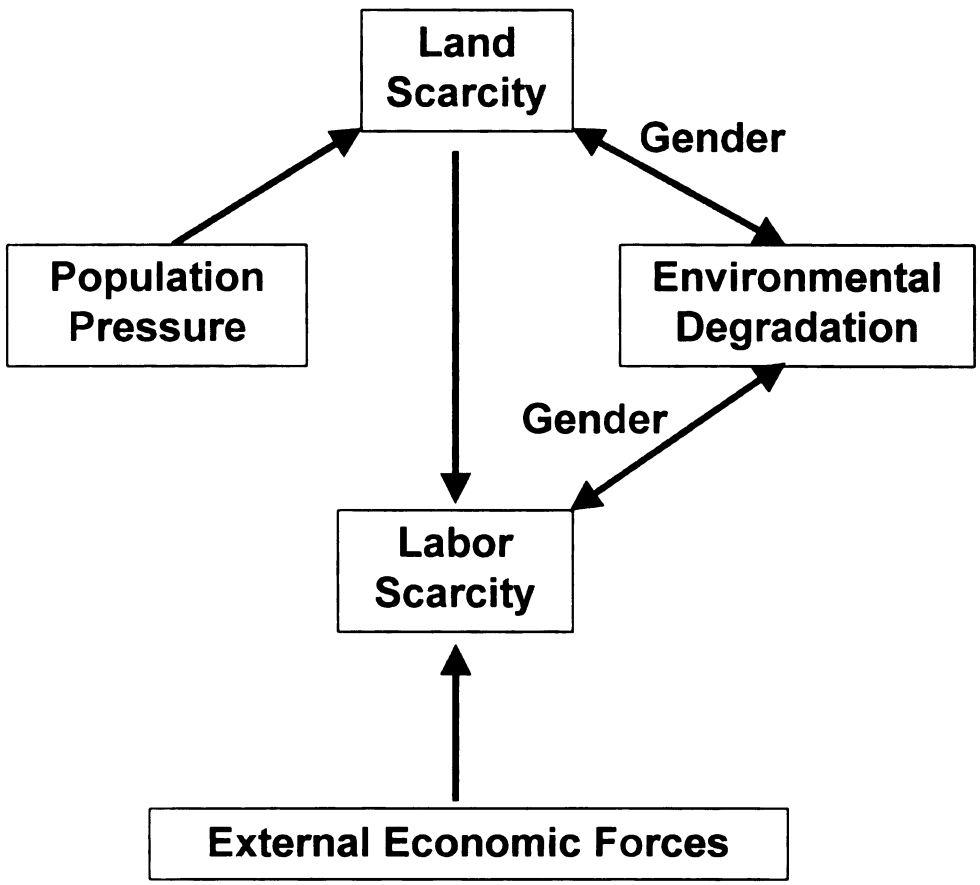

Figure 11. Model of simultaneous land and labor scarcity.

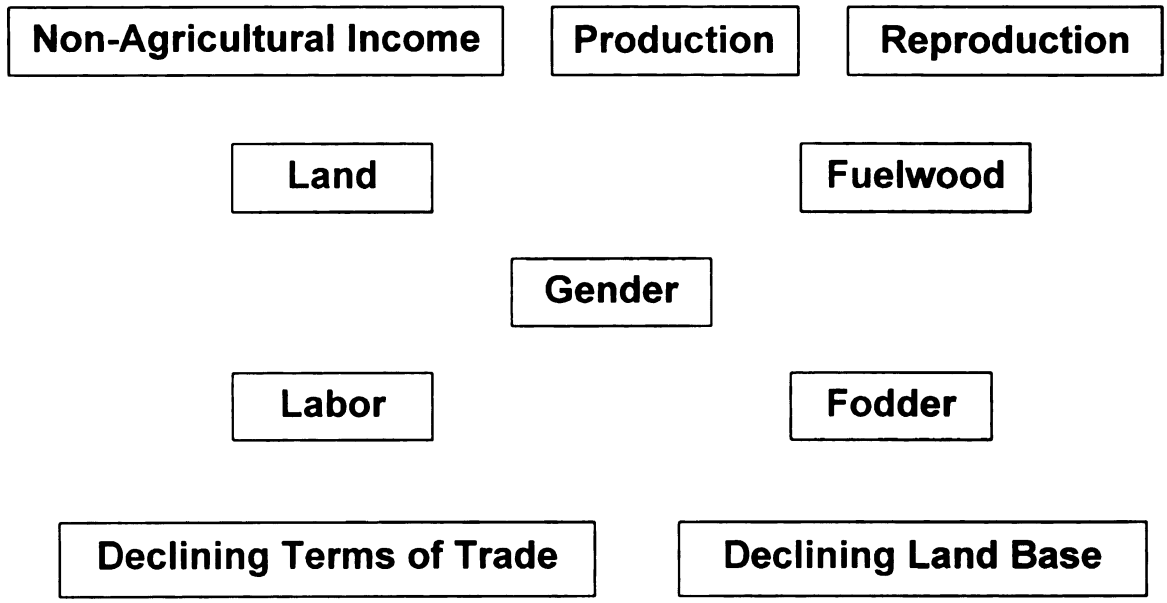

Figure 12. Model of factors affecting simultaneous land and labor scarcity.

manure in maintaining soil fertility and crop production. In the past, fodder grass was readily available in the interstitial spaces within or between farms, but farmers report that it is increasingly difficult to obtain. Scarce land as well as inadequate labor for traveling increasing distances both limit the availability of fodder and hence the number of cattle which can be maintained per household. The quantity of livestock reportedly declined by 50% between the 1950s and 1980s due to lack of fodder and increasing labor demands (O'Kting'ati 1985, iii). Other evidence of the declining availability of fodder is that in the 1960s, the sale of fodder was virtually unknown, but now people travel up to 10km to obtain it (O'Kting'ati and Kessy 1991, 77). The declining quantity of livestock kept has various consequences for household sustenance, but particularly relevant to the trends in land and labor is that the cattle manure available for fertilizer is inadequate to maintain soil fertility at past levels, much less to intensify production on smaller plots of land.

This simplified outline of the major inter-dependent social and environmental trends on Kilimanjaro illustrates how social changes at multiple scales have contributed to on- and off-farm resource degradation, which in turn has put further constraints on the ability of households to sustain themselves. The scope, quantity, and rates of these changes on Kilimanjaro are important questions that have been and continue to be examined by various researchers (e.g. Lyimo *et al.* 1999). The purpose of the present qualitative analysis is to elaborate these processes in greater detail as they relate to each other and as they are experienced by the farmers themselves. While clarity of exposition requires that different processes be addressed in turn, the highly relational character of these processes makes this exposition challenging. It will become evident that the way

farmers themselves talk about their lives indicates a high awareness of the complex and tightly bound relationships among the processes that affect them.

4.2 Land Scarcity

I begin this analysis with the critical trend of land scarcity, already well-recognized and established in the literature on Kilimanjaro (e.g. Fernandes *et al.* 1984; Gamassa 1991; Lema 1997; Lyimo *et al.* 1999; O'Kting'ati and Kessy 1991). For most of the farmers interviewed, small plot size and unavailability of local land was indeed identified as a primary constraint on household sustenance. However, rather than accepting the assumption that natural population increase directly *causes* land scarcity, it is necessary to understand the land tenure system, land inheritance, variability of landholding size, and land fragmentation *in the local cultural context* as critical mediators affecting land scarcity.

4.2.1 Land Tenure, Transfer, and Fragmentation

The Chagga have a unique cultural tradition associated with land tenure and inheritance. This tradition is embodied in the term *kihamba* which, though often used in the scientific literature to refer to the Chagga homegardens themselves, more accurately refers to the class of mountain land which is considered ancestral land. When asked whether *kihamba* land is owned by individuals, clans, or the government, most farmers responded that it is the property of clans or, in certain senses, individuals, despite the legal status of all land in Tanzania as property of the government (Shivji 1998, 81).

> *Vihamba* land is the property of the clan, it's not permitted to sell. Each person has an inheritance, his child has an inheritance, and so on. It's not the property of the government.[1]

Indeed, the Chagga have succeeded historically in maintaining clan control over occupied land on the mountain, even while villagization programs were carried out in other parts of Tanzania by the early socialist government (Shivji 1998, 13(fn)). This resistance to villagization means that the traditional dispersed pattern of homesteads surrounded by agroforestry plots has been maintained to this day.

Clan control of land also results in highly secure land tenure, encouraging long-term investment, without, however, the uncontrolled right of individuals to transact land. The right to transact land is often part of economic definitions of security of land tenure (e.g. Clay *et al.* 1996, xii, 25), but is not requisite for secure tenure, as the case of Chaggaland illustrates. Title deeds are usually unnecessary, since the borders of property, marked by a particular tree (*sale—Draecaena afromontana*). Sale of ***kihamba*** land was reported to be rare in Lyasongoro. It usually occurs between clan members, and only with the sanction of the clan for some special circumstance. When I asked why Chagga who have jobs elsewhere do not sell their land, one farmer responded with extreme surprise, "To sell your farm?! Ha! Where will you live?"[2] When I said that these people already live elsewhere, she said, "It's very hard for a Chagga to sell his farm."[3] She pointed out that even if he does not live on the farm now, he may move there in retirement, his son or grandson will want to farm it, and he will want to be buried there. If he were to sell, it would only be to a relative.

Strong cultural and spiritual meaning is attached to the particular ancestral lands of each Chagga. This is evidenced by massive annual pilgrimages (at Christmastime, and smaller pilgrimages at Easter) to the mountain by Chagga who live away, and by the strong desire of the Chagga to be buried on the land where their ancestors are buried.

Also, critical for understanding the process of land fragmentation, farmers reported a strong cultural value attached to each son inheriting a piece of land from his father, even if the small size of the plot forces him to make his living elsewhere. When asked whether one of her sons would need to obtain another farm or find other work, given the small size of her farm, a farmer replied, "Even if he will work and get another farm, he must get his share."[4] Similarly, another farmer elaborated:

> Even if it's a small farm, each one gets his space to build a house. He gets at least a place to put a garden. If it's a small farm, indeed, this is how it's arranged. If he's able, if he has his livelihood like this one, he can buy a farm someplace else. But here at home he gets his space to build his house. Indeed, this is how it's done in our parts. If there's a person with a small farm and each one is allotted his small place, he puts his house there and his little garden. Then if he goes where there's work and he has cash, he buys a farm some other place, but here at home he has a place to *hold on to*.[5]

As one villager succinctly put it, "We don't have farms here, we just have little plots to live on."[6]

Farmers claimed that in most cases this cultural value attached to land inheritance overrides the desire to maintain consolidated plots large enough to viably support a family, though fathers may decide to allocate larger plots to some sons and smaller plots to others. According to tradition, the larger plots are given to the first- and last-born sons, the last-born being given the responsibility to care for his parents and to inherit their portion of the ancestral land at the time his father chooses. One respondent argued that in the next generation, children will be forced to leave for lack of land, despite the reluctance of Chagga to leave Kilimanjaro. I remarked that otherwise it might become like a city on the mountain. He replied, "It already is! If you cut down all the trees you would see that it already is a city. The houses are just hiding in the trees."

As Collins (1987, 22) points out, land scarcity may result from processes other than population density. It may, for example, be a consequence of inequity in landholding size and corresponding social inequity which locks a large number of smallholders out of access to lands controlled by a small number of large estates. This is the type of social dynamic brought to the fore by a regional political ecology approach to population-environment relations. However, according to the respondents, this dynamic of inequity in landholding size has little role to play in land scarcity, at least in the vicinity of Lyasongoro, because a) individual holdings larger than five acres are few to none, with most estimated at two acres or smaller, and b) wealth is no longer strongly associated with landholding size, but rather with success in off-farm enterprises or employment. Nevertheless, it must be borne in mind that large holdings such as coffee plantations restricted expansion of farmers on Kilimanjaro in earlier periods (Gamassa 1991, 7). Within the narrow range of five acres or less, inequities in landholding size have resulted from initial differences in land allocation when Lyasongoro was first settled approximately a century ago (farmers report that those ancestors with more livestock to exchange with clan leaders were given larger plots) and from the differential inheritance among sons described above. It was reported that farmers in Lyasongoro with excess land (larger plots claimed more recently at the highest elevations) may allow relatives or neighbors to farm it without compensation, other than the labor invested in improvements such as terraces.

Due to the gender-differentiated processes of out-migration and off-farm employment alluded to above and described more fully below, access to land for women is increasingly problematic. In Chagga society, which is strongly patriarchal, women are

not expected to inherit land, but rather to have only usufruct rights to land via their fathers, their fathers-in-law, their husbands, and their sons, in succession during the course of their lives. Unfortunately, in this traditional scheme unmarried women, women bearing children out of wedlock, women who do not have male children, women who are widowed at a young age, divorced and abandoned women, and abused women who wish to leave their husbands do not necessarily have access to land.

> Girls are not given *vihamba*, only boys. When you get married your husband is given a *kihamba* by his father. If he doesn't have much he'll give according to what he's able. If there are many married sons, you must divide the land so that each one gets a little bit. If there are few children, you get land accordingly.[7]

While these problems are not unique to Kilimanjaro, there does seem to be greater resistance to women gaining ownership of *vihamba* land than to women holding title to newly settled land. Even in the latter case, women face barriers and inequities. A widow recalled that at the time of her husband's death, he had recently purchased land in West Kilimanjaro, but because the title was not to be found she lost all rights to that land.

Migration patterns and changes in modern society have probably increased the proportions of unmarried and divorced women. Perhaps for this reason and perhaps due to increased sensitivity to issues of gender equity, several interviewees agreed that daughters should be able to inherit land for their own security, but doubted that this would occur with much increased frequency due to the strength of the cultural tradition. Only fathers with very large farms were thought likely to bequeath *kihamba* land to a daughter. One elderly farmer related that her sister had been given *shamba* land (plots in the lowlands) by her father as a form of security, because he recognized that her husband was abusive. This farmer herself was widowed at a young age. Because she had already borne male children, she was allowed to remain on her husband's land but received no

assistance from her in-laws. Therefore, her father gave her a gift of cattle to provide some additional security. When asked if her daughters would receive an inheritance of *kihamba* land, she replied:

> No. No. They won't get a portion. Females definitely don't get anything. There are some who get a portion, like in Himo, in the lowlands, like my birth father gave to my sister. And me, my father gave me a cow.... Now other fathers know, they don't look at whether this one is male or this one is female. It depends on that father. Other fathers give out portions even for those who are female, they get their portion, their inheritance.[8]

The contradictions contained in this answer are indicative of the social changes and tensions surrounding the issue of gender and land. Many farmers are willing to acknowledge that women need more equitable access to land, but few are willing to alter tradition to give land to their daughters.

To summarize, I would argue that natural population increase on Kilimanjaro is not the singular cause of land fragmentation and land scarcity, as implied by traditional population models. Hypothetically, in a different cultural context population increase could be off-set by outmigration to urban or to less densely-populated agricultural areas in Tanzania. However, the cultural preference among the Chagga for each son to inherit a plot of land on which to build a home, even if not to live and farm, results in reduced plot sizes regardless of outmigration. Hence, the local cultural context and land tenure system are critical mediators influencing the relationship between population growth and the creation of land scarcity. Since access to land is locally structured by gender, marital status, age, and other related circumstances, these factors also mediate land scarcity. Furthermore, outmigration is also an age- and gender-differentiated process which, as will be detailed below, helps to explain how both land and labor can be simultaneously scarce.

4.2.2 Land Scarcity as a Constraint

With the specific cultural context of land scarcity on Kilimanjaro in mind, the question of the relative significance of land scarcity as a constraint to household sustenance needs to be asked. In particular, land scarcity as a factor influencing agricultural management, particularly homegarden stratification, diversification, and spatial arrangement, needs to be explored. Respondents consistently pointed to land scarcity and small plot size as a major constraint, requiring trade-offs between desirable management practices. For example:

> ...if there is a large area of trees, s/he will remove trees in order to get fodder grass for cows. This too s/he reduces in order to make space for farming. Because the number of children is increasing. These farms you found in the old days, our ancestors had big farms. Now that you have many children, indeed, it's increasingly divided up. In the end what's left over is small, each person just gets his small plot. It's like a building plot.[9]

In addition to trade-offs between land uses, farmers attributed declining soil fertility to land scarcity. As a farmer explained, even though the soil on Kilimanjaro is carefully tended, it is tired because it gets used every year, year after year. In the past, there was more land with space available for grazing, farming, fallowing, etc.

As expected based on the ecology of homegardens, farmers positively associated land scarcity with the extreme diversity, mixing, stratification, and spatial and temporal heterogeneity of the Chagga homegardens. Perhaps more surprising is that farmers invariably identified land scarcity as the primary or only reason for mixed cropping (*kilimo mseto*) in the homegardens, claiming that there is no other reason or benefit for mixing crops and that crops always produce better when grown apart. For example, one farmer said that the reason for mixed farming is that there is not enough space and that

farmers would get better yields if they planted each crop apart, if there were only enough space to do so.

One benefit of homegardens frequently cited in the literature is the efficient capture of light by multiple strata despite restricted space. When asked whether farmers take light utilization into account in managing their homegardens, respondents replied that farmers know inadequate light can be a problem. However, they attributed inadequate light to the mixed cropping system, rather than viewing the mixed cropping system as a means to efficiently utilize light. The following dialogue provides an example of this perspective.

> [But do you see any benefit to using light well by mixing everything, in order to use all the light?] Really, if you mix everything, nothing will get enough light. Eh. Because when you want coffee to reach here, and bananas are up above, now the coffee doesn't get enough light. Now, if we had big plots, we would put coffee here, bananas over there. Now we have small plots. Mm. [Okay. Is there any benefit to having shade for any crops? Or no?] Eh. There are areas like there in the field, you have to plant, for example, beginning there by the boundary, you plant one tree there for purposes of shade. Eh. There's a period of sun here that really burns, January and February. Now that sun is really bad. It scorches the earth. And then that soil has no fertility. Eh. It dries up very quickly.[10]

Thus, for the most part, inter-mixing of crops seemed to be perceived as a necessary evil rather than as an efficient system with ecological benefits. Many farmers said the mixed farming system is used simply because it was established by their ancestors. After hearing this explanation, I began to ask farmers why, in that case, did their ancestors, the inventors of the mixed homegarden system, initially mix crops if they had a good deal more land. This question received various contradictory responses. Several farmers replied that their ancestors had started mixed farming simply because they didn't know any better. Another mentioned that while the elders who developed the agricultural system had been knowledgeable, nowadays farmers just place crops here and

there wherever there's space, mixing crops because they have no space to do otherwise. Other replies included:

> I wouldn't know, truly. We found mixed farming on the day we were born.[11]

> Because in the past they had very large farms. They planted, they put trees for borders, and so on. Now these days plots have become very small here. They divided plots for the children to sleep there.[12]

> You can separate each thing, but land is scarce. We have allocated that your space is small, so you have to mix everything here. And you apply manure. But if you apply manure, things go just fine. Eh. ...Indeed, the ancestors had big farms, but they didn't know the meaning of agriculture. [The meaning of agriculture?] Eh. They had not yet recognized the meaning of agriculture. [Really?] If they had recognized that, agriculture where you put maize here, you return there, you put this, you return, you put beans here, if they had planted this way. But they didn't know its meaning. Eh. Nowadays people have planned with intelligence. They know things. And they've studied and so on. Eh. They have already studied and they know that if you mix it ruins things. It's ruined, some things choke out others. Mm.[13]

None of the farmers interviewed (an admittedly small sample) seemed to be aware of the many reported mechanisms by which intercropping may improve productivity per unit land area and general ecological sustainability. These mechanisms may include complementary use of soil resources, provision of beneficial partial shade to coffee, efficient light capture, layered distribution of root systems (Fernandes and Nair 1986, 112), conservation of soil and moisture, efficient cycling of nutrients, and plant diversity (Torquebiau 1992, 192-9). The Chagga homegardens are often cited in the literature as a particularly fine example of a sustainable traditional agroforestry system, at least under past conditions (e.g. Fernandes *et al.* 1994). Yet today Chagga farmers seem to view intercropping as an inevitable, rather than ingenious, method for dealing with land constraints and they do not seem to have a clear understanding of why their ancestors may have developed the method.

It is difficult to ascertain where the ideological preference for monocropping in the village comes from. Certainly monocropping is strongly identified with "modern" agriculture, suggesting that national-level discourse on agriculture has perhaps neglected the potential of intercropping systems, even while many Tanzanian agronomic researchers study and promote agroforestry and intercropping. During the colonial period, Chagga farmers were pressured to grow coffee only in monocrop, and therefore a monocropping preference might have derived from that period. However, on the whole Chagga farmers successfully resisted this pressure, continuing to provide beneficial partial shade to coffee by mixing with bananas and other trees (O'Kting'ati 1985, 36).

This raises a number of interesting questions. Why, then, did respondents not acknowledge any productivity or ecological benefits to intercropping? Are these ecological mechanisms not highly relevant for productivity per unit land area in this case? This explanation is unlikely. O'Kting'ati (1985, 114) reports that the Chagga homegardens have higher land expectation values than monocultures, even when production from minor crops is ignored. Were the early Chagga farmers aware of these benefits and did they intentionally mix crops despite having relatively larger landholdings? Have Chagga farmers gradually lost local knowledge of these benefits due to farm management practices being made tacit or rote? Or has this knowledge disappeared through collision with external knowledge systems that continue to promote monocropping as "modern" agriculture? Unfortunately, definitive answers to these questions are beyond the scope of this study, but the assumptions of one farmer about the presumed inferiority of mixed cropping are apparent in the following discussion:

> (Mixed agriculture) is traditional agriculture. (laughs) Because this spatially segregated kind is expert agriculture. Or no? [I don't know, it depends, I think.] To separate crops isn't expert agriculture?[14]

However, the tone of her query to me suggests that while experts might view mixed cropping as inferior, she herself was uncertain.

It is also important to note that while farmers seemed to view *inter*-mixed cropping as a necessary evil, they placed a very high value on diversified agriculture, that is, growing a wide variety of crops on their plots.

> These coffee and banana trees together, we were, the farm came with these coffee and banana trees. Therefore we can't remove them. Because land is scarce. Indeed, this is why people mix. But if we had enough land to be able to put banana trees over this whole farm, and another crop here like coffee, it would be better. Eh. Because the coffee would produce a lot. And a lot of bananas would bear, if we weren't mixing them. But now we're obliged to mix. You mix this, you bring that, you put this, you put that, in order to get something to eat. Without mixing, you don't get food.[15]

In sum, the farmers viewed land scarcity as a critical constraint on the farming system, forcing them to make trade-offs among necessary land uses. They viewed intercropping as a tradition put in place (literally, given the location of tree plantings) by their ancestors and simultaneously as a necessary evil forced on them due to land scarcity, but resulting in lower productivity. They did not recognize any benefits to intercropping in terms of productivity per unit area, beneficial crop interactions, or other ecological benefits, but they did value the diversity of foods and other products produced in the homegardens.

4.3 Labor Scarcity

As I discussed in the introduction to Section 2, the terminology of "scarcity" is problematic as it has typically been used in development discourse. The previous section demonstrated how, although farmers' plots are small and space is indeed cited as a

constraint, this condition is not an objective, given fact, but rather the product of historical and material processes, including cultural factors. This section relates the extreme distress expressed by Chagga farmers, especially women, in the face of insufficient time and help in terms of labor to meet the productive and reproductive needs of the household. However, this conceptualization of labor scarcity, like land scarcity, should not be taken as an isolable and inevitable fact, since labor scarcity is conditioned by a great many contextual factors. These factors range from structural trends, such as declining terms of trade, to cultural factors influencing gendered divisions of labor and "needs" definition to socioeconomic changes driving choices about out-migration and education. Thus, when farmers speak of insufficient labor, this must be recognized as a simultaneously real and socially-constructed outcome of historical and material processes influencing individuals' decision-making processes.

4.3.1 Challenging the Divides

Before turning to the question of how labor can be scarce in a context of land scarcity, I would like to first address some problematic theoretical issues. Chagga households' livelihood strategies are extraordinarily complex and the trend appears to be towards further diversification of activities, each requiring household labor. In this complex and dynamic context, the traditional division between productive and reproductive activities and between cash crops and subsistence crops becomes very ambiguous and, I would argue, difficult to justify. Likewise, as discussed in the introduction, the necessity of diversification of income sources also has led to the increasing importance of non-farm income and ambiguity in the divide between agrarian/non-agrarian households. In the past, feminists and other theorists strived to

distinguish even "subsistence" agricultural production from domestic work and reproduction (Deere and León de Leal 1981, 360). Today, Mbilinyi argues for a gender analysis that links production and reproduction and "rejects the false dichotomy." She points out, "The national economy depends on the unpaid work of women (and to a lesser extent, men) to produce food for household subsistence, to provide fuel and water, to maintain the household and family on a daily basis and thereby reproduce the labour force" (Mbilinyi 1997, 322).

This has important theoretical implications because much economic analysis of rural and agricultural sectors has been predicated on these divisions. Commonly, the exclusion of reproductive activities (often primarily the work of women) from these analyses has resulted in skewed interpretations. In fact, this exclusion is one of the reasons suggested by Collins (1987, 24) for the assumption of excess labor in rural areas, which in turn leads to the failure to recognize the phenomenon of simultaneous land and labor scarcity. Excluding reproductive activities from analysis also excludes much of the environmental dynamics of agricultural livelihoods, since natural resources gathered and used for purposes of household reproduction are considered irrelevant to production. The analysis here does not rely on a strict division between productive and reproductive activities, nor between cash crops and subsistence or food crops, in part because of the theoretical implications and in part because such a division cannot be sustained, particularly from the perspective of farmers themselves. Women farmers say they value food crops for household subsistence, but also value coffee for needs such as school and medical expenses, and for buffering seasonal fluctuations—in other words, also for household subsistence.

Bananas provide an example of the ambiguity of these divides. One farmer explained that in the past bananas were once so plentiful that there was no local market for them. Then there came to be a market for bananas, on and off the mountain, and they became both a cash and food crop. Now that productivity has declined and is especially low at high altitudes, they have become only a food crop for many families. Bananas remain a profitable cash crop for farmers who grow them in excess of their needs, especially in the productive middle zone, but in contrast some farmers in Lyasongoro have to purchase them in local markets to meet their own household needs. Research indicates that bananas are gradually being replaced by maize and rice as a staple food (Lyimo *et al.* 1999, xix). In the case of one family, which grew very few bananas because they lacked the labor for planting new trees, cassava was grown as a substitute staple.

Similarly, leaf and vegetable crops, which are often considered subsistence crops, are now grown both for consumption and profitable sale while maize, commonly a cash crop, might be sufficient only for household consumption. Only coffee is grown solely for sale and never for household consumption, but even this income is often required to meet household maintenance expenses, such as food purchases, school fees, or health care, as opposed to luxury items or investment in farming or business enterprises. Many farmers complain of the declining productivity and profitability of coffee, but one woman farmer, in clarifying the reasons why she will nevertheless not reduce the number of coffee trees, explained the value of coffee in subsistence and cultural terms:

> Coffee is a commercial crop, it helps with the children's education. You can't remove it completely. Even if you get only a little, it helps, to get money. These bananas are just for food. But (coffee) is for commerce. If people get two buckets, like four kilos, four kilos you get money that helps the children to go to primary school. [Even to reduce it a little bit isn't good?] Coffee? (laughs) The men love coffee. If you even break a branch! (laughs)[16]

The ambiguity of the productive/reproductive divide is also evident in the case of fuelwood, which is grown on-farm for household cooking but is also gathered in the forest, split, hauled, and sold for cash income, primarily by young women.

4.3.2 Non-Agricultural Income

In the context of small plot sizes per household, declining productivity, and poor terms of trade for coffee and other crops, Chagga farmers are increasingly incorporating non-agricultural income into their livelihood strategies. As one farmer put it:

> Agriculture doesn't pay in Chaggaland, not to depend on. This is because plots are small.[17]

> Truly, here in Chaggaland people really use their intelligence. You have to be clever to find a way to live.[18]

This trend of farm households engaging in a range of non-agricultural activities is not unique to Kilimanjaro. Rather, it is arguably the trend throughout sub-Saharan Africa, though probably under-reported due to entrenched assumptions about sectoral development (see Section 1.1 and Bryceson 1997). Non-agricultural income may take the form of various business enterprises or employment engaged in by household members living on the mountain or by household members out-migrating to work elsewhere but maintaining ties with home. Illustrations of the first case will be elaborated here and the latter case will be addressed in the subsequent section.

Farmers clearly articulated the impossibility of relying on only one type of income activity, agricultural or non-agricultural. For example:

> You can't say that you'll just farm, you'll fail to have cash to buy supplies and so on. You can't say you'll just have a job, you'll fail to have produce for the children, or little things for eating. Therefore, both of these are equally important.[19]

When asked how a woman farmer saw the importance of the farm compared to her husband's work in the city in terms of obtaining household necessities, she replied:

> Truly, in our region, a person with a small area has trouble. Because the value of Tanzanian currency is low. Now if you won't use these kinds of things (commodities) for your home, you will definitely have trouble, you will live only with difficulty. If you depend only on that cash, cash with which you buy vegetables, you buy sugar, you buy meat, etc., it's not enough. Now you see the reason why we farm a bit; you get potatoes, you get squash, you get a little of everything here on the farm, bananas, coffee.[20]

Thus, despite the trend towards non-agricultural income, agricultural production remains central for household sustenance. Several farmers who had attempted to start their own shops reported that this was not reliable as a primary source of income.

> You find that as soon as you've opened a business, immediately you are defeated, you've quit it.[21]

> The store isn't enough to meet our needs and to tend to the family like this farming. It's just something to help out, to get a little extra cash.[22]

By now a theme of the need for cash on Kilimanjaro should be apparent. Over the last century, roughly, the region has undergone a transition to a cash-dominated economy, yet one where agricultural production for household consumption remains important. This transition has had far-ranging consequences for social and ecological relations on the mountain, including changing modes of social support and subsistence, and dependence on cash crops or non-agricultural income. With the advent of economic reform and "cost-sharing", as discussed in Section 1.1, households need cash for school fees and medical expenses that were formerly provided by the state. While a cash economy does, in theory, allow households increased flexibility to purchase goods or to buffer seasonal shortages via savings, reports indicate that increasing needs for cash have weighed heavily on the poorest segments of the population, who frequently lack access to

cash income sources, capital, or loans. The Kilimanjaro Regional Nutrition Programme reported:

> Though Kilimanjaro is not a deprived region as far as social and economic infrastructure is concerned as compared to other regions, there are some extremely socially and economically poor households in the region. Such households have low access to resources, especially land and all other basic human needs such as health, housing, and food (KRNP 1990, iv).

Differential access to cash income in an increasingly cash-dependent economy, probably more so than landholding size, helps to explain the high levels of social inequity on Kilimanjaro today, a relatively wealthy region, though other factors such as cultural norms also contribute. "Quite often material progress in 'best' villages is not matched with social progress" (KRNP 1990, Preface).

Commoditization is an example of one outcome of the growing dependence on cash. *Salati*, or watercress, is a very nutritious wild vegetable that was traditionally a common resource available in streams and irrigation ditches. Today it is sold in the market as a commodity. In Lyasongoro, an individual dammed off a section of a stream with a bank of stones in order to lay private claim to the *salati* grown there (Figure 13). Henceforth, this source of nutrition will only be available to others via the market. As commodities replace traditional means of meeting household needs, certain forms of expertise and knowledge are reportedly being lost, leading to further dependence on cash.

> Now you come to find people are going with the times. Traditional houses and grass aren't to be found, they use tin sheets. What causes it is this, there are many uses of cash. In the past, many needs were met by craft expertise. Expert knowledge that didn't require any cash.[23]

Knowledge of local medicinal plants and their uses is another example of this increasingly rare traditional expertise.

Figure 13. Privatization and commoditization of *salati* (watercress) on common property.

Cash should allow households some room to negotiate seasonal demands. On Kilimanjaro, women have traditionally been the market sellers. They continue to use the markets to balance cash and food demands and buffer seasonal fluctuations. However, as will be elaborated below, farmers report that they are not able to save enough cash or food stores to see them through the season of scarcity. The regional economy also depends heavily on cash income from tourism, which unfortunately is also highly seasonal in character. To make matters worse, the low season for tourism coincides with the agricultural off-season. A farmer with male relatives who worked occasionally in the tourist industry described the role of tourism in the village economy as follows.

> A lot of the wealthy people's houses are for things to do with the mountain, tours, hotels.... Yes, it's a big support. If it weren't for the climbing season, it would be very difficult.... [Does this cash get spread around?] Yes, it circulates around in the village.... Climbing businesses truly help a lot. If you yourself aren't able, your husband goes, or your child, or another person, but that person when s/he gets money, you have your business, s/he comes with it, you get a customer. Therefore, this cash circulates.... But money available in large quantities here on the mountain, there isn't any, in these parts there isn't any. And farming doesn't pay.[24]

Thus, some of the cash income from tourism reaches villagers directly or indirectly, but others reported that much of the cash leaves the mountain, especially when spent on luxury items.

4.3.3 Migration, Work, and Residency Patterns

Non-agricultural household enterprises—which are increasingly necessary in the context of the cash economy, declining agricultural productivity, and land scarcity—are drawing household labor away from agricultural activities. At the same time, some household members are removed from agricultural labor entirely due to migration to nearby urban areas (predominantly Himo, Moshi, and Arusha) or to other regions.

Because of the historical influence of missionaries and settlers on Kilimanjaro, the Chagga had a reputation for being highly educated and migrating to urban centers to work in government and business, long before land scarcity became critical. The Chagga diaspora is fascinating in itself, but it is beyond the scope of this work to detail these migration patterns. Here I will focus on the implications of out-migration for household strategies, labor patterns, and land scarcity on the mountain.

Given the severity of the land shortage on the mountain, it is at first glance surprising that more Chagga do not simply migrate to other regions where agricultural land is abundant. Farmers identified several reasons for a general resistance to out-migration, foremost among them a cultural attachment to living on the mountain.

> On Kilimanjaro, land is scarce. You have already been told that for the Chagga it's very hard to move to many other areas. They don't like to at all. Except that the state of life these days makes people learn they must move to other parts, because you find the family has insufficient space for a person, to help his family. Indeed, so many these days are raising themselves up this way. But you will find that he won't let go of the section that he was given by his parent. He can't let go of the place, he can't leave it empty like desert. You will definitely find that he tends it. If not himself, he'll hire even a goat.... But for land to be empty without anyone, it's not easy, it's not easy.[25]

As this explanation suggests, even absentee owners will usually arrange for some cultivation, or at least grazing, of their land. Often the arrangement will be with neighboring family members or with a hired laborer to maintain a homegarden or, as in one case I observed, simply to clear the land for seasonal maize planting which requires less day-to-day maintenance than a homegarden.

Class and opportunity structure probably play the most important role in determining who will out-migrate, despite the cultural attachment to the mountain. Wealthier, educated Chagga will migrate to where job and business opportunities are and poor, landless farmers will also migrate to where land is available. Age is another

important factor, as younger people perceive farming as a less desirable occupation, given the shrinking land base and declining terms of trade.

> Children often don't want to busy themselves with farming matters...they are bound to go to the city.[26]

> Truly it's tiring, life here in the countryside is hard. Because you're just chasing after money. If you don't, you use up all your strengths. So now we've started to compare rural life and city life. City life is better I think, because I've already stayed in the city. And it's not just me who's stayed in the city, even others like it, but when it has to be the farm, I stay on the farm.[27]

Many of the older children, both male and female, of the farm families were in vocational training in the cities.

Statistics on the precise gender, age, class, and education make-up of the part of the population out-migrating are unavailable. Of the farm families sampled, 8 women and 8 men of the younger adult generation (about 36% of the total number of adults) plus one man of the middle generation lived primarily off the mountain during the period of research. No one from the eldest adult generation lived off-mountain. Farmers reported that wives often accompany husbands who out-migrate. These families where all adults are off-mountain would not appear in my sample of residents. However, wives do not generally out-migrate without their husbands, supporting my impression that out-migrants are disproportionately male and of younger generations. Other reports also confirm this impression that mostly married women are left behind to work in agriculture (KRNP 1990, 66). Migration and residency are further complicated by every variety of migration pattern—seasonal, weekend, holiday, for temporary employment, for education, for retirement, residing with relatives, etc.

Complex rural-urban migration patterns are being reported worldwide as part of the diversified strategies of rural families in the context of declining terms of trade for

small farmers. Remittances from the urban employed to their wives or parents in rural areas have been crucial in some cases for rural families' survival. From this small study, however, the importance of remittances from urban areas is not clear. Women in the study with husbands working off the mountain did usually receive cash support. However, parents reported that they did not receive significant support from their children residing in towns and that, in fact, some children were being supported during their education by cash earned and food grown on the mountain. This implies a strategy of sending young people to urban centers in order to foster their independence from the family and their freedom from not very promising futures in agriculture, rather than with the expectation of significant future remittances. The following discussion explains this dynamic:

> [And your children who stay in Arusha?] They just depend on us, they haven't earned much cash yet. If you get a little, like 2000 (TShillings), you have to send it to them, so on and so forth. I see s/he has trouble, s/he endures it. (laughs) S/he endures it. Especially the girl, I tell her, she just started (vocational school) last year, March. She hasn't been there very long. So, she has to pay the costs of the vocational lessons, soap for washing, oil for cooking and lamp oil, that is, she's bound to make demands on us here at home. [Do you think there are more necessities (living) in the city than in the village?] There are more. Especially the food there. And here we get greens (*mchicha*) from the garden. They have to buy it. There in the city it's for sale, maize we can grow, we use produce from the cows, there they buy, everything just for food. [How do you view life in the city, or how do they see it?] Very difficult, truly difficult. But you teach them how to be able to endure until they can succeed. [Do you think they'll return again to the village?] I think they'll make this decision themselves. If s/he succeeds in their work, if s/he comes to practice it here in the village, it's s/he herself/himself who arranges it. If s/he desires to work there (in the city), it's s/he herself/himself who will plan it. We don't make their plans.[28]

Another farmer, who had herself lived in the city in the past, described a more equitable relationship between household members living in the city and the village.

> But also, city life without the farm wouldn't be possible for people.... Because people in the country get cash from those in the city. And those in the city get things from those in the country. These things help out.[29]

It is important to note that the families interviewed in this study were confined to ordinary farmers, though in general Chagga farmers are considered wealthy by Tanzanian standards. Most of the younger generation in Lyasongoro have cement-block homes rather than wattle-and-daub construction or traditional Chagga round houses. However, dispersed around the mountain are the occasional large, modern homes built by Chagga successful in business, government, or academia, both in Tanzania and abroad. With the exception of those who live on the mountain and invest in tourism, creating employment opportunities, these very wealthy Chagga reportedly have little impact on the rural economy.

> [You said that cash doesn't circulate here. How do you view the wealthy people who live outside, but have a house here? Do you think they help with development on the mountain, or...] Wealthy people who live outside, likewise, due to understanding, people don't come to understand from a distance. They just put up their house, but to depend on him/her to make things productive here is difficult, because s/he already knows that income here is very hard (to get). It's better to go to the city where you can seek and find income.[30]

> [What do you think of the wealthy people from Kilimanjaro who live outside, do you think they help here in the village or they don't help?] Truly, not all of them. Maybe you find your relative or your brother, s/he can help you. But others less close it's not very easy. They help their own kind with whom they have a relationship.[31]

AIDS is another factor related to migration and social change which has impacted Chagga households both in rural and urban areas. In at least two, and perhaps three, of the 10 households sampled, children orphaned because of AIDS were dependents of their extended family. The land inheritance of the deceased may be available for the use of the extended family, slightly alleviating land scarcity (though this does not apply to the case of orphans living with their maternal grandparents). However, this probably does not compensate for the proportional loss of productive, adult family members and the

increased proportion of child dependents. Regarding AIDS, as one farmer put it, "They are being cut down like grass; they are laying down like grass."[32]

Understanding these migration and work patterns, in combination with the traditional system of land inheritance in Chaggaland, helps in large part to explain the phenomenon of simultaneous land and labor scarcity. As would be expected in a context of declining plot sizes, declining productivity, and declining terms of trade, many Chagga are out-migrating. This does not automatically translate to more space for those remaining, however, because cultural norms require that even those sons out-migrating receive a plot of land, even if it's only big enough for a house and garden. Thus, some agricultural land is lost to house-building and other areas may go uncultivated if no one from the family resides there. If someone does reside there, it is likely to be women, children, and older generations, who must replace the agricultural labor provided in past generations by resident men in the household. Given smaller plot sizes, it might be assumed that overall labor requirements would be lower than in the past and that, therefore, despite out-migration, labor should be in surplus. This assumption is predicated on a narrow view of mainly "productive" household activities, ignoring the labor, typically women's labor, required to reproduce the household. This reproduction in turn depends in part on natural resources available off the farm and held in common, such as fuelwood and fodder. Land scarcity and land degradation make these resources less available and severely impact household labor requirements. The next section will detail how households negotiate competing demands for their labor, and how gender and other social relations impact this process.

4.3.4 Division of Labor and Gender Relations

With increased out-migration of men, a basic typology of three household types must be considered. First, there are male-headed households with the husband present and active in day-to-day farm and household management. Second, there are households where the males are absent but have the final say in certain decisions. These might be considered de facto female-headed households. Finally, there are de jure female-headed households. The proportions of the last two categories seem to be increasing with increased out-migration of men.

Historically, the general gender division of labor in Chagga culture was that women were responsible for household reproduction and homegarden agriculture and men and boys were responsible for livestock. When coffee was introduced, men became more involved in management of and labor in the homegardens, particularly the profitable components. Today, however, most of the men in the families interviewed pursue other occupations or have out-migrated. Some elderly men and capital-poor men are full-time farmers, but their labor tasks are somewhat differentiated from those of women in the household. Husbands, sons, and schoolchildren may help with agricultural tasks occasionally or seasonally. However, in Lyasongoro women perform the majority of farm labor and farm management tasks. Today there is also some increased flexibility in the traditional gender division of labor. For example, some women are learning to prune coffee trees and to work as mountain climbing porters, and some men are willing to cut fodder grass and clean cow stalls.

Women are primarily responsible for family subsistence and increasingly for "productive" activities as well, whether agricultural or non-farm enterprises. They are

therefore the first to feel labor, cash, and transport constraints as well as grass, fuelwood, and food shortages. Although here I focus on labor constraints as expressed by women farmers, it should be evident from the following quotations that labor shortages lead to and link systemically with other problems and constraints. For example, although soil fertility and production can be improved by application of cow manure, families often have insufficient labor to collect fodder to maintain more stall-fed cattle.

> [You don't want more than one cow?] I'm not able to because it's a lot of work. [Work to get fodder grass, or everything?] Now. If you have two or three cows, they can prevent you from doing the farm work, like cultivating, and when it comes time to harvest coffee you won't have the time. If I had family enough to do the work, I would add two or three cows, we would help each other out. Yes.[33]

Note that this farmer must consider seasonal labor constraints (planting season and coffee harvest season) in deciding how many cattle to keep. In this family, half of the children were attending trade school off the mountain, the others lived at home but attended school locally, and the husband worked frequently as a porter on the mountain. Thus, the wife bore primary responsibility for household and farm work, in addition to providing full-time care for her ill, elderly mother-in-law.

In theory, labor constraints could be ameliorated by hiring laborers, but for many cash-poor families this is not feasible.

> Now we have no cash to hire laborers to trap those *fuko* (type of rodent pest) down below. If you plant banana trees and one is eaten, it falls, and if you plant...it goes on this way. So, there's no assistance with labor to help here on the farm.[34]

Note that while best management practices for controlling *fuko* were known, the labor to implement them was insufficient. Furthermore, those women farmers attempting to raise cash through commercial enterprises, such as small stores, reported difficulty balancing

labor requirements on the farm and at the store. One woman determined that the time invested in the store had not proved worthwhile.

> But the way work has started to squeeze now and then, and much of the time I don't have the opportunity to watch the store and get such a small amount of income. Now here we're going into May, and continuing into June, indeed, it's the time for cultivating. When you've finished hoeing, you are planting, when you've finished planting, you're weeding, even twice. Therefore, the time I have to look after the store is scarce, it's the work for food crops so you don't lose them. That is, the store isn't enough to meet our needs and to support the family like this farming. It's just something to help out, to add cash.[35]

Therefore, she decided to withdraw her involvement from the store, a group enterprise.

In the traditional gender division of labor, men perform the annual pruning of coffee branches (critical for maintenance and productivity). The technique requires some special training, perhaps three months at the local trade school. In households without resident men who can perform this task, women farmers may hire male relatives or neighbors to assist them. Although farmers invariably reported that it is not wise to skip the pruning one year if labor is unavailable, because it will hurt production in future years, one household headed by a widow reported that late in the season they still did not have sufficient cash to hire a neighbor to prune. She said that she would like to obtain training in coffee branch pruning herself, but had not had the opportunity.

Implicit in the reports of many women farmers is that labor is even more of a constraint than land, sharply countering the assumptions of traditional population-environment models. One family, with a relatively large farm in the higher elevation area of the village where land was more recently allocated, reported insufficient labor to fully utilize the land.

> ...there's no one to help us, if the children are doing their own work. For us, we're defeated. [So, you have land, but no labor.] Land is there, eh, there isn't enough labor.[36]

However, this family occasionally farmed a plot in the lowlands, requiring only seasonal labor (rather than year-round maintenance) which a teenage daughter provided, although she normally attended trade school in a neighboring village. One farmer's husband earned sufficient cash income from his off-farm employment to purchase land in the lowlands, but the wife reported that she would not have enough time to manage it (even though she already employed a male laborer for assistance with her homegarden plot).

> I don't have another farm plot. If I needed it I would get it, but I would get very tired. I can't do it.[37]

However, the priority of land shortage versus labor shortage varied with circumstances from household to household and only a few farmers identified one over the other as a primary constraint. This key point indicates the simultaneity of land and labor scarcity at both the regional scale and the household scale.

4.3.5 Social Support and Stratification

Gender, age, and labor relations are closely linked to issues of wealth stratification, marginality, and social support in the village. Understanding the continuing significance of the homegardens in this community requires addressing these issues, since marginalized households appear to be more dependent on the diversified homegarden than wealthier households. Although the economic importance of homegardens on the mountain is decreasing for some farmers (relative to maize-bean farming at lower elevations), mixed farming on the *kihamba* plot is still the main source of income and subsistence for others, especially those without business enterprises, lowland plots, or easy access to capital.

To understand the range of options farmers have for coping with livelihood constraints, I asked about the extent to which individuals could call on others for social

support as various forms of material aid. In Section 4.4.3 (Migration, Work and Residency Patterns), I discussed the generally limited extent of social support provided by community members living off the mountain. Here I discuss the range of social support within communities and households on the mountain.

Most farmers reported that each adult individual has his or her own cash account, unless a married couple shares one account. Married couples of each generation typically have their own plot of land.

> [Do your in-laws farm together with you, or each one has their plot?] Each person has just their small plot, garden-size. It's like a garden, it's just a small plot. Eh. Each person has their little plot.[38]

> [And do you all share one fund? If one person needs cash or aid, do you help each other out or does each person have a separate fund?] Each person has their fund. Eh. Each person has their fund. There's no mutual aid. [Therefore, even if your (adult) male children help with the farm, it's just to help out, they won't get any profits from the plot? It's yours?] No. It's each person. Like the way these girls help, they just help out. [But this son has already married, so his wife has her portion of land?] He's already married. She has his portion, and his cows. She does her work by herself. [It was like this even in the old days?] Even in the old days. Eh. Even in the old days.[39]

When women are widowed or divorced, they may face extreme isolation if neither their husband's nor their natal families are willing to provide support. The widow who already had male children was allowed to reside on her husband's land, but received no other help from her in-laws.

> When my husband died, I was busy with the children all by myself! Without help from in-laws, without the aid of inheritance, without any help at all, it was that I had moved here because my husband died. I took care of myself by myself, there wasn't help, if you request aid they don't give it.[40]

This level of individualism, even between generations of one family living on neighboring plots, is quite distinctive to Chagga culture in contrast to other Tanzanian ethnic groups where pooling resources is more common.

Substantive social support between more distant relatives or neighbors is likewise reportedly rare, especially between members of different class strata. Most of the households in the sample were relatively poor. One farmer described her relations with wealthier people as follows:

> You will find wealthy people will look after their fellow wealthy people. But a wealthy person won't meet a person of a low class. If he knows that a wealthy person will help a poor person, many times even if he gives to you it's just a little.[41]

Hence the forms of social support typical in the village do not appear to serve as redistribution mechanisms, since the main forms are either mutual assistance between people of a similar class or else very limited assistance from wealthier to poorer households. The same farmer also reported that requesting aid from wealthier people could invite derision[42] and shame; the wealthier donor may never let the poorer supplicant forget the favor.

These findings concur with a study of class relations on Mt. Kilimanjaro, in which Chagga cultural ideals of wealth and entrepreneurship, in combination with the influence of introduced ideologies of development and modernism and the erosion of social safety nets and kinship obligations, were found to negatively impact childhood malnutrition (Howard and Millard 1997, 11-12). These findings point to the contradiction between the international reputation of the Chagga for wealth and education and the reality of a sector of poor, marginalized farmers, linked to the pressures of a tightening cash economy and limited distribution of resources from wealthy to poor.

At the same time, however, some forms of mutual aid between members of the same social class reportedly make a significant difference in household livelihood strategies. Examples I observed or that were related to me included giving seeds or

cuttings, sharing extra fodder grass, trading advice, cooperating in business enterprises, assisting with house building, managing lowland plots, gift giving at times of celebrations or funerals, and grandchildren providing labor and care for grandparents. Also, as reported above, some landowners with excess land may make it available to land-poor relatives. The relative importance of these forms of social support for household livelihoods is difficult to measure and warrants further study, but farmers appeared to value such exchanges highly.

4.3.6 Seasonality

Seasonal variability in the economy and the farming system on Kilimanjaro is a source of hardship, especially for the poor. It is necessary to understand this dynamic since one benefit of the mixed homegarden system, with its variety of seasonal and year-round crops, is that it helps to buffer this seasonality.

When asked when the "season of trouble"[43] occurs, all farmers agreed that the worst season runs from the beginning of the long rainy season (monsoon rains—*masika*) until July when the rains end and the tourist season resumes. During this time, farm production and income are low, savings from the coffee harvest have usually already been spent, and the tourist season is low. This is also the maize-bean planting season in the upland zone, when women have the most heavy work to do, and it is the cold season when more food is required to fuel this work, especially at high altitudes. The confluence of these factors results in overall food scarcity, cash scarcity, and economic constriction on the mountain.

It is interesting that the tourist (mountain-climbing) season affects villagers to such an extent, since a large proportion of the income from tourism probably does not

remain on the mountain—for example, park fees and payments to outside tour companies. Some Lyasongoro men and men from other villages on the mountain earn income as guides and porters, but village leaders and women complained that much of this income is spent in the cities and on luxury items, including alcohol and cigarettes. I believe that if a greater proportion of tourist money were captured by or redirected to village women responsible for household subsistence, it could make a large impact on the household cash supply and village development.

When asked how households cope during this season, one farmer replied that you just have to get by, skipping meals if necessary. 1974, 1983, and 1997-1998 (El Niño) are remembered as very bad years when people went hungry. Hence, in addition to seasonality, weather and pest variability from year to year also have serious consequences for household survival. The Kilimanjaro Regional Nutrition Programme reports that the region maintains food storage "godowns," but that storage at the household level is lacking due to pest problems. Forms of household storage include drums, silos, sacks, cribs, and attic spaces (KRNP 1990, 21-22).

Farmers did not consider reserving cash savings or selling off livestock to be realistic or reliable solutions to the cash and food constraints of the low season.

> Here there isn't anything that we can sell in order to save up that cash. Or there's nobody to buy their necessities from us. We don't get anything, even the crops which we want to harvest here on the farm, they don't last for very long. If you harvest them here on the farm, immediately they're just finished. Perhaps I don't know if it will reach July, if they (crops) reach then they're already finished. Because the farm closes up (dries up) a lot. And the maize doesn't produce. It doesn't produce the same in our parts (our elevation). Until August, it doesn't do much.[44]

> The coffee money has been taken by CBD. Now you can say you'll save some of that cash from coffee if you get it, if there's no CBD, then you have it. For us, if the cash isn't available because of CBD, or if you have your cow, you sell it. If you don't have a cow, you don't have coffee, indeed, you just have trouble.[45]

Furthermore, farmers said that even if they had livestock to sell during the low season, they would be forced to sell at low prices, since the cash constriction would translate to a severe scarcity of buyers on the mountain. Most farmers were adamant that they could not hope to save enough cash to see them through the difficult season, even in years of favorable weather. However, they agreed on the importance of having a savings account, if possible, especially for medical emergencies. Interestingly, a sermon at the village church counseled members to keep a savings account[46] and to make a plan for managing the household economy, particularly given the declining state of the national economy and the inability of the government to provide support.

While cash and food are scarce during the long rains, several farmers noted that the total number of cattle that can be maintained is limited by grass availability in the dry season as well as by labor available in that season to search farther for grass, if necessary. The number of cattle kept, in turn, limits the quantity of manure available for soil fertility maintenance and thus overall crop productivity. Many farmers dry maize stalks that can be stored for up to two years to use when fodder is scarce or when labor for cutting fodder grass is unavailable.

Grains, legumes, and bananas can also be dried and stored for food, but supplies for canning or otherwise preserving food are not readily available. Thus farmers are often forced to sell produce at low prices when it comes into season at once (especially tomatoes) and to buy produce out of season that they are accustomed to use in cooking (such as various vegetables). Cassava tubers (*mhogo*) can be left unharvested for over a year, providing another form of storage and buffering of seasonal scarcity. Bananas usually produce year-round, with a low season lasting only one-quarter of the year during

which some households buy bananas in the market. However, banana production varies annually if the weather is severely wet or dry (bananas produce well in wet weather and poorly in dry weather, while maize, coffee, and bean crops may suffer in very wet years). Farmers reported that *kisori* (Panama disease) increases in hot, dry years.

4.4 Homegardens, Environmental Dynamics, and Natural Resources

4.4.1 Homegardens

The analysis above outlines the importance for Chagga farmers of complex and changing land, labor, and gender relations. In this section, a focus on the homegarden system itself provides an illustration of how these social dynamics play out in systemic relation with each other. In addition, analyzing the homegarden system makes it clear that these social dynamics cannot be isolated from environmental dynamics, since each impacts the other. In the current context of change on Kilimanjaro, social changes have contributed to environmental decline, which in turn puts further pressure on the socioeconomic system.

A major benefit of the homegarden agroforestry system, described in Section 1.3 above and in the literature, is that mixing various crops and trees enables vertical stratification which makes efficient use of scarce resources, particularly light and space. As explained in Section 4.2.2, farmers cite land scarcity as the major motivation for mixed cropping in the homegarden, and also express a preference for a diversified production system to meet household needs. However, the small size of plots today has pressured farmers to seek other sources of food production and cash income.

> Well me, the way I see it, because this mixed agriculture truly has a lot of benefits in it. There are many benefits in it, but if you have a big area, mm hm....It's not enough to meet the needs of the family. It's not enough.[47]

While acknowledging the benefits and necessity of mixed cropping, many farmers compared it negatively to other forms of agriculture considered more modern, such as monocropping or less intensive intercropping. One farmer said, "Mixed farming is only with difficulty, hassles."[48]

Chagga farmers' perceptions of this discourse of "expert" versus "traditional" agriculture (also discussed in Section 4.2.2 above), and development discourse generally, impacts their attitudes about homegarden agriculture and their livelihood strategy choices. When asked about the invention of the homegarden system by elders in the past, a farmer replied:

> Eh, they were using mixed agriculture. But it was for household uses, not for development. Not development. It was for the sake of household requirements. But they were clever because the youth we have now, you find that development began in the past. They were clever.[49]

In this way, the Chagga try to balance a respect for their ancestors and for cultural traditions with the ideologies of modernity and development, which sometimes conflict with these traditions.

> We are going with the times. We can't go back again. You can't tell someone to go backwards. Indeed, even life these days.[50]

The form of mixed cropping that makes homegardens a distinctive agroforestry system is the intimate mixing of crops and trees of various heights, forming vertical strata and complex horizontal arrangements. To explore farmers' views on and understanding of the ecology of this form of mixing, I asked them about their practices of planting trees in the homegarden and management of shade. Most farmers reported that scarcity of space and competition with crops, including banana and coffee tree crops, constrained tree planting in their homegardens.

Farmers' understanding of the dynamics of light competition and their active management of shade is evident in the following explanation.

> But we also care about that distance (between trees) because of when it squeezes together banana trees and coffee a lot. Likewise, you come to hoe for crops, you see that other plants like maize and beans aren't coming. Eh, because of that shade, if it closes up. Or a period like this one right now, the time of preparations for planting maize...the places that have a lot of banana trees they are preparing to reduce them.[51]

In response to a question about whether it is possible to incorporate more multipurpose trees in the homegarden by pruning them to reduce shade, a farmer replied:

> If you increase the number of trees on the farm, you don't get coffee, the banana trees get spindly, even if there are very many roots underground, it's not good for farming then, to plant maize, cassava, even beans. Because if you plant a lot of trees... [you won't get a lot of produce]. You know our agriculture is the mixed kind. [Yes.] Therefore, if there gets to be too much shade, the beans don't come, even cassava, bananas will get spindly, even the coffee.[52]

Another farmer emphasized individual preferences in making shade management decisions and tree-planting decisions. When asked if a farmer needs to know how far apart to plant coffee and banana trees, she responded:

> Now this just depends on your space, if you want them far apart, if you want them close together. One person you find doesn't like to crowd those trees so that grass doesn't become scarce. When you have them close, then the shade has spread over even the grass. Therefore, the grass below doesn't grow. Eh. Places with shade. A person plants far apart in order to have space if grass is there. Or s/he puts in other trees, or of another kind. So that depends on the needs of the person. If it's an area in the valley that isn't appropriate for grass, or a person has a big farm—you see you find they've already planted lots of cypress trees (*Cinara cupresii*)! Another person you find plants far apart and mixes with grevillea (*Grevillea robusta*). If it's a section that isn't located close to the plot. Because those cedars you can't put in places with bananas or coffee, you don't plant amongst the cedars. They must be on the side, like a place that's extremely rolling.[53]

In contrast, other farmers emphasized the inheritance of tree planting patterns from previous generations.

> And us, for example those of us who were children in those days, children of people of the old days, we haven't planted banana trees or coffee to tell you the truth. We found it this way. Our work is just to weed. We found it. Say there is one that dries up, a banana tree, you take it out and you return one to that very place. But we've only put in banana trees.[54]

Several respondents said that the general trend has been for farmers to reduce the number of trees in their homegardens in comparison to previous generations, to make space for other uses.

> Now you find if he has planted many trees, his father has given him a portion with many trees, and now those trees are for his service. He wants to build a cow shed, or a kitchen, or a house for sleeping—to build with bricks, even if it's bricks, now, there are sections of timber. So. If it's not to build, you'll find he's reduced for reasons of shade, he's reduced in order to plant fodder grass, or to farm.[55]

However, the participants in my study, who may have self-selected for interest in environmental concerns, all expressed willingness to plant at least a small number of new tree seedlings. Even within the sample, interest varied widely, however, with some farmers planting or tending a larger number and variety of trees. I asked one farmer why she has so many different species of trees while other farmers may grow only a few species. She said it depends on "each person's diligence and drive to plant trees."[56] The number of trees and number of species did not appear consistently correlated (in this small sample) with household characteristics such as farm size or wealth.

As explained in the overview above, soil fertility was cited as a severe constraint on productivity in the homegardens, in addition to constraints of space, light, pests, and disease. Most households enumerated steep declines in crop productivity over the years, mostly attributed to soil fertility decline. As one farmer put it, the soil "has already been cultivated a lot. These days it doesn't have the strength it had in the past."[57] Another remarked that because the soil is tired, if you don't wait a month or so to properly cure

green manure before application, you won't get a good harvest, whereas in the lowlands you can plant the day after you turn the soil.

Without being prompted, farmers were able to give quantities of production in the past compared to the present, using local units such as *gunia* (90 kg sack) and *debe* (18 litre tin). For example, regarding coffee, one farmer obtains only one *gunia* today, but remembers harvesting 30 *gunia* from her grandfather's plot in the same village in the past. Another reported she had harvested only about 4-5 kg of coffee per year in the last three years (due to cold weather which exacerbated CBD), but in the past, before CBD and before dividing the *kihamba* between herself and her son, she obtained five *gunia*. A study in another village in the district reports that farmers are producing 50kg/acre of coffee compared to 250-750 kg/acre obtained in the 1970s (Lyimo *et al.* 1999, 6). One farmer reported a reduction in maize production from six *gunia* to one-and-a-half or two *gunia* and a reduction in beans from two to one *gunia*, while another reported a reduction in maize from three to two *gunia* and in beans from two to one *debe*. Several farmers pointed out that in the past even farmers at high altitudes were able to grow bananas in excess of their needs, enough to sell. A farmer's husband reported that when his elderly mother used to go to market, she needed five helpers to carry her sugarcane to sell, whereas now the farm does not produce excess sugarcane, reportedly due to declining soil fertility.

Significantly, soil erosion has been a relatively less widespread problem in the village, despite steep slopes. The homegardens serve as excellent controls on erosion because they provide good ground cover, especially mulch and close grasses and crops (Anderson 1982, 116). Also, contour terraces are built on slopes (many of the rock

terraces were built by previous generations). In contrast, some lowland areas with less steep slopes, but with open, monocropped fields, are more susceptible to severe erosion (Anderson 1982, 33), now being mitigated by the promotion of grassy contour bunds. There are reports of extensive soil erosion along waterways and steep upland areas in other parts of the mountain, however (O'Kting'ati and Kessy 1991, 80; Anderson 1982, 33).

As alluded to above, soil fertility has been maintained traditionally by application of cow manure from stall-fed cattle. However, land and labor scarcity both limit the availability of fodder grass, which limits the number of cattle that can be kept. Thus, soil fertility decline can be attributed, at least in part, to the systemic effects of the simultaneous shortage of land and labor. The following scenario is typical of how these multiple constraints play out. One farmer with an especially small farm usually collects fodder grass from the farm plot itself, but when it is scarce, she has to collect it from the forest reserve or even purchase it. She tries to buy it from friends or relatives who might give her a good price. She would like another cow, but the farm does not have enough grass. Yet the one cow she has does not produce enough manure to maintain soil fertility and production on the plot. Very few village farmers can afford to buy commercial fertilizer.

The critical role of cow manure, but also labor, appears in the rich description offered by a farmer of her brother-in-law's strategy for maintaining soil fertility and productivity.

> Yes, you can increase fertility through management practices. [By keeping cows or...?] Keeping cows and even on the plot, by farming the plot and raising cattle that produce a lot of manure. You spread it, if there's something that you are planting, you plant it with a lot of manure. Here's the fertility, and there's a lot of

> manure. You know here at my in-laws there are banana trees. Because they have a lot of cows, he has like four cows. Four. Now, those banana trees are big ones. So he has a lot of manure, and his farm isn't big. It happens that it's not big in size. Here he plants bananas and it's he who stands with the farm, to work by himself. The manure is plentiful, it's spread everyplace, and he has farm work to do every hour. To expand, every minute, and every minute he is busy. If it's branches (coffee) he does the work himself, every minute he knows to keep himself busy. Many plants are going in, so, with the bananas, you find it's with manure, manure, manure. So, even in the lower altitudes, when you're renting, you do it this way. They have enough cows for manure.[58]

She does not explain how her brother-in-law is able to obtain fodder for four cows if his farm is not big, but since these farmers reside in the upland part of the village where plots tend to be relatively larger, the farm may not be exceedingly small or it may be easier to obtain fodder grass from the neighboring forest reserve. In addition to the key role of manure, an interesting aspect of this description is that it is very reminiscent of involution, the development of extremely intensive labor inputs to offset productivity decline, as described by Geertz (Section 2.1.3).

The limited scope of this study resulted in a focus primarily on the homegarden component of the farming system, but it is important to acknowledge the role of farming in lowland *mashamba* (fields) in systemic interaction with upland homegardens. Another study lamented the neglect of this interaction in past research (Lyimo *et al.* 1999, xx). With respect to soil fertility, other authors have raised concerns over the practice of transporting crop residues from the lowlands to supplement organic manure in the highlands, resulting in degradation of soil in the lowland fields (e.g. Cook and Grut 1989, 24). However, of the ten households in this study's sample, at least four owned no lowland fields at all and ecological interactions between lowland and upland fields appeared minimal, perhaps because of the high altitude of Lyasongoro and constraints of transportation. Economically, seasonal maize-bean cultivation in the lowlands appears to

be increasingly important in livelihood strategies of those households who can afford the labor and cash inputs (seed, fertilizer, and pesticide as necessary).

It is also arguable that soil fertility decline is not solely an outcome of current land and labor scarcity, but may be a trend in the homegardens over the very long term, exacerbated by recent developments. While it is not possible to definitively assess the sustainability of the Chagga homegardens as they were cultivated long ago, a nutrient cycle analysis of a contemporary homegarden would help to assess the significance of some identifiable changes in the system. For example, while farmers emphasize scarcity of fodder and manure, other changes in the nutrient cycle include the increased export of bananas from the mountain and the fact that human waste is now disposed of in latrines, whereas in the past it was recycled in the homegardens.

4.4.2 Forestry

Analyzing the social and environmental dynamics of the homegardens reveals that these changes impact forest resources both on and off farms. In particular, declining homegarden size appears to lead to three major trends in forest resources:

1) increased pressure on resources in the Kilimanjaro National Park and Forest Reserve;

2) decreasing tree density at the landscape scale; and

3) changing tree density, vertical distribution, horizontal distribution, and species distribution at the homegarden scale.

First, as the size of homegardens declines, households have less space overall for trees and often food or cash crops take priority over fuelwood, fodder, or timber trees. O'Kting'ati (1985, 38) estimated that farmers obtained only about one-third of fuelwood

needs on-farm even prior to 1985. Land pressure has also reportedly reduced the area of common lands and interstitial spaces where cattle could be grazed or fuelwood or fodder could be collected in the past. While some households facing scarcity turn to purchasing fodder or fuel, others in Lyasongoro travel into the neighboring park and forest reserve, where collection of fodder and dead wood for fuel is allowed. Several farmers, including two who are members of the village forestry committee (*Kamati ya Misitu*), reported observing degradation of forest resources in recent decades (e.g. smaller and sparser trees, rarer species disappearing, and less wildlife). This degradation may be a result of illegal harvesting of live wood.

With increasing constraints on cash income, some villagers in Lyasongoro have turned to splitting dead wood in the park to haul and sell by the headload for small amounts of extra cash. In the past, young men tended to practice this form of income generation, but today it is primarily young women, even girls of primary school age.

A second trend resulting from the declining size of homegarden plots is that overall tree density (excluding coffee and banana trees) at the landscape scale (below the forest reserve) is reportedly declining. This is due to the pressure to harvest available trees for fuelwood or timber in conjunction with an apparent decline in tree planting. Concern over this trend has led to both regional and village-level tree-planting campaigns. The village forestry committee was initiated in recent years with government funding. Its members occasionally patrol the forest to discourage illegal cutting of live wood (as do park employees) and to encourage tree planting in the village. The farmers' awareness of landscape scale impacts of deforestation is evident in the following statement.

> If we ruin the forest, indeed, we ruin ourselves. Eh, and water is increasingly drying up because of the degradation of the forest.[59]

The village also prohibits felling of trees near riverbanks, even though the trees are considered privately owned.

A third set of trends occurs at the homegarden scale. In addition to an average decline in tree denstiy, as homegarden size declines, tree planting is increasingly removed to the farm margins, resulting in a less vertically-stratified homegarden system. Also, the age and species structure of trees in the homegardens is probably changing. Farmers noted that rarer species they remembered from their younger years were no longer to be found. As pressure for fuelwood and timber increases, fewer trees reach maturity and fewer are replaced as they are harvested or senesce (Figure 14).

5 Summary and Conclusions

5.1 Theoretical Implications

The case of Mt. Kilimanjaro extends theories of population, environment, land, and labor relations. It illustrates how, in the current context, even while land is scarce, labor too can be in shortage. The case of Mt. Kilimanjaro extends theories of population, environment, land, and labor relations. It illustrates how, in the current context, even while land is scarce, labor too can be in shortage. This is not to say that some households are short on labor while other households in the region are short on land, but rather that most households simultaneously experience both constraints. This indicates simultaneous land and labor scarcity at both the household and regional levels. The context I refer to includes economic changes brought on by economic reforms, increasing needs for cash, declining terms of trade for farmers, pressures toward diversification of income and non-

Figure 14. Senescence of a mature tree.

farm activities, out-migration, a shrinking land base, declining soil fertility, and degradation of natural resources, both on- and off-farm. The gendered division of labor, the age- and gender-differentiated character of out-migration, and the inter-dependence of productive and reproductive activities are central to these processes, which result in a continual squeeze on farmers' labor and capital resources.

While the case of Kilimanjaro and the Chagga homegardens is unique in terms of particular cultural, historical, and ecological circumstances, these same processes are occurring in other rural locations. Theories of land and labor relations in rural economies cannot continue to neglect the trend towards de-agrarianization and diversification of income, even while agriculture remains of critical necessity for rural households' sustenance. Nor can they neglect the centrality of gender relations for understanding differentiation within rural households, and labor constraints in particular. These findings are no surprise to Chagga farmers. While they may be significant theoretically, they are most interesting in that they reveal the biased assumptions, particularly gender-blindness and reductionism, that prior scholarship brought to analyses of population, environment, land, and labor relations.

5.2 Recommendations

The farmers in this study were, for the most part, aware of "best management practices," but most of these are labor-intensive and many are capital-intensive. In terms of practical implications, this research suggests the need for appropriate technologies which are labor-saving and do not require high capital investment in order to improve productivity on small plots. Perhaps even more critical than new technologies would be changes in local institutions that would help to alleviate the strain on individual

households, such as access to credit, pooling labor or funds, or redirecting some of the income from tourism to village women for use for development projects (e.g. child care nurseries, flour mills, food processing and storing facilities, fuel-efficient stoves, or income-generating activities). Given the size of the tourist trade on Kilimanjaro and the extreme need for cash income, even the diversion of a small proportion of tourist income to women's efforts at village development could make a significant impact on household livelihoods. A number of organizations already promote tree nurseries on Kilimanjaro and the government has initiated a nationwide tree-planting campaign, with one million trees expected to be planted in Moshi District (Lyimo *et al.* 1999, 6).

This study also suggests a number of questions for future research. For example:

- How is tree density, spatial distribution, and species distribution in the homegarden belt changing over time?
- How do changes in the homegardens affect the forest reserve?
- What are the precise ecological, economic, and social linkages between farming in the uplands and in the lowlands, within and between households?
- How have recent social and cultural changes impacted management of the homegardens? (e.g. changing gender relations, out-migration of youth, AIDS)
- How do local-, regional-, and national-level policies, discourse, and ideology affect Chagga farmers, economically and socially? (e.g. modernism, development, structural adjustment, monocropping, privatization, cost-sharing)

- How has the unique Chagga diaspora influenced processes on Kilimanjaro?

Some of these suggestions for future research concur with a recent report by the Selian Agricultural Research Institute, which also suggests many additional questions specific to crop, livestock, and tree research needs on Kilimanjaro (Lyimo *et al.* 1999, 104-108).

5.3 Conclusion

The story I have related here is that of simultaneous land and labor scarcity on Mt. Kilimanjaro in a social and economic context of increasing constraints. There is a larger story, however, to which I have alluded above, but which I choose to revisit here in hopes of leaving its lasting impression on the reader. This is the story of the serious and critical impact, on real people in particular locales, of the economic and agricultural development policies generated at national and international levels. In assessing the impact of structural adjustment policies on agricultural livelihoods in Tanzania, Forster and Maghimbi reach a sobering conclusion:

> There is little optimism for the future. The overall message seems to be that there were many mistakes in the past but that the new system has done nothing to improve the situation. There is much recognition of the ineffectiveness of top-down measures and bureaucratic excesses, and of the need to listen to the peasants: but this is to be seen in the overall context of entrenched elite privilege which also enables the process of law to be used for personal advantage or even to be circumvented. Unregulated capitalism has not made the lot of the peasant any easier, and has deprived many of their means of livelihood. There clearly is a need to improve peasant agriculture, and culture involves some constraints as well as sometimes being responsive to innovation (Forster and Maghimbi 1999, xxiii).

The lot of farmers on Kilimanjaro certainly does not seem to be easier as a result of structural reforms, which have failed to take into account the realities of those, particularly women, coping with shortages of land, labor, and cash. Forster and

Maghimbi's assessment is fair in that it takes into account the complexities of interactions between local cultural factors and "top-down" policies.

Is more research into these complexities the solution to the problems of rural people in Tanzania? While some research may be part of the solution, it must be acknowledged and seen clearly that development research itself is embedded in the same material and discursive relations that shape development policies. Throughout the course of this research, I felt acutely the contradictions of my presence in Tanzania as a white, female, graduate student researcher from the U.S., one of the wealthiest and most powerful countries in the world. I found my role to be incompatible with the needs I was hearing expressed by Tanzanians for self-determination, autonomy, and fair access to resources. As an elderly doctor, who had long experience with foreign student researchers on Kiliamanjaro, put it, "Let's be honest. These students come, they make their recommendations, and they leave, but the recommendations never come with any resources for implementation attached, so the same recommendations continue to be made."

I close with this moment of self-reflexivity because I ask the reader to likewise question your own relationship to these processes, even to the villagers of Lyasongoro, Kilimanjaro, Tanzania. Mbilinyi reminds us:

> The relations of production, consumption and distribution within which rural women work are therefore not limited or confined to the peasant household. They include TNCs, the World Bank, other donors, experts, consumers, taxpayers, politicians and others located in both the North and in Tanzania. Residents in the North are part of the politics of peasant agriculture in Africa. The coffee and tea they drink, the clothes they wear, the taxes they pay and the policies their governments promote implicate them in the deepening exploitation and oppression of African workers and growers (Mbilinyi 1997, 340).

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END NOTES

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[1] *Vihamba ni mali ya ukoo, hairuhusiwi kuuza. Kila mtu anarithi, mtoto wake anarithi, na kadhalika. Serikali, siyo ya serikali.*

[2] *Kuuza shamba lako?! Ha! Utaishi wapi?*

3 Ni ngumu sana kwa Mchagga kuuza shamba lake.

[4] *[...pengine, mtoto wa kiume mmoja, itambidi kuenda kutafuta shamba lingine, kutafuta kazi nyingine?] Hata kama atafanya kazi na kupata shamba lingine, lazima apate sehemu.*

[5] *Hata kama ni shamba dogo, kila mmoja anapata mahali pa kutengeneza nyumba. Anapata tu mahali pa kuweka bustani. Kama ni shamba dogo, ndiyo ni hivyo wanapanga. Kama ana uwezo, ana kibarua chake kama huyu, anaweza kununua shamba lake pahali pengine. Lakini pale nyumbani anapata mahali pa kutengeneza nyumba yake. Ndiyo hivyo huko kwetu wanafanya. Kuwa na mtu ana shamba dogo na kila mmoja anagawiwa mahali pake, ndogo tu, aweke nyumba yake na kibustani chake. Halafu akienda kwenye kibarua akiwa na hela, anunua shamba mahali pengine, lakini pale nyumbani ana pahali pa* kushikia.

[6] *Hatuna mashamba hapa, tuna kiwanja kuishi tu.*

[7] *Watoto wa kike hawapewi vihamba. Ni watoto wa kiume. Ndiyo unapoolewa mume wako anapewa kihamba na baba yake. Unakuta kama hana atakupa kulingana na jinsi anacho. Kama watoto wanaoa ni watoto wengi, lazima ugawe ili kila mmoja apate kipate kidogo. Kama watoto ni wachache, unapata sawa sawa ulivyokuwa.*

[8] *Hapana. Hapana. Hawatapata sehemu. Wa kike hawapati kabisa. Kwa kweli kuna wengine wanapata sehemu, kama, kama ni Himo na shamba lako liko porini, ni baba yangu mzazi alimpa dada yangu. Na mimi, baba, alinipa ng'ombe.... Sasa baba wengine wanajua, hawaangalii huyu ni wa kiume au huyu ni wa kike. Inatokana na yule baba. Baba wengine wanatoa yaani sehemu hata kwa wale wa kike wanapata sehemu yao, urithi wao.*

[9] *Halafu unakuta wengine kama kuna eneo kubwa la miti, anatoa miti ilikuwa kwa ajili ya kupata majani ya ng'ombe. Haya anapunguza kwa ajili ya nafasi ya kulima pia. Kwa sababu watoto wanaongezeka. Mashamba haya ulikuta zamani, mababu zetu walikuwa na mashamba makubwa. Sasa unapokuwa watoto wengi ndiyo inazidi kugawanyisha. Mwisho inayobakia ni kidogo, kila mtu anapata sehemu kidogo tu. Kama vile ni kiwanja.*

[10] *[Lakini unaona faida yo yote kuhusu mwanga, kutumia vizuri mwanga, kwa ajili ya kuchanganya kila kitu, ili uweze kutumia mwanga yote?] Kwa kweli, ukichanganya kila kitu, havipati mwanga wa kutosha. Eh. Kwa sababu unapotaka kahawa imefikia hapa, na migomba iko kule juu, sasa kahawa haipati mwanga wa kutosha. Sasa tungekuwa na mashamba makubwa, tungeweka kahawa hapa, migomba hapo. Sasa mashamba ni madogo. Mm. [Okay. Kuna faida yo yote kupata kivuli kwa mazao yo yote? Au hamna?] Eh. Kuna sehemu kama huko shambani, lazima unaotesha kwa mfano kuanzia pale mpaka hapa, unaotesha mti mmoja hapa kwa ajili ya kivuli. Eh. Kuna kipindi jua huko kwetu linawaka sana, Januari, na mwezi wa pili. Sasa jua lile ni*

libaya kwa kweli. Linaunguza ardhi. Na ardhi ile haina rutuba. Eh. Inakauka haraka sana.

[11] *Sitajua kwa kweli. Eh. Hata tulipozaliwa sisi tulikuta mseto siku ile.*

[12] *Kwa sababu ya, waliotesha kwa sababu walikuwa na, zamani walikuwa na mashamba makubwa sana. Waliotesha, wakaweka mpaka, na hivi. Sasa wakati hivi hapa tumekuwa vidogo. Eh. Wakuja kukata watoto wakalala huko.*

[13] *Unaweza kutenga kila kitu, lakini ardhi ni ndogo. Tumetoa sehemu yako ni kidogo, lazima uchanganye kila kitu hapa. Na uweke mbolea. Lakini ukiweka mbolea, vinaendelea tu vizuri. Eh. ...Ndiyo, walikuwa (wazee wa zamani) na mashamba makubwa, lakini walikuwa hawajui maana ya kilimo. [Maana ya kilimo?] Eh. Walikuwa hawajatambua maana ya kilimo. [Kweli?] Wangekuwa wametambua ya kwamba, kilimo ukiweka mahindi hapa, urudi hapo, uweke hiki, urudi uweke maharagwe hapa, wangeotesha hivyo. Lakini sasa walikuwa hawajui maana yake. Eh. Sasa hivi watu wamepanga kwa akili. Wanajua nini. Na kisomo na nini. Eh. Wameshasoma wakajua uchanganya inaharibu. Inaharibika, vingine vinanyonya vingine. Mm.*

[14] *Ni kilimo cha kienyeji. (laughs) Kwa sababu hiyo kutenganisha ni kitaalum. Au siyo? [Sijui, inategemea, nadhani.] Kutenganisha si kitaalum?*

[15] *Hiyo kahawa na migomba pamoja, sisi tulikuwa, lile shamba lilikuwa na ile kahawa na migomba. Kwa hiyo hatuwezi kutoa. Kwa sababu ardhi ni ndogo. Ndiyo maana wanachanganya. Lakini tungekuwa na ardhi kubwa ya kuweza kufaa hili shamba lote la kuweka migomba, na zao lingine hapa kama kuweka kahawa, ingekuwa vizuri zaidi. Eh. Maana kahawa ikatoka sana. Na ndizi zitatoka sana, bila ya kuchanganya. Lakini sasa inabidi tuchanganye. Unachanganya hiki, unaleta hiki, unaweka hiki, unaweka hiki, ili tupate kitu cha kula. Kinyume ya kuchanganya, hupati chakula.*

[16] *Hiyo (kahawa) ni mazao ya biashara, inasaidia watoto kusoma. Eh. Huwezi (kutoa) kabisa. Hata ukipata kidogo inasaidia, kupata pesa, hiyo migomba ni kwa chakula tu. Eh. Lakini, ni kwa biashara...Eh. Watu wakipata sadolini mbili, kama kilo nne, kilo nne unapata pesa inasaidia kwa watoto kuenda shule ya msingi. Eh. [Hata kupunguza kidogo, haifai?] Kahawa? (laughs) Wababa wanaipenda kahawa. Hata ukivunja tawi! (laughs)*

[17] *Mambo ya kilimo hayalipi kwa sehemu ya Wachagga, kutegemea hapa kwetu. Haihitaji kutokana maeneo ni madogo.*

[18] *Kwa kweli hapa kwetu Wachagga, watu wanatumia akili sana. Inabidi utumie akili ili uweze kuishi.:*

[19] *Huwezi kusema kwamba ulime tu ukose hela za kununua manufaa na nini. Huwezi kusema ufanye kazi tu ukose mazao ya watoto, au vitu vidogo vidogo vya kula. Eh. Kwa hiyo vyote viko sawa.*

[20] *Kwa kweli, huko kwetu, hata mtu mwenye eneo lidogo, anapata shida. Kwa sababu thamani ya hela ya Tanzania ni ndogo. Sasa kama hutatumia vitu kama hivi kwa ajili ya nyumbani kwako, lazima utapata shida, utaishi kwa shida. Ukitegemea tu ile hela, hela ya ununue mboga, ununue sukari, ununue nyama, yaani kila kitu, haitoshi. Sasa unaona maana ya tunalimalima, unapata viazi, unapata maboga, kila kitu unapatapata huko shambani, ndizi, kahawa.*

[21] *Unakuta mara moja umefungua biashara na mara umeshindwa, umeiacha.*

[22] *Yaani duka haliwezi kutosheleza kwa kutunza familia kama hiyo kulima, kilimo. Hiki ni kitu cha msaada tu, kuongeza hela.*

[23] *Lakini sasa unakuja kwa watu wanaenda na wakati. Nyumba za kuzeeka tena na majani hakuna, wanatumia bati. Ambalo ni hilo linaleta, kuweka matumizi ya pesa ni mengi. Zamani walikuwa matumia mengi ni utaalum. Ujuzi wa kitaalum, ambao hakuna matumizi ya pesa.*

[24] *Nyumba [ya matajiri] nyingi ni kwa ajili ya mambo ya mlimani. Ni mambo ya tours, mambo ya hoteli.... Ndiyo, ni mtegemeo mkubwa. Lakini kinyume na kuwa na huo msimu wa mlima, ingekuwa shida sana.... [Hela hii inatawanyika?] Eh, ndiyo unakuta sasa inazungukazunguka kwa kijijini.... Kwa mambo ya mlima kwa kweli inasaidia sana. Kama wewe huwezi, akija mume wako anaenda, au mtoto, au mtu mwingine, lakini yule mtu anapopata pesa, una biashara chako, anakuja naye, anapata mteja. Kwa hiyo hela hii inazunguka.... Lakini pesa inayopatikana kwa wingi zaidi hapa mlimani, hakuna, kwa sehemu hizi hakuna. Mambo ya kilimo hayalipi.*

[25] *Eh! Kilimanjaro, ardhi ni ya shida. Eh. Umeshawahi kuambiwa kwamba Wachagga ni wagumu sana kuhama na kuhamia maeneo mengi. Hawapendi sana. Isipokuwa sasa hivi inatokea ya hali ya maisha inafanya watu wajifunze kuhama na kuhamia sehemu nyingine kulingana na familia ya mtu unakuta mahali ambapo haimtoshelezi, kusaidia familia yake. Basi wengi sasa hivi ndiyo wanainuka. Lakini utakuta sehemu aliyopewa na mzazi wake haachii, hawezi kuwa apaachia, hapaachii tupu wa jangwa. Lazima ukute anapotunza. Kama siyo yeye lakini anamkodi hata mbuzi.... Lakini kwa ardhi ambayo iko tupu haina mtu, si rahisi, si rahisi.*

[26] *Na watoto mara nyingi hawapendi kujishughulisha na mambo ya kilimo... lazima wataenda mjini.*

[27] *Kwa kweli inachosha maisha ya hapo [shambani] magumu. Yaani unaandama na pesa tu. Kinyume na hapo unatumia nguvu zako. Kwa hiyo sasa tumeanza kulinganisha maisha ya shamba na mjini, ya mjini ni nzuri zaidi naona, kwa ajili mimi nimeshakaa mjini. Na siyo mimi ambayo nimekaa mjini tu, hata wengine wanapenda, lakini inapobidi shamba,...nakuwa shamba.*

[28] *[Na hawa watoto wanaokaa Arusha?] Wanatutegemea tu, bado hawajapata hela za kuuza nyingi. Lazima ukipata kidogo kama elfu mbili unawatumia unawapelekea, hivyo hivyo. Naona anajua shida, anaivumilia. (laughs) Anaivumilia. Hasa yule wa kike namwambia, ameanza tu mwaka jana, mwezi wa tatu. Hajamaliza siku nyingi pale. Kwa hiyo anatakiwa malipo ya kulipa elimu ya mafundisho, ya sabuni ya kufua, ya mafuta ya kupakia na ya taa, yaani ni lazima atakuwa anadai hapa nyumbani. [Unadhani mahitaji ya mjini ni zaidi kuliko kijijini?] Ni zaidi. Hasa chakula cha pale. Na hapa tunapata mchicha kwenye bustani. Wao wanainunua tu. Pale mjini ni kununua, mahindi tunaweza kulima, tunatumia kwa ng'ombe, kule wananunua, kila kitu chakula tu. Eh. [Unaonaje maisha ya mji, au wanaonaje maisha?] Magumu sana, magumu kwa kweli. Lakini unamfundisha jinsi ya kuweza kuvumilia mpaka wanaweza kufanikiwa. [Unadhani watarudi tena kijijini?] Naona hawa wapange wenyewe. Eh. Kama akifaulu na kazi yake, akija kufanyizia huko kijijini, ni yeye mwenyewe anapanga. Kama ana hamu ya kufanya kule kule, ni yeye mwenyewe atapanga. Sisi hatumpangii.*

[29] *Lakini pamoja na hayo maisha ya mjini bila shamba watu hawawezi kuwepo...Kwa ajili wale wa shamba wanapata hela kwa ajili ya wale wa mjini. Na wa mjini wanapata vitu kwa ajili ya wale wa shamba. Hivi vitu vinasaidia.*

[30] *[Ulisema kwamba hela haizungukia hapa. Unaonaje matajiri ambao wanakaa nje, lakini wana nyumba hapa? Unadhani wanasaidia maendeleo ya mlimani, au...] Matajiri wanaokaa nje hata hivyo kutokana na ufahamu, watu wamekuwa na hawafahamu wa mbali. Wanaweka tu nyumba, lakini kutegemea kwamba atazalishia huko ni ngumu, kutokana na ameshajua upato kwa huko ni vigumu sana. Afadhali kule mjini unaweza kutafuta na kupata upato.*

[31] *[Unaonaje matajiri wa Kilimanjaro lakini wanakaa nje, unaonaje wanasaidia hapa kijijini au hawasaidii?] Kwa kweli, siyo wote. Labda ukute ndugu yako au kaka yako, anaweza kukusaidia. Lakini wengine wa pembeni si rahisi sana. Wanasaidia wenzake ambao wana uhusiano nao.*

[32] *Wanafyekwa kama majani, wanalala kama majani.*

[33] *[Hutaki zaidi ya ng'ombe mmoja?] Nimeshindwa kwa sababu ni kazi nyingi. [Kazi ya kupata majani au kila kitu?] Sasa. Ukiwa na ng'ombe wawili watatu, wanaweza kukuzuia kuzifanya kazi za shambani, kama kulima, na wakati wa kuchuma kahawa hutapata nafasi. Kama ningekuwa na familia ya kutosha kufanya kazi, ningeongeza ng'ombe wawili au watatu, tukiwa tunasaidiana. Ndiyo.*

[34] *Sasa hamna hela za kuweka vibarua vya kukondoa zile fuko huko chini. Ukiotesha migomba na unaliwa, unaanguka, ukiotesha, ndiyo hivyo. Basi ikawa, hamna msaada wa kivibarua ya kusaidia huko shambani.*

[35] *Lakini jinsi kazi zinaanza zimesonga mara kwa mara, na sana sina nafasi ya kukaa dukani na kuwa na mapato ndogo sana. Eh. Sasa huko tunaenda kwa mwezi huo wa tano, kuendelea wa sita ndiyo ni wakati wa kulima. Umeshalima unaotesha, umeshaotesha unapalilia, hata mara mbili. Kwa hiyo nafasi ya kuangalia dukani nakuwa na ni kidogo, ni shughuli ya mazao yasipotee. Yaani duka haliwezi kutosheleza kwa kutunza familia kama hiyo kulima, kilimo. Hiki ni kitu cha msaada tu, kuongeza hela.*

[36] *...hakuna msaada wa kutusaidia, kama watoto wanafanya kazi ya vibarua vyao. Kwa sisi, tunashindwa. [Kwa hiyo una ardhi, lakini hamna vibarua.] Ardhi ipo, eh, hamna vibarua wa kutosha.*

[37] *Sina shamba lingine. Ningehitaji nitapata, lakini ningechoka sana. Siwezi.*

[38] *[Na shemeji wengine, wanalima pamoja, au kila mmoja ana shamba lake?] Kila mtu ana shamba chake kidogo tu, kibustani. Kama bustani, ni shamba kidogo tu. Eh. Kila mtu ana kishamba chao.*

[39] *[Na nyinyi nyote mnashirikiana na mfuko mmoja? Kama mtu mmoja anahitaji hela au msaada, mnasaidiana au kila mtu ana mfuko?] Kila mtu ana mfuko wake. Eh. Kila mtu ana mfuko wake. Hakuna cha kusaidiana. [Kwa hiyo, hata kama watoto wako wa kiume wakisaidia na shamba, ni kama kukusaidia tu, hawatapata faida ya kihamba? Ni wewe?] Hapana. Ni yeye. Kama hawa wa kike wanavyosaidia, wanasaidia mingi tu. [Lakini hapa mtoto huyu ameshaoa, kwa hiyo mke wake ana sehemu yake?] Ameshaoa. Ana sehemu yake, na ng'ombe wake anao. Anafanya kazi yake peke yake. [Imekuwa hivyo hata zamani?] Hata zamani. Eh. Hata zamani.*

[40] *Marehemu alipofariki, nilikuwa ninashughulikana na watoto peke yangu!, bila ya msaada wa shemeji, bila ya msaada wa urithi, bila msaada wo wote, ikawa nilikuwa nimehamia hapa kwa sababu mume alifariki. Mimi nilijishughulisha mwenyewe, hamna msaada, ukiomba msaada hawakupi.*

[41] *Utakuta matajiri atafuatilia sana matajiri wenzake. Lakini tajiri hamkuti mtu wa hali ya chini, akijua kwamba tajiri atamsaidia maskini, mara nyingi hata akikupa ni kidogo.*

[42] *Watasimanga.*

[43] *"msimu wa shida"*

[44] *Kama hapa kwetu hamna kitu tunachoweza kuuza ili tubaki na zile hela. Au kutununuzia matumizi, hamna. Eh, hatupati kabisa, hata mazao tunayotaka kuyavuna huko shambani, hayafikii hata muda mrefu, kama ukiyavuna huko shambani, sasa hivi yanaisha tu. Labda sijui kama itafikia mwezi wa saba, yakifikia hapa yameisha. Kwa sababu shamba ni la kufungafunga sana. Na mahindi hayatoki. Hayatoki sawa sawa huko kwetu. Mpaka mwezi wa nane, hayashughulikii.*

[45] *Hela ya kahawa imeshikwa na CBD. Sasa ungesema utabaki na hela ile ya kahawa kama ungepata, kama si CBD, ndiyo ninayo. Sisi, kama hela haipatikani kwa CBD, au kama una ng'ombe wako ukauza. Kama huna ng'ombe, huna kahawa, ndiyo, shida tu.*

[46] *akiba*

[47] *Basi, mimi ninavyoona kwa sababu hicho kilimo cha mseto kwa kweli kuna faida nyingi ndani yake. Kuna faida nyingi ndani yake, lakini, kama utakuwa na sehemu kubwa, mm hmm.... Haitoshelezi kwa matumizi ya familia. Haitoshelezi.*

[48] *Cha mseto ni kwa shida tu, tatatizo.*

[49] *Eh, walikuwa wanatumia kilimo cha mseto. Lakini ilikuwa kwa matumizi ya nyumbani, siyo maendeleo. Siyo maendeleo. Ilikuwa kwa ajili ya matumizi ya nyumbani. Lakini wangekuwa na akili ambao vijana wanao sasa hivi, unakuta maendeleo yameanza zamani. Waliokuwa na akili.*

[50] *Tunaenda kwa wakati. Hatuwezi tena kurudi nyuma. Huwezi kumwambia kurudi nyuma. Ndiyo hata maisha ya siku hizi.*

[51] *Lakini pia tunajali umbali ule kutokana na, inaposongamana sana migomba na kahawa, vile vile ukija kulima unaona mengine kama mahindi na maharagwe hayatoki. Eh, kwa ajili ya kivuli ile, ikifunga. Au kipindi kama hiki cha sasa hivi wakati wa maandalizi wa kuotesha mahindi...sehemu ambayo ina migomba mingi wanaandaa kupunguza.*

[52] *Ukiongeza kiasi cha miti shambani, kahawa hupati, migomba imekuwa mirefu, hata kama mizizi ya huko chini ni mingi sana, haufai kulima sasa, kuotesha mahindi, yaani mahombo yale, hata maharagwe. Kwa sababu ukiotesha miti mingi [hutapata mazao mengine]. Unajua kilimo chetu ni cha mchanganyiko. [Eh, ndiyo.] Kwa hiyo, kivuli kikuwa kingi haitokei maharagwe, hata mahombo, migomba itakuwa mirefu, hata kahawa.*

[53] *Hiyo sasa ni nafasi yako, kama unamtaka mbalimbali, kama unataka karibukaribu. Mwingine unakuta hapendi kusukumanisha ile miti kwa ajili majani yasikosekani. Unapo karibu ndiyo tena hata majani kivuli kinakuwa kimetanda. Kwa hiyo*

majani ya chini hayakuwapo. Eh. Kulikuwa na kivuli...Mwingine anaotesha mbalimbali ili ina nafasi kama majani yawepo. Au anaweka tena miti mingine, au ya aina nyingine. Kwa hiyo pale ni kwa matumizi ya mtu. Kama ni sehemu za bonde, ambazo hazifai majani, au mtu anayo shamba kubwa, unaona unakuta wameshaotesha miti ya mitarako mingi! Mwingine unakuta anaotesha kwa mbalimbali anachanganya na meresi. Kama ni sehemu ambayo haiko karibu na shamba. Kwa sababu ile mitarako huwezi kuweka sehemu za ndizi au kahawa, huoteshi na mitarakwe. Lazima ni kando, siyo kama ni mabondemabondemabonde.

[54] *Na sisi, kwa mfano sisi waliokuwa watoto saa hizi, watoto wa watu wa zamani, hatujaotesha migomba au kahawa kwa kweli. Eh. Tulikuta. Kazi yetu ni kupalizi tu. Eh. Tulikuta, sema kuna nyingine inakauka, migomba, unatoa kwenye kina ile unarudishia pale huko huko. Lakini migomba tu tumeiweka. Eh.*

[55] *Unakuta sasa kama ameotesha miti mingi, baba yake amempa sehemu ya miti mingi, na yeye sasa ile miti ni kwa ajili ya huduma yake. Anataka kutengeneza banda la ng'ombe, au jiko, au nyumba ya kulala, kujenga matofali, hata kama ni matofali sasa kuna sehemu ya miti. Haya. Kama siyo kujenga utakuta amepunguza kwa ajili ya kile kivuli amepungua ili aoteshe majani ya ng'ombe, au kwa kulima.*

[56] *juhudi zake za kuotesha miti.*

[57] *Imeshalimwalimwa sana. Siku hizi haina nguvu tena kama zamani.*

[58] *Ndiyo, kwa namna ya utunzaji unaweza kuongeza rutuba. [Kwa kutunza ng'ombe au...?] Kutunza ng'ombe na hata lile shamba, lile shamba kwa kulima na kutunza ng'ombe ambazo zinatoa samadi nyingi, unatandika, kama kuna kitu ambacho unaotesha, unaotesha na mbolea nyingi, hapa rutuba, na mbolea inakuwa nyingi, unajua hapa kwa shemeji kuna migomba. Kwa sababu wana ng'ombe mengi, ana ng'ombe kama wanne. Wanne. Sasa ikawa, na ile migomba ni ile mikubwa. Basi akawa na mbolea nyingi, halafu shamba lake siyo kubwa. Ikawa siyo ya saizi. Hapa anaotesha migomba na anakuwa ni yeye anasimama na shamba, kushughulisha peke yake. Inakuwa mbolea ni nyingi, inatandikwa kila mahali, na yeye kila saa anakuwa na kazi ya kulima. Ya kupanua, kila dakika, na kila dakika anashughulikia, kama ni matawi anashughulikia mwenyewe, kila dakika anashughulikia anajua, mimea inaingia nyingi, basi kwenye migomba, unakuta ni kwa mbolea, mbolea, mbolea. Basi, hata huko chini, unapokodikwa, unakuwa sasa hivi, ndiyo hivyo. Wana ng'ombe za kutosheleza kwa samadi.*

[59] *Tukiharibu msitu ndiyo tunajiharibia mwenyewe. Eh, na maji yanazidi kukauka kwa ajili ya msitu unapungua.*