

**UNDERSTANDING THE RELATIONSHIPS BETWEEN WOMEN'S ACCESS TO
LAND RESOURCES AND HOUSEHOLD FOOD SECURITY IN EASTERN KENYA**

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Abstract

Household food and nutrition security remains a major societal challenge, especially in the arid and semi-arid regions of sub-Saharan Africa. In smallholder farming systems, women play a critical role in improving household food and nutritional security as producers, food providers, and primary caregivers. However, women face multiple constraints in their access to land resources, limiting their livelihood potential. In response to calls to elevate women's access and control to agricultural resources, this dissertation seeks to better understand the relationships between women's access to land resources and household food and nutritional security. This research is set in the Kamba smallholder agricultural systems of Machakos and Makueni Counties in Kenya. It draws on theoretical concepts from the sustainable livelihoods approach, social capital, access theory, and social-ecological resilience.

To better understand the formal and informal institutions governing land resource access in Kamba communities, I take a life stage perspective to identify how women navigate within local institutions to adapt to the shocks and stresses affecting their land resource access. Drawing on 77 key informant interviews, twelve focus group discussions (n=134), and eight community meetings (n=363), the findings reveal that women use a diverse set of relational access mechanisms to prepare for, and adapt to, land resource loss. The confluence of local gender norms and legal processes of land registration appear to constrain smallholder women from formal land ownership, although legal rights exist. The findings highlight that careful consideration of local institutions and gender norms is needed in national policy reforms that aim to promote women's access to land resources. By comparing life stages, I find emerging challenges that women in old age face in accessing land resources, particularly in cases of grandmothers raising their grandchildren in skipped-generational households. Employing a

livelihood asset analysis, I focus on grandmothers' access mechanisms. The findings show that grandmothers' social capital facilitates the accumulation of other livelihood assets that support household food and nutrition security. I examine how different dimensions of social capital relate to women's participation in agricultural decision-making as a proxy for their level of land resource access. Findings from qualitative data and a multi-level regression analysis of survey data from 206 women within 127 villages indicate that women actively use bonding and bridging social capital to acquire information and agricultural training. Village market places and local administrative offices appear to facilitate informal and formal information transfer. These village characteristics mediate the associations between women's bridging social capital and women's participation in agricultural decision-making. Regional education levels mediate the association between linking social capital and women's participation in decision-making, underscoring the presence of cross-scale interactions. Drawing connections to household food and nutritional security, I examine the associations between childhood anthropometric growth measures and women's participation in agricultural decision-making by using cross-sectional household survey data from 221 mother and child pairs. Results indicate a significant positive association between child growth and women's participation in agricultural decision-making, which is not observed with men. The results suggest the need for greater consideration of collaborative intra-household gender dynamics when promoting nutrition-sensitive agricultural practices. Thus, this dissertation contributes a nuanced understanding of the institutional, social, and gendered elements in land resource access and household food and nutritional security among smallholders in semi-arid regions of Kenya.

Résumé

La sécurité alimentaire et nutritionnelle des ménages reste un défi majeur pour la société, surtout dans les zones arides et semi-arides d'Afrique sub-saharienne. Parmi les systèmes de petits exploitants agricoles, les femmes jouent un rôle essentiel dans l'amélioration de la sécurité alimentaire et nutritionnelle des ménages, en tant qu'agricultrices, fournisseuses d'alimentation et aidantes et soignantes principales. Cependant, les femmes sont confrontées à diverses contraintes dans leur accès aux ressources foncières, limitant leurs moyens de subsistance. En réponse aux appels visant à améliorer l'accès et le contrôle des femmes aux ressources agricoles, cette thèse vise à mieux comprendre comment l'accès des femmes aux ressources foncières est lié à la sécurité alimentaire et nutritionnelle des ménages. Cette recherche étudie les communautés agricoles Kambas dans les comtés de Machakos et Makueni, une région semi-aride du Kenya. Elle s'appuie sur une gamme de concepts incluant l'approche centrée sur les sources de revenus durables (*sustainable livelihoods approach*), le capital social, la théorie de l'accès (*access theory*) et la résilience socio-écologique.

Pour mieux comprendre les institutions formelles et informelles régissant l'accès aux ressources foncières dans les communautés Kambas, j'utilise l'approche du cycle de vie (*life stage approach*) afin d'identifier comment les femmes naviguent au sein des institutions locales et s'adaptent aux différents chocs et stress affectant leur accès aux ressources foncières. En s'appuyant sur 77 entretiens avec des informateurs clés, 12 discussions de groupe (n=134) et 8 réunions communautaires (n=363), les résultats révèlent que les femmes ont recours à un ensemble diversifié de mécanismes relationnels d'accès pour se préparer à la perte de ressources foncières et s'y adapter. La combinaison des normes locales liées au genre et les procédures légales d'enregistrement des propriétés foncières semblent contraindre l'accès des femmes au

titre formel de propriété foncière, bien que des droits de détenir une propriété existent. Ces résultats mettent en évidence la nécessité d'accorder une plus grande attention aux institutions locales et aux normes de genre lors des réformes politiques nationales qui visent à promouvoir l'accès des femmes aux ressources foncières.

En comparant les différentes étapes dans la vie de ces femmes, je trouve que les femmes plus âgées sont confrontées à de nouveaux défis dans leurs accès aux ressources foncières, en particulier les grand-mères qui s'occupent de leurs petits-enfants dans des ménages dont les parents sont absents. J'étudie les mécanismes d'accès des grand-mères en analysant leur actifs des moyens de subsistance. Les résultats démontrent que le capital social de ces grands-mères améliore leur possibilité d'accumuler d'autres moyens de subsistance pour soutenir la sécurité alimentaire et nutritionnelle de leurs familles.

J'examine comment les différentes dimensions du capital social sont liées à la participation des femmes dans la prise de décisions dans leurs exploitations agricoles, la participation étant ici utilisée comme une variable *proxy* représentant leur niveau d'accès aux ressources foncières. Les données qualitatives et les résultats d'une analyse de régression multi-niveaux utilisant les données d'un sondage sur 206 femmes provenant de 127 villages indiquent que les femmes utilisent activement les liens forts (*bonding*) comme les liens faibles (*bridging*) du capital social pour acquérir de l'information et de la formation agricole. La présence de marchés publics ou de bureaux administratifs dans le village semblent faciliter le transfert des connaissances formelles et informelles. Ces caractéristiques associées au village influencent l'association entre les liens faibles (*bridging*) du capital social féminin et la participation des femmes dans les décisions agricoles. Le taux d'éducation primaire dans chaque division influence l'association entre les liens sociaux (*linking social capital*) et la participation des femmes dans les décisions. Ceci indique la

présence d'interactions entre les échelles d'analyse. En connectant nutrition des ménages et sécurité alimentaire, j'examine ensuite les liens entre les mesures de croissance anthropométrique des enfants et la participation des femmes à la prise de décisions agricoles à l'aide de données de sondage auprès de 221 couples mère-enfant. Les résultats indiquent une corrélation positive et statistiquement significative entre la croissance de l'enfant et la participation des femmes dans la prise de décision agricole, une association que l'on ne retrouve pas chez les hommes. Les résultats montrent qu'une meilleure prise en compte de la dynamique des relations de genre au sein des ménages est nécessaire à la promotion de pratiques agricoles répondant aux besoins nutritifs. Par conséquent, cette thèse délivre une compréhension nuancée des éléments institutionnels, sociaux et liés au genre dans l'accès aux ressources foncières et dans la sécurité alimentaire des petits exploitants des régions semi-arides du Kenya.

Contributions to knowledge

This dissertation provides empirical evidence in support of culturally relevant, social-ecologically appropriate approaches to enhancing women's access to land resources in the smallholder farming systems of semi-arid Kenya.

Chapter 2

- Presents a novel life stage approach to examine natural resource management issues.
- Identifies changing attitudes towards the 2010 Kenya constitutional change in land inheritance for daughters, and captures the gradual adaptation of national land succession reforms within local interpretations of customary law.
- Reveals the confluence of local gender norms and legal processes of land ownership, which constrains smallholder women from acquiring formal land ownership.

Chapter 3

- Provides an in-depth examination of grandparents' provision of childcare and nutrition to grandchildren within skipped-generational households in Kambaland.

Chapter 4

- Delineates how levels of education and poverty mediate the association between linking social capital and women's participation in agricultural decision-making.
- Identifies how interactions between a household's social capital, division- and village-level characteristics mediate women's participation in agricultural decision-making.

Chapter 5

- Identifies feedback relationships between child nutritional growth and women's participation in agricultural decision-making, with implications for breaking the

generational cycle of undernutrition among women.

- Introduces a causal loop diagram that examines pathways and mediating factors between intra-household productive decision-making and child nutritional growth.

Chapter 6

- Introduces an adapted conceptual framework that combines the sustainable rural livelihood approach, social-ecological resilience, and gendered access mechanisms to provide thematic support for policy and programmatic efforts that seeks to better address slow, moderate, and fast-changing cycles within complex social-ecological systems.

Contributions of co-authors and remarks on style

This dissertation follows a manuscript-based format. As a result, there is some repetition in the text. I am the primary author of all the chapters of the dissertation. Chapters 2, 4, and 5 are coauthored with Dr. Gordon M. Hickey. Chapter 3 is coauthored with Dr. Zipporah Bukania. Chapter 3 has been published as a book chapter in *Food Security, Gender and Resilience: Improving Smallholder and Subsistence Farming*, Routledge (2016). Dr. Gordon M. Hickey provided academic supervision, intellectual input, theoretical and methodological development, funding, and writing support for all chapters. Dr. Zipporah Bukania provided intellectual input and contributed to the writing of Chapter 3.

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La vie n'est facile pour aucun de nous. Mais quoi, il faut avoir de la persévérance, et surtout de la confiance en soi. Il faut croire que l'on est doué pour quelque chose, et que cette chose il faut l'atteindre coûte que coûte.

Marie Curie (1867-1934)

As quoted in Madame Curie: A Biography (1937) by Eve Curie Labouisse, Part 2, p. 116.

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List of Abbreviations

AIC	Akaike Information Criterion
AIDS	Acquired immune deficiency syndrome
ASAL	Arid and semi-arid lands
BMI	Body mass index
CHW	Community health workers
DFID	Department for International Development (United Kingdom)
FAO	Food and Agriculture Organization of the United Nations
HAZ	Height-for-age z-score
HIV	Human immunodeficiency virus
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy and Research Institute
KALRO	Kenya Agricultural and Livestock Research Organization
KARI	Kenya Agricultural Research Institute
KDHS	Kenya Demographic and Health Survey
KNBS	Kenya National Bureau of Statistics
KEMRI	Kenya Medical Research Institute
KES	Kenyan Schilling
LM	Lower Midland
NGO	Non-governmental organizations
RQDA	R-based Qualitative Data Analysis
SD	Standard deviation
SE	Standard error
SLA	Sustainable Livelihoods Approach
SPSS	Statistical Package for the Social Sciences
USD	United States Dollar
WAZ	Weight-for-age z-score
WHZ	Weight-for-height z-score
WFP	World Food Programme

CHAPTER 1

GENERAL INTRODUCTION

Household food security remains a major societal challenge, especially in the arid and semi-arid regions of Africa (Charles *et al.*, 2010; IFAD, 2011; WFP, 2013). Here, climate change, population growth, environmental degradation, and food price volatility are some of the most significant factors impeding household food security for many smallholder farmers (Charles *et al.*, 2010; Fafchamps, 1992; Keane, Page, Kergna, & Kennan, 2009; Sage, 2013; WFP, 2013). Local factors affecting household food security in semi-arid regions include smallholders' livelihood strategies, their access to resources, and the diverse institutions that affect their rural livelihoods (Averbeke & Khosa, 2007; Ellis, 2000a; Sutherland, Irungu, Kang'ara, Muthamia, & Ouma, 1999; Turner, 1999). This dissertation focuses on how women, as significant smallholder and subsistence farmers and key contributors to household food and nutrition security in the semi-arid regions of Kenya, access land resources, and considers the implications for public policy and future research.

1.1 Literature review

1.1.1 Food security and smallholder farmers

The most widely accepted definition of food security is “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (FAO, 2003, p. 28). Increasingly, nutritional security has been brought to the forefront of food security discourse with the emergence of the triple burden of malnutrition - undernutrition, micronutrient deficiency, and obesity (Pinstrup-Andersen, 2007). This has involved a shift from programs

focused on the outcome indicators of hunger, based on measures of caloric intake, to measures of “hidden hunger”, involving specific nutrient deficiencies and the incidence of overweight and obesity (IFPRI, 2016).

Among the rural populations of sub-Saharan Africa, more than two thirds are considered smallholder farmers (Dixon, Gulliver, & Gibbon, 2001; Dixon, Tanyer-Abur, & Wattenbach, 2004). Smallholders have been broadly described as small-scale farmers, pastoralists, forest keepers, and fishers who manage areas varying from less than one hectare to ten hectares (Altieri & Koohafkan, 2008; FAO, 2012). They are characterized as using mainly family labour for their production activities and as using part of their produce for subsistence needs (*ibid.*). Although the scale of production and output is considered small relative to commercial farmers, subsistence and smallholder farmers produce up to 80 percent of the food consumed in Asia and sub-Saharan Africa (FAO, 2004, 2012; IFAD, 2011). With limited assets such as land resources, agricultural inputs, and access to markets, credit, insurance and other formal institutions, smallholder and subsistence farmers are often restricted in their capacity to cope during shocks and stresses, including times of poor harvest, drought, and pest outbreak. Smallholder farmers often lack sufficient capital to invest in labour-saving agricultural technologies (Dixon *et al.*, 2001) and are experiencing a diminishing supply of farm labour due to urban migration and lower levels of engagement in agriculture among younger generations (Doss *et al.*, 2011). Even in seasons of abundant harvest, smallholder farmers regularly struggle with depreciating crop values due to local supply gluts, an increase in domestic supplies and competition from imported agricultural produce (Ackello-Ogutu, 2011; FAO, 2012).

However, smallholders’ diverse livelihood strategies, which can involve complementing rain-fed agriculture with herding livestock, small-scale aquaculture, artisanal and other off-farm activities, have demonstrated the potential to enhance their household resilience in the face of

adversity and change (Ellis, 2000b; FAO, 2011). The improvements observed in projects promoting sustainable smallholder agriculture (Kahane *et al.*, 2013), climate-smart agriculture (Zougmore *et al.*, 2016), and nutrition-sensitive agriculture (Jaenicke & Virchow, 2013), to name a few, provide examples of the potential for smallholders to enhance their household food and nutritional security. From the perspective of public policy, the high prevalence of smallholder farmers in rural regions, their key role as producer of affordable and nutritious domestic foods, and the poverty challenges they disproportionately face in many societies, points to the need to better understand the complex relationship between smallholder livelihoods and household food security in different contexts (FAO, 2004).

1.1.2 Women and access to land resources in sub-Saharan Africa

Among smallholders in Africa, women play a critical role in improving food and nutritional security. They constitute an increasing proportion of producers in the rural agricultural sector as more men seek seasonal or salaried work in urban centers (Doss *et al.*, 2011). Responsibilities to prepare and cook food for other household members generally rest with women in rural African communities (Kevane, 2012). Similarly, women are often the primary caregivers to children, elderly, and the sick (Akpotor, 2009; Shah, 2012). Recognizing their multiple roles, many international aid and development agencies have called on national policy-makers and the scientific community to better support smallholders with a particular focus on more equitable allocation and access to agricultural resources for women and youth (Alkire *et al.*, 2013; FAO, 2011, 2012; Shah, 2012; Sraboni, Malapit, Quisumbing, & Ahmed, 2014).

In rural Africa, women generally face more constraints than men in their access to productive factors, such as credit, agricultural inputs, and arable land resources (Agarwal, 1988, 1994a, 1994b; Besteman, 1995; Carney, 1988; Carney & Watts, 1991; Gray & Kevane, 1999; Kevane, 2012; Koopman, 2009). In most patrilineal agrarian societies, land use is regulated by

men acting as local customary authorities, who typically assert that women should obtain land through their husbands and his kin and thus, are secondary holders of land rights (Kevane, 2012). Such access to land resources through kinship is often tenuous. In many cases, women lose access to land resources when marital relations end in separation or the death of the husband, further jeopardizing their agricultural livelihoods (Gray & Kevane, 1999; Hyder *et al.*, 2005; Makura-Paradza, 2010).

Previous research focused on gendered interactions within households in rural Africa has found that patterns of agricultural production and household consumption vary with women's access to natural and financial resources (Kevane, 2012). Evidence indicates that women are more likely than men to invest a larger proportion of their household income in childhood education (Gonzales, Jain-Chandra, Kochhar, Newiak, & Zeinullayev, 2015; Thomas, 1990). In South Africa, the extension of old-age pensions in 1993 to black South Africans significantly improved nutritional growth measures in girls when their grandmothers received pensions - a finding not replicated with grandfathers' pensions (Duflo, 2003). However, women's preferences concerning investments in children are not homogeneous. Kevane's (2012) review of studies on gendered consumption in rural Africa found that a preference for sons exists in feeding and schooling practices.

Previous research on gender and agriculture has also indicated that women's and men's cropping patterns and engagement in livestock rearing were not clearly separated along gender lines. Doss (2002) found that women in Ghana were more likely to concentrate on non-staple food crops such as vegetables, often leaving staple crop production to their husbands. Although women are less likely to cultivate cash crops, such as cocoa, those who do have been found to be more likely to be in female-headed households and are more likely to own landholdings (*ibid.*). Such studies have questioned the assumptions of a unitary model of household preferences

(Becker, 1981). Yet as Goldstein and Udry (2008) noted, it is difficult to attribute variation in the practices of men and women solely to differential household bargaining. Insecure tenure due to the economic or political context may be another significant factor in predicting land resource access (Goldstein & Udry, 2008; Kevane, 2012). Turner's (1999) research on the gendered shift in livestock wealth in the Sahel found that women invest predominantly in smaller livestock such as goats, sheep, and poultry, rather than cattle, even if they reported to prefer cattle to small stock. They justified their choices by alleging influences from marital relations and local religious and customary values. Such findings highlight how agricultural and land resource access are closely governed and influenced by social norms, local institutions as well as household economies and individual preferences (*ibid.*).

1.1.3 Land use and contemporary land tenure in Kenya

A critical determinant of land resource access and the environmental resources that link to it is land tenure (Ogolla & Mugabe, 1996). In Kenya, prior to the nineteenth century, Arab, Portuguese, and Indian traders settled along the coast of the South Indian Ocean. The Portuguese were the first European settlers in the seventeenth and eighteenth centuries to establish trading posts in politically semi-autonomous settlements along Mombasa and other coastal towns (Maxon, 2009). Agriculture and trading were the main livelihood activities in these coastal regions at this time (Rutten & Ombongi, 2005). The interior areas of the country were inhabited by several ethnic groups, classified by their language, composed of the Bantu, Nilotes, and Cushites (Ochieng, 1985). Crop production and pastoralism by different ethnic groups broadly determined land use. Around the once volcanic Mount Kenya, the Bantu-speaking Kikuyu, Embu, and Meru ethnic communities practiced agriculture in the fertile alluvial soils and engaged in staple food trade among other natural resources with Bantu-speaking Kamba people from the more arid region south of Mount Kenya (Ochieng, 1985). Ethnic communities such as

the Nilotic Luo, Nandi, and Bantu-speaking Luyhia, practiced mixed-farming, animal rearing and crop production in western Kenya, especially in the Lake Victoria region (Rutten & Ombongi, 2005). Nilotic-speaking ethnic groups such as the Masaai, Turkana, and Nandi practiced pastoralism. They controlled large land areas expanding from the coast of Lake Victoria to the Rift valley for their nomadic pastoral livelihoods in the nineteenth century (Maxon, 2009).

Today, land in Kenya is generally categorized into freeholding land, government or trust land, and common land. Freeholding land is individually owned, either inherited or purchased. Most smallholder farmers in Kenya cultivate on free-holdings, although, other forms of tenure co-exist. Since the 1960s, land adjudication and consolidation processes have led farmers to have government officials survey their land in order to receive a land plot number or register for a title deed. However, the process of land titling and adjudication remains on-going and many farmers still do not possess title deeds to their land.

The second major category of land is government (or trust) land. Under this form of land tenure, considerable land was allocated to farmers through land settlement schemes with the government retaining rights to the land. For example, people who have been displaced for the establishment of national game reserves and conservation parks, often cultivate on trust lands allocated by the government for resettlement. Also, Kenyan men who served in the British army during the Second World War were among those originally settled by the colonial government in the post-war period (Osborne, 2014).

Third, common lands are used, managed, and protected by the community. They include sites such as school grounds, certain forests, common pathways between farms, water springs, and even dams that are built by the community with support from government or non-governmental organizations (NGOs). Of these different land tenure arrangements, this dissertation focuses

primarily on gendered access to freehold land resources, which tend to be tightly intertwined within institutions of marriage, family structure, and inheritance.

In 2010, Kenya promulgated its new Constitution, with clauses acknowledging individuals' rights to acquire and own property (The Constitution of Kenya, 2010 article. 40). Major land reforms introduced in the Constitution included the elimination of gender discrimination in law, customs and practices related to land and property in land (article 60 (1)(f)) with the exception of agricultural land. Customary laws apply in governing land succession and allocation as long as they are consistent with the Constitution. This clause granted women formal rights to inherit land, addressing a common form of discrimination against unmarried, widowed, and divorced women (Cotula & FAO, 2007). The constitutional change was publicized in the media as an era of new rights for daughters to inherit land from their fathers (Ayodo, 2012; Wambugu, 2011). Yet, dual sets of legal and customary laws regarding land tenure in many communities have diverse implications for women's land access (Meinzen-Dick & Pradhan, 2002; Borwein, 2013).

1.1.4 Kamba people in the semi-arid midlands of Kenya

In 2013, Kenya's eight province boundaries were redrawn into forty-seven counties through a process of devolution (see Figure 1.1; Cornell & D'Arcy, 2014). Makueni County, Machakos County, and Kitui County are considered part of the arid and semi-arid lands (ASAL), covering 82 percent of Kenya (Ogolla & Mugabe, 1996). The main economic activities in the ASALs are pastoral, ranching, wildlife-based systems and dryland farming (Ogolla & Mugabe, 1996). Rainfall varies regionally, with the total annual average range between 500 and 1300mm (Jaetzold, Schmidt, Hornetz, & Shisanya, 2006). There is 66 percent rainfall reliability during the growing period of the first rainy season (<100 to 450 mm), and 80 to 530 mm in the second rainy season (*ibid.*). There is a long and short rain season between March to May and October to

December, respectively. Being part of a semi-arid and arid climate, the area is considered to have low agricultural potential compared to the high-potential areas near Mount Kenya (Figure 1.2).

Over 95 percent of the inhabitants in Machakos and Makueni Counties are from the Bantu-speaking Kamba ethnic group. Among the 42 official ethnic groups in Kenya, the Kamba originated from the Niger-Congo language family region of the continent (Hodd, 1991; Tiffen, Mortimore, & Gichuki, 1994). Kamba people represent approximately 9.3 percent of Kenya's population, one of the five largest ethnic communities in the country. Oral history implies that the earliest Kamba people settled in the area of Mbooni Hills around the seventeenth century (Kaplan, 1984). The Kamba ethnic group observes polygamous and monogamous marital unions within a patrilineal society (Tiffen *et al.*, 1994). High fertility rates and nonmarital childbearing, as well as the HIV/AIDS pandemic in the 1990s and 2000s resulted in intergenerational family structures where grandmothers become the primary caregiver for their grandchildren in many Kamba communities and in Kenya more broadly (Linsk & Mason, 2004; Nyambedha, Wabubbam, & Aagaard-Hansen, 2003; Omariba, 2006). Kamba communities generally maintain associations with their clans, follow religious beliefs based on Catholic and Protestant Christianity and retain traditional beliefs of magic and fear of curses (Hobley, 2010).

Kamba smallholder farmers generally rely on subsistence production, combining food crop and livestock production on terraced farms (Jaetzold *et al.*, 2006). Common crops include maize, beans, pigeon peas, green grams, cassava, sweet potatoes, arrowroot, pumpkins, kale, nightshades, oranges, tangerines, lemons, mangos, avocados, papaya, bananas, and cotton (Jaetzold *et al.*, 2006; Personal observations, 2013). Beyond subsistence production, many farmers engage in casual labor and non-farm activities such as basket and rope weaving (Personal observations, 2013), which is often supplemented with the collection of forest products

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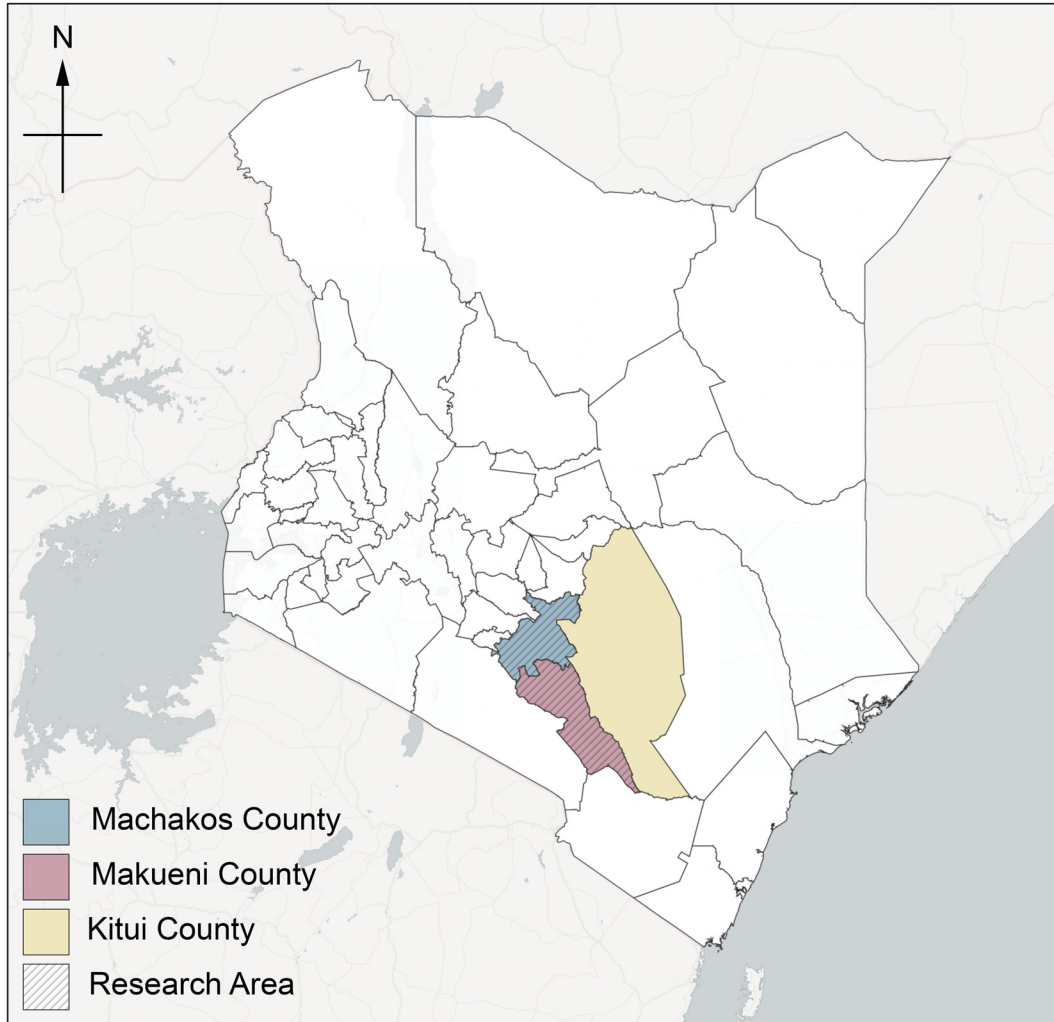


Figure 1.1 Kenyan counties selected for my research area.
Source: author & Bolbach (2017)



Figure 1.2 Arid and semi-arid lands in Makueni County. *Source:* author (2013)

such as firewood, charcoal, herbal medicine, honey, and wild-edible food, and with traditional alcoholic brews for consumption and small-scale trading (Kagio & Musembi, 2013; Shumsky, Hickey, Johns, Pelletier, & Galaty, 2014).

In part due to low soil fertility in the arid and semi-arid regions, Kamba smallholder farmers frequently face low crop yields and consecutive seasons of crop failure (Jaetzold *et al.*, 2006). Seasonal dependence on government and international food assistance via food provision or ‘Food for Work’ programs persist in Machakos, Makueni, and Kitui Counties. The generally high prevalence of childhood undernutrition in the region (KNBS, 2015, Table 1.1) has led the Kenyan government making food and nutritional security one of the nation’s top six development priorities (Aligula & Kamau, 2013).

1.1.5 Research need

With calls to enhance household food and nutrition security by elevating women’s access and control to agricultural resources, increasing research and policy efforts have been based on understanding the relationship between women’s autonomy within the household and childhood nutrition (Carlson, Kordas, & Murray-Kolb, 2015; Cunningham, Ruel, & Ferguson & Uauy, 2015; Richards 2013), health (Molyneux, Murira, Masha, & Snow, 2002; Sharma & Kader, 2013; Thorpe, VanderEnde, Peters, Bardin, & Yount, 2016), and economic impacts (Ashraf, Karlan, & Yin, 2010; Holvoet, 2005). Previous research has shown that improved access to land resources by women can enhance food security (Agarwal 1994a, 1994b; Frankenberger & Coyle, 1993), but these results are far from conclusive. Moreover, there is a lack of empirical evidence relating women’s autonomy in agricultural production to nutritional measures in the context of the resource-scarce, famine-prone arid and semi-arid regions of Kenya. There is also relatively little evidence on how women’s land resource access in rural smallholder communities has

Table 1.1 Undernutrition prevalence in children under the age of five in Machakos, Makueni, and Kitui Counties, Kenya

Indicator	2003 KDHS ¹	2008-09 KDHS	2014 KDHS		
	Eastern Province ²	Eastern Province	Machakos County	Makueni County	Kitui County
Stunting (%)	32.5	41.9	26.5	25.1	45.8
Wasting (%)	4.2	7.3	6.5	2.1	3.1
Underweight (%)	21.4	19.8	8.1	10.2	19.7

1 KDHS: Kenya Demographic and Health Survey

2 Data available by the provinces prior to Kenya's change to a county administrative system in 2010

evolved since the 2010 Constitution of Kenya. Research is therefore needed to improve our understanding of women's access and control of land and agricultural resources, such as crops, livestock, and agricultural income and the social and institutional factors affecting their access within the rural population.

1.2 Motivation for research

Before my doctoral research, I gained research experience in the field of public health in developing area contexts. I came across clinicians who portrayed clinical work in developing countries as treating a conveyor belt of sick patients and sending them back into the environment that contributed to their diseases in the first place. They expressed that by engaging in public health research, they aimed to change the underlying contextual factors at the root of many illnesses. Similarly, I was disappointed in the individual perspectives of public health and development research that often viewed context-specific culture, norms, and societal preferences as extraneous factors that should be adjusted for; and the perspective that populations are made up of individuals who are passively exposed to health risks in their social environments. I agreed more readily with the theories of ecosocial-determinants of health and the perspectives that individuals are active change-makers in their daily efforts and communal interactions, especially within rural contexts. Furthermore, I was particularly interested in understanding the interplay between societies and natural environments. I decided that examining smallholder and subsistence farmers working towards food and cash crop production within complex social-ecological systems was an ideal starting point. Reducing chronic hunger and nutrition insecurity in the youngest generations can help to bring about lasting societal change. As a non-farmer and an outsider to the population under study, I was cognizant of the hazards of interventionist approaches to scientific inquiry without first understanding the ways smallholders have worked to survive in their own environment.

Within the literature on food and nutritional security, I found research participants' values and norms were often reported to impede policy and program effectiveness. I wanted to further understand the nature of critical societal core values, beliefs, and customs that could influence individual production and consumption decisions and behaviours, albeit specific to a particular group and context. In 2010, two years before the start of my doctoral research, Kenyans voted for a new constitution in a referendum. It was an opportunity to study land resource access, a highly politicized and controversial issue, often resulting in conflicts, corruption, but also community participation in conservation efforts. Access to land resources by marginalized populations became a major consideration in my research. Moreover, I recognized that smallholders are characterized by high social cohesion and a persistence to strive in their communities. This sprouted a curiosity to better understand how women in these landscapes utilize social connections under resource limitations and contextual constraints, to build viable rural livelihoods. Through my research, I aim to contribute empirical evidence to help move the challenging topics of land relations, household nutrition security and public policy forward. As an applied social science researcher, I also aim to engender dialogues to give voices to the men and women living in smallholder and subsistence agricultural communities.

1.3 Research objectives

The aim of this dissertation is to investigate how women's access to land resources relates to household food and nutritional security in the semi-arid region of Kenya. Specifically, my four research objectives are:

- (1) To determine how smallholder women access land resources under local institutions

(Chapters 2 & 3)

- (2) To describe the livelihood assets and strategies that smallholder women use to access

land resources across their life stages (Chapters 2 & 3)

- (3) To identify the relationships between smallholder women's social capital and their access to land resources (Chapter 4)
- (4) To examine the relationships between child nutrition and women's access to land resources (Chapter 5)

1.4 Theoretical background

Conceptually, this research draws primarily on the sustainable livelihoods approach and is complemented with theories of social capital, resource access, and social-ecological resilience. Social capital theories expand on the nuances of social relations and the benefits they provide to individuals' livelihood strategies and outcomes. Access theory incorporates considerations of gendered power relations and flows of benefits from land resources among individuals within an extended family. Social-ecological resilience thinking embeds household livelihood strategies within a social-ecological system that is subject to agricultural seasonality, regular internal stresses, and external shocks. Characteristics of system dynamics such as feedback, thresholds, and resilience fit well with the sustainable livelihood framework where livelihood outcomes feed back into the contextual resource base and change the household's livelihood assets.

1.4.1 Sustainable Livelihoods Approach

The Sustainable Livelihoods Approach (SLA) is based on the perspective that different people in different places use a combination of resources and activities in order to make a living (Chambers, 1995; Scoones, 1998). The SLA offers a people-oriented development perspective and recognizes the context-specific realities facing the rural poor (Scoones, 2009). It emphasizes strengthening the set of capabilities and assets that already exist within households. The SLA places people within their *context*, including shocks, stresses, and seasonal trends, which may weaken or enhance their livelihood outcomes and opportunities. Second, within the context, people have different endowments of *livelihood resources* such as natural capital, financial

capital, human capital, and social capital. Third, the SLA looks at how people exploit different capitals through formal and informal *institutional processes* and *organizational structures*. North (1990, p. 97) describes institutions as “the humanly devised constraints that structure political, economic and social interactions”. Institutions can range from formal rules to informal constraints that guide livelihood strategies. Fourth, the SLA considers how people use their existing assets and their *livelihood strategies* to improve their livelihood outcomes. These strategies consist of agricultural intensification (e.g. increasing inputs of fertilizer and irrigation) (Carswell, 1997) and extensification (buying more land while using the same farming inputs per area) in agricultural systems. In more complex systems of agro-pastoralism or peri-urban agriculture, previous studies have used the SLA to explore strategies for selective livelihood diversification (e.g. multiple sources of income during different seasons) (Ellis, 2000a; 2000b), progressive specialization (e.g. becoming the best tomato growers in the region) and strategies that involve migration (e.g. to marginalized forest lands or to urban areas in search of wage or salary-based work) (Morse & McNamara, 2012; Sundar, 2006). Lastly, through these strategies, people achieve sustainable *livelihood outcomes* in terms of income, well-being, food security, nutritional health, as well as resilience to shocks and stresses while sustainably shaping their resource base.

The SLA was further developed to incorporate the livelihood assets pentagon (DFID, 1999, Figure 1.3). Livelihood assets may be described as five stocks of capital (Ellis, 2000b). First, natural capital refers to environmental and biological resources such as land, water, and other ecosystem services that are utilized by people as means of survival. There are renewable (e.g. fishery stocks, forests, soil fertility) and non-renewable (e.g. extractive metals, ores, oil) natural resources. It can vary spatially from low to high agroecological potential (Ellis, 2000b). For example, in the semi-arid regions of Kenya, there is less spatial diversity than in the surrounding

coffee and tea-producing region of Mount Kenya. Natural capital can vary temporally under human control that seeks to increase the productivity from natural capital (e.g. sedentary agriculture) (Ellis, 2000b). Second, physical assets comprised of “man-made” capital created by economic production processes (Ellis, 2000b). Physical assets are generally considered producer goods that are used to generate productive flow of output. Infrastructure assets such as roads, power lines, and piped water supplies facilitate livelihood diversification by saving costs and time involved in transactions (e.g. rural smallholder women save time in water collection from a river when they have access to a communal water pump or piped water). Tools and built structures such as granaries, fences, ploughs, pesticides, and irrigation pipes are important for smallholder livelihoods. Access to physical capital usually requires sufficient labour and skills, such as building a well or making bricks. Communication tools such as mobile phones help producers coordinate with other producers, brokers, and gain information on market price changes. Most people in rural Kenya own mobile phones; however, access to electricity is intermittent and not guaranteed. Third, human capital refers to labour available to a household, which increases with investment in education, training, and health. Larger households reduce their risk of labour loss due to illness and migration, and have more opportunities to diversify their livelihood strategies (Ellis, 2000b). Within households, collective human capital is dependent on internal demographic factors such as births, deaths, marriage, migration, children growing older and unexpected events such as divorce or contextual stresses and shocks (Moser, 1998). Public policies concerning education and health services designed to raise the level of human capital at the national scale can have major impacts on rural livelihoods. Fourth, financial capital refers to income, savings, credit, and remittance. It is more readily used to purchase other forms of productive capital, or to acquire consumer goods. Other forms of savings are practiced in smallholder systems, such as keeping livestock as a store of wealth and storing food to buffer

against poor harvests. Remittance is becoming more accessible in rural Kenya as mobile money transfers become popular. Households with greater stocks of financial capital can engage more readily in non-farm livelihood activities that require greater initial capital and skills, whereas poorer households tend to engage in non-farm livelihood activities with lower entry constraints (e.g. firewood collection) (Ellis, 2000b). Fifth, social capital, as a key part of the SLA, captures social claims through norms of reciprocity within communities and between households deriving from social ties (Moser, 1998). There are multiple theories and conceptualizations of social capital, which I will examine more closely in Section 1.4.2. Social capital in the context of smallholder systems is related to the moral economy and is used as social insurance, particularly by women (Platteau, 1991). Time and resources in building and enriching social ties and trust become investments and social safety nets for future livelihood activities (Ellis, 2000b). As social capital refers to the assets generated from relationships, it is more readily observed and measured in community associative membership than among informal acquaintances within local and regional networks (Morse & McNamara, 2013).

The SLA has been criticized as being less applicable to explaining how global processes such as globalization, food price volatility, climate change or international poverty reduction efforts affect local-level livelihoods. Ellis (2000b) has noted that access to livelihood assets can be modified by social relations, the influence of culture, and power relations across social divides, such as ethnic, class, and gender, which is not sufficiently depicted in the SLA framework (Michaud & Forsyth, 2011). Further, livelihood capitals often lead to the measurement of tangible livelihood outcomes in relation to economic productivities such as crop yield, labor, and mean consumption per capita (de Haan & Zoomers, 2005). Other intangible outcomes from activities in leisure, culture, psychological and emotional support, reputation, and trust are subsumed into social capital or regarded as having little significance with livelihood

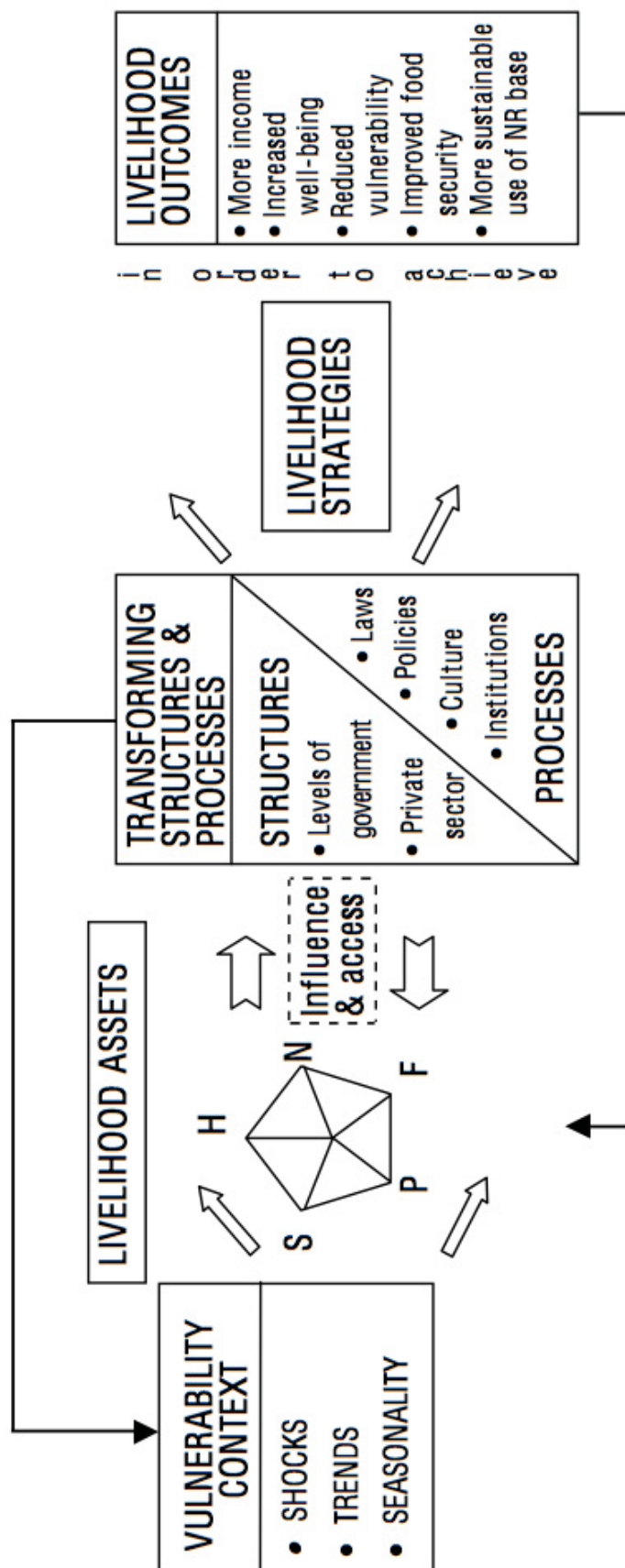


Figure 1.3 Sustainable livelihoods framework by DFID.

Key: H = Human Capital, N = Natural Capital, F = Financial Capital, S = Social Capital, P = Physical Capital
Source: DFID (1999)

sustainability (Koning, 2002). To bolster the SLA in this research, gender relations and local institutions pertaining to cultural values are emphasized.

1.4.2 Social capital

Social capital is characteristically different from other natural, human, financial, and physical capitals (Ostrom, 2000). Created through social relations, social capital can be enriched with use and through time and efforts on shared activities. In contrast to the other livelihood capitals, social capital can wane when transaction activities fall into disuse (*ibid.*). Scoones (1998, p. 8) defined social capital as “the social resources (networks, social claims, social relations, affiliations, associations) upon which people draw when pursuing different livelihood strategies requiring coordinated actions”. Ostrom (2000, p. 176) expanded the concept of social capital further to encompass less tangible dimensions of social relations, such as “the shared knowledge, understandings, norms, rules, and expectations about patterns of interactions that groups of individuals bring to a recurrent activity”. In examining power relations within social class contexts, Bourdieu (1986, p. 247) developed the concept of cultural capital as the “institutionalized relationships of mutual acquaintance and recognition”. Portes (1998, p. 6) offered a more nuanced conceptualization of social capital as an entitlement, or “the ability of actors to secure benefits by virtue of membership in social networks or other social structures”. Beyond individual benefits, Putnam, Leonardi, and Nanetti (1993, p. 167) asserted the value of social networks for communal benefits “that can improve the efficiency of society by facilitating coordinated actions”. He emphasized civic participation and political engagement that accompanies the norms of reciprocity and trustworthiness from connections among individuals. Social networks have the potential to transform social capital into tangible benefits for the community as a whole. In recent years, social capital theories have been applied in understanding social determinants of health. Regional variations of social capital, measured by household

indicators and contextual characteristics have been used to explain distributional variations in disease prevalence (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Subramanian, Kim, & Kawachi, 2002).

My research mainly draws on Portes and Scoones' conception of social capital as an actor's ability to benefit resources from her social networks. I also adopt an approach used in public health scholarship that posits that regional variations of social context and characteristics also impact an individual's accumulation and use of social capital as a resource. In addition, I use Coleman's (1988) and Granovetter's (1973) theories of social capital dimensions encompassing bonding, bridging, and linking, which I further describe in Chapter 4. My research is also guided by Ostrom's (2000) and Durlauf's (1999) caution that social capital can be used to reinforce power, control, and access to resources among social actors to create inequalities among resource users and cause social exclusion (Ellis, 2000b). Patronage networks, weak institutional structures, and sanctions against corruption facilitate the exploitation of social capital (Phillips, 2002; Streeten, 2002), which is particularly prevalent in cases of elite capture among development programs (Ostrom, 1992; Warren & Visser, 2016).

Social capital as a livelihood asset is difficult to measure. Informal networks of acquaintances and friends are difficult to track, even with long-term ethnographic methods. Social capital indicators, such as trust and reciprocity, are less observable or can emerge at times of serious livelihood crisis (Ellis, 2000b). Some indicators of social capital, such as the background characteristics of group members, are also criteria that result in social relations. Other indicators of social capital, such as collective action, are intermediary or outputs of social relationships. The nature of social capital as a cause and outcome of experience (e.g. individuals' leadership experience and status) also hinder research efforts to attribute observed phenomenon

to social capital (Andriani & Christoforou, 2016). Importantly, individual and social-centric conceptions of social capital are not mutually exclusive (*ibid.*).

1.4.3 Theory of access

My research also draws on access theory (Ribot & Peluso, 2003) to complement the SLA with an analysis of gendered power relations, and to more systematically draw out the livelihood strategies that women use to access land resources. Access theory defines “access” as the ability to benefit from resources, and also describes a “mechanism” as the means, processes, and relations that actors use in accessing resources (*ibid.*). Beyond rights-based access mechanisms, Ribot and Peluso (2003) theorized there are at least two other types of access: structural and relational access mechanisms. Rights-based access refers to that which is sanctioned by law, custom or convention. On the other hand, illegal access refers to situations where benefits are obtained through an illegal mechanism (e.g. theft). These mechanisms are not condoned by society’s norms or rules. However, illegal mechanisms of access, such as land squatting, are highly contested and historically complex issues in Kenya, and affect understandings of who has proper claims of access. Within access theory, structural mechanisms and relational mechanisms are viewed together to describe sub-categories of access: access to technology, to capital, to market, to labour and labour opportunities, to knowledge and information, to authority, access through social identity, and access through the negotiation of other social relations (*ibid.*). Each type of mechanism can work within parallel, complementary, conflicting, sequential, and nested institutional and social structures. Access analysis involves: (1) identifying the flow of the benefits from land resources; (2) identifying the mechanisms by which different actors gain control and maintain the benefit flow and its distribution; and (3) analyzing power relations underlying the mechanisms involved, which can be systematically traced out spatially and historically (Blaikie, 1985; Ribot, 1995).

Differences between resource access and ownership in access theory resonate with Sen's (1981) distinction of entitlement from endowments (Devereux, 2001). He defined entitlement as "the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces" (Sen, 1984, p. 497). Leach, Mearns and Scoones (1999, p. 233, emphasis added) added that "environmental entitlements refer to the alternative sets of utilities derived from environmental goods and services over which social actors have *legitimate effective* command and which are instrumental in achieving wellbeing; and 'capabilities ... are what people can do or be with their entitlements'. Thus, an endowment can be conceived as a community's reserve of arable land that farmers could potentially cultivate, while an entitlement is the actual plot of arable land that farmers have the labour, time, and technology to cultivate and benefit from, through access mechanisms available within local institutions. Lin's (2001) theory on the "strength of position proposition" can be understood as one of the theories bringing social networks, access, and entitlement approaches together. Landowners who generally have more capital and assets than landless members in the community can more readily leverage their access mechanisms to acquire additional land resources. This can further marginalize community members who are in lower socio-economic positions and lack power to benefit from their resource entitlements (Lastarria-Cornhiel, 1997; Rose, 2002). In my research, smallholder women are viewed as actors who strategize to enhance their access to land resources. Both rights-based and non-rights-based mechanisms are studied as a process by which their access is gained, maintained, controlled, and changed over time (Peluso, 1996; Ribot & Peluso, 2003).

Critiques of access mechanisms noted that differences between structural and relational mechanisms are unclear (Koch, 2008). For example, rights-based mechanisms can also be perceived as a type of structural mechanism; other access mechanisms, such as "access to

market” can be considered as structural, relational, and rights-based. “Bundles of power” can be possessed by individuals or created or lost through negotiations. Leach and Mearns *et al.* (1999) pointed to the lack of conceptualization of how resources are gained and distributed, or how people devise and get involved in different forms of “access mechanisms” (Koch, 2008).

1.4.4 Social-ecological resilience

The broad motivation for my research is also to enhance the resilience of smallholder farming systems to household food insecurity. Social-ecological resilience has developed from resilience thinking in complex systems science (Folke, 2006; Walker *et al.*, 2006). Systems scientists recognized that the inter-dependence between resource users and the natural environment involves feedback pathways and self-regulatory mechanisms not dissimilar to the ones observed in predator-prey cycles (Holling, 1973). The concept of resilience has been used and defined in various interdisciplinary studies (Berkes & Folke, 1998; Carpenter, Walker, Anderies & Abel, 2001; Gunderson & Holling, 2001; Gunderson, Holling & Light, 1995; Klein & Nichols, 1999). Adger’s (2000, p. 347) definition of resilience within the social domain is “the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change”. Integrating social and ecological systems in resilience thinking provides ways to examine the interplay between disturbance, stress, and reorganization that characterizes the iterative nature of seasonal resource use, and the fluctuating prosperity and poverty of highly natural resource-dependent communities (Carpenter *et al.*, 2001). Social-ecological resilience of any system is characterized by the presence of adaptive capacity, redundancy in functions, social learning, and innovation involving societal governance and human ingenuity (Folke, 2006; Walker *et al.*, 2006; Walker & Salt, 2006). An adaptive cycle involves four phases: exploitation or growth, conservation, release, and reorganization (Gunderson & Holling, 2002). Redundancy refers to functional redundancy, where a system contains different components that can provide

the same function and compensate for the loss or failure of others; or responsive diversity, where components that produce for redundant functions also react differently to disturbance (Simonsen *et al.*, 2015). When facing disturbances, resilient systems may undergo adaptation to maintain their functions, structures, identities, and feedback. Alternatively, they may reach a system threshold that leads to transformation to another state, defined by alternative functions, structures, and identities (Holling, 1973; Walker *et al.*, 2006). As smallholder farmers' livelihoods are closely dependent on their natural environment, framing our understanding of their livelihood dynamics and access mechanisms within a complex social-ecological system perspective allows greater consideration of physical disturbances such as drought and the interplay with institutional contexts in Kenya's post-constitutional era (Walker *et al.*, 2006).

However, critiques of social-ecological system approaches note that they have a tendency to downplay interpretive traditions of social research and favour quantitative couplings of social and ecological components that are more amenable to empirical research. Social-ecological system approaches are also generally insufficient at recognizing the roles of culture, power, agency, and intentions exterior to livelihood improvements as probable causes of system changes (Fabinyi, Evans & Foale, 2014; Stojanovic *et al.*, 2016). Systems approaches have also been criticized as depoliticizing the observed situation by viewing feedback mechanisms and available choices of reactions as neutral (Evans, 2011). Combining social-ecological resilience thinking with access theory enabled me to better consider social questions of power relations, cultural values and equity as they relate to land resource access and food security outcomes (Cote & Nightingale, 2012).

1.4.5 Conceptual framework

Figure 1.4 introduces a conceptual framework that draws from the theoretical foundations of the SLA, social capital theory, access theory, and social-ecological resilience. This conceptual

framework places households within a social-ecological systems context of shocks and seasonal stresses. Similar to the sustainable livelihood framework by DFID (1999), households draw from five different livelihood capitals: natural, physical, financial, human, and social capital. The major difference between my proposed framework and Scoones' (1998) framework is that I distinguish the set of livelihood capitals between men and women. I separate the livelihood capitals by gender and add potential pathways for interactions between the preferences and use of the capitals by members of the households. In this framework, the field of institutional processes and structures extends outside individual household and is embedded within the greater social-ecological system. Through a set of formal and informal institutional processes and organizational structures, household members develop *de facto* access mechanisms in their daily operational activity space (Ostrom, 2005). Within the rural setting, the informal institutions encompass cultural values, identities, and community norms. Formal institutions are more distant from the household to represent *de jure* rules, policies, or clauses in the constitution that are less familiar to the average actors in the system. Arrows between the institutional processes and social-ecological context depict the feedback mechanisms that exist between the two components of the framework. For example, economic policies for expanding agricultural development, driven partly by the International Monetary Fund and the World Bank's Structural Adjustment Policy, have drastically decreased forested land and wildlife habitat in Kenya (Ogolla & Mugabe, 1996). As a result, political efforts have resulted in more protective laws for land and environmental conservation.

Similarly, the framework highlights potential feedback mechanisms within the household. Men and women's livelihood strategies lead to certain livelihood changes in food and nutritional security, resilience, and the sustainable use of their natural resource base individually and

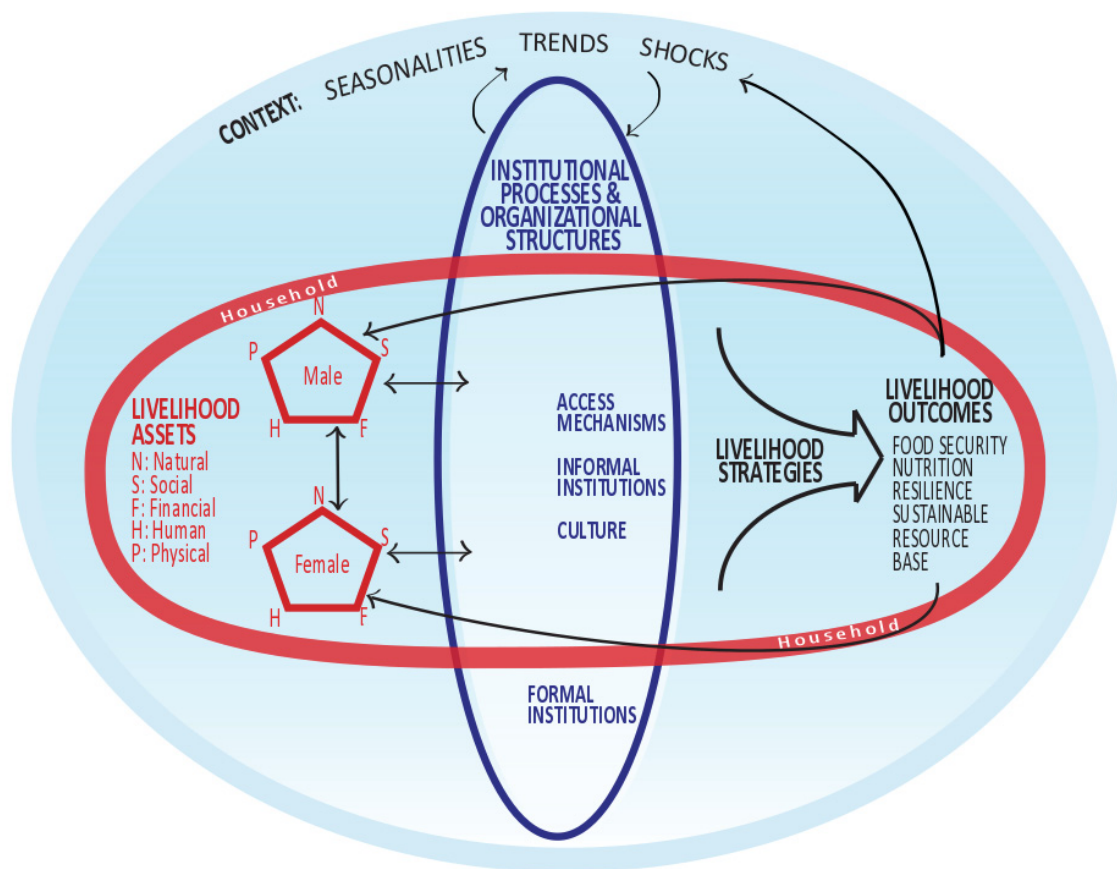


Figure 1.4 Research conceptual framework.

Source: Adapted from the Local institutions and livelihoods: Guidelines for analysis. Messer & Townsley (2003)

collectively. The livelihood outcomes, then, feed back into enhancing or maintaining livelihood assets. For example, a well-nourished child will be more likely to achieve higher educational potential, in turn influencing her human capital and the household's collective knowledge.

My research objectives, outlined in Section 1.3, are developed with the different components of this conceptual framework in mind.

1.5 General methodological approach

The overall research design for this dissertation included multiple data collection and analysis methods applied at different scales of observation (divisions¹, community, household, individual) and involved diverse sources (qualitative and quantitative primary data, secondary data, literature review). This mixed methods approach offers “a research design with philosophical assumptions as well as methods of inquiry... Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone” (Creswell & Plano Clark, 2007 p. 5). This thesis used qualitative results to inform the design of quantitative survey instruments (Chapters 4 and 5), merged qualitative and quantitative data in a single study (Chapter 4) and addressed women's access to land resources as the program of inquiry in multiple studies (Chapters 2, 3, 4, 5). Mixed methods research provides strengths that can offset the weaknesses of both quantitative and qualitative research (Creswell & Plano Clark, 2007). Open-ended information allows a better understanding of local rules and values regarding gender and cultural dimensions of natural resource management. It provides rich contextual details that can inform the interpretation of quantitative results. Quantitative information provides a measure of prevalence and interrelationships that may be only detectable

¹ Divisions were administrative regions in Kenya that were one level under districts. Sub-counties were called “divisions” and counties were called “districts” in the administrative naming system prior to 2010. Divisions were subdivided into locations.

at greater aggregated scales. Mixed methods research therefore provides more comprehensive evidence to triangulate results. Quantitative results can also point to gaps that may require more in-depth exploration of the mechanisms and rationales behind observed behaviours. Understanding the gender dimensions of land resources involves acknowledging the historical and political realities of marginalized groups and power dynamics within existing institutional structures. Gender dimensions of land resource management also inevitably involve the presentation of multiple realities from men and women. Understanding participants and researchers positionally and biases therefore requires a level of closeness that combines pragmatism, advocacy and constructivism worldviews (*ibid.*). Increasingly, applied social sciences recommend multiple forms of evidence to inform audiences such as policy makers, practitioners, and other stakeholders (*ibid.*). The dialectical perspective of using multiple paradigms (Levins & Lewontin, 1985) helped me to better understand and value social-ecological systems.

Field research was carried out from 2013 to 2014 as a part of an overarching collaboration between the Kenya Agricultural Research Institute (KARI)² and McGill University, titled, “Enhancing Ecologically Resilient Food Security in the Semi-Arid Midlands of Kenya”. Below, I describe the specific qualitative and quantitative methods used in the research. In the field, I worked in partnership with KARI staff and the Kenya Medical Research Institute (KEMRI). Local scientists and field research assistants were employed as needed and were instrumental in establishing connections with district agricultural officers, extension officers, chiefs, village elders, and household members to conduct various research activities.

² The Kenya Agricultural Research Institute (KARI) was later renamed as the Kenya Agricultural and Livestock Research Organization (KARLO) in 2014. In the dissertation, I used the acronym KARI when I refer to personnel from KARI and used the acronym KARLO in acknowledgement sections.

1.5.1 Qualitative research methods

Following an exploratory case study research design (Yin, 2008), data collection focused primarily on understanding community and local-level perspectives relationships and issues. From 2013 to 2014, over the duration of ten months, I conducted community meetings, focus-group discussions, and in-depth key informant interviews in Makueni County with an interpreter. Data collection took place in rural villages in Kitandi Location³, Mumbuni Location, Kathonzweni Location, and Kathekani Location, surrounding four major towns (Kola, Wote, Kathonzweni, and Mtito Andei) along the Machako-Wote Road, Wote-Makindu Road, and Nairobi-Mombasa Highway (Figure 1.5). Wote is the administrative capital of Makueni County, situated 129 km south-east by road from Nairobi, the capital of Kenya. The four sites selected had varying levels of population density, levels of land privatization and agro-ecological characteristics within the semi-arid midland region. Northern parts of Makueni County have a comparably higher average rainfall than southern parts (Jaetzold *et al.*, 2006).

Community meetings were organized as men-only and women-only gatherings. Farmer participants in the larger KARI-McGill project and non-participants were eligible to attend. The community meetings lasted between 90 to 150 minutes. A list of semi-structured questions was prepared, which addressed topics on land access, inheritance, family and marital relations regarding land, gender relations regarding agricultural resource access, and respondents' perceptions of, and experiences with, the constitutional change in 2010. Phone numbers of interested participants were collected for follow-up key-informant interviews.

Focus group discussions were organized as men-only, women-only, and mixed-gender

³ Locations are a type of administrative region in Kenya. Locations are a third level subdivision below counties and sub-counties. Locations are further subdivided into sub-locations.

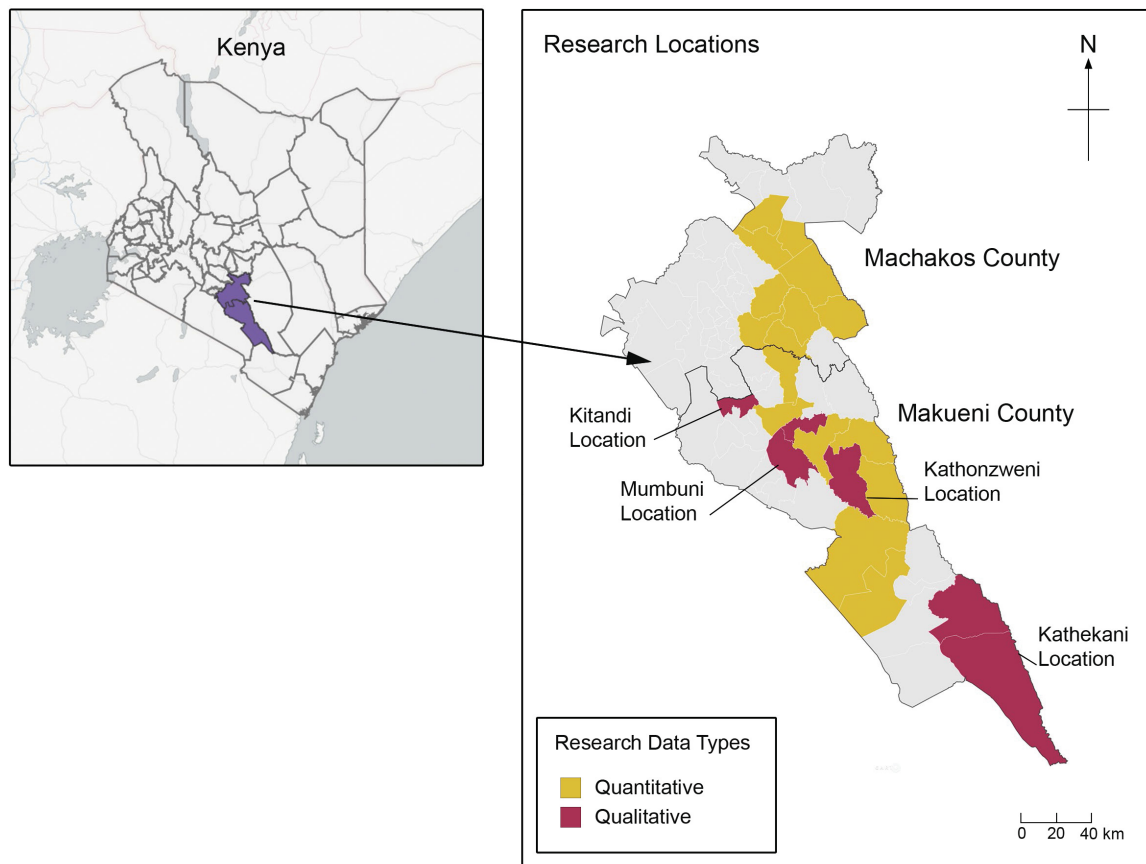


Figure 1.5 Research locations within Machakos and Makueni County.
Source: author & Bolbach (2017)

gatherings of six to 15 people, lasting approximately 90 to 120 minutes. However, no participants who came to the focus group were turned away. There were two focus groups with 21 and 32 people. The topics discussed focused on rights-based, structural, and relational access to land and agricultural resources in Kambaland. Gender differences in agricultural roles and responsibilities were also covered. The discussions drew out the different perspectives on customary versus constitutional rights for daughters to inherit land. The process also allowed space for participants to engage in dialogue around gender relations, difficulties in land access they faced as women, and strategies to balance between adherence to formal and customary institutions of land resource allocation.

Key-informant interviews sought perceptions and experiences of individuals, from smallholder farmers, village elders, assistant chiefs governing a sub-location, a chief, extension service officers from the Ministry of Agriculture, and research scientists from KARI and KEMRI. The interviews were approximately 90 minutes in duration. Questions in the semi-structured interview included: one-day recall of food eaten that was grown on their farmland or purchased from the market, who used and how did they benefit from their land resources, what roles did the respondents have in the family and community, experience with voluntary associative groups, group access to land resources, experience with family land inheritance, decision making for land purchases and inheritance, and attitudes towards the constitution versus customary laws.

I used an interpreter during the community meetings, focus group discussions, and key-informant interviews. The discussions were audio-recorded, transcribed into the local dialect Kikamba or English in full, and then translated into English. This served as a way to verify the interpreted messages at the time, and provided an opportunity to translate longer responses that

were not translated by the interpreter in their entirety at the time. I chose to encourage the continuous flow of responses by respondents, rather than interrupting them for further interpretation (Rubin & Rubin, 2005). Transcripts from men-only meetings were given to male native Kikamba speakers for transcription. Transcripts from women-only and mixed-gender meetings were given to both female and male Kikamba transcribers. Female transcribers were intended to transcribe dialogues from women-only gatherings, however, due to time constraints and some transcribers being unable to complete the allotted work, I chose to spread most of the transcription work among the two transcribers who were reliable and efficient (one male and one female).

The qualitative data were analyzed via semi-open coding and axial coding using the computer software R-based Qualitative Data Analysis (RQDA) (Huang, 2016). The details of the analysis and the interpretations of data pertaining to the different research questions can be found in Chapter 2 (Section 2.2.3) and Chapter 4 (Section 4.4.1).

1.5.2 Quantitative research methods

1.5.2.1 Household and community surveys

This research draws on data from three quantitative surveys. The first household survey was conducted by KEMRI and contained 277 households with mother-child pairs in Makueni and Machakos Counties in 2012. I then conducted a second household survey in 2014 with the same 277 mothers from the previous KEMRI survey. A third community survey was conducted with village elders in the villages where the household surveys were administered in 2014. The questionnaires from 2014 were written in English. Survey data were used to measure maternal and child nutritional status, intra-household decision-making, mothers' community engagement,

and social connections. Details on the sampling design and the indicators pertaining to specific research questions are detailed in Chapter 4 and Chapter 5.

1.5.2.2 Training research assistants, administering, and inputting survey

In this section, I will address the process of training, administering, and inputting data that contributed to the rigor and limitations of the results. Enumerators were selected based on data collection experience in other KARI surveys and recommendations from KARI supervisors who were familiar with their performances. I trained 20 enumerators and six KARI research assistants, who acted as supervisors of teams of three to four enumerators. In the training sessions, we reviewed each survey question to clarify meanings, which assisted in standardizing the method of enumeration. The enumerators practiced administering different questions in pairs, one acting as the enumerator and one as the respondent in the local Kikamba dialect. All enumerators, KARI research assistants, and an assistant with communications experience from a Kamba radio station, provided feedback to improve the Kikamba terms and the syntax of the questions. This exercise aimed to minimize the variability of terms and syntax used when the questions were asked in the field and to familiarize regional-specific terms in the survey. The exercise aimed to clarify areas of confusion in the survey and to practice how to build rapport with respondents and conduct the questionnaire in a respectful and non-judgmental way.

The household and community surveys were administered in two weeks. Research assistants located respondents from the 2012 KEMRI survey, which contained their name, their household head's name, their village, division, sub-location, location, and county information. As the survey was a follow-up of the same respondents surveyed in 2012, finding the correct respondent was a high priority. At the end of each day, I checked each filled questionnaire, discussed problematic areas with enumerators, and verified the codes that were used by the enumerator. Research assistants were tasked with checking the questionnaires, ensure the

respondents on the list had all been interviewed, and record the reason for attrition.

The data from the paper surveys were entered by a team in Nairobi using the software Statistical Package for the Social Sciences (SPSS). I trained the data entry team and answered any questions or discrepancies that arose. Data from 221 household questionnaires and 127 community questionnaires were entered twice by two different data entry assistants. This helped validate the data entered and facilitate searching (and subsequent corrections) of data discrepancies with the original paper-based questionnaires acting as reference. Data entered was converted and analyzed in Stata, a general-purpose statistical software package. Survey indicators and statistical analyses are detailed in Chapter 4 and Chapter 5.

1.5.2.3 General statistical analyses

Four main statistical tests were used in Chapter 4 and Chapter 5. The following section briefly describes the purpose and assumptions associated with each procedure.

Multilevel regression analysis

Multilevel regression analyses are useful to study relationships among variables that have a hierarchical data structure, as there are different biological and social processes that influence observed outcomes at many levels. They address potential ecological or aggregation fallacies when the appropriate “unit of analysis” is not used (Robinson, 1950) by estimating microscopic or individual level, as well as macroscopic or aggregate level, simultaneously. Multilevel regression models consider intra-class correlation and heterogeneity in the underlying variance, and allow for complex data structures (Jones & Subramanian, 2015). They provide a specification of predictor variables from multiple levels (fixed effects) and a specification of correlation among responses from the same clusters (random effects). In Chapter 4, the following general multilevel model was used:

$$Y_{ij} = \beta_0 x_{0ij} + \beta_1 x_{1ij} + \alpha_1 W_{1j} x_{0ij} + \alpha_2 W_{1j} x_{1ij} + (u_{0j} x_{0ij} + u_{1j} x_{1ij} + e_{0ij} x_{0ij} + e_{1ij} x_{1ij})$$

$$\text{Level 2 variance: } \sigma_{u0}^2 x_{0ij}^2 + 2\sigma_{u0u1} x_{0ij} x_{1ij} + \sigma_{u1}^2 x_{1ij}^2$$

$$\text{Level 1 variance: } \sigma_{e0}^2 x_{0ij}^2 + 2\sigma_{e0e1} x_{0ij} x_{1ij} + \sigma_{e1}^2 x_{1ij}^2$$

The multilevel fixed-effect regression model was used to predict whether there were significant associations between social capital indicators at the individual or household level (level 1) and divisional indicators (level 2) on women's participation in decision-making at the household level.

Chi-square Test of Independence

The Chi-square test is used to determine if there is a significant association between the two categorical variables from a single population. The null hypothesis (H_0) is that variable A and variable B are independent; while the alternative hypothesis (H_1) is that variable A and variable B are not independent (Pagano & Gauvreau, 2000). The following formula was used to compute the expected frequencies:

$$E_{r,c} = \frac{n_r * n_c}{n}$$

Where $E_{r,c}$ is the expected frequency count for level r of Variable A and level c of Variable B, n_r is the total number of sample observations at level r of Variable A, n_c is the total number of sample observations at level c of Variable B, and n is the total sample size. To find the test value, the following formula was used:

$$\chi^2 = \sum \left[\frac{(O_{r,c} - E_{r,c})^2}{E_{r,c}} \right]$$

The critical value was obtained from the χ^2 distribution table, at $\alpha = 0.05$, with degrees of freedom = (row-1)(columns-1). $O_{r,c}$ is the observed frequency count of cell r, c .

The assumptions for this test are as follows:

1. The sampling method is simple random sampling.
2. The variables under study are all categorical.
3. The sample data is displayed in a contingency table and the expected frequency count for each cell of the table is at least 5.

In Chapter 5, the Chi-square test was used to test for independence between socio-economic or biological variables of respondents and households with categories of anthropometric z-scores of weight-for-height, height-for-age, and weight-for-age measures (Chapter 5).

Kruskal-Wallis H-Test

The Kruskal-Wallis H-test is a rank-based non-parametric analog to the one-way ANOVA (Dinno, 2015). It uses rank measures to determine if there is at least one comparison group that is statistically significantly different from one or more groups of an independent variable on a continuous or ordinal dependent variable. The null hypothesis (H_0) is that the mean ranks of samples from the populations are expected to be the same. The alternative hypothesis (H_1) is that the mean ranks of sample from the populations are not the same (Corder & Foreman, 2009). The test statistic is given by:

$$H = (N - 1) \frac{\sum_{i=1}^g n_i (\bar{r}_i - \bar{r})^2}{\sum_{i=1}^g \sum_{j=1}^{n_i} (r_{ij} - \bar{r})^2}$$

Where n_i is the number of observations in group i , r_{ij} is the rank (among all observations) of observation j from group i , N is the total number of observations across all groups, $\bar{r}_i$ is the average rank of all observations in group i , $\bar{r}$ is the average of all the r_{ij} .

A correction for ties is made by dividing H by:

$$1 - \frac{\sum_{i=1}^G (t_i^3 - t_i)}{N^3 - N}$$

Where G is the number of groupings of different tied ranks, and t_i is the number of tied values within group i that are tied at a particular value. The H probability distribution approximates chi-square distribution when the 5th assumption is met. The critical value was obtained from the χ^2 distribution table, at $\alpha = 0.05$, with degrees of freedom equals the number of groups – 1.

The assumptions for this test are as follows:

1. The dependent variable is measured at the ordinal or continuous level, or the assumption of approximate normality of observations cannot be met.
2. The independent variable consists of two or more categorical, independent groups.
3. The observations are independent of each other in each group.
4. The independent variable has the same shape and homogeneous variability. If this assumption is not met, the Kruskal-Wallis H-test can be used to compare mean ranks.
5. The sample data are displayed in a contingency table and the expected frequency count for each cell of the table is at least 5.

The Kruskal-Wallis H-test was used to determine whether the mean ranks of the ordinal dependent variable (women's participation in agricultural decision-making), were significantly different across four groups of weight-for-age z-scores (below -2, -2 to below -1, -1 to below 0, and 0 and above). The Kruskal-Wallis H-test is an omnibus test statistic that cannot indicate which group is significantly different from each other. It only indicates at least two groups are statistically different. The following ad-hoc test is used to determine which groups are different from another in Chapter 5.

Dunn's Test

Dunn's z-test statistic approximates exact rank-sum test statistics by using the mean

rankings of the outcome in each group as a pair-wise post-hoc test of the Kruskal-Wallis test (Dinno, 2015). Formulas used to compare group A with group B are:

$$\overline{W}_i = W_i/n_i$$

Where W_i is the sum of ranks, and n_i is the sample size for the i th group. We calculate:

$$z_i = \frac{y_i}{\sigma_i}$$

Where i is one of the 1 to m multiple comparison, $y_i = \overline{W}_A - \overline{W}_B$, and σ_i is the standard deviation of y_i , given by:

$$\sigma_i = \sqrt{\left\{ \frac{N(N+1)}{12} - \frac{\sum_{s=1}^r (\tau_s^3 - \tau_s)}{12(N-1)} \right\} \left(\frac{1}{n_A} + \frac{1}{n_B} \right)}$$

Where N is the total number of observations across all groups, r is the number of tied ranks, and τ_s is the number of observations tied at the s th specific tied value.

The probability that the null hypothesis was found by random chance follows the standard two-sided test interpretation $p = P(|Z| \geq |z|)$.

The Bonferroni adjustment for multiple comparisons is found by calculating:

$$p^* = pm$$

Where m is the number of individual pair-wise comparisons.

In Chapter 5, the Dunn's test was used to determine which groups of women had participation in agricultural decision-making that were significantly different from another, based on their children's weight-for-age z-scores.

1.6 Dissemination activities

Dissemination efforts aimed to report, verify, and triangulate results with community members and other stakeholders. The activities took place in Machakos and Makueni Counties, Kenya as

well as in the capital Nairobi from November 4th, 2015 to Dec 7th, 2015. I had several meetings with Kenyan scientists and researchers to present the results and plan for the dissemination program. Four dissemination sessions took place across four rural markets (Kyuaa in Yatta sub-county, Watema in Kaiti sub-county, Thavu, in Kathonzweni sub-county, and Kiunduani, Kibwezi-West sub-county) spread across 238 km from Nov 17th to 20th, 2015. One session was set in Machakos County and three were set in Makueni County due to my longer research engagement with communities there. There were a total of 164 farmers, agricultural extension officers, chiefs, and sub-county agricultural officers in attendance. In all four sessions, I drew on the knowledge of the participants to provide a picture of the nutritional needs of a child during the neo-natal period and early childhood, the findings regarding women's participation in decision-making, and the importance of community engagement such as attending community-wide public meetings. I drew illustrations as the discussion progressed to help with visualization and produced three actionable recommendations (Figure 1.6). In two of the four sessions, we incorporated short skits of role-playing to demonstrate different styles of intra-household discussion, negotiation between men and women in planning for the next farm season, and simulated women's attempts to share new information to household leaders. I found that by incorporating examples of typical family dialogues in Kikamba, the farmers were more engaged. The activities aimed to engender reflections on how intra-household negotiations also take place within their own household.

I conducted member-checking interviews with different groups during breakout discussion sessions (Figure 1.7) to further triangulate my research findings. The small group discussions and presentations helped solidify the dissemination messages and identify reactions and challenges in the farmers' experience. Farmers had high expectations, as they should, given their contribution in time and effort to providing information during periods of data collection. The



Figure 1.6 Participant using the visual aid in her feedback at Kyuaa dissemination session. *Source:* author (2015)



Figure 1.7 A male-group discussion at Kyuaa dissemination session. *Source:* author (2015)

dissemination experience reaffirmed the importance and benefits of presenting results to the research participants and validating findings of social science research.

1.7 Ethical considerations

Permission to carry out my study was granted by McGill University's Research Ethics Board (Appendix 7.1). In the field, I requested permission to conduct my research with farmers who participated in community meetings, focus group discussions, interviews, and surveys. I communicated with the assistance of an interpreter that I was a student doing research with KARI within the larger KARI-McGill project, focusing on food security and land resources. Although I hoped my research would be useful, it would not have any immediate practical outcomes and could, at best, only indirectly inform government policies and development programs. I presented my project objectives to county assistant chiefs, village elders, and sub-county agricultural officers to gain permission to conduct my research in Makueni County. Mobilization of research participants was assisted by field assistants employed through KARI. Access to specific groups, such as widow's groups, was through an announcement by an assistant chief.

Access to research participants outside the KARI-McGill project regions was through a recommendation from the Makueni County Ministry to contact a senior chief at Kathakani location. With the sponsorship letter from KARI detailing my research objective within the greater KARI-McGill food security project, the senior chief assisted my access to community groups in his administrative region.

I maintained the confidentiality of my interviewees by keeping my research notes and surveys locked in the KARI office, and subsequently kept in a locked location at McGill. Pseudonyms were used when reporting the data. Transcribers signed a Data Use Agreement concerning the confidentiality of content in audio recordings and the conditions of use

(Appendix 7.5).

We explained the general purpose of the project and the purpose of recording the process via audio recording to participants of community meetings, focus group discussions and interviews. Participants were informed that they could withdraw from the process at any time if they wished to do so. They gave verbal consent at the beginning of each research activity. We explained in written and verbal form the purpose of the survey to respondents. Respondents gave written consent to participate in the survey and were told that no compensation would be given at the end.

1.8 Positioning myself in the research process

It is important within social science research to be reflexive of the lens with which I view the research subject and the research process; and to be cognizant of my potential influence on the research through my perceived social class, my pre-determined position in relation to the participants, and how I actively managed my research position within the research process. A researcher's positionality also influences their interpretation, understanding, and ultimately their confidence in other's research (Savin-Baden & Major, 2012).

In the field, I was aware of the multiple identities I carried and the perceptions these identities might have evoked with research participants, project research scientists, research assistants, and the rural community in which I stayed. I am an un-married young woman, a student "from KARI", a Chinese from Canada, and a Christian, which, to different degrees, worked for my initial introduction to the Kamba community. The participants in the initial community meetings were familiar with the larger KARI-McGill food security project that started in 2011 and had met other McGill students who visited prior to my doctoral research. As part of the greater project, I was accepted as a "student doing research" in the area. I was quickly given a common Kamba name, "Ndanu", which the participants from my first focus group chose

after our meeting, which means “joyful” or “happy”. I introduced myself using the Kamba name and my English name in all subsequent meetings. I also adopted traditional greetings and responses that younger Kamba people use when greeted by an older Kamba person. I soon realized it was important within the introduction to explain where I was born, as I did not look like what they perceived a Canadian might look like. My Chinese identity helped dispel some connotations associated with westerners, such as missionaries, British colonialists, and aid volunteers. In some instances, I was welcomed because of Chinese influences in Kenyan rural settings, such as cheaper products, motorcycles, and mobile phones; and support provided by the Chinese government in building Kenya’s highways, water tanks, and railway. I explained that I was there as a student to learn from them, the research participants. The rural Kamba communities where I worked were predominantly Christian, where all research community meetings and focus groups began and ended with a prayer. Although I did not understand the prayers spoken in Kikamba, I was also reassured by the prayers and what they represented at the beginning of each meeting.

Power hierarchies within Kamba group settings were clear in the sitting arrangement, where speakers, foreigners, and KARI staff received individual chairs, and community leaders and those who arrived early received a place on a long wooden bench. The majority of participants sat on the ground when meeting outside or in chairs, if available. To the best of my abilities, I moved from speaker to speaker during each meeting. I kept myself at eye-level or below the speaker, and maintained eye contact while audio-recording his or her response. Although I relied on the interpreter who stood behind me to interpret the messages from Kikamba to English, and moving from person to person took a longer time, I felt it was one small way of lessening the power relations between the participants sitting on the ground and myself. During key-informant interviews with female farmers, I asked to have a tour of the farm as a way to place the

respondent in a physically less formal interview format. On the farm, respondents were much more knowledgeable and familiar with the environment than my interpreter and me. Respondents had more agency in the conversation, to showcase the different crops they produced, point to plots of other family members, mention boundary conflicts, and they picked weeds or harvested crops while answering questions. Asking for a tour of the farm also worked as a way to interview the woman apart from her husband when the husband was also at the homestead.

My preconceived notions on the constitutional rights of women in land succession have influenced my approach to discussions on land inheritance. However, recognizing the bias I held, I tried to frame open questions and not be satisfied with responses that aligned with my own conclusions. I revisited similar questions from different angles and probed further, in order to better triangulate the responses from the groups and the individuals. It was difficult at times not to seem biased. My position as an outsider in the Kenyan context, and my experience as a Chinese immigrant, led me to view that “culture” is often unduly blamed for differences that people might not understand. By blaming culture, it also implies that one culture may be better than another.

I recalled one of the first questions the KARI researchers and field assistants were interested in was, “How long will you stay?” It became clear to me that my position as a western student, flying in for a few weeks or months, is transient. Some were less guarded of their views and said to a research assistant, “You will assist her in this short time. She wants to collect her data so she can go home”. The exchange struck me as I reflected on my relationship with my interpreters, research assistants, and survey enumerators. Some were employed by KARI. My research activities added workload to staffs’ regular responsibilities in the project. I was cognizant of field constraints in resources and paid in advance to cover the cost of fuel, mobile phone air-time, per-diem, to start mobilizing research participants. At the same time, I was wary that the lack of

transparency in costs of items in the rural setting may put my research budget at risk.

I was careful in selecting personable and respectful female interpreters who were proficient speaking in the local dialect, Kikamba, and in English. I chose interpreters who were not a part of the research community. Instead, individuals who were not recognized within the community were chosen in order to maintain anonymity of respondents within usually close-knit rural communities. I found that respondents were more likely to critique the leaders within the community. My position in relation to research assistants evolved as I learned to balance my role as a leader, a manager, and a peer to the interpreters, research assistants, and survey team. In displaying optimism and persistence in managing the quality of the research process, I aimed to encourage their research efforts, especially in the process of administering household surveys under arduous physical conditions in remote semi-arid Kenya.

1.9 Organization of dissertation

My research was carried out based on a general proposal and evolved through time, based on the results that informed subsequent research questions. However, the organization of the dissertation is designed to present the research findings in a cohesive and logical manner to best convey the main findings of each chapter and the overall research contributions. The dissertation follows a manuscript-based format and is written as a series of journal articles (Chapters 2, 4, 5) and a book chapter (Chapter 3). Most of the chapters are at various stages of submission and publication in international peer-reviewed journals (Table 1.2).

In Chapter 2, I present a broad contextual analysis of women's challenges and the mechanisms they use in accessing land resources across their life stages. I focus on how the local institutions and perceptions of the constitutional change in land succession for women may have influenced their land resource access. Through this examination, it became clear that women's role as grandmothers in skipped-generational households warrants further analysis.

In Chapter 3, I present a narrative of the emerging challenges grandmothers face in accessing land resources and securing nutritious food for their household members, particularly for grandchildren. I focus on grandmothers' livelihood capital assets and how the capitals support or hinder their desired outcomes in smallholder agrarian systems. From this analysis, it appears that grandmothers' respected status and community involvement over time associate significantly to their agricultural resource access.

In Chapter 4, I investigate the relationship between women's social capital and their access to land resources by using their decision-making participation in agricultural production as a proxy for access. By examining social capital dimensions at the divisional, village, and household levels, I highlight the associative influences that distal factors have on women's intra-household decision-making.

In Chapter 5, I examine the associations and feedback relationships between women's agricultural decision-making and childhood nutritional growth measures. The results provide empirical evidence that suggests gender-equitable decision-making dynamics within the household is associated with childhood nutritional status. Furthermore, the feedback mechanism between child nutritional growth and women's decision-making correlate with more resilient household food and nutritional security.

In Chapter 6, I present a summary of the findings, a critical discussion of the emerging themes, and identify future research directions to conclude the dissertation.

Table 1.2 Organization of result chapters and targeted journals

Chapter	Title	Targeted Journal
2	Local institutions and smallholder women's access to land resources across life stages in semi-arid Kenya	Journal: <i>Land Use Policy</i> *
3	Land to feed my grandchildren: Grandmothers' challenges in accessing land resources in semi-arid Kenya	Book chapter in: <i>Food Security, Gender and Resilience: Improving Smallholder and Subsistence Farming</i> . Routledge §
4	Cross-scale relationships between women's social capital and agricultural decision-making in semi-arid Kenya	Journal: <i>Journal of Rural Studies</i> *
5	Gendered associations between agricultural decision-making and child nutrition in semi-arid Kenya	Journal: <i>Food Security</i> *

§ Published

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CHAPTER 2

LOCAL INSTITUTIONS AND SMALLHOLDER WOMEN'S ACCESS TO LAND RESOURCES ACROSS LIFE STAGES IN SEMI-ARID KENYA

Abstract

Land is a critical resource in smallholder farming systems, access to which is known to contribute to household food security. In many rural small-scale farming systems, local institutions serve to guide land access. While such local institutions generally evolve from customary laws, they also adapt to existing state laws within changing social-ecological contexts. This study explores how smallholder women enhance their access to land resources using strategies guided by local institutions in semi-arid Kenya. Using qualitative data collected through in-depth key informant interviews (n=77), twelve focus group discussions (n=134), and eight community meetings (n=363), we explore how women living under multiple and nested local institutions access land resources at their different life stages. Results reveal women predominantly use relational access mechanisms to prepare and adapt to a shortage of land resources at different life stages. Results also suggest that women use rights-based access mechanisms predominantly to prevent land resource shortages. This paper highlights the need for land policies to better consider resource users' challenges across their life stages in order to support more pluralistic systems of land resource access and to enhance gender equity.

Keywords: Access mechanisms; Customary norms; Gender; Land; Resilience

2.1 Introduction

Access to land resources is vital for agrarian livelihoods and is critically linked to household food and nutrition security. For subsistence and smallholder farmers, access to land resources can be understood as their ability to benefit from land resources (Ribot & Peluso, 2003). However, many smallholders in Kenya do not have formal rights to access arable land resources as either property or registered tenure. For those who do not possess the formal rights to own, sell, or use land for production or as collateral to gain access to credit and other resource assets (Dixon, Gulliver, & Gibbon, 2001), land access is often determined by the complex interpretations of local customary laws, traditional norms, and values. Within this context, understanding the ways in which women access land resources in patrilineal cultures is a critical rural development concern (Agarwal, 1988; Agarwal, 1994a; 1994b; Besteman, 1995; Cotula & FAO, 2007; Doss *et al.*, 2011; Englert & Daley, 2008; Gray & Kevane, 1999; Meinzen-Dick, Brown, Feldstein, & Quisumbing, 1997). In the context of rural semi-arid eastern Kenya, a growing proportion of women are cultivating domestic plots of land as more men migrate to urban centers for employment. Women also tend to carry the primary responsibility for providing and preparing meals in rural households (Horenstein, 1989; UNICEF & Ahmed, 1985). Despite the lack of formal tenure or customary entitlements to own or inherit land, women have long been exercising ways to access land resources to support their livelihoods. Better understanding of how formal and informal institutions are affecting their land resource access in such a changing landscape has the potential to inform policies and programmatic interventions seeking to promote gender equity and household food security.

This paper draws on life-stage approaches, access theory, and social-ecological resilience scholarship to explore how Kamba women access land resources through formal and informal Kamba institutions. Although access analysis involves tracking the flow of the benefits between

resource stakeholders, it insufficiently incorporates the place of institutional norms and structures that allocate resource entitlements, which, in turn, shape access (Koch, 2008; Leach, Mearns, & Scoones, 1999). The life-stages perspective offers a time frame to help track the flow of the benefits across different users in multiple generations and across the different life stages of an individual.

Common stages in the human life-cycle can be categorized as infancy, childhood, adolescence, adulthood, and old age. Elder, Jr. and Rockwell (1979) understood life stages as biological development, social, and historical meanings of age. Biological development is marked by “a simple index of stage in the inevitable process of growing older” (*ibid.*, p. 2), such as the biological start of menstruation that marks adolescence. Social age identifies age patterns in social roles and timetables, such as the role of a spouse or parent after marriage or childbirth, respectively. The historical meaning of age refers to “membership in a specific cohort to the experience of history and social change” (*ibid.*, p. 2). A life-course perspective incorporates an understanding of the process by which life is impacted by larger context, distant events, and social relations with families and individuals. Longitudinal and life-course approaches have previously been used to investigate how time and events that existed earlier in life may impact later life outcomes (see Alwin & Wray, 2005; Ben-Shlomo & Kuh, 2002), in health, economic performance, social assistance, and the role aging plays on gender and social relationships (Udvardy & Cattell, 1992). However, relatively little attention has been paid to life-course perspectives in the context of land resource management. Recognizing this gap, we draw on the linear sequence of the life stages from infancy to old age, recognizing that the specific entry to, and duration of, stages vary across cultures and societies (Crockett, 1997). Within these life stages, women play multiple roles in the family structure as: daughters, sisters, wives, mothers,

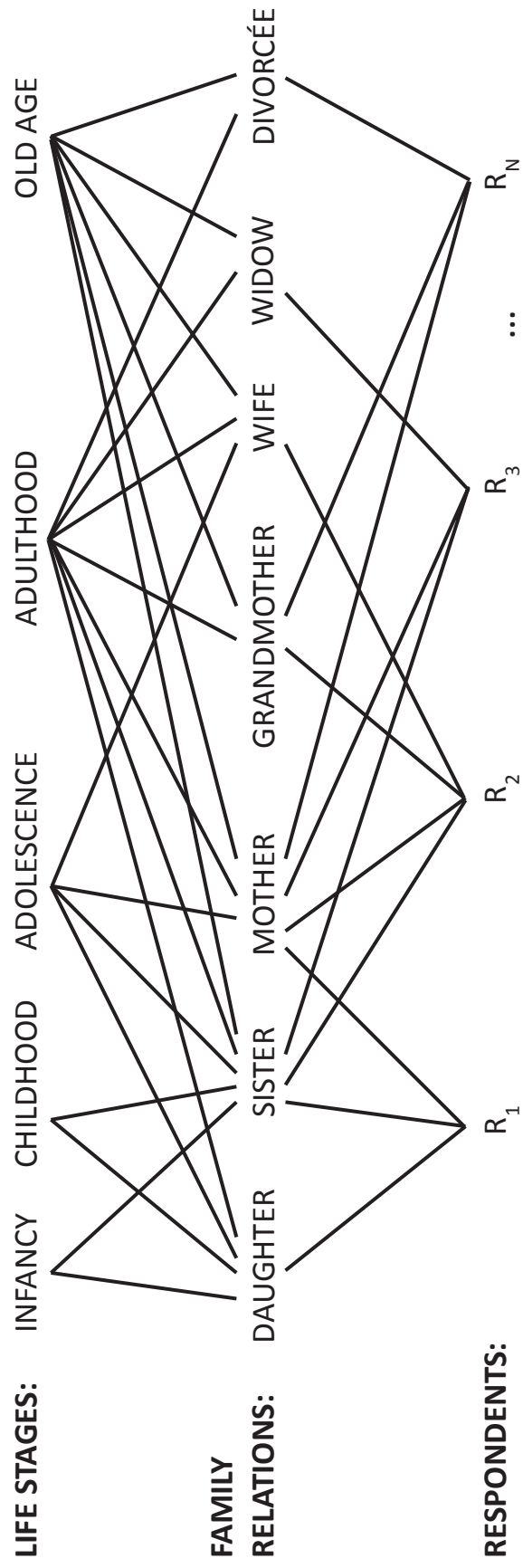


Figure 2.1 Cross-classification of life stages and family relations in respondents. *Source:* author (2017)

grandmothers, divorcées, and widows. There are subsequently cross-classifications between life stages and familial relations. For example, an individual woman can be a daughter, wife, and mother, simultaneously; and motherhood can occur during adolescence or adulthood (Figure 2.1).

To guide our analysis of women's land resource access across their life stages, we draw on concepts derived from access theory and social-ecological resilience. Ribot and Peluso (2003) defined access "mechanisms" in terms of the means, processes, and relations that actors use to derive benefits from resources. Access theory provides an understanding of natural resources beyond the focus on legal rights and property relations to resources to include many different non-rights-based mechanisms of access. For our study, we focused on rights-based, structural, and relational mechanisms of land resource access. These mechanisms work in parallel within complementary, conflicting, sequential and nested structures (Peluso, 1996; Ribot & Peluso, 2003). Critiques of access theory have indicated the lack of precision between mechanisms that are structural or relational and the limited attention paid to how the redundancy and adaptability of access mechanisms evolve during times of shock and stress. As a result, we borrow from resilience thinking to better inform our understanding of women's land resource access in the face of abrupt land shortages and other household stresses and shocks.

Resilience science considers the adaptive capacity of a social-ecological system to absorb shocks and still maintain function, as well as its capacity for renewal, re-organization, and development (Berkes, Colding & Folke, 2003; Folke, 2006; Gunderson & Holling, 2002). Resilience within the social domain has been defined as "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change" (Adger, 2000, p. 347). Adaptive capacity in social systems can be understood as the existence of networks that create flexibility in problem solving and balance power among

interest groups (Carpenter, Walker, Anderies & Abel, 2001). The adaptive capacity of a smallholder land tenure system can be conceptualized using four phases within an adaptive cycle (Walker & Salt, 2006). Early in the cycle is the rapid growth phase, a period when actors or groups exploit new opportunities and available resources. The transition to the conservation phase involves the accumulation of materials and connections between actors. The interconnected components are more strongly regulated, while new ways of doing things are excluded. The structure and connections causes the system to become more efficient in the ways it functions, however it also becomes more rigid and less flexible, reducing the system's resilience (Biggs, Schlüter, & Schoon, 2015). Third, the release phase is a short phase, or disturbance, that exceeds the system's resilience and breaks apart its reinforcing interactions. Regulatory controls weaken as material and energy are released from their previous connections. Linkages are broken and natural, social, and economic capital may exit the system. For example, new technology or a market shock can lead to abrupt changes in a smallholder system. Fourth, the chaotic release phase transitions to the reorganization phase. This phase provides opportunities for innovation, experimentation, and reestablishment of social, economic, or power relations (Walker & Salt, 2006). In fragile social-ecological systems, small disturbances can cause a large range of responses with potentially dramatic social consequences (Adger, 2006; Karpati, Galea, Awerbuch, Levins, 2002). For this study, the adaptive cycle provides a useful framework to help explore the evolving interdependence between social actors and their natural resource base in Kamba smallholder agricultural contexts.

2.2 Study setting

Our research was conducted in Makueni County, one of the three counties that constitute Kambaland. The Kamba people settled in the region east of Mount Kenya more than 200 years ago. Today, Kamba farmers predominantly practice rain-fed agriculture on small parcels of land,

supplemented with livestock rearing, income from casual labor, beekeeping, and the small-scale trading of artisanal crafts (Juma & Ojwang, 1996). Low use of technology, combined with highly variable rainfall and decreasing soil fertility often results in low crop yields and a high prevalence of malnutrition in the region (Jaetzold, Schmidt, Hornetz, & Shisanya, 2006; Kaplan, 1984; KNBS 2015).

From 1969 to 1970, and in the mid-1980s, sections of land in Makueni County were formally surveyed. Farmers could receive administrative plot numbers and eventually formal title deeds for their agricultural land as part of Kenya's major land registration process, which started in the 1950s. Despite this effort, large areas of land in the region still lack formal tenure arrangements partly due to the long process and the administrative costs of surveying and registration (Nyamu-Musembi, 2008).

In 2010, Kenya's newly promulgated constitution signed into law the rights of people to own and inherit land without gender discrimination (The Constitution of Kenya, 2010). This reform aimed to address discrimination against unmarried, widowed, and divorced women (Cotula & FAO, 2007). However, the Kenyan Constitution also contains an exemption for agricultural lands from the Land Succession Act, recognizing that in some counties, customary laws will govern inheritance rights as long as they are consistent with written law (Judicature Act, Chapter 8, Section 3, 2010).

Land is rarely sold in Kambalands. However, distress sales do occur, as a last resort under pressures of poverty, such as the need for medical procedures, legal services, or burials, and tends to result in long-term negative impacts on the poorest households in the community (Adoko & Levine, 2008). Traditionally, clan leaders influenced the vetting process for a land buyer at the time of sale. However, their influence in land sales has greatly decreased due to large government efforts to establish individual freeholder land tenure (Nyamu-Musembi, 2008).

For a detailed description of the land tenure systems of the Kamba people before Kenya's independence, see Lambert (1947).

2.3 Methods

2.3.1 Approach

To better understand how Kamba women access land resources within local sets of institutions, we followed an exploratory case study approach (Creswell, 2007; Yin, 2003). A case study approach allowed an in-depth exploration of women's land resource access strategies and the formal and customary institutions that guide women's choices. Land resource allocation, customary norms, and justification of choices require a nuanced understanding of the local social context, with limited researcher control over behavioral events (Yin, 2003). The case study approach allowed in-depth descriptions of the phenomenon under study, recognizing the boundaries between phenomenon and context are not clearly evident (*ibid.*).

2.3.2 Data collection

From June 2013 to August 2014, the lead author conducted eight community meetings [four women-only (n=280), four men-only (n=83)], twelve focus group discussions [four women-only (n= 45), four men-only (n=19), and four mixed-gender (total n= 70)], and 77 in-depth key informant interviews within four administrative locations: Mumbuni, Kitandi, Kathonzweni, and Kathekani (Figure 2.2). Key informants included smallholder farmers, agricultural extension officers, village elders, church community leaders, government appointed chiefs and county agricultural officers. Community meetings and focus group discussions followed a semi-structured interview guide exploring the history of land use, young adults and women's barriers and opportunities to accessing land resources, views on the constitutional clause regarding land inheritance, and customary laws regarding land. We followed purposive and snowball sampling strategies to identify key informants for our in-depth interviews.

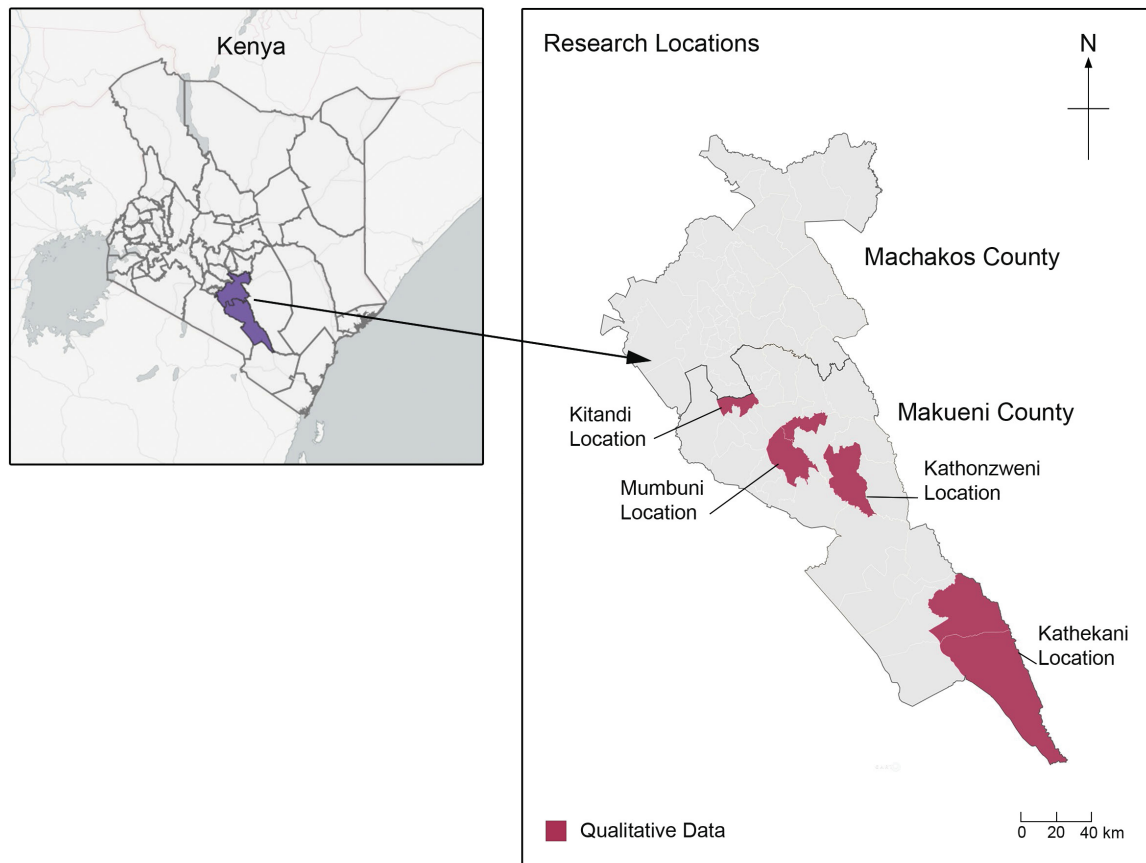


Figure 2.2 Research locations in Makueni County. *Source:* author & Bolbach (2017)

Semi-structured and open-ended questions included topics on land and property relations among family members and their attitudes and perceptions of constitutional change affecting inheritance, land access after marriage, and household food security. Informed consent was discussed and agreed prior to all community meetings, focus group discussions, and interviews. Audio recordings were transcribed in English or the local Kikamba dialect in full and then translated into English.

2.3.3 Data analysis

Our analysis was divided into three stages. First, transcripts were thematically analyzed following a deductive approach, drawing from the theoretical lens of Ribot and Peluso's three mechanisms for access. The observations were initially categorized into the three access mechanisms proposed by the theory. However, there was openness within the categories that allowed for pattern recognition through semi-open coding and axial coding procedures (Berg, 2004). This process led to the importance of women's roles within their life stages emerging as key to better understanding the local institutions affecting their land resource access. R-based Qualitative Data Analysis (RQDA) was used to manually code the text into initial categories while deriving codes based on theoretical considerations that oriented towards our original research questions (Babbie, 2002). Emergent themes revealed the distinct challenges Kamba women face in accessing land resources that related to their different familial roles as "daughters", "sisters", "wives", "mothers", "grandmothers", "divorcées", and "widows". We subsequently categorized these roles into a general framework using common life stages: "infancy", "childhood", "adolescence", "adulthood", and "old age". Although extended families play a salient role in Kamba social structure, our analysis excluded familial relations, such as "aunts", that may not play a direct role in land resource access.

Second, we classified the strategies women used in relation to land resource access using an adapted version of Robinson and Berkes' (2010) classification of four strategies in response to loss of livelihood resources: preparatory, coping, recovery, and adaptive strategies. First, preparatory strategies are plans and actions that take place well before the possible decrease in access to land resources as a preventive measure. Second, coping strategies are reactionary behaviours that do not directly restore access to land resources but ameliorate the wellbeing of actors after disturbance. Third, recovery strategies are enacted to regain access to land resources. As Robinson and Berkes (2010) noted, these strategies can also be perceived as aspects of adaptation. However, adaptive strategies involve re-organization and innovation in livelihood activities that are newly introduced.

These strategies were then cross-categorized into the three access mechanisms: rights-based, structural, and relational (Ribot & Peluso, 2003). The criteria used to determine rights-based mechanisms included the means of access through legal rights and entitlements supported by customary law. Structural mechanisms were means of access to land resources through technology (e.g. fences, water wells, seed varieties), access to capital, and access to markets. Other mechanisms that require access to labour, authority, knowledge, identity, and social relations required both structural and relational mechanisms at varying degrees. The "access mechanism" column in Table 2.1 also includes "limited access", which refers to a lack of access strategies, and the resulting alternative, often leading to a drastic change in women's livelihoods, for example, moving to the marketplace.

2.3.4 Assumptions and management of limitations

To minimize sampling bias arising from purposive and snowball sampling, four focal locations were selected spanning 175 km of the approximately 190 km length of Makueni County. Purposive sampling across the four focal locations and across genders was used to capture

diverse agro-ecological contexts, a range of livelihood measures, and perspectives on land resource access. Semi-structured questions were piloted with five local research assistants to check for clarity and neutrality, while being reflexive that the topic of gender and land resources (following the change in the Constitution) can be controversial and emotive. Response bias was observed particularly when respondents used model answers that reflected their expectations of what government officers, development program workers, or foreign researchers would like to hear. However, different phrases of the same questions were asked non-consecutively during the course of the interview using probing strategies to help converge the responses given by a respondent. Efforts to minimize potential confirmation bias included detailed tracking and identification of transcripts and manual coding and categorization of the themes that emerged (Yin, 2003) using the R-based Qualitative Data Analysis software (RQDA) (Huang, 2016). We enhanced internal validity through dissemination of preliminary findings with local farmers and community members in November 2016. The dissemination process allowed for general informant feedback and local respondent validation (Yin, 2003).

2.4 Results

Our analysis of how Kamba women access land resources across their life stages revealed nuanced strategies that women commonly employed. In what follows, we present salient examples of the shocks and stresses women reported facing across different life stages and in different familial roles and examine their responses to such challenges. Our categories of women depend on their relationship with others. This was found to be applicable within the Kamba cultural context, where the social importance of the family unity and the responsibility of the individual to the community tend to outweigh individual preferences. However, we recognize that using these categories may limit a broader understanding of women's livelihood strategies that includes other personal characteristics, such as occupation, education, or social position.

2.4.1 Infancy, childhood, and adolescence

Land resource use in early life stages is similar between female and male as children. Respondents in interviews and focus group discussions indicated that children from infancy to adolescence are predominately beneficiaries of land resources. They consume food crops produced on the farm, and benefit from income generated from crop and livestock production in the form of school fees, health services, and other daily needs. As they grow older and become more physically capable, they become more engaged in crop cultivation activities, participating in weeding, harvesting, and post-harvest activities, as well as contributing to livestock rearing. Girls were reported as being expected to learn how to prepare and cook staple food crops, for example, harvesting pigeon peas before cooking or hulling, storing, and milling maize. Most children are taught to collect water and firewood in order to cook food for the household. Some richer households reported having “house girls” or “house boys” who collect firewood, water, and tend to domestic needs such as maintaining the homestead, washing clothes, cooking, grazing livestock, and cultivating crops in exchange for shelter, food, and sometimes schooling. These children often came from households that could no longer support the burden of childcare. Our respondents indicated that these informal arrangements between host families and the children’s families could be terminated at any time for various reasons, including resource availability.

2.4.2 Adulthood

2.4.2.1 Daughters and sisters

As Kamba people enter adulthood, the mechanisms of access to land resources for men and women diverge. Focus group discussions revealed that sons are generally allocated land by their fathers to build a new home and use this land for crop and livestock production to support their

new families. Daughters are expected to leave their natal family and access land resources through marital relations with their husband's families.

A male participant explained:

My daughters are all married. They have got a husband so they have got their piece of land ... It was according to tradition that when a girl is married she owns her husband's portion and she is no longer mine ... unless one divorces her husband ... that's when you can just tell her just cultivate here (Participant interview, July 10th, 2013).

Even when parents have allocated land to their daughters and sons, women reported facing barriers to securing their inherited land. Some women reported being convinced by their brothers to sell their inherited land to their brothers in exchange for more liquid assets, such as a cow, with the reasoning being that they are already cultivating on their husband's land at a distance from the natal family farm. A male interviewee reported that his brothers planned to establish joint-title with their sisters as a way to prevent future claims to a piece of land by their sister's future husband. As one male respondent noted:

Each brother, we have agreed to have a piece and to have the title deed written with his name and that of mother's land with one of the sisters' names. One sister name accompanied by a brother's name who will take care of land after the sisters are married ... If we wrote two names either one sister and another for brother, showing this title was processed by two different people, ... you can't do anything with that title when you are alone. (Participant interview August 12th, 2013).

Women's entitlement to land resources appeared to be less dependent on their roles as daughters and sisters and more predominately on their role as wives in Kambaland.

2.4.2.2 Wives

The most common form of land access that women reported is through their husbands. Kamba people practice patrilineal land inheritance. In this context, brides traditionally live with their groom's family. Focus group discussions with both men and women revealed that, especially in rural communities, customary marriage practices are usually performed as a prerequisite to civil and religious marriage practices. One of the most recognized marriage traditions involves the family of the groom paying a bridewealth of three goats, two male and one female, to symbolize the departure of the woman from her natal family and her union with the husband's clan. The customary marriage practice of paying a minimum bridewealth reinforces the notion that married daughters have become dependent on the resources of her husband's family. The wife often has user rights to the parcel of land given to her husband. Depending on the bride and the family's financial assets, participants reported that the newly married couple often lives with the groom's parents until their own dwelling is built, or when a second son gets married at which point the newer couple takes their place. Discussions related to marital traditions also indicated that the last son and his spouse tend to live with his parents. The daughter-in-laws often carry the responsibility of cooking for the parents-in-law and caring for them in their old age.

Interviews revealed that wives in Kamba culture are entitled to ask their husbands for allowances to make purchases for food and household items. There were very low reports of joint-land titles between wife and husband, similar to reports by Nyamu-Musembi (2002) in Makueni County and in other ethnic communities across Kenya and Africa (Claassens, 2005; Mitchell, 2007; Yngstrom, 2002). Hence, wives seldomly gain benefits from land resources through formal ownership. Within focus group discussions, women shared the various strategies they use to enhance their customary entitlement to land resources. Respondents described expectations for a wife to ask permission from her husband when making decisions concerning

the purchase and sale of certain agricultural assets. A common example raised was the sale of goats or cattle, as opposed to smaller livestock like poultry. It was frequently reported that a projected use for money is needed before the sale of farm assets is approved. Women commonly cited reasons such as needing money for their children's school costs and building bricks for the homestead. Failure to get approval from the household head before making certain transactions could have severe repercussions, including domestic violence, the deterioration of marital relations, and separation. However, our results indicated that women engaged in less overt strategies to raise modest amounts of money, such as selling small amounts of maize or eggs without their husband's permission. Respondents acknowledged these mechanisms were regularly practiced, but carried similar risks and repercussions. Some women reported overestimating the prices of food to their husband in their negotiation for household allowances, in order to meet other household needs or make personal purchases. Other women reported seeking permission to engage in casual labour for wages or to join women's self-help groups to borrow money in times of need (see Appendix 2.1 Section 1.6; James & Po, 2016). As a female focus group participant explained:

You may find we [the husband and I] had talked and not resolved, the reasons may be diverse... In short, I may want to sell a goat but my husband doesn't want that because it might be the only goat – you know he is preserving for the dry season every year. I just submit and request permission to do casual jobs... most men don't like us women doing casual jobs because they feel ashamed (July 24th, 2013).

However, while such mechanisms served to increase access to small amounts of financial capital, they were not described as increasing access to land resources. Within a stable marriage, women in our sample raised concerns regarding their claim to accessing land resources. This included uncertainty in their access to purchased land in the likelihood that the husband marries a

second wife. The sharing of land resources was a frequently cited concern for the women who contributed to the original land purchase. During focus group discussions, women also expressed uncertainty in their rights to own land or the possibility of joint-registration of their husband's land. A female participant expressed the need for clarity in title and registration process, "We even don't know. We are surprised like where [we] have been married [we] have stayed there for a long time and the title deed is for the husband [sic]" (July 24th, 2013). Other participants were unaware of their rights to register land individually or own a title deed. As another participant explained, "It is the way it is in Ukambani. A woman cannot be given a title deed unless they change the situation" (Female interview participant July 17th, 2013). In contrast, as noted before in relations to siblings, men readily consider joint-registration with their sisters in the process of land succession. In relations to formal marital rights, the younger generations reported being more aware of their rights and how changes in legislation might affect them.

2.4.2.3 Mothers and land registration

Our results indicated that giving birth to a son offers a strong relational mechanism that better secures a woman's access to land resources. This mechanism was also demonstrated by the cultural phenomenon of a female-husband. Among some couples that have not been able to give birth to sons, the wife may resort to finding another woman to marry customarily as her wife. The primary purpose of the same-sex union is to produce a male offspring. This would enable the now female-husband to continue the male lineage and secure her land resource access (Cadigan, 1998; Oboler, 1980; Po & Bukania, 2016).

Although having sons can provide younger wives with some degree of security to land resources, parents were reported to have the stress of allocating land to their children when they begin their own family. As mothers, one of the major concerns raised was securing their children's access to family land. Some mothers, who had sufficient savings to purchase land,

reported they would register their son's name in the purchase contract if they were in discord with their husband. They justified this strategy as a way to ensure the legitimate succession of land to their sons. As one mother explained, "I have bought the land and have differed with my husband. He can come and take, but if I register it using my son's name, he can't take it from him. He is his son" (Focus group participant, July 24th, 2013). However, despite using their own savings to purchase land, there remained opaque rules and uncertainties between the informal and formal land market systems and the customary land resource management that often prevent mothers from formally owning land (Meinzen-Dick *et al.*, 1997; Meinzen-Dick & Pradhan, 2002; Englert & Daley, 2008). One female participant considered recruiting the help of her natal parents and explained that risking harmony within the household deterred her decision:

On the issue that we were talking about of land purchase, I can forge with my father, so that it appears that he is the one who bought it for me, but it can cause a lot of problems, because when my husband comes to know, he will say that his in-laws don't respect him and I may be beaten up and... chased away, so it is better to use my husband's name on the title deed (Female participant, July 24th, 2013).

Other women justified the need to register purchased land only with their husband's name in order to ensure formal succession of land to the next generation (see Appendix 2.1 Section 2.2). One woman explained using only her husband's name as a preventive strategy for future conflicts between her sons:

I may have five sons and I buy land and register with the eldest one's name and unfortunately, I and my husband pass away. There will be a lot of problems because that son will never share it and says it was bought for him alone. So it is good if I use my husband's name so that there will be no problems in case of anything [*sic*]. (Female participant, July 24th, 2013).

In this sense, the diverse justifications women reported for registering purchased land under the husband's name was viewed as a preparatory mechanism for securing land tenure for the next generation (Table 2.1). Although Kamba women now have the legal right to purchase and own land, many continue to have secondary access rights, in part, to incorporate this new opportunity under existing Kamba rules of land management. One woman explained, detailing process of using national identification cards in the registering process:

If I am the one who has bought that piece of land, it should be registered under my husband's name ... I don't bear his names of our fathers [father-in-law]. But because the children will register using their father's [sur]name, ... it's good his name be used to register that piece of land - even if I am the one who bought it [*sic*] (Female focus group participant, July 24th 2013).

While men can directly purchase land with the support of legal and customary institutions, women reported facing social and administrative barriers. Additional rationales given by women to register land under only their husband's name are presented in Appendix 2.1 (Appendix Section 3.1 & 3.2). Although women have gained legal rights to purchase and own land in Kenya, most Kamba women we interviewed expressed reluctance to register purchases under their name. As one informant noted, "You know, we fear problems, because when the men hear that their wives have bought land, they will feel low and weak and so to avoid these problems, we give the land to our sons" (Female participant, July 24th, 2013). These justifications indicate that the formal land reforms, which promoted women's access to land resources, are in practice nested within customary institutions, rather than framed above as the Kenyan Constitution established. Local rules, norms, and gendered land relations reflect, more closely, the changing customary values that affect land resource management. In response, some women reported

using relational mechanisms to continue accessing land resources within the patriarchal social constructs and familial rules, as one woman described:

You know what is there at home is his, even the loan that I get [from women's groups] is his because he says [I] am his, so when am there, I just submit... Whatever I get out there [women's groups], I share a little with him so that he will not feel disrespected in his leadership in the family...him also, when he gets casual jobs, he should also give me some so that I can pay back the loan (Female focus group participant July 24th, 2013).

Within these relational mechanisms of access, our discussions revealed that under the familial institution of respect for the husband, women also expected reciprocal support.

2.4.2.4 Parents with unmarried and divorced daughters

Un-married women have considerably weaker rights to access land resources. Participants cited entitlements for daughters who are not married to cultivate on their natal parents' remaining land parcel, especially when the daughters had children. However, parents in our interviews frequently indicated that they had not allocated land to their daughters based on the assumption that the daughters will farm their husband's land after marriage or the daughters were too young to be considered for land allocations. However, with Kenya's rates of premarital fertility measured nationally at 19% in 2003 (Clark, Koski, & Smith-Greenaway, 2017), we observed that customary norms and social discourse concerning land resource access are adapting. Parents reported that marital separations were becoming more common and daughters were often reported as having returned to their natal home. The economic need to support never-married or divorced daughters and their children have left many families hesitant to allocate land definitively to their sons. Parents reported that one common strategy is to save a piece of land for the parents, in case their daughters return due to a separation. Parents indicated that this strategy also eases some of the pressures from their sons who seek their own land parcels to start their

families. Others suggested an option was to formally pay a surveyor to subdivide the land among their sons and daughters even when their daughters were in a stable marriage. One parent said:

In Ukambani, they don't usually give girls land unless you are not married and you are mature enough, like let's say you have children in your parent's home. ... That's ... when you can be given land with ... your brothers (July 29th, 2013).

However, we found that the customary allocations of land to unmarried daughters were the result of a perception of need, rather than a view that daughters have the same access rights as sons.

2.4.2.5 Parents with married daughters

Parents who expressed that their daughters should not be eligible for land inheritance after marriage justified this view through adherence to Kamba customary laws. As one respondent explained, “To the Kamba law, we are Kamba people. When someone is married, [she] gets land where she is married from the father” (male focus group participant, July 11th, 2013). One village elder remarked, “It is like murder!” (August 9th, 2013) in response to married daughters seeking land inheritance. Some parents justified their negative views with the need to protect ancestral land. As another informant expressed, “She might sell the piece [I] have given her and go to stay with the husband” (July, 11th, 2013).

Both men and women viewed the Constitution of Kenya as a foreign institution, a remnant of British colonial rule. A woman stated, “The constitution is new, but we have practiced the Kamba traditions for long” (July 24th, 2013). Other parents, who were adapting to the changes, reflected on older customary institutions being slow to change. Another respondent said, “Constitution should be followed, but these are things ... which already has its own [rules]. It is very hard to change it” (July 24th, 2013). While some mothers lamented their lack of power to decide how to allocate land, other women saw the constitutional change as giving them the power to bequeath land to their married daughters:

Yes, I am feeling the change [from the Kenyan Constitution in 2010], because it says that daughters should inherit land ... When a daughter is married, she should inherit land and women should have title deeds like the husbands. But we don't know whether that is possible (Female participant, July 15th, 2013).

Some people described finding ways to adapt interpretations of customary law through other commonly recognized Kamba values such as unity. For example, some reported hearing parents use the slogan “a child is a child” that was introduced through the media to help eliminate gender discrimination in land succession. “She is married and she is mine. She will have other parents, but when she comes back she is mine”, one mother said (July 15th, 2013).

2.4.2.6 Divorcées

Previous research in rural Africa has described how women face institutional challenges as wives when claiming land in the case of a divorce since wives rarely have formal joint-tenure to their husband's land (Englert & Daley, 2008). In such situations, extensive proof is often needed to demonstrate the wife's contribution of money or labour to the land (Nyamu-Musembi, 2002).

Many families reported not having the financial means to formally subdivide their land or not having enough land to provide for their daughters and their grandchildren. A male participant recounted, “It is so hard for them [parents] to accept because they say, 'well, I only have a small piece. It is not even enough for my sons, how can you ask me to give to my daughter' [*sic*]” (July 11th, 2013).

Many Kamba women who become separated from their husband's family struggle to survive without any access to land, leading some to leave their children under the care of their grandparents. Respondents described a traditional process of divorce that can be initiated by the wife's family. In this case, the wife's family presents the “goat of refusal” (*mbui ya ulee*), which signifies the wife's separation from the husband's clan and her customary entitlement to land of

the husband's family. The natal family then needs to repay the full bridewealth to the husband's family or, if the woman remarries, the second husband is responsible for repaying the bridewealth (Appendix 2.1, Section 2.5). Respondents explained that the inability of the women's family to repay the full bridewealth is additional pressure for women to stay within undesired marital arrangements. If the husband initiated the separation and "chased away" the wife without due customary process, the wife and her children retain their customary entitlements in the husband's clan.

One of these customary entitlements in relation to the customary process of divorce is a woman's right to be buried in her husband's land. Many participants indicated that if the customary process has not been fulfilled, and the wife dies, the husband has the customary right to claim her body to be buried in his family land. Customary consensus also indicated that the burial of the bride within a family-in-law's land could further legitimize her children's claim to their father's land after they become adults. Community advocates for women explained that a husband's family can deter divorcées from being buried in their family plots to prevent their children from further securing their claims to the land. Our research participants noted that women without land can often suffer with their children, not only economically, but also culturally. Respondents described one of the last options for some women without family land was to be buried in the government cemetery (Appendix 2.1, Section 2.5). From the intricate process of divorce and the land entitlement of future generations, this result underscores the diverse meanings and practical consequences connected to land resource access for Kamba families. Beyond agricultural assets, land access includes the values of a new settlement, a place of retirement, and a place to 'rest the bones'. The perception of land as a place of retirement is relevant for Kambas in their old age.

2.4.3 Old age

2.4.3.1 Parents and grandparents

Some parents in our study reported holding on to land resources as leverage to gain their children's care and support during old age. We found parents can delay the transfer of land parcels to their sons due to a fear of children selling the family land and abandoning agricultural livelihoods. Multiple interviewees indicated a reluctance to prepare a will, referring to a widespread belief that writing a will would lead to the parent's death. However, the attitudes toward bequeathing land resources to their children were found to be heterogeneous. Some parents were reported to have prepared a will, allocating land to their children regardless of gender before the Kenyan Constitution was introduced in 2010.

Grandparents face a different type of challenge in Kambaland, particularly regarding their access to land resources. Since the first case of HIV/AIDS in the 1980s in Kenya, grandparents were faced with the responsibility of caring for their orphaned grandchildren. Many reported having to struggle to feed and raise their grandchildren. Others reported selling productive assets, such as land and livestock, to afford their child's medical treatment for HIV/AIDS, or to support their grandchildren. Other grandparents found themselves supporting young children as their single daughters left their children under their care, while they went in search of casual employment in another community or in urban centers. Grandparents reported that the money their daughters earned as house helpers or as casual labourers was often not sufficient for their daughters' own cost of living. Although the grandparents in our study reported economic stress, most expressed acceptance and care for the grandchildren as their own children. Many continued to cultivate farms in order to generate food and funding for their grandchildren's education. Others hired additional land when existing farmland had been allocated to adult sons in the family, augmenting their access to land resources.

2.4.3.2 Widows

Under the Kamba's customary institutions on land resource management, after the male heads of households pass away, the widows gain the customary rights-based access to land resources. As one female participant affirmed:

According to Kamba customs and traditions, when the husband is alive, the woman can't sell goats. Hers are chicken. But when he is dead, the woman now becomes the head of the family and can sell anything she wishes to sell with no restriction from anybody whatsoever (July 24th, 2013).

However, respondents also noted that the formal transfer of ownership of land from the deceased husband to the widow was rare. Predominantly, widows were seen as becoming the formal guardian of the title deed, retaining a customary entitlement to make decisions, but not formally recognized if legally challenged. Alternatively, it was commonly reported that the eldest son would become the guardian of the title deed to prevent conflicts until the widow passed away. However, the fragility of the widow's customary entitlement was reported as being revealed when a problem arises within the family. One female participant explained:

If my husband dies, the title deed will be with me because [I] am the wife. But if they [the sons] see I cannot give it to them, he [the husband] will leave the title to the first son and he will be like the father. It is like that, the culture (July 10th, 2013).

Widows reported that their access to their deceased husband's land resources was highly subject to the relationships with their relatives, the support of their parents-in-law, and the community. A community advocate described occurrences of young widows being driven away by their extended family members due to land resource appropriation:

Now when the husband passed away, after two weeks when they buried him, ...they called the clan and they chased the woman away. They put out all her belongings ..., only

clothes not anything else, and told her to go away because she is the one who... bewitched the husband (July 3rd, 2013).

Our findings suggest that older widows are less vulnerable with increased social support from the community and support from their adult children. However, some widows who had reduced physical capacity to attend to their land parcels also reported that their neighbours and relatives had targeted their fallow land. In such cases, they described strategies to secure their land resources in old age that involved their children's assistance with cultivation or farm-sharing with other widows in the community. This situation has also been observed in the Luo ethnic community in western Kenya (Okuro, 2008). Widows reported being hesitant to lease land to other family members or non-family members, as it might lead to encroachment or physical danger.

2.5 Discussion

This exploratory study provides a nuanced perspective of how Kamba women access land resources through their different life stages within multiple sets of formal and informal institutions. In the following sections, we discuss how taking a life-stage perspective and incorporating social-ecological resilience thinking can help to better consider the roles of customary norms, and institutional and gendered land relations in building sustainable livelihoods.

2.5.1 Resilience thinking and land resource access in Kambaland

In Kambaland, smallholder households are likely to be negatively affected by the rapidly changing social, political, and environmental contexts. However, women reported employing diverse strategies to remain resilient in the face of change, with implications for research and policy.

From the focus group discussions and interviews with women, the “conservation phase” of the adaptive cycle emerged the most clearly. Accounts of clearing uncultivated and unoccupied land in Makueni County one or two generations ago captured more closely the growth phase of an adaptive cycle, where land resources were abundant. The conservation phase is typically characterized as a phase of growing stasis and rigidity (Folke, 2006; Walker & Salt, 2006). In the conservation phase, farming households can become strongly interconnected, through marriages, local lineages (Goldstein & Udry, 2008; Kevane, 2012), and social networks (Darnhofer, Fairweather, & Moller, 2010). In the face of a shock, such as the return of a divorced daughter, mothers in our study reported forgoing their entitlement to subdivide their son’s land inheritance in order to preserve harmonious relations within her family. The importance of preserving stasis during the conservation phase is analogous to the importance of minimizing dissent among family members. A similar result was found in Tanzania, where Englert and Daley (2008) reported that women avoided expressing a desire for joint land registration to their husband to minimize their husband’s distrust and suspicion of a potential separation. Our findings also indicated that Kamba land tenure systems have evolved towards a more efficient institutional process with clear avenues of access for women, but has also led to a more rigid perception of female land entitlement and allocation (Section 2.4.2.4). Results indicated that when women have socially supported access to land resources alternative to their husband’s, whether it is inherited from their natal family or through purchase, they indicated a greater coping capacity in the face of stresses and shocks in later life stages.

Although our analysis provides only a snapshot of the complex land relations present in Kambaland, interviews with men and women indicated that people’s interpretations of customary laws concerning land resources were slowly adapting to contextual changes. A female participant said, “You know before, daughters were not given a share of their land, but now even if she is

married, she has a share in her [natal] place” (July 15th, 2013). Such discourse on land relations reflects changes in the larger social context regarding the empowerment of women:

You see many times when a daughter is chased away and goes back to her home place, she doesn't have a piece of land ... they should have a share in their father's place ... because these days daughters are being educated, so when she gets a job she can buy her piece of land (Female participant, July 15th, 2013).

The emerging interpretations of customary law indicated by our respondents appeared to be more flexible in addressing the immediate livelihood needs of unmarried daughters. Respondents compared the relatively slow acceptance of daughters' rights to land succession to the gradual shift from the previous customary attitudes that educational investments in boys would yield returns in old age to the current prevailing attitudes that educating girls and boys are of equal importance. However, this evolution is not without disruption. The “release” and “reorganization” phases of social-ecological land tenure systems involves actors actively working towards the improvement of women's land resource access and social status. The process involves social conflicts, disputes, legal actions, and sanctions. Borrowing from Moore's (1986) definition of customary law, “as a cultural construct with political implications, a set of ideas embedded in relationships that are historically shifting” (Merry, 1988 p. 880), local processes of disputing can reshape formal customary institutions (Benda-Beckmann, 1981) and informal institutions of attitudes, norms, and values.

2.5.2 Access strategies to land resources

Our cross-classification of Ribot and Peluso's (2003) rights-based, structural, and social access mechanisms with four different resilience strategies: to prepare for, coping with, recover from, and adapt to land resource loss (Robinson & Berkes, 2010) found that women in Kambaland depended largely on relational mechanisms of access, primarily through kinship, despite their

potential entitlements to land inheritance promoted by the Kenyan Constitution. With frequent reports of wives being chased by their in-laws, we found that women employed multiple relational access strategies to compensate for their often-tenuous land resource access in the event of a parent or a husband dying (Tables 2.1 & 2.3).

To enhance their control and access to land resources, wives reported building trust and reciprocity within their marital relationships (Section 2.4.2.3 and Table 2.2). We also found that widows involved community members in protecting their land and cultivating their land. The first strategy involves village leaders, clan members, chiefs, and assistant chiefs in settling land disputes among neighbours and family members (Table 2.3). Second, women participating in our research reported organizing neighbours, self-help groups, and farmer groups in cultivation co-operations (Table 2.3). In semi-arid Kambaland, we found labour-sharing was being widely utilized within rural networks, especially for building farm terraces. This has been supported by the large number of arid and semi-arid land projects, which targeted women and community development within Kambaland, a neighbouring district, Kitui, in the 1980s and 90s (Carlioni & Horenstein, 1985).

Although women reported using relational mechanisms of access, women also cited some disadvantages in their reliance on this approach. Men and women both expressed instances where village administrators, such as customary tribunals for land disputes, were susceptible to bribery and favoritism. Furthermore, many women noted the high costs of food preparation and monetary fees that are involved in inviting clan leaders as arbiters of land disputes, and the possibility of non-resolution.

Tables 2.1 to 2.5 present our analysis of the strategies adopted by women classified into four types: strategies that are primarily used to prepare for, cope with, recover from, and adapt to land resource shortages. We observed two patterns: (1) rights-based mechanisms of access are

often used to prevent and prepare for a pending loss of land resources; and (2) education-related behaviours, such as providing quality education for children (Table 2.4) or introducing new variants of drought resistant crops (Table 2.5), both function to recover land resources in the future. Similarly, women diversify their livelihood activities, particularly with access to knowledge, technology, market, and financial capital, to adapt to land resource loss (Tables 2.2, 2.4, & 2.5). Many parents expressed that not only was higher education for both young women and men a valuable investment in their future, but it also contributed to the parents' old age security. Moreover, children's financial ability to purchase additional land parcels could be perceived as a recovery from the subdivisions of family land in previous generations. Previous research on rural African family patterns has indicated that consanguineous ties appear to be more relevant than conjugal relations in terms of access to livelihood resources (Clark & Hamplová, 2013; Fortes, 1958).

2.5.3 Life-stage perspective and gendered resource policies

This study adopted a life-stage perspective to more systematically describe the role-specific stresses and shocks women face in acquiring and maintaining access to land resources in Kambaland. Understanding how women can and do access land resources across their life stages, and recognizing their particular vulnerabilities at certain life events, can help to inform land use and land succession policy options for Kamba women. For example, in our study area, questions of fairness regarding the constitutional clause on land succession were regularly raised. Both men and women expressed the perceived inequality that sons can receive land from only one source: their father, and daughters conceivably can receive land from two sources: their father and from their husband. From an individual perspective, this situation was viewed as benefitting the daughters at the expense of parents and sons. However, parents in our research sample often cited equal portions of land allocation for their sons while daughters are expected to receive a

Table 2.1 Examples of shocks or stresses to women's land resource access during childhood and associated strategies

Life stage	Shocks or Stresses	Strategies	Access mechanisms	Other actors	Primary functions
Childhood	Sister's husband comes to claim natal land	Brothers register their names with their sister's name on the title deed of her land inheritance.	1. Rights-based 2. Structural 3. Relational 4. Limited access	1. Individual 2. Household 3. Community	Preparation X Coping Recovery Adaptation
	Father passes away	Father divides the land and plants some sisal to show the demarcation of the land before he dies.	Structural	Household	X
	The first wife dies. The second wife of the father mistreats the children of the first wife	Children return to mother's natal family.	Relational	Household	X
	Children cannot afford the funeral of a parent, reduced income from loss of labour, debt	Neighbours, funeral committee, community groups visit and fundraise for funeral cost.	Relational	Household, Community	X

Table 2.2 Examples of shocks or stresses to women's land resource access during marriage and divorce and associated strategies

Life stage	Shocks or Stresses	Strategies	Access mechanisms	Other actors	Primary functions
Marriage	Husband marries a second wife	Woman secures her share of the family land with physical demarcation.	1. Rights-based 2. Structural 3. Relational 4. Limited access	1. Individual 2. Household 3. Community	Preparation X Coping Recovery Adaptation
	Wife maintain sufficient control of household and land resources	Wife shares information and funds from self-help group savings with husband to build trust and reciprocity.	Relational	Household	X
	Wife separates from husband	Woman lives with natal family and inherits land from her father.	Relational	Household	X X
Divorce	Wife separates from husband	Woman rents arable land, diversifies her livelihood activities.	Structural (access to financial capital, knowledge, markets)	Individual	X X X
	Wife separates from husband	Woman rents a place in the market town.	Limited access	Individual	X X

Table 2.3 Examples of shocks or stresses to land resource access as widows and associated strategies

Life stage	Shocks or Stresses	Strategies	Access mechanisms	Other actors	Primary functions
			1. Rights-based 2. Structural 3. Relational 4. Limited access	1. Individual 2. Household 3. Community	Preparation Coping Recovery Adaptation
	Widow lacks sufficient physical energy to farm	Widow employs someone to cut thorny shrubs, clear and prepare land to cultivate.	Structural (access to financial capital)	Community	X
	Widow lacks sufficient physical energy to farm	Widow participates in labour-sharing groups to provide resources.	Relational	Community	X X
	Land tenure is insecure	Children assist in the protection of title deed or the process of title deed transfer to the widow's name.	Rights-based	Household	X
	Land disputes arise after the death of the head of household	Chairman of the clan settles land disputes.	Relational (access to authority)	Household Community	X
	Widow receives threats of being chased away from the homestead	Widow seeks assistance to go to court.	Rights-based, Relational	Household NGO Community	X
	Widow receives threats of being chased away from the homestead	Widow maintains good relationship with the parents-in-law and the relatives.	Relational	Household	X
	Widow receives threats of being chased away by husband's relatives	Widow leaves with her children.	Limited access	Household	X

Widowhood

Table 2.4 Examples of shocks or stresses to land resource access as mothers and grandmothers and associated strategies

Life stage	Shocks or Stresses	Strategies	Access mechanisms		Other actors	Primary functions		
			1. Rights-based 2. Structural 3. Relational 4. Limited access			Preparation	Coping	Recovery
Parenthood and Grandparenthood	Husband feels disrespected when mother purchases land	Mother registers the land using the son's name.	Relational		Household	X		
	Daughter separates from her husband	Parents ask their sons to share his land with his sister. The sons have their family to support. Some would not oblige.	Relational		Household		X	
	Daughter separates from her husband	Parents save a piece of land for themselves when subdividing the land to the sons, in case daughters return from a marriage separation.	Rights-based		Household	X		
	Sons fight for purchased land after death of parents	Register purchased land under husband's name.	Rights-based		Household	X		
	Daughter leaves her children under the care of grandparents	Grandparents use remaining land or rent land to cultivate for food and household income.	Rights-based Structural		Household		X	X
	Grandchildren do not have land entitlement	Educate grandchildren, in hope that grandchildren can purchase their own land.	Structural (access to knowledge, financial capital)		Household	X	X	X

Table 2.5 Examples of non-life-stage specific shocks or stresses to land resource access and associated strategies

Life stage	Shocks or Stresses	Strategies	Access mechanisms	Other actors	Primary functions
Non-specific	Drought and crop failure	Households rely on food assistance.	1. Rights-based 2. Structural 3. Relational 4. Limited access	1. Individual 2. Household 3. Community 4. NGO	Preparation Coping Recovery Adaptation
	Drought and crop failure	Households plant drought resistant crops.	Structural and relational (access to authority) Structural (access to technology)	Household	X X
	Drought and crop failure	Women ration the food or borrow food from neighbours.	Relational	Household Community	X
	Drought and crop failure	Women engage with NGO for programs such as Food for Work.	Structural and relational (access to labour)	NGO	X X X
	Drought and crop failure	Household buy rain water harvesting rubber tanks or build permanent water tanks.	Structural (access to financial capital and technology)	Household	X X
NGO: Non-governmental organizations					

land portion from the remaining land of the parents. Using a life-stage perspective has revealed that the constitutional change on land succession can potentially reduce women's vulnerability to losing land access - not only as daughters and as mothers, but also as grandmothers. When women have rights-based access to land resource beyond their marital entitlement, it can facilitate their coping strategies in old age and during times of disturbance. The high prevalence of skipped-generation households where grandparents care for grandchildren in Kambaland and other rural smallholder communities signals the potential value of taking a longer-term life-stage perspective.

2.6 Conclusion

Land policies aiming to alleviate resource constraints among women in smallholder systems may have better impacts through more systematically considering the heterogeneity of their challenges across life stages. In addition to the immediate gender impacts, a life-stage perspective can also contribute to longer-term evaluations of policy interventions with intergenerational consequences (Berkes, 2004; Gaven *et al.*, 2015). Where gender disparities are most pronounced among the poor (Quisumbing & Maluccio, 2003), this perspective, together with access mechanisms and adaptive cycle approaches, can be applied to help better understand long-term changes in access within smallholder rural livelihood systems.

Programmatic efforts to increase women and men's awareness of constitutional changes and how the resulting formal laws work with or against customary laws within their communities will require closer collaboration between diverse actors within different rural settings. Using a life-stage perspective that is common across cultures may provide a valuable scaffold to help co-investigate trends in the evolution of rural livelihood systems. For example, in our study area marital separations are becoming more accepted, more girls are achieving higher levels of

education, and more women are entering into non-domestic labour forces. One of the emerging roles for rural women within the life-stage perspective is as individuals who are unmarried, without children, and independent in their livelihoods from men. Future research to advance our understanding of how smallholder farmers perceive, experience, and adapt to policy change can benefit from taking a life-stage perspective to better consider potential inter-generational dynamics.

This study highlights how customary institutions that are widely perceived as being subordinate to formal laws can sometimes play a greater role in local-level land resource access. In the case of Kamba women, legal access to land claims and land purchases appears to be nested within a consideration of traditional social and gender relations. Our findings suggest that the confluence of customary values and formal processes in land markets can potentially reinforce constraints on women's independent access to land resources. In Kambaland, enhancing men and women's awareness of women's marital and succession rights has the potential to facilitate women acquiring joint land titles. Further sensitizing government and non-government actors to the social concerns and operational barriers to implementation will likely serve to alleviate existing bottlenecks Kamba women experience in registering as landowners. Having an in-depth understanding of how different actors across their life stages gain control, maintain control, and distribute benefits from land resources has the potential to contribute to both the equity and effectiveness of existing land use policy.

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Appendix

Appendix 2.1 Quotes on land resource access across women's life stages

	Quotes
Sisters Section 1.1	"Each brother, we are three, each brother we have agreed to have a piece and to have the title deed written his name and that of mothers land with one of the sister's name, one sister name and accompanied by a brother's name, who will take care of land after sisters are married because we have told not to write on them, maybe you can write for them alone and fortunately they are married, so that person can be married whether in Kisumu, either Kikuyu and about ten years to come, you will see a Kikuyu coming to sell that land *laughing* but if we wrote two names either one sister and another for brother, showing this title was processed by two different people, for example just say muthiani or Annah Nduku, you can't do anything with that title when you are alone" (male informant, August 12 th , 2013).
Wives Section 2.1	"We even don't know. We are surprised like where [we] have been married [we] have stayed there for a long time and the title deed is for the husband." "What do you think of you owning your name with your husband on the title deeds?" (female informant, July 10th, 2013). "I don't know if it can have two names. It's only for husband because he goes to take a loan. They don't tell us. I don't even understand why it's only for husband. I can like to have my name because when he dies *laughs* What will it be done? But with my name *laughs* and I can give the sons" (female informant, July, 10th, 2013).
Section 2.2	"And for you, will you have any title deed for yourself?" "There is nothing like that here. It is the husband who has it." "Do you want it?" "Yes, I want it, but I cannot be given." "Why can't you be given?" "It is the way it is in Ukambani. A woman cannot be given a title deed unless they change the situation" (female informant, July 17 th , 2013).
Section 2.3	"I am asking is it a must [that] I register his name on the title deed? And [I] am the one who has bought that land. Nowadays women have their rights to buy and own land, so I will register my name and when he comes with another wife and a conflict develops, I will leave them to stay and I with my children migrate to the piece, which I have bought. And if more problem occurs, we shall seek legal procedures and when I am not there, my children have the right to say that piece belongs to their mother" (participant from women focus group, July 24 th , 2013).
Section 2.4	"Yes... but now you know what is there at home is his, even the loan that I get [from women's groups] is his because he says [I] am his so when am there, I just submit and find that we are in terms together. Whatever I get out there [women's groups], I share little to him so that he will not feel disrespected in his leadership in the family" (participant from women focus group, July 24th, 2013). "The little I give to him is for showing him that I took the loan, but for another different purpose [planned project]. If I give him much, we will disrupt the

	budget, yes, so that we can get close and him also, when he gets casual jobs, he should also give me so that I can also pay back the loan. That is luring him passionately” *group laughter* (participant from woman focus group, July 24 th , 2013).
Section 2.5 Divorce	"In divorce, [there is] repayment of the goat of separation and bride price. If the girl does not re-marry, nothing is paid. If the girl re-marries, the man who marries the girl will pay the first husband back the dowry, bride price - even if the father of the woman has used up the money/goats" (participant from men focus group discussion, July 11 th , 2013).
	"If she is buried there, the children will come to demand for that piece of land and that is why, the person [relative] keeping her there cannot agree to bury the lady there..." "Where do they bury them?" "in the cemeteries, government plots for burying people" (female participant, June 29 th , 2013).
Mothers buying land Section 3.1	"I am saying, let's not hide the truth, I can buy a land and am not in good terms with my husband. I can take my son to be the owner of that land"(women focus group, July 24th, 2013). "I have bought the land and have differed with my husband. He can come and take, but if I register it using my son's name, he can't take it from him. He is his son" (participant from women focus group, July 24th, 2013).
Section 3.2	"If I am the one who has bought that piece of land, it should be registered under my husband's name even if I don't bear his names of our fathers [father-in-law](the woman's national ID does not bear the name of her father-in-law/husband). But because the children will register [their identification] using their father's name, even if I don't appear anywhere, it's good his name be used to register that piece of land --even if I am the one who bought it" (participant from women focus group, July 24th, 2013). "I am saying the issue of names depends on the size (age) of the children, because let's say they are in primary school and they have no ID's and an ID number is needed to get the plot number. Where will I get it from? So it is better I write my husband's name even if we have differed since there is law and agreements are there" (participant from women focus group, July 24th, 2013).
Parents and inheritance law Section 4.1	"To the Kamba law, we are Kamba people. When someone is married, [she] gets land where she is married from the father [in law]" (participant from men focus group, July 11th, 2013). "Only unmarried daughters get to inherit" (participant from men focus group, July 11th, 2013). "...she might sell the piece [I] have given her and go to stay with the husband" "The constitution followed the African way because you could not let your relatives suffer... Even if the constitution allows for that I can't accept. She should stay in the land of the husband" (participant from men focus group, July 11th, 2013). "It is so hard for them to accept because they say, 'well, I only have a small piece. It is not even enough for my sons, how can you ask me to give to my

	daughter” (participant from men focus group, July 11 th , 2013).
Section 4.2	“The constitution is new, but we have practiced the Kamba traditions for long” (participant from women focus group, July 24th, 2013). “Okay, constitution should be followed, but these are things which have base and something which already has its own [rules]. It is very hard to change it.” (participant from women focus group, July 24th, 2013). “We have not gotten so much into the constitution, so we live just as we found our parents living” (participant from women focus group, July 24th, 2013).
Section 4.3	“Yes, I am feeling the change (from the constitution in 2010), because it says that daughters should inherit land but that is not what it should be (have been)... When a daughter is married, she should inherit land and women should have title deeds like the husbands. But we don't know whether that is possible.” Interviewer: “Can you tell us why you think it is hard for a daughter to have a title deed?” “She is in her place (her husband's) and I am here. How do I give her the title deed? This is my land she should go and get hers.” Interviewer: “Do you have a title deed where you are married?” “No” “Do you think it is difficult for your daughter where she is married to be given a title deed? From her husband?” “You see, I don't know whether I should be given a title deed.” “Yes I agree it is very difficult for the husband to give it to his wife but it is possible to have ownership of the title deed to have two names.” I said. “Here they can't agree to that.” “What do you think about how the constitution in Kamba land will it be followed?” “I don't know whether it will be followed.” “Can you have that discussion with your husband?” “No, he cannot agree” (female informant, July 17th, 2013). “She is saying, a girl child is just the same as the boy child. So, okay, yes, now for their tribe, it is not allowed for the girl to have land but for them, for the mother and the father, they have planned to have a piece of land for their daughter, whether married or unmarried.” (female informant, July 12th, 2013) “Do you think the constitution has brought any change?” “Yes because like for someone like us who doesn't have a son [to] passes on [the land], now the brothers of the husband would come and start fighting over it. Everyone would want it. But if you have shared it with your children, nobody can come there” (female informant, July 15th, 2013). “You know before, daughters were not given a share of their land, but now even

	if she is married, she has a share in her [natal] place” (female informant, July 15 th , 2013).
Discourse on customary rules on land access Section 5.1	“You know before, daughters were not given a share of their land, but now even if she is married, she has a share in her [natal] place” (female informant, July 15th, 2013). “You see many times when a daughter is chased away and goes back to her home place, she doesn't have a piece of land, so they should have a share in their father's place...because these days daughters are being educated, so when she gets a job she can buy her piece of land” (female informant, July 15th, 2013).
Section 5.2	“She is married and she is mine. She will have other parents, but when she comes back she is mine” (male informant, July 10th, 2013) “The rights of women, that is one of the main changes... They have rights to share the properties... They divorce. The wife has the right to share the property with the husband equally" (young female informant, July 17th, 2013). “You can get your name on one of the shops if you have two shops. You cannot get any share if you have one farm”(young female informant, July 17th, 2013).
Old age: parents Section 6.1	“I don't know, but the reason I don't like dividing, I don't want them [my children] to sell because I don't want another person to get into our family. But I usually tell them, if they won't sell it, then I will divide. But it seems they are those who want the land to be divided, so that they can sell and then go and as per me, I cannot accept”(female informant, August 8th, 2013).
Old age: widows Section 6.2	“Truly, according to Kamba customs and traditions, when the husband is alive, the woman can't sell goats. Hers are chicken. But when he is dead, the woman now becomes the head of the family and can sell anything she wishes to sell with no restriction from anybody whatsoever” (participant from woman focus group July 24th, 2013). “If I pass away, my wife automatically is the one to care, but the title deed will not be given her name. But she will keep it for them [the children] [sic]" (Male informant, July 12th, 2013).
Section 6.3	“If the husband dies, the title deed will be with me because [I] am the wife. But if they see I cannot give them, he will leave the title to the first son and he will be like the father. It is like that, the culture” (female informant, July 10th, 2013). “There is a lot of problem in Kenya. Mostly when your husband died, there they get chance of, they can just say, my child, for example the father [in-law] can say my child was the one who was working, the things which is here belongs to us, things like that, because mostly of the Kenyans women, they remain [at] home and they allow their husbands to go and work”(female informant, widow female household head, July 15th, 2013). ""Now when the husband passed away, after two weeks when they buried him,

	after two weeks, they called the clan and they chased the woman away. They put out all her belongings like clothes, only clothes not anything else, and she told her to go away because she is the one who... bewitched the husband. So they were claiming that the woman is the one who bewitched the husband, and he died. So they were chasing her away, then she came to our office, when she came to WRCDI "Women Research Centre Development Institute, where we advocate for women's rights, w advocate for land, women rights, mmmm. land rights.. so when she came to report to us, we wrote a letter to the parents and the clan. Then they came to the office, they explained us, then we asked them, how can you prove that she is the one who bewitched the husband? They said, they had ah...these native people, ah.. magicians, they call them, I don't know... in kikamba we call them 'awe'. These are traditional medicine men who are consulted and they use spirits to tell people the cause of what has befallen them. ... They consulted one, and the one they consulted is the one who told them that she is the one who bewitched the husband. ...Ah, so we told them, they have to go for him and bring him in the office so that he can prove.. . He refused. He did not come because he knew we will take him to court. When he didn't come, we told them now you can see, how these people cheat you. How can you bewitch your husband who you have been staying with and has been helping you, there is nothing like that. So we told them, what they have to do is to return everything they haven taken from that wife and let her back in their home, or else we take her to, we take them to the court. We discussed and discussed they said they don't want to go to court now they have understood the constitution what it says because we had tell them how the constitution says and... how the woman is having a right to stay there and to own her husband's property, so if they dont want we will take them to the court. They said they will take the other option, the woman will go back to her home and they will never disturb her again. The woman went back, she is still there, ah” (female informant, July 3rd, 2013).
Women in political arenas	“Women in the past like they were being beaten by their husbands without no say, but now because of the constitution they know the law, yeah, they can forward that to court. Yeah, also the women they couldn't, in the past they were not supposed to be big people like in the committees but they are now free, they are free by the constitution, they can even vie for the government seats”(female informant, July 12th, 2013).

Preface to Chapter 3

In Chapter 2, I broadly examined women's access mechanisms to prepare for shocks and stresses in their land resource access across their life stages in semi-arid Kenya. I established that redundancy in women's sources of land resources could be associated with household livelihood resiliency, especially in women's old age. In Chapter 3, I further focus on women's old age, using a case study of grandmothers' livelihoods to examine the emerging challenges women face in accessing land resources and securing nutritious food for their grandchildren. Complementing the access mechanisms found in Chapter 2, I present how the five livelihood capitals available to senior women could potentially support or hinder their access to land resources in skipped-generation households using a comparison between two grandmothers' experiences. An earlier version of this chapter was published as a book chapter with Zipporah Bukania (2016) in an edited book titled, "Food Security, Gender and Resilience: Improving smallholder and subsistence farming".

CHAPTER 3

LAND TO FEED MY GRANDCHILDREN: GRANDMOTHERS' CHALLENGES IN ACCESSING LAND RESOURCES IN SEMI-ARID KENYA

Abstract

This chapter describes local Kamba institutions surrounding women's land resource entitlements and examines, beyond such entitlements, the livelihood strategies aging women employ to support their family members. It compares two grandmothers who face different challenges to provide for their grandchildren. Using the sustainable livelihood approach, we find that grandmothers' social capital enhances their land tenure security and facilitates their accumulation of other livelihood assets, which highlights the importance of aging women's local knowledge on household nutrition.

Keywords: Aging; Food security; Gender; Livelihoods; Local institutions; Nutrition

3.1 Introduction: Women and access to land resources in sub-Saharan Africa

In the rural areas of many developing countries, women face more barriers than men in accessing livelihood assets, especially land (Agarwal, 1988, 1994a, 1994b; Besteman, 1995; Carney, 1988; Carney & Watts, 1991; Gray & Kevane, 1999; Koopman, 2009). This prevails despite the fact that over 70 percent of smallholder farmers in sub-Saharan Africa are women (Alliance for a Green Revolution in Africa [AGRA], 2014). In many Kenyan communities, women are customarily entitled to usufruct rights to cultivate the land of their husbands or fathers. Such secondary access to land resources through

kinship persists today, and remains tenuous in many patrilineal and even in matrilineal inheritance systems. In many cases, widows, divorcées, and women who are in informal unions, or have not married, lose access to their land, making them and their children vulnerable to food insufficiency and malnutrition (Gray & Kevane, 1999). Studies on women's land rights have shown empirically that these critical entitlements are correlated with increased empowerment and better outcomes for women and children (Agarwal, 1994a, 1994b; Doss, Kovarik, Peterman, Quisumbing, & van de Bold, 2013; Frankenberger & Coyle, 1993).

Traditional means of accessing land resources in Kenya are shifting. Demographic trends—such as an aging population, increased attendance of girls in school, non-marital childbearing, decreased rates of marriage, and, particularly, grandparents nurturing grandchildren in multigenerational or skipped-generational households—highlight the increasing importance of women's entitlements to land resources. Changes in formal and informal institutional processes, such as land privatization and customary inheritance, likewise have overarching impacts on women's access to land resources (Food and Agriculture Organization of the United Nations [FAO], 2011). A pertinent example, in our case, is the major reform in land inheritance introduced in Kenya's 2010 constitution (The Constitution of Kenya, 2010).

Our aim in this chapter is to shed light on the situations surrounding grandmothers' entitlement to land resources for nurturing their grandchildren—an illustrative case of one group of marginalized caregivers. By 2020, the elderly population in Africa will increase substantially, with a majority of the population being women (Udvardy & Cattell, 1992). Although not all elderly people are grandparents, it is estimated that the

population of people above 60 years old will increase to between 203 and 212 million by 2050 (HelpAge International, 2002; Lekalakala-Mokgele, 2011). Yet, very little is known about how grandparent-maintained households fare with respect to food security. Due to their declining health, and the growing trend of grandparents rearing grandchildren in rural communities, it is critical to understand their challenges and strategies for food and nutritional security. Recognizing this need, in this chapter we discuss the challenges that grandmothers face in terms of land tenure security, which weakens their efforts to provide nutritious food for their grandchildren within the semi-arid drylands of eastern Kenya. Specifically, we focus on grandmothers in the semi-arid villages of Makueni County.

This chapter uses a narrative method to understand Kamba grandmothers' livelihoods and their strategies to access land resources. Such stories are constructed, rhetorical, and interpretive (Riessman, 1993). This method is well suited to reflect an internalized reality of rural smallholder farmers including social life, culture, experiences and identities (Mitchell & Egudo, 2003).

The chapter relies primarily on five community meetings held with 216 women and 43 men, two focus group discussions with 21 women and 10 men, and key informant interviews with 69 women and 18 men in 2013. We separated the community meetings and focus group discussions by gender and used purposive and snowball sampling strategies to select key informants in the same villages where the previous meetings were held. The discussions focused on topics of land resource access, land inheritance, and grandparents' livelihood realities and their strategies. Transcripts of the discussions and interviews were analyzed using inductive semi-open coding and focused on themes

pertaining to grandparents and aging men and women. The results draw primarily on the qualitative fieldwork data, plus relevant secondary literature on Kamba cultural traditions concerning marriage, land succession, and women's means of access to land.

In what follows we briefly introduce the existing local norms and values related to women's entitlement to land resources within the Kamba ethnic community. We then draw out the changes in land entitlement for grandmothers in relation to men in the family, and the attitudes grandparents reported towards the growing trend of rearing grandchildren. We then compare two cases to contrast the dynamics of land access in typical rural Kamba scenarios to illustrate the multiple layers of constraints that grandmothers face in caring for their grandchildren. Finally, we discuss the livelihood assets and strategies grandmothers engaged in to enhance their social-ecological resilience in the face of old age, and maintain their access to food, dietary diversity, and nutritional security for their grandchildren and other household members.

3.2 Women's customary land entitlements in Kambaland

The Kamba ethnic group has historically practiced both polygamous and monogamous marriages within a patrilineal society (Tiffen, Mortimore, & Gichuki, 1994). Kamba people generally maintain associations with their clans, although clan cohesion is gradually weakening. Some aspects of the traditional beliefs in magic and family curses that were common at the turn of the 20th century (Hobley, 1910) appear to remain a part of Kamba society, and are often associated with family land disputes. However, the predominant religious belief in Kamba communities is Christianity and Catholicism. In Kambaland, as elsewhere in Africa, high fertility rates and non-marital childbearing, as well as the HIV/AIDS pandemic that began in the 1980s, have resulted in the emergence

of skipped-generational family structures wherein grandmothers become the primary caregivers for their grandchildren (Linsk & Mason, 2004; Nyambedha, Wandibba, & Aagaard-Hansen, 2003; Omariba, 2006). This phenomenon gained attention globally through movements, such as Canada's Stephen Lewis Foundation, that fundraise money for grandmothers who raise AIDS orphans. By exploring grandmothers' access to land resources and livelihood strategies in semi-arid Kenya, this chapter may lead to a better understanding of the fate of grandmother caregivers elsewhere in Africa.

In order to illustrate the structural challenges grandmothers face in accessing land resources and providing nutritional security for their grandchildren, we describe women's land tenure relations, as wives, mothers, daughters, and widows, within the Kamba culture. According to Kamba traditions, as explained to me by women and men in Makueni County, women have customary entitlement to land from their spouses for cultivation, but women are not entitled to inherit ancestral lands from their fathers. In order to access land, one of their major livelihood resources, women are expected to become a wife. "Whoever marries has a piece of land," a man explained during a men's-only focus group discussion (male informant, July 11th, 2013). Not only are women expected to marry, men are also expected to display signs of maturity, often through starting a family, before they are given their own piece of land by their fathers to build a home and cultivate a farm independently. A female informant explained, "The husband had pieces of land so [the wife] possess[es] the land together with the husband" (June 29th, 2013). Wives hold customary ownership of their spouse's land after the spouse dies, but young widows often face challenges different from older widows who have established their relationships and status within the household as grandmothers.

In the Kamba tradition, when a woman marries into a man's family, the groom's family pays a bridewealth, which includes a minimum of three goats. After marriage, the wife no longer belongs to her father's clan as she belongs to the husband's clan. She will rely on her husband and his parents for her livelihood. This separation of women from their natal clans is one of the primary justifications for women losing entitlement to inheritance of ancestral land in their natal village. If a wife formally separates from her husband, traditional processes are well understood and in place to reconcile or recognize the separation. If the wife initiates the separation from her husband, and her natal family formally pays the husband's family back one goat as the "refusal goat" (*mbui ya ulee*); this act signifies a complete separation from the husband's family and clan. She relinquishes her customary entitlement to land or property from the husband's family and loses her customary entitlement to be buried in her husband's ancestral land. Yet, if the refusal goat is not paid, the husband is entitled to have his wife's body brought back to be buried in his land even if they have separated. After separation, a wife has the option to return to her natal family; however, divorced women often remain ostracized by their families and natal clan, in part due to reluctance to provide her and her children with land.

According to customary norms, young widows should continue to farm on their husband's land. They have increased decision-making power over agricultural practices, but they remain under the authority of their in-laws when it comes to making decisions over large sales and purchases. We were told of numerous cases where relatives would intervene after the husband passed away to make decisions on land resources and assets on behalf of the husband, especially if the father-in-law or mother-in-law was not present.

In scenarios where the husband's land is coveted, the widow can be blamed for a number of faults to justify casting her out of the husband's family. She could even be blamed for the husband's death, or harassed by neighbouring siblings-in-law and other relatives until she is coerced into giving up her rights to her husband's land. The relatives may also rule in favour of giving the children the land instead of transferring formal ownership to the widow. Moreover, the relatives generally rule traditionally in favour of the sons and not the daughters of the widow.

Some customary protections for women are in place, but are not often accounted for in planning. For instance, one male informant explained: "[I]f you have sons and daughters, [a daughter] who doesn't get married will have the right to be given a portion of that land" (July 25th, 2013). In contrast, in most cases, the return of a daughter from a failed marriage is an unplanned event, which the family does not account for. Similarly, in the allocation of land resources, the household head does not account for a land parcel for a returned daughter and her children. This is frequently justified by the limitations of land already allocated to sons in the family who require the parcels of land for their own families. If the land has been allocated to the sons in the family for cultivation, the parents traditionally leave a piece of land for themselves where they cultivate with the lastborn son. Once the parents pass away, the last-born son inherits that piece of land in addition to any piece of land that the parents previously allocated to him. In other cases, the eldest son inherits the family land and is instructed by the father before he passed away to subdivide the land among the siblings, brothers, and unmarried sisters. When a daughter returns from a marital separation, it poses an economic shock to the family system by increasing household dependents' expenditure and land resource supply.

Although the daughters may be entitled to a sub-section of the land remaining for the parents, they are often refused by their family members. As a mother in Makueni County noted: “Wise parents would leave a piece of land for themselves in case of daughters who come back” (July 11th, 2013).

The Kenya’s 2010 constitution proscribes the discrimination of land succession by gender or marital status. However, most respondents and research participants expressed they followed the Kamba traditional institutions with regards to land inheritance. The majority of respondents interpreted the constitutional clause as: if a daughter remains unmarried, she is entitled to a piece of her father’s land to cultivate and support her children. They maintained the prevailing value—that married daughters should rely on their husband for land resources and are not entitled to land inheritance from their father. One female respondent stated: “Because she [the daughter] is married... when you are married you stay there... The husband has land, where will she be going? The same way she was married and went” (July 16th, 2013). In the case of a separation, the respondent explained, “She should [look] for another and get married... or she looks for a job and works for the children... but the one who was never married, this is her land, because she has no where to go” (July 16th, 2013). This justification is based on the perceived equity of “inherited” land holdings between a man and woman. Another male respondent explained: “She cannot own two lands, [from] her husband and [from] my shamba. No, she has to have one shamba” (July 11th, 2013).

3.3 Changes in access to land resources for grandmothers

In comparison to the insecurity of secondary access to land resources that many women experience, a grandmother may have increased access to the land. Within the family, a

grandmother maintains her role as a wife, a mother, and a mother-in-law, as well as a grandparent. If her husbands' land has been subdivided to her sons, she is less likely to be dispossessed by relatives from the land she cultivates. If her husband is not alive, customarily, she becomes the head of the household. Having lived in the community for many years, the grandmother may have established extensive relationships within the community by participating in women's groups and clan and family meetings; organizing multiple religious celebrations, engagements, marriage negotiations, weddings, and funerals; and attending innumerable types of fund-raisers for other families. The social networks, reciprocity, and trust she has established in her community not only add to her social capital, but, often, her status through time. In turn, the grandmother uses her social capital and social status to better secure her access to land resources for her livelihood (see Box 3.1). In the last section of this chapter, we use the sustainable livelihoods framework (Chambers, 1995; Ellis, 2000; Scoones, 2009) to synthesize the potential strategies grandmothers have at their disposal to enhance their resilience to shocks in old age and to secure their access to land resources.

There are certain familial norms that protect a grandmother's access to land resources in our study area. For example, her adult children must all agree informally through discussions, or formally in court, upon decisions surrounding land division and sales. With their grown children's assistance, the family may decide to transfer the title deed from the name of the deceased father to their mother's name. Yet, with a relatively secure access to their land, grandmothers face other kinds of difficulties related to a rising trend of nurturing their grandchildren as primary caregivers.

Box 3.1 Women purchasing, leasing, and sharing of land

Besides accessing land through marriage and kinship, the last decade has seen a rise in women purchasing land on their own, in groups, and having their name on title deeds, either as co-owners or individual owners. In Makueni County, we met women who contributed money to purchase land with their husbands, where the name on the title deed or land number, a precursor document of the title deed issued by the surveyor, only had the husband's name. In other instances, women hire or lease land by the season, either individually or as an organized women's group or as a mixed, male and female farmer group.

As an example of group dynamics concerning the shared use of land, one participating farmer from the Kenya Agricultural Research Institute-McGill food security project stepped forward to allocate a piece of their own land for the establishment of a demonstration farm. The farmers group leadership committee and group members established written agreements concerning the use and sharing of the land, the work, and the outcomes of their efforts. Other groups leased land for the demonstration plots and similarly took formal group decisions about sharing of responsibilities and benefits.

3.4 Growing trends of grandparents rearing grandchildren

Grandchildren are left in the care of their grandparents commonly because the children's parents have died, or they have left to look for work in urban centres. "For the first month or two, they would send money home. After that, they disappear and we do not know where they are," one grandmother lamented (female informant, August 5th, 2013). Grandparents often step in when caring for the number of children in the family is beyond the ability of the parents. This is seen as "sharing the load". When the parents are absent, many grandparents choose not to abandon the young children if they have the ability to support them. One grandmother explained: "We see [the grandchildren] as our own children. We are responsible for them" (female informant, August 5th, 2013).

Taking on the responsibility of the primary caregiver for grandchildren is not widely perceived as having a negative impact on prior household consumption and livelihood stability; in contrast, it is more often seen as a common familial obligation (P. Wambua, personal communication, August 3rd, 2013). This is more apparent in rural communities where men may only participate in the upbringing of children financially, and women on daily care and feeding. Due to changing cultural and social circumstances (see Box 3.2), gendered responsibilities and roles in our study area are beginning to change, with men increasingly participating in childcare.

In many cases, both grandparents take part in raising funds for school fees. If the grandparents are able, they support their grandchildren through secondary and post-secondary education. Many grandparents stated that one of the major challenges of rearing grandchildren is paying for their school fees. Public secondary school fees were publicized to cost close to 10,000 KES per year; boarding schools cost more than 66,000 KES per year (Matata, 2015). Daily wages in rural Makueni County average at 300 KES. The grandfathers and grandmothers echoed each other in their experience of coping with raising their grandchildren. It is common to involve

Box 3.2 Factors contributing to skipped-generational households

Some of the factors contributing to the growing prevalence of skipped-generational households are an increased cost of living, increased numbers of single mothers, and orphaned children due to the HIV/AIDS epidemic. Among those interviewed, many attributed an increased cost of living as the primary reason young men hesitate to marry and start a family. Although economic barriers hinder formal marriages, whether customary, religious, or civil, fertility rates remain high and contraceptive use remains low. Having children out of wedlock is very common. Literature across developing countries provides strong evidence that additional years of girls' education is correlated strongly with delayed childbearing (Lloyd & Mensch, 1999). Yet within rural Kamba regions, the prevalence of young single mothers remains relatively high. Single mothers may not get support from the children's father, and are often left with limited options of rearing children on their own, or leaving them with their grandparents while the mothers search for casual employment in urban centers. Given the small salary young women often earn in urban centers, grandparents expressed low expectation of having their daughters send any money home to support their children. Finally, there is a high prevalence of HIV/AIDS in Kambaland, affecting both women and men. Orphaned children are most often left under the care of their grandparents. There are local NGOs, such as the Orphaned and Vulnerable Children, which assist orphans and the elderly affected by HIV/AIDS deaths. Such organizations support the children with school expenses, but rarely do they allocate funding to nutritional needs of the elderly grandparents and their orphaned grandchildren.

communities in public efforts to raise school fees through community fund-raisers, better known as *harambees* (a Kiswahili word that translates to “Let’s all pull together”).

Grandmothers generally have the gender-defined responsibilities of providing food and clothing, passing on stories of Kamba traditions, customs, and morals, as well as skills around the kitchen and the virtues of sanitation and hygiene. Grandfathers are generally involved with transferring agricultural and trade skills, such as maintenance of the plough, keeping of the cattle and goats, and sometimes poultry. In cases where the grandfather is not working and is not contributing funds to support the grandchildren, either due to poor health, lack of employment, or costly habitual expenses, such as alcohol and cigarettes, the grandmother copes to support the grandchildren. Some reported searching for employment on neighbouring farms as a casual labourer or by selling artisanal crafts (Juma & Ojwang, 1996), such as hand-braided ropes or baskets made from sisal fibers (Figure 3.1).

3.5 Land to nourish my grandchildren

In rearing their grandchildren, grandmothers shift her retirement plans. Besides changing her division of harvest for domestic use or market sales, she may also have to start cooking again for her grandchildren. In a multigenerational household, the grandmother’s daughter-in-law usually cooks and serves her. The daughter-in-law is the wife of the youngest son, who traditionally lives with her mother-in-law. In the literature, there have been cases of surrogate motherhood where grandmothers breastfeed young infants in order to sustain the lives of their grandchildren who have lost their mothers or who may be infected with HIV from mother-to-child transmission (Oguta, Omwega, & Sehmi, 2004). Partly, it is tried as a last resort by the grandmothers, who do not have enough money to buy milk formula or cow’s milk for the grandchildren. In more prosperous cases, grandmothers can indirectly benefit from land resources through her relatives, and other sons and daughters. The grandchildren might have uncles and aunts to help the



Figure 3.1 A woman weaving a basket while returning from a meeting.
Source: author (2013)

grandmother, contributing food, money, or both. They may contribute part of the harvests from their own farms to their mothers, or they may harvest together in an extended compound, even storing the harvests in the same granary. However, grandmothers explained that these are rare occurrences as their sons have their own families to support, their own mouths to feed.

Besides kinship networks, grandmothers who are able to participate in community groups, such as church committees, women's micro-lending groups, revolving savings self-help groups, or farmer groups, have additional means to transform their social networks, participation, and reciprocal trust into resilient mechanisms to support their grandchildren. One of these mechanisms is labour-sharing to grow more food for their households. Many grandmothers in our study reported being involved in farmers groups to share the labour burden of managing a farm. Yet, many grandmothers encounter physical or economic barriers to benefitting from their social surroundings. For example, some grandmothers reported withdrawing from farmers groups that primarily dig terraces together in each member's farm as they suffer from physical ailments that prevent them from providing their share of labour to the group. Others chose not to join a revolving savings group because they cannot afford the fees required to participate the meetings, limiting their access to micro-credit and loans to support their livelihoods. In more demanding cases, grandparents who own land may use their title deeds as collateral to borrow money from formal banks. This risks having their land taken away by the banks if they are unable to repay the loan and interest. In other cases where families do not have the official documents to apply for a loan, some reported using the corrugated metal sheets from their roofs, or other physical materials of value, as collateral. The consequences of default contribute greatly to the reluctance of smallholder landowners to apply for formal loans as a means to advance their livelihood strategies.

As described above, grandparents go through additional stresses to provide food for their grandchildren. Yet, grandparents' apparent low nutritional awareness and some unhealthy food habits pose further concerns for their grandchildren's nutritional state. Basic food staples in eastern Kenya are often cereal-based, predominantly comprised of corn, rice, wheat, sometimes legumes, and lentils. Grandmothers' food and nutrition knowledge impacts the dietary diversity they provide for their grandchildren. Younger children, especially under the age of five, are the most vulnerable and susceptible to infections due to their immune systems in early development (Dewey & Mayers, 2011). Young children have increased needs for foods that are high in nutrients and protein for growth.

Addressing age-specific dietary needs sometimes proves challenging due to environmental constraints and a lack of affordable nutritious foods. Sometimes highly nutritious foods are available, but they are not incorporated into the diet. For example, a woman might sell eggs and use the income to purchase sugar or bread even though eggs have more nutritional value. Pumpkin and arrowroot is commonly grown on farms and eaten during breakfast, but these crops generally take longer to prepare and more firewood to cook, making them less convenient than white bread and margarine. Local indigenous leafy vegetables and wild edible plants are high in minerals and vitamins, but are often not cooked for family meals due to their association with poverty, crop failure, and low social status (Shumsky, Hickey, Pelletier, & Johns, 2014). Indigenous crops that are high in nutrients and grow abundantly in the semi-arid regions, such as sorghum and pearl millet, have lost favour to corn, rice, and wheat due to various reasons, mainly rooted in colonial land and labour policies (Brownhill, 2009).

Higher societal value is perceived in processed, convenient food bought with money in the market (e.g. sweetened white bread) over farm grown produce (e.g. cassava). Moreover, processed foods, such as potato chips, candies, and soda beverages that have high sugar, salt, and

fat content, are welcomed by both young and old in the rural communities. While households may purchase a variety of food from the market to complement food crops from their farms, farmers also expressed that their food security is vulnerable to food price volatility. Many farmers reported a preference to rely solely on food crops from their own farms.

3.6 Comparing the cases of Anna and Lilian

To illustrate the multiple layers of constraints that grandmothers face in caring for their grandchildren, we compare and contrast two cases to show how land is accessed by grandmothers in typical rural scenarios in Makueni County.

3.6.1 The case of Anna: “The land is not mine to give”

Anna (pseudonym) lives on a farm in Mumbuni sub-location where her husband stays at home due to old age. As the primary farmer of the land, Anna prepares the land before each rainy season with a hoe, ox, and plough to cut terraced ridges and to drop seeds. On her husband’s approximately one-and-a-half-acre plot of land, she plants maize, pigeon peas, sorghum, and cowpeas for subsistence. Everything she eats is grown from her farm except for kale, which she purchases from the market. She produces milk from her two cows. Before the long rainy season when she often experiences a shortage of food, she performs casual labour on other people’s farm for cash to buy food from the market, but chances for employment are infrequent.

Besides the piece of farm for her and her husband, she uses remittances from her unmarried daughter to hire a piece of land from her sister-in-law. The rent is 1,000 Kenyan Shillings (KES) (approximately 11 USD) per season. On that land parcel, she grows cotton and maize to support her three grandchildren, aged seven, nine, and ten. In the last season, she sold a total 2,000 Shillings of cotton and used the earnings to buy seeds for food crops in that planting season. In recounting the reason for hiring a piece of land, she said it is to avoid having to use the ancestral land, which has been informally divided to her three sons. Anna’s sons were allocated a piece of

land to cultivate approximately ten years ago, when they got married. In my interview with Anna (July 11th, 2013), she explained that it was difficult to stay with her sons' families as the division of labour became problematic: "Someone may not want to cook or fetch water and conflicts may arise". Her sons who cultivate their pieces of land do not hold official titles to the land. Rather, the father of Anna's husband holds the title deed, although he is no longer alive. He had two wives. Until the sons of the two families agree with each other, the process of acquiring a title deed for Anna's husband will not begin.

Anna's daughter, on the other hand, was never married and gave birth while staying with Anna. "Yeah, I told her not to abort, [but to] just give birth and bring [her children] to me," said Anna. Since her daughter is unmarried, according to Kamba tradition, she is entitled to her father's land for cultivation to support her children. "She has not been given...the shamba is for the grandfather, the father of my husband". When asked: "But [do] the sons have some piece of land from your husband?" Anna responded: "My children? Yes, that shamba". When asked: "Can your daughter also be shown a piece of land to cultivate?" Anna replied: "If it could be mine, I can give [it to] her...But the land is not [mine]". She further explained: "She could not, [it would] bring much tension ... [I]f you bring tension [by asking for land] you can be evacuated with your children. Where will you go?" As a married woman, Anna has traditional land entitlement, but since her husband is still living, decisions concerning land are in his hands. She explained: "Furthermore, it is not mine. Even [if] she want[ed], where will I get [the land] from?" She cannot ask her husband, "because the shamba is not for [my] husband and we are many", which indicates there are many brothers of the husband. Anna said: "[W]hen you are my brother, when you show your daughter a piece of land, and even you, yourself, you are not entitled to that piece of land... [B]rothers can raise many questions". When asked whether Anna's sons could allocate a piece of land to their sister, she revealed: "Now the ones with wives

cannot accept [the request] to cut [a piece of land] where they [have been] cultivat[ing]”. Her three sons could allocate a piece of farm to their sister: “[T]hey don’t have a problem with that, but their wives...they can’t move a piece for her, even a small one”. If husbands allocate land to their sisters, they are, in effect, taking land away from their own wives. This makes wives reluctant to agree for men to share land with their sisters. I was told: “[I]n two to three days, they [wives] start conflicts. There will be conflicts every day”.

On the hired land, Anna is allowed only to plant food crops, not permanent crops, such as fruit trees. She must seek permission for each agricultural decision from the wife of her brother-in-law, who became the owner of the land after the brother-in-law passed away. Not only does each decision require ongoing negotiation with the sister-in-law, production is limited and short-term. This constrains her access to land resources and undermines household food security, as she is not free to plant what and when she wanted. In the event that the owner ceases to rent out the land, she will lose her hired land. “If I had one [piece of land of my own], I can cultivate and at long last, I [will] leave it to [the grandchildren]” (July 11th, 2013). We asked: “If you would have your own land, can you give it to your daughter?” Anna answered: “*Kabisa* (Entirely)”.

3.6.2 The case of Lilian: “I sold even the land upon which I sleep”

Lilian (pseudonym) was born around 1930. She lives in a grass thatched mud hut on the top of a rocky hillside. The land runs steeply down towards the sandy dried bed of the river, where women fetch water each day. She was married to a woman when she was very young. The female-husband (see Box 3.3) provided for Lilian, allocating a portion of land for her to cultivate and feed her children. By the time of our interview, both her female-husband and the original male husband had passed away. Lilian owned the land. She said, “Here, [we] sell the land to assist ourselves like I sold one to educated my child who had passed [the exams] well” (August,

1st, 2013). From the interview, we learned that Lilian has sold a number of small portions of her land. She said, “Even where I have built, I have sold.” Although she had full customary entitlement and ownership of the land, she was struggling with generating income to support her grandchildren. She recounted that the biological father was not responsible for supporting her and her children. He had his own wife and family. Lilian wove sisal ropes and sought casual labour almost daily. The Thursday we visited, there were two young girls playing around the homestead. “Look from there,” Lilian pointed across the slope, “where the land reaches, do you see those sisal plants until up there, it was mine but I sold it ... because the wife of my son left me with her children and went to get married again. If I couldn’t sell it, where would I get food and I can’t work? Even this remaining one [land terrace], I am looking for a buyer to find school fees”. Her grandson is a secondary school student. He is involved in an incident and was summoned to court. In order to pay the legal fees, Lilian sold portion after portion of her land. Ultimately, she ended up selling the piece of land where her thatched mud hut stood. Lilian’s case is an example of distress land sale to pay for education. The only reason she said she was still staying there was because she lacked funds to move and rebuild in another location. The buyer sympathized and allowed her to stay on the piece of land until she could gather the funds to relocate. She added, “Tell her that now ... last year, school fees [was] 70,000 Shillings... Now for the next year is still 78,000 Shillings. Even for this year, I have not paid school fees, but the child is still in school and I want to say that [I] am still searching for money... I can get only 7,000 Shillings for exam so that he can sit for those exams”. The chief from Kasunguni sub-location has been assisting in her grand-son’s education with 40,000 Shillings from a governmental bursary fund. With the sponsorship support from the chief, Lilian’s grandson was promised to be kept in school even though she owed school fees. As we parted, she pointed to

Box 3.3 Female-husbands in Kambaland

In Kamba tradition, when a married couple cannot produce a son, whether due to male or female infertility, the wife may choose to marry a younger woman as her “wife”. The wife will then take on the role of the “female-husband” of the young woman. All rituals for these marriages are observed. A bridewealth is paid to the young woman’s father, and the rules of divorce apply (Herskovits, 1937: 335). In this circumstance, the marriage differs from lesbian marriages as the union is legally and socially accepted but the relationship is not sexual. The expectation for the young woman is to provide a male heir for the female-husband. She likewise expects to be housed and given access to land and other livelihood resources. The female-husband takes responsibility for, and has rights over, any children born by the bride. In cases where the husband may be infertile, the young woman seeks a man outside the marriage to conceive a child. The biological father does not have rights over the children or any of the resources of the marriage. A woman married to a female-husband explained, “the father had two wives...one gave birth to daughters only and the other [wife] had sons. So the [wife] who had [given birth] to daughters only, married two of them [the informant and another woman as co-wives]” (August 1st, 2013). Through a woman-to-woman marriage, the female-husband protects her access to material wealth, especially land resources and family inheritance, by acquiring a wife and producing a son who can perpetuate the husband’s lineage.

the tiny shape of a homestead across the river-carved valley and told us that, after the interview, she would trek across the valley to her neighbour and borrow some food to cook for the evening's meal.

Five months later, we visited the widows group meeting again and met Lilian, her grandson's legal case was ongoing, but she had relocated to another piece of land. She said that things were better since the relocation. The owner who had previously bought her land needed to start using the land. So the owner had lent her some money to relocate, which she would pay back through installments. She has since rebuilt her home even though she continues to struggle for her livelihood.

3.7 Grandmothers' sustainable livelihoods, assets, and strategies

From a grandmother's perspective, a woman's secure access to land holdings can have a tremendous impact on her and her household's food security. In Anna's case, the local institutional processes do not provide her with the secured resources she needs to support her grandchildren. She has access to financial capital to hire a piece of land and access to labour by hiring casual workers, such that she can benefit from cotton sales. This relatively fortunate case depicts circumstances where financial capital is present but the main constraint is natural capital: available land for cultivation. Anna expressed that she hires a piece of land to avoid cultivating her sons' farm in order to keep peace within her family. Even though there is a traditional hierarchy within the family, whereby the wife submits to the husband in decision-making and the sons and daughters obey their parents, this case highlights that livelihood strategies within the network of family relations is often more complex. Anna employed a livelihoods strategy, which forwent entitlement to land and prioritized harmonious family relationships. Anna's daughter is unmarried with three young school-age children. According to Kamba traditions, she is entitled to a piece of land from her father for her and her children to grow food. Yet, often patriarchal

norms and customary institutional processes fall short in actually protecting marginalized members in the household and the community. In Lilian's case, she had full ownership of her land, albeit small, rocky, and with low productivity. Although she eventually had to sell the land upon which her thatched dwelling was built, she was able to generate funds when needed to help her grandson in judicial court fees. Both cases portrayed grandmothers and grandchildren embedded in structural poverty. Lilian, who is relatively poorer than Anna, was able to use her land as an asset, and her entitlement to sell, as her last resort to care for her grandchild. Anna, who has financial capital acquired land through lease-agreement, cannot make decisions without permission from the landowner, and in turn also struggles to ensure food security for her grandchildren. The two cases demonstrate the need for greater comprehension of local realities in order to design land policies that aim to improve access and lift smallholder farmers out of structural poverty.

In general, we found grandmothers, as well as other smallholder farmers, have poor access to irrigation and other mechanized farming technologies and poor access to farm inputs, market, credit, and unemployment. As more youth seek jobs in towns, farm labour is also diminishing within rural communities. With limited access to information and knowledge, farmers often succumb to greater exploitation from agricultural intermediaries during the sale of harvests. However, by drawing on the sustainable livelihoods framework (Chambers, 1995; De Haan & Zoomers, 2005; Ellis, 2000; Scoones, 2009), we found that grandmothers have better access to specific livelihood assets, which enables them to become more resilient through other livelihood strategies.

We look more closely into grandmothers' diverse natural, physical, human, financial, and social capital to understand how they maintain their livelihoods in the semi-arid smallholder system. Considering natural capital, smallholder farmers in our study area generally have low

access to water resources; many hours and much energy is spent on sourcing water from sand dams, rivers, and groundwater pumps. Although grandmothers' physical capacity to engage in manual labour is reduced, they have family members, relatives, neighbours, and other community group members who offer their assistance in collecting water, and in agricultural labour, enabling grandmothers to better benefit from the land. Moreover, grandmothers' years of experience in the community facilitates land tenure security locally even though they do not possess formal ownership of the land. Besides land resources, poultry is another form of natural and financial capital that grandmothers and women have greater autonomy of control. Compared to other livestock, such as goats, sheep and cattle, poultry rearing is predominately within women's domain.

Grandmothers' knowledge of the surrounding environment contributes to their familiarity with locations of available wild edible foods and fibres. They may collect themselves or instruct family members to forage in order to diversify the diets in the family (Shumsky *et al.*, 2014). This unique knowledge of wild edible plants, their locality, seasonality, nutritional, and medicinal benefits is an often undervalued form of human capital, which is not likely acquired from a book or from a classroom. Other types of indigenous knowledge that have been passed down across generations are slowly disappearing. For example, the local Kikamba dialect is only taught until early levels of primary education. In Kambaland, local indigenous language and customs are often preserved through storytelling. One grandmother told the authors it is her responsibility to transfer such knowledge to her grandchildren. Although many grandmothers we interviewed in rural and resource-constrained communities had little or no formal education, they had a wealth of life experience in Kambaland. The older generations have survived through major political upheavals, the transition to Kenya's independence, and historical droughts in the area. For example, the two grandmothers described the months during the Mau Mau uprising

before the independence of Kenya, when they had to hide and live in the forests for long durations away from their homes. Among these harsh conditions, they have first-hand experience of what is required to be resilient in the face of shocks. Although caregiving poses additional stresses to grandparent-headed households, exacerbating their often-compromised nutritional status, our observations suggest that grandmothers have a wealth of local knowledge and effective coping capacities, having survived in resource-limited rural environments for decades.

Grandmothers' physical capital in the context of semi-arid farming systems is closely tied with their social capital. Many forms of physical capital that are measured at the national scale, such as storage and transportation infrastructure, telecommunications, housing, and farming equipment, are important at the local scale to smallholder grandmothers. Social capital that has accumulated over many years provides grandmothers with advantages over younger women in their access to resources. For example, older women typically have a greater range of mobility than younger women, because elder women travelling alone over long distances receive less disapproval by family members due to social values and norms. Older women also tend to have more avenues of communication to raise issues with chiefs, or government agencies, due to their more extensive social networks. Some elder women with leadership roles in the community are involved in local politics, and lead village-level administrations or religious committees. Young women who are newly married into the community have fewer opportunities to build this form of social capital.

Grandparents who are not actively engaged in caregiving have more time to engage in civic volunteering, such as helping with political campaigns within their local districts. This, in turn, increases their network connections, status, and experience through community participation. We keep in mind that elders who are isolated due to reduced physical mobility and health will have varying, but generally falling, degrees of access to social activities that take place outside the

home. In such cases, the common local practice of holding small women's group meetings at the homes of members allows for otherwise isolated widows to share in fellowship, as well as resources, spiritual support, and livelihood strategies that such social capital permits.

Our results indicated that grandmothers tend to gain more memberships in different associative and social groups. This has implications for their accumulation of financial capital as these groups often involve some aspects of micro-lending or revolving credit and savings. They are also more likely to be listed on the household rosters at the chief and assistant chief's office, enabling a higher likelihood for employment, enrolment in farmer groups, or development initiatives funded by NGOs, as well as government and foreign international development agencies. Having more experience with decision-making and leadership within the community, grandmothers, as a group, have rich knowledge of who are the key actors and the local norms in the local community. This allows them to discern more successfully which investment efforts will be fruitful, both in promoting individual and household assets and in building community cohesion (Figure 3.2).

3.8 Policy implications

By recognizing existing challenges that grandmothers face in accessing land resources, and their growing burden of rearing grandchildren, this chapter aims to open a discourse on how development policies, especially regarding agriculture and land, may be informed by a gender perspective within sustainable livelihoods approach. Efforts by international development agencies have placed a high importance on women's empowerment as the foundation to successful intervention and programmatic efforts. A recent report by the FAO on "Women in Agriculture: Closing the Gender Gap for Development" (2011), recognized the importance and power of customary land rights. The report underscored that raising women's legal literacy, ensuring that they understand their land, marital, and individual rights, and the ways these rights

can be enforced and protected, can galvanize women's roles in agriculture. Furthermore, there is a need to address the gap of educating and evaluating government officials, such as agricultural extension officers, along gender targets. Women organizations can also be effective in ensuring women's voices are heard through the participation of women in local government. For example, the constitution of Rwanda and Kenya mandate that 30 percent of parliamentary representatives be women. In the United Republic of Tanzania, where local land disputes are settled by village land councils, three out of the seven members in the council must be women (Ikdahl, 2008). Although women's representation in natural resource governance has yet to reach such prevalence on the ground, we recognize that these mandates are a step forward in getting women's voices heard. Adjustments and assistance in bureaucratic procedures, such as joint-titling, have the potential to better protect women within marriage. Policies that support assistance in applying for land titles, such as acquiring official documents (e.g. birth certificates), or filling out forms can also narrow the gender gap (FAO, 2010).

From our analysis of the specific livelihood assets of Anna and Lilian, and by interpreting the local institutions that governs grandmothers' use of their livelihood assets within the rural Makueni context, we portrayed the livelihood strategies available to grandmothers. We found that grandmothers have greater amounts of physical, financial, and social capital to care for young children than young widows or single mothers. Through offering examples of being resilient members of the community, the cases of Anna and Lilian show that their food and nutritional security is low and their vulnerability to internal and external shocks is extremely high. Ultimately, secure access to land resources offers an important way in which grandmothers can increase their social-ecological resilience (Adger, 2000; Bahadur, Ibrahim, & Tanner, 2010; Cote & Nightingale, 2012; Holling, 1973).

Such resilience can be supported through innovative land and agriculture related policy frameworks that integrate mechanisms to foster gendered resilience within households so that marginalized groups, such as single mothers and grandmothers, are supported to pursue livelihoods that offer food and nutrition security to themselves and their grandchildren.

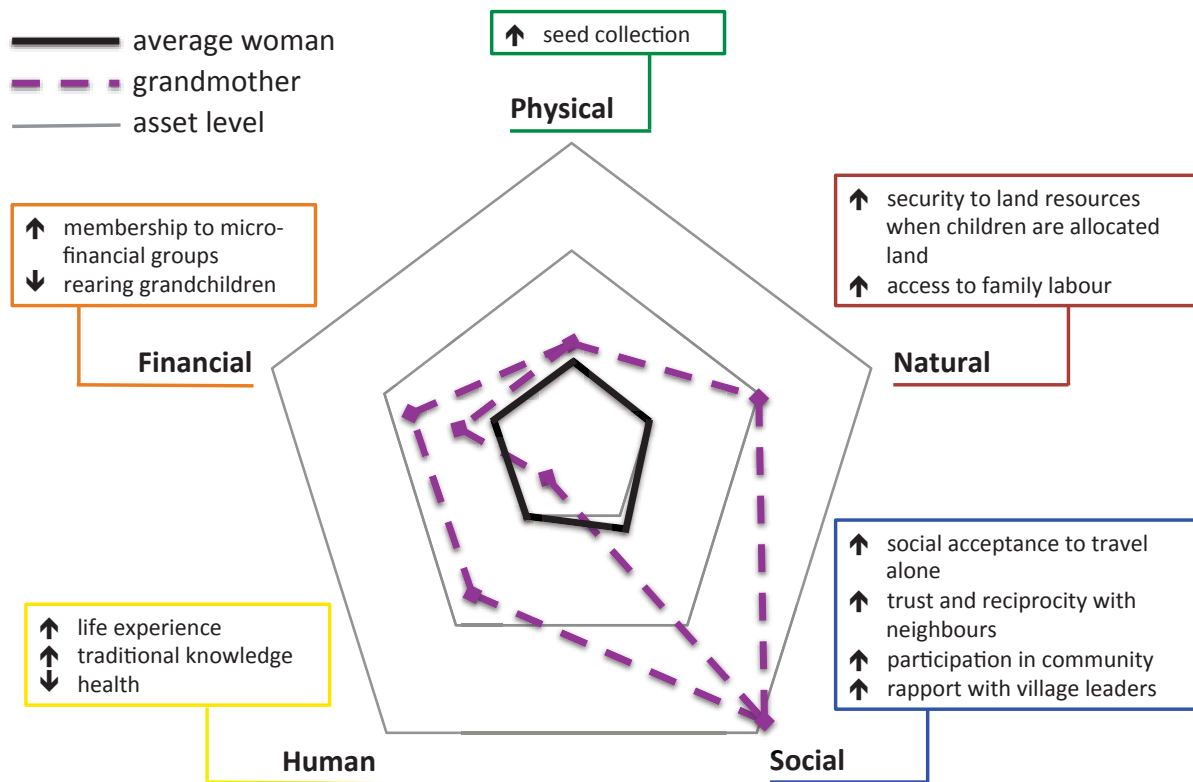


Figure 3.2 Grandmothers' livelihood assets in smallholder communities.
Source: author (2017)

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Preface to Chapter 4

In Chapter 3, I illustrated how grandmothers utilized their social capital to enhance other livelihood capital assets. Grandmothers' land resource access and nutritional security were bolstered with increased family labour, expansive community networks, informal credit sources, and traditional knowledge on wild edible plants. In Chapter 4, I further examine how the different dimensions of social capital relate to women's access to land resources. I use women's decision-making participation in agricultural production as a main indicator of informal agricultural land resource access. I examine three dimensions of social capital: bonding social capital, bridging social capital, and linking social capital, and test their associations with women's participation in agricultural decision-making across regional-, village-, and household-levels using a multilevel statistical analysis and qualitative analysis.

CHAPTER 4

CROSS-SCALE RELATIONSHIPS BETWEEN WOMEN'S SOCIAL CAPITAL AND AGRICULTURAL DECISION-MAKING IN SEMI-ARID KENYA

Abstract

Women's social capital is developed through community networks and can influence their intra-household bargaining positions, with significant implications for resource allocation in smallholder agrarian communities. However, how women actively utilize different dimensions of social capital to enhance their access to agricultural resources remains understudied. This paper presents an investigation of the relationships between women's participation in agricultural decision-making and bonding, bridging, and linking social capital, village characteristics, and aggregate social factors in rural semi-arid Kenya. Mixed methods were used to collect data from eight community meetings, 12 focus group discussions, 77 stakeholder interviews, and surveys from 206 households in 127 communities. Results indicate that women use their bonding social capital to acquire information and training. High bridging social capital was associated with increased involvement in decision-making when a market place and or chief's office was present in the village. However, a negative association was found between women's high linking social capital and women's participation in decision-making. The results underscore the presence of a cross-scale interplay between contextual factors and social capital dimensions, which can mediate women's decision-making participation.

Keywords: Gender; Intra-household dynamics; Kamba people; Multilevel Analysis; Social ties

4.1 Introduction

Gender relations are increasingly recognized as being critical to household food security and nutrition in subsistence and smallholder agrarian systems (Agarwal, 1997; De Haan & Zoomers, 2005; Doss *et al.*, 2011). The study of intra-household power relations has sought to explore gendered social dynamics within the domestic realms of smallholder farming families in the Global South, particularly in relation to agriculture, natural resources, and food security (Agarwal, 1997; Doss, Kovarik, Peterman, Quisumbing, & van den Bold, 2013; Kevane, 2012; Meinzen-Dick, Brown, Feldstein, & Quisumbing, 1997a; 1997b; Sraboni, Malapit, Quisumbing, Ahmed, 2014). Demographic trends from the 1980s have indicated that women dominate in the agricultural sector in rural Africa (Doss *et al.*, 2011) as men typically engage in seasonal or permanent rural-urban migration. Although more women are engaging in rural agricultural labour, women's access to agricultural and land resources often remain constrained by gender rules and customary norms in rural communities. Recent steps in legislation and public policies have begun to promote gender equity in African nations (Cotula & FAO, 2007; FAO, 2010). However, within small-scale contexts, qualitative evidence has indicated that women often sacrifice their entitlement to productive resources, such as land, in order to maintain harmony in the nuclear and extended family (Po & Bukania, 2016) or adhere to societal standards (Turner, 1999). Extensive evidence from across the Global South has shown that when women have enhanced access to household resources and greater autonomy to make household-, child-, reproductive- and health-related decisions, children in their households exhibit improved nutritional growth and health outcomes (Carlson, Kordas, & Murray-Kolb, 2015; Cunningham, Ruel, Ferguson, & Uauy, 2015; Richards *et al.*, 2013; Ziaei *et al.*, 2015). Other authors have observed that when women make more agricultural decisions and take leadership roles within their community, there are correlated increases in household crop and dietary diversity, adoption

of agricultural innovations, and improved productivity (Alkire *et al.*, 2013; Bryce, Coitinho, Darnton-Hill, Pelletier, & Pinstруп-Andersen, 2008; Carletto, Ruel, Winters, & Zezza, 2015; FAO, 2011; Malapit, Kadiyala, Quisumbing, Cunningham, & Tyagi, 2015). The multiple roles and responsibilities of women as cooks, caregivers, and cultivators are more likely to influence their preferences towards preserving food security and enhancing nutritional intake for household members (Malapit *et al.*, 2015; Meinzen-Dick *et al.*, 1997b).

Although the majority of women in smallholder agricultural systems do not have formal land tenure to secure their access to agricultural resources, the vast research on intra-household resource allocation indicates that women's access and control of agricultural resources in the household largely depends on their command of social and economic resources (Agarwal, 1997; Ashraf, 2009; Doss, 2013; Turner, 1999). This includes their income from paid work (Bamji & Thimayamma, 2000; Howell, 1973; Lado, 1997), access to credit (Ashraf, 2009; Holvoet, 2005), and non-labour market assets such as the bridewealth that is brought into marriage (Bélanger & Li, 2009). Biological factors such as the women's age, age of first birth, and duration of birth spacing have lasting consequence on women's continuation in school (Kim, 2010), and participation in formal and informal labour markets, which in turn, impact their bargaining position (Malhotra & Mather, 1997).

Moreover, women's social status and leadership experience within the community also influence how socially-embedded and bureaucratic institutions (Cleaver, 2002) enable or constrain their bargaining position. We further recognize that women's bargaining positions evolve within greater community networks that facilitate the diffusion of novel information. These networks can allow the exercise of sanctions and relax or force compliance with social values and rules. In the case of tight-knit networks, the social pressure on women may lead to exclusions of alternative ideas, and perpetuation of traditional gender roles (Narayan, 1999). In

contrast, research on collective action has shown that community-driven development can be conducive to the spread of innovative ideas and can spearhead social movements that engender scalable and widespread change (Dasgupta & Beard, 2007; McCarthy & Kilic, 2015). While previous research identifies how women are affected in different contexts, further research is needed to address how women, as agents of change, use social capital to navigate their access to agricultural resources. It remains understudied how different dimensions of social capital may facilitate or hinder women's access to agricultural resources and how these dimensions may interact across different scales. Recognizing the multiple factors and complex power relations at play, this paper examines how women, embedded within a rural smallholder context, draw on their different types of social capital to influence their participation in agricultural decision-making. This empirical research aims to bridge a critical gap between social capital and the intra-household decision-making literature.

In what follows, we describe foundational theories of social capital in the context of resource access for rural livelihoods, and structural dimensions of social capital in terms of its relationship with women's agricultural decision-making. We then introduce the case of rural eastern Kenya and the mixed method research approach we draw upon. We discuss the results and interpretations regarding the dimensions of social capital, and their relationships with supportive contextual and compositional factors. Finally, we propose insights that can further our understanding of social capital within smallholder systems.

4.2 Social capital theories and resource access

Among its diverse definitions, social capital can be understood as an endowment of “tools and assets” fostered through social relations and interactions between people or groups of people, guided by power structures and local institutions to reduce the “social over-head costs” of co-operation and improve smallholders' access to livelihood resources (Bates, 1990; Ostrom,

1999). Beyond individual benefits, Putnam (2000, p. 19) asserted a more widely recognized definition of social capital as the “networks, norms of reciprocity and trustworthiness” which contribute at the societal level, to improving “the efficiency of society by facilitating coordinated actions” (Putnam, Leonardi & Nanetti (1993, p. 167). Social capital has also been conceptualized from a more sociocentric view of capital as a collectivity (Adler & Kwon, 2002). It can be understood in terms of the less observable norms of reciprocity and trust among members and institutions or shared identity built upon beliefs and values (Putnam, 2000; Woolcock & Narayan, 2000). While we recognize the importance of this broader conceptualization of social capital to theory and research, in this article we focus on an individual understanding of social capital. We examine the direct and indirect relations individuals maintain to further improve their livelihood outcomes (Burt, 2001).

Social capital research in the context of accessing agricultural resources has predominantly focused on nuclear households as the basic unit of measure, with limited treatment of gender relations within households (Mayoux, 2001). However, the social and other capital asset reserves of men and women are known to be markedly different within the same household (Agarwal, 1997). Previous literature examining gender and social capital in smallholder contexts has reported that men, in general, have greater access to social capital than women (Katungi, Edmeades & Smale, 2008). In Ghana, one study reported that men were significantly more likely to belong to, and participate in, agricultural cooperatives than female household heads (World Bank & IFPRI, 2010). A systematic review (Quisumbing *et al.*, 2014) found that males are more likely to participate in agricultural or production-oriented groups and females dominate women, clan, or village groups (Davis & Negash, 2007; Godquin & Quisumbing, 2008). The purpose of participating in groups also differs along gender lines: males were reported to participate for commercialization and marketing, whereas female join for social insurance and building assets

(Kariuki & Place, 2005). Although men dominate leadership and management positions within resource groups, women have been reported with a comparative advantage as managers of money. In the case of watershed groups in Kenya, women were cited as less susceptible to corruption than men as treasurers, with men preferring mixed-gender farmer's groups than men's groups (Quisumbing *et al.*, 2014). Women can enhance their social capital assets relatively easier than other financial, natural, physical, or human assets. Moreover, different dimensions of social capital may differentially influence women's access to resource capitals. Recognizing women's existing social capital within rural smallholder contexts, and the need to better understand how social capital can work to empower women, this study examines the three dimensions of social capital commonly described in structural social capital theory (Coleman, 1988; Granovetter, 1973; Woolcock, 2001) and how they may help or hinder women's bargaining position in agricultural production at the household level.

4.2.1 Different dimensions of social capital

Literature on social capital has identified three common structural dimensions: bonding, bridging, and linking (Andriani & Christoforou, 2016; Coleman, 1988; Granovetter, 1973; Woolcock, 2001). Structural dimensions of social capital “refer to a variety of networks that contribute to cooperation and, more specifically, to mutually beneficial collective actions” (Andriani & Christoforou, 2016, p. 11). Bonding social capital is often characterized by network relations within groups of people with similar cultural, religious, or ethnic backgrounds and socio-economic status, for example, within extended families, groups of close friends, and neighbours (Granovetter, 1973; Woolcock, 2001). The social relations that predominantly foster bonding social capital are also described as “strong ties” (Granovetter, 1973). Strong ties are characterized by norms of trust and reciprocity within groups built on processes of frequent interpersonal and sometimes emotional interactions (Putnam, 1993). Farmers with strong

bonding social capital within a stable support network of extended families and neighbours are more likely to be recipients of new agricultural technology or information. For example, Kiptot and colleagues (2006) found that the agroforestry technologies aimed to enhance soil fertility in Western Kenya were mostly shared along kinship ties. However, gender-specific groups may lead to social seclusion and lower access to new information, as found in India, where strong bonding social capital in groups was found to have isolated women from outside opportunities, new technologies, and might have contributed to women's higher dependence on male relatives for various needs (Meinzen-Dick, Behrman, Pandolfelli, Peterman & Quisumbing, 2014; Padmaja, Bantilan, Parthasarathy & Gandhi, 2006). High bonding social capital may exert social pressure to conform to expected norms, restrict new entrants to social networks, or reinforce exclusive identities (Portes & Landolt, 1996). In the context of women's access to livelihood resources, strong bonding social capital can reinforce traditional gender dynamics, which may hinder changes in women's autonomy regarding land and agricultural resources use.

The second dimension of social capital is bridging social capital, which is created across groups of people from different social backgrounds (Granovetter, 1973; Putnam, 1993). Bridging connections are commonly described as being effective in the diffusion of information from diverse sources due to heterogeneous groupings of people (Schuller, Baron, & Field, 2000). Bridging social capital has also been theorized to accumulate through civic engagement, such as engaging in voluntary associations or public meetings (Putnam, 1993). Moreover, civic engagement, such as voting, also allows opportunities for people across socio-economic status to gather and exchange ideas regarding their community (Carpini, 2000). It relies less on interpersonal relations, but builds on the basis of shared goals and generalized trust in the broader community. Bridging ties facilitate an individual's access to resources that are available from different groups (Andriani & Christoforou, 2016).

The third dimension, linking social capital, is often characterized as an extension of bridging social capital as it is accumulated from network relations between people or groups from different social classes (*ibid.*). These social ties can facilitate community groups' ability to engage with external actors in positions of power and authority to further access resources outside local groups (Meinzen-Dick *et al.*, 2014; Woolcock, 2001), or to influence community rules in resource allocation. Distinct from the first two dimensions, linking social capital among relationships that traverse social and economic hierarchies represents a vertical relationship (Andriani & Christoforou, 2016; Sabatini, 2009; Woolcock, 2001). Case studies of smallholder farming communities in Swaziland and Malawi have shown that women's active political participation and direct or indirect connections with leaders within the community have led to greater access and security of land resources by bypassing formal bureaucratic barriers (Rose, 2002).

Alternatively, linking social capital has been theorized to sustain social inequality within hierarchical networks. Special interest groups may use their linking social capital to engage in lobbying or rent-seeking strategies. Exploitation of linking social capital can lead to free-riding, elite capture, and corruption (Meinzen-Dick *et al.*, 2014; Ostrom, 2000). In contexts where institutional and governance structures against corruption are still developing, linking social capital often coincides with patronage or clientele networks, and abuse of authority can be observed at the local up to national levels (Musgrave & Wong, 2016; Warren & Visser, 2016).

Putnam (2000) also observed that people with exclusive ties, such as ethnic-based or faith-based groups, develop bonding social capital, whereas people with inclusive ties, such as youth development associations, develop bridging social capital. The different dimensions of social capital have also been dichotomized broadly based on their outcome: bonding social capital is essential in helping individuals and groups to subsist or "get by" and bridging and

linking social capital are important for “getting ahead” (*ibid.*). These dimensions of social capital are important to distinguish and are widely used in furthering social capital theory.

Social capital has been examined at various scales: within the community (Pretty & Ward, 2001), across organizations and policy networks (Henry, Lubell & McCoy, 2011), and at state or national levels (Kawachi, Kennedy, Lochner & Prothrow-Stith, 1997; Subramanian, Kim & Kawachi, 2002). Contextual factors can be viewed as characteristics of the geographical region, such as the presence of an agricultural extension office, presence of a river, or national identity, that are not dependent on micro-level household data. Compositional factors are dependent on micro-level data. In our study, they are a function of household or individual responses, usually calculated from household surveys. For example, a compositional social capital variable could be the percentage of households in the division that have more than five community group memberships. The variable describes a division-level characteristic that varies division from division, and is calculated from household-level data. Other examples of compositional factors are national unemployment rates, state prevalence of families below the poverty line, and division prevalence of primary school completion. These contextual and compositional variables influence who people interact with, how they interact, and what types of information is transmitted, and in turn, has significant impacts on resource access and management, especially for female farmers (Healy, Haynes & Hampshire, 2007).

4.3 Case study: Rural eastern Kenya

To understand how different dimensions of social capital associate with women’s participation in agricultural decision-making, we explored the case of Kambaland in the semi-arid regions of eastern Kenya. The Kamba ethnic group is one of the five largest ethnic groups in Kenya, with a total population of approximately 3.9 million (KNBS, 2009). Based on customary tales, Kamba people settled in the region east of Mount Kenya more than 200 years ago. Kambas in rural

Kambaland predominantly practice rain-fed agriculture, supplemented with income from casual labor, beekeeping, and small-scale trading of artisanal crafts (Juma & Ojwang, 1996). Farmers cultivate small parcels of land, on average two hectares, with limited inputs, such as animal manure to maintain soil fertility (Odhiambo, Nyangito & Nzuma, 2004). In the arid and semi-arid agro-ecological zones, rainfall is highly variable and declines in soil fertility have often led to low agricultural yields (Jaetzold, Schmidt, Hornetz & Shisanya, 2006; Kaplan, 1984). Staple crops include maize, sorghum, millet, and legumes, such as mung beans, dolichos beans, and pigeon peas. Cattle, sheep, goats, and poultry are common livestock in the region.

Although most members of the household engage in agricultural activities, there are traditional divisions of labour between men and women. Traditionally, men are responsible for tilling before each planting season using oxen and plough. Young men who have the physical ability to carry a 16-litre pesticide sprayer often are the ones who apply pesticides. Women are involved in harvesting and post-harvest activities (Figure 4.1), which includes selecting and saving seeds for the next season (Mucioki, Johns & Mucioki, 2016). Although these forms of division of labour were reported by respondents across communities, most agricultural activities were often carried out by both men and women. Respondents noted joint involvement of men and women, especially in weeding and digging terraces to prevent soil erosion and nutrient loss. In the more arid regions of Kambaland, household livelihoods are dependent on a mixture of agriculture and pastoralism since the risk of crop failure is relatively high. Here, the division in gender is more defined. According to tradition, men are managers of larger livestock, such as cattle and goats and women are managers of smaller livestock, primarily chicken (Brownhill, Njuguna, Mungube, Nzioka, Kihoro, 2016). Most women in this region own small-livestock and respondents described their autonomy to sell chickens without having to seek permission from



Figure 4.1 Two women engaged in the post-harvest activity of selecting pigeon peas.
Source: author (2014)

male family members. This autonomy has been shown to facilitate women's income generation, local group formation, and their access to supplementary sources of dietary protein from eggs and chicken (*ibid.*). Household food and nutrition security is pertinent in rural Kambaland, as the three Ukambani counties have 25 to 46 percent of their children five years old and under classified as malnourished (KNBS, 2015). Although smallholder households in the region are generally constrained in their natural resource-dependent livelihoods, the Kamba people have long utilized existing circles of social relations to enhance their resource base and livelihood strategies (Brownhill & Njuguna, 2016).

4.4 Methods

To assess the role of structural social capital in women's access to agricultural resources, we used a mixed method research design drawing on qualitative and quantitative data collected from Machakos and Makueni Counties, two of the three counties that constitute Kambaland in the arid and semi-arid eastern region of Kenya (Figure 4.2).

4.4.1 Qualitative data collection and analysis

From 2013 to 2014, the lead author conducted eight community meetings [four women-only (n=280), four men-only (n=83)], twelve focus group discussions [four women-only (n=45), four men-only (n=19), and four mixed-gender (total n=70)], and 77 in-depth key informant interviews in Makueni County, specifically within four administrative locations: Mumbuni, Kitandi, Kathonzweni, Kathekani (Figure 4.2). The data generated served to inform the design of questions and indicators used in the subsequent surveys and corroborate quantitative results. Focus group discussions followed a semi-structured interview guide. Discussions were audio recorded with verbal consent and transcribed in local Kikamba dialect or English and then translated into English. Transcripts were thematically analyzed using the inductive process of semi-open coding (Berg, 2004).

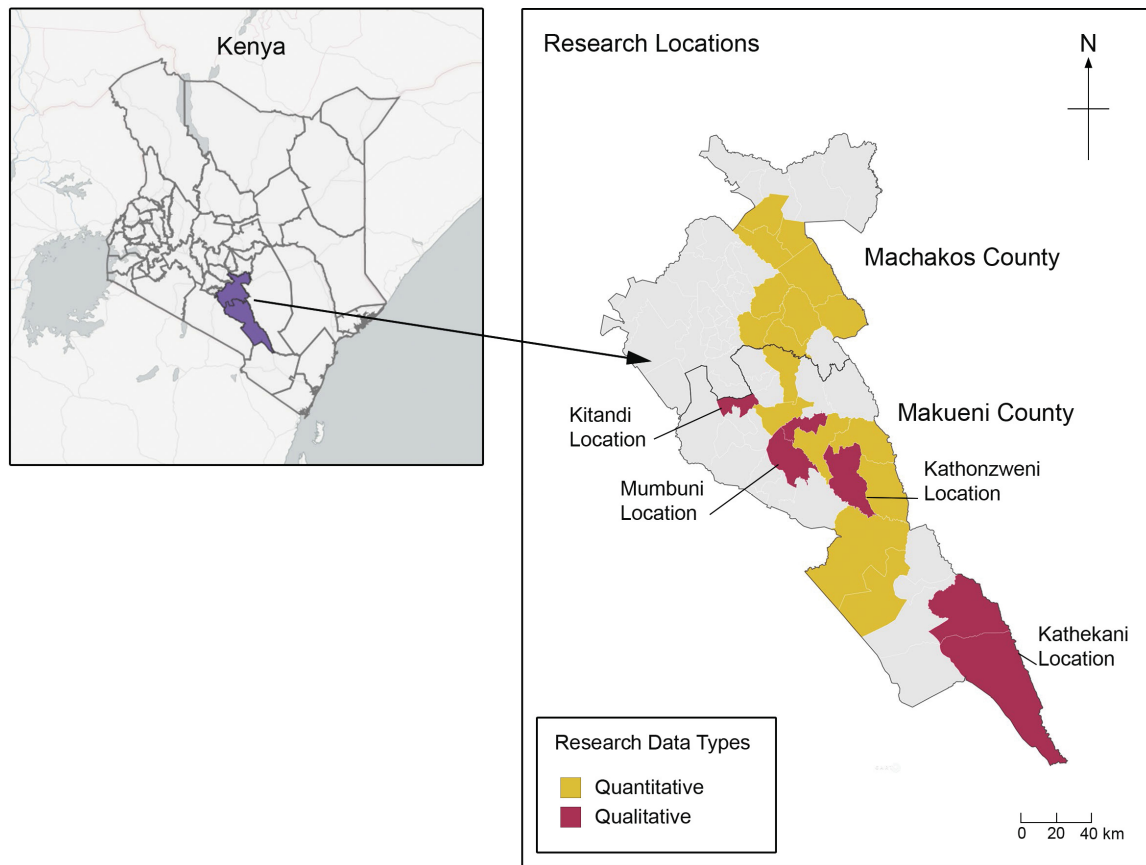


Figure 4.2 Research location map. *Source:* author & Bolbach (2017)

4.4.2 Quantitative data collection and analysis

In 2014, the lead author administered a household survey using a multi-stage sampling strategy in both counties. The first stage involved clustering by county, with 324 households meeting the inclusion criteria of having a non-pregnant woman of at least 15 years old with children six to 36 months old. These households were selected from district lists that contained 72 registered and active farmer groups as part of a larger agriculture and food security project (Hickey, Pelletier, Brownhill, Kamau & Maina, 2012). In the second stage, 255 households were selected through simple random sampling. After recruitment, and data cleaning, 206 women were included in the final data analysis. The survey covered topics concerning agricultural decision-making, land tenure, and indicators of social capital adapted from the Indian Human Development Survey (Desai *et al.*, 2005). Questions were informed by previous focus group discussions. Household and community surveys were piloted by local informants and revised before use in training sessions with local enumerators. The household surveys were administered at the homes of respondents in the local dialect, Kikamba, and lasted approximately 50 minutes. All respondents provided written consent at the time of data collection. Three attempts were made to administer the survey with each pre-selected respondent in the event the respondent was not available at prior visits. Community surveys were administered to village-elders or sub-county chiefs located in the 127 different villages where respondents resided. Each community survey included questions on village characteristics, such as access to markets, credit, political administration, available community organizations, and government programs.

4.4.2.1 Outcome variable: Agricultural decision-making

Table 4.1 provides the variable definitions used in our quantitative analysis. The primary outcome variable for our analysis was women's level of participation in agricultural decision-making. It was constructed using a battery of eight questions concerning farm activities

Table 4.1 Variable descriptions

Outcome variables	Description
▪ Women's agricultural decision-making	Discrete variable index score from 0 to 8
▪ The range of community groups from which information was received	Discrete variable index score from 0 to 12
▪ The range of community groups from which training was received	Discrete variable index score from 0 to 12
Independent variables	Description
<i>Individual-level</i>	
Bonding social capital	
▪ Attended and/or contributed to a local fund-raiser	Categorized into (0) no or (1) yes
▪ Total number of bonding group memberships	Discrete variable from 0 to 7 memberships
Bridging social capital	
▪ Attended public community meetings	Categorized into (0) no or (1) yes
▪ Total number of bridging group memberships	Discrete variable from 0 to 5 memberships
▪ Voted in the last election	Categorized into (0) no or (1) yes
Linking social capital	
▪ Participated in any political campaigns	Categorized into (0) no or (1) yes
▪ Had household member in village administration or government office¹	Categorized into (0) no or (1) yes
Social-demographic variables	
▪ Women's highest level of education	Categorized into (1) Higher than primary school (2) Completed primary school (Std. Grade 8) (3) Lower than primary school
▪ Women's age in years	Continuous variable 15 years and above
▪ Household asset index¹	Categorized into (1) first tertile (richest) (2) second tertile (3) third tertile (poorest)
▪ Gender of household head¹	Categorized into (0) male or (1) female

¹ Household-level variables

Table 4.1 Variable descriptions (continued)

Independent variables	Description
<i>Village-level</i>	
▪ Road access	Categorized into (0) vehicle-accessible roads in dry seasons (1) vehicle-accessible roads in rain seasons
▪ Presence of a chief or assistant chief's office	Categorized into (0) no or (1) yes
▪ Presence of a market place	Categorized into (0) no or (1) yes
▪ Presence of a stand selling alcohol or addictive substance	Categorized into (0) no or (1) yes
▪ Total number of available community groups and government programs	Discrete variable from 0 to 37 total community groups and government programs
<i>Division-level</i>	
▪ Compositional bonding social capital	Mean Proportion of respondents with (1) high number of memberships in bonding groups (median value serves as the reference for the high and low groups) and (2) attended or contributed in local fund-raisers
▪ Compositional bridging social capital	Mean Proportion of respondents with (1) high number of memberships in bridging groups (median value serves as the reference for the high and low groups), (2) attended public meetings, and (3) voted
▪ Compositional linking social capital	Proportion of respondents involved in political campaign activities
▪ Poverty prevalence	Proportion of households living in the poorest tertile of the household asset index
▪ Literacy prevalence	Proportion of respondent completed primary education (Std. Grade 8)
<i>Contextual variables</i>	
▪ County	Categorized into (0) Machakos County or (1) Makueni County
▪ Agro-ecological zone	Categorized into (0) Lower Midland 4 or (1) Lower Midland 5

commonly reported by respondents from previous focus group discussions and key informant interviews. These were: “In the past season, who decided to: ‘buy specific seeds’, ‘prepare the lands’, ‘start weeding’, ‘spray chemicals’, ‘apply manure’, ‘plant trees’, ‘build terraces’”, and “Can you alone decide to sell the harvest from this land”. A positive response was counted if a respondent reported herself as being one of the household members who made the decision. For example, if “husband”, “father-in-law”, and “respondent” were reported as the individuals who decided on applying manure, the response would be one. If “respondent” were not reported among the people who made the decision, the response would be zero. Eight responses were summed to create an agricultural decision index score out of eight.

We further asked respondents whether they or their family received information as a form of assistance (Yes or No) from a list of twelve types of community groups: “neighbours”, “extended family”, “relatives in Kenya”, “clan”, “women’s groups”, “men’s groups”, “farmers’ groups”, “church members”, “community health workers”, “non-governmental organizations”, “agricultural extension officers”, and “family outside Kenya” in the past twelve months. The twelve responses were summed and used as a proxy of information diversity, a second outcome variable with values from 0 to 12. Similarly, responses on whether they or their family received training as a form of assistance from the twelve types of community groups were collected as the third outcome variable.

4.4.2.2 Explanatory variables

Our explanatory variables were divided into three levels: individual, village, and division.

Level 1 Covariates: Individual-level social capital

We categorized social capital into bonding, bridging, and linking. Recognizing that social capital, with its diverse and often mutually inclusive meanings, is often ambiguous in its measure and categories (Durlauf, 1999), we selected indicators that are supported by theoretical

understanding and contextual realities. Two indicators were used for bonding social capital. First, whether or not respondents contributed money at a local fund-raiser in the past year. This is a proxy indicator measuring trust and adherence to norms and collective action (Grootaert & van Bastelaer, 2001). Adherence to social norms does not preclude the presence of social pressure and obligation. However, monetary contribution and participation in local fund-raisers reflect respondents' expectations and experiences with community members based on trust, as well as social obligation. Respondents described a reciprocal support system that worked by households coming together to support others in need, with the expectation that other households will come to their assistance when their own need arises (Stern & Coleman, 2015). Second, the total number of memberships in groups that generally share similar social backgrounds, such as self-help groups, revolving savings groups, youth groups, religious committees, clan or family committees, funeral or wedding committees and food assistance groups sponsored by NGOs like Food for Work (with World Vision). In these voluntary and associative groups, most members self-select and share similar customary or religious values. A Bible scripture reading group, for example, has members who share the same Christian faith (Nyangena & Sterner, 2008). Through frequent interactions and the high intensity of cultural and emotional exchanges, such groups primarily foster bonding social capital. At the same time, lower levels of bridging or linking social capital exist among these groups when members engage in welfare development activities, which depend on broader community participation. For example, members in a labour-intensive Food for Work assistance program generally come from a similar socio-economic status with similar food shortages, and meet certain poverty-level eligibility requirements for food assistance. The process of labour-sharing on each other's farms at regular intervals also likely fosters bonding social capital.

We used three indicators to capture bridging social capital: (1) whether the respondent attended public community meetings; (2) the total number of memberships in groups with members from diverse social backgrounds; and (3) whether the respondent voted in the last election. Attending public community meetings and casting a ballot in a major election are examples of civic participation, a critical indicator of social capital (Putnam, 1993). These are also activities in the rural context where a large group of people from diverse backgrounds gather, either to attend a public village meeting or to line up for many hours to cast a vote, evidenced by long lines during the 2013 national election (Figure 4.3). The gathering of large groups of people from diverse backgrounds, while waiting for the meeting to start or standing in line, foster informal exchanges of information characteristic of bridging social capital interactions. Memberships in professional and community development groups, such as farmer groups, agricultural or milk co-operatives, women welfare groups, formal microfinance groups (e.g. Rafiki, Kenya Women Microfinance Bank), community health program groups, water harvesting or dam committees, and non-food assistance NGO project groups can capture community interactions that foster bridging social capital. These characteristics are similar to the group distinctions used by Story (2014) for measuring bonding and bridging social capital. The subset of community groups selected as a proxy measure of bonding social capital was based on the theoretically homogenous background of members and the exclusiveness that limited the set of community members eligible to be involved in these community groups. Similarly, the subset of community groups selected as a proxy measure of bridging social capital was based on the theoretically heterogeneous background of membership and their common community-based development goals of the groups.

Linking social capital was categorized based on the relationships between two or more



Figure 4.3 Queues at a voting centre in Kenya during the 2013 general election. *Source:* Stephenwanjau [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

actors from two social strata of power. These strata can be along formal divides by membership in institutional organizations, such as the county government, local village administration, or NGOs or divisions in social class. We used two indicators for linking social capital: (1) whether the respondent participated in any political campaigns, such as organizing meetings and volunteering for rallies with the representative they support; and (2) whether any household member belonged to the local administration, such as a village or ward council or government office. These indicators proxy linking social capital from an input perspective where respondents who answered “yes” are more likely to have exposure to political representatives, campaign organizers, and local administrators, and have more opportunities to create linking social capital than respondents who answered “no”. This is similar to the measure of years of formal schooling as an input indicator of human capital and observed collective action as an output indicator of social capital (Grootaert & van Bastelaer, 2001). We note that higher linking social capital may not always correlate with beneficial access to information or economic resources, as social capital has been shown to also foster negative outcomes (Durlauf, 1999).

Although the dimensions of social capital are measured as distinct variables, they are theoretically not mutually exclusive. For example, women who actively participate in training activities in farmer groups (hosted by agricultural extension services or NGO-sponsored programs) can foster more bridging social capital, less bonding social capital, and even linking social capital with NGO personnel. Moreover, these women are more likely exposed to new agricultural methods or nutrition sensitive information that will influence their preferences, which will reflect in their decision-making participation on the farm. While we acknowledge that community associative groups can foster multiple types of social capital, we measured bonding and bridging social capital by memberships in community groups that primarily foster strong ties or weak ties. We recognize that this is one of the limitations in measuring social capital

dimensions from group and association memberships without additional measures of inclusivity, frequency, or participation and engagement of members.

Level 2 Covariates: Village characteristics

Village-level indicators were: (1) whether or not the village had a chief or assistant chief's office; (2) had a market; (3) had a location in public to purchase alcohol or other addictive substance; and (4) the combined total number of available community groups and government programs out of a list of 37 groups and programs. These were used as contextual variables to capture the development-related characteristics of the village. A chief or assistant chief's office provides multiple services to the community. The chief's office is often where large groups of people gather for community announcements, where official documents, such as identification cards, application forms and recommendation letters are prepared as prerequisites for official group formation, including license, land title, or grant applications. It is also the gateway for outsiders with new programs or information to gain formal permission to operate in the community. Theoretically, its presence can foster multiple dimensions of social capital and in general, community development. Marketplaces are centres of informal exchange of information and trade, with restaurants, salons, and cyber-cafes that facilitate social gatherings. In rural Machakos and Makueni Counties, and in many counties across the country, "market day" is a bustling day held usually once a week, at a centralized village or town location. These markets are often near the main tarmac road where farmers and vendors arrive on buses to sell their products and where herders bring large herds of cattle and goats for auctioning (Field observations 2014). As part of traditional responsibilities, women play a major role in purchasing food and domestic items for households and selling or marketing farm produce. These market-based activities provide weekly opportunities for information exchange. Women establish their informal networks at places, such as produce stands, salons, or teashops. When

women relay new information they gain from the market to their family members, they may further engage in related household or farm decision-making.

Level 3 Covariates: Division-level aggregate characteristics

Administrative divisions within Machakos and Makueni County were used to form aggregate indicators at a greater spatial scale (Grootaert & van Bastelaer, 2001). In the public health literature, social capital is often examined at the neighborhood or administrative level in relation to individual health outcomes. In our study, household survey data was aggregated following methods outlined by Kawachi *et al.* (1997), Kim, Subramanian, and Kawachi (2006), and Subramanian *et al.* (2002). Administrative divisions were chosen as the level of aggregation so there was sufficient variability between 18 divisions and variability of micro-level data within divisions. There was a range from five to 26 households sampled per division. The compositional bonding social capital variable was calculated by taking the average of: (1) the proportion of respondents who attended or contributed to a local fund-raiser; and (2) the proportion of respondents who had above median number of memberships in groups that foster bonding social capital (Kim, Subramanian, & Kawachi, 2006). Similarly, the compositional bridging social capital variable was calculated by taking the average of: (1) the proportions of respondents who attended public community meetings; (2) voted in the last election; and (3) had above median number of memberships in groups that fostered bridging social capital. The compositional linking social capital variable was the proportion of respondents that participated in a political campaign activity in each division. We calculated the proportion of women who completed primary education as a proxy for population education level in each division and the proportion of households living in the lowest asset tertile as a proxy for population socio-economic development in each division.

Control covariates: Individual and household characteristics

We controlled for potential individual and household-level confounders for women's participation in agricultural decision-making. Women's highest level of education was categorized into "above primary", "completed primary", and "below primary school", which in Kenya's educational system is eight years of primary education. Women's age in years, household asset index were inputted as continuous variables. The household asset index was calculated by summing ownership of household consumer products (such as clock, radio, television, solar panel, animal cart, motor vehicle, boat), and improved dwelling structures, such as "corrugated iron" versus "grass/thatch/tin cans/other" as roof materials, "cement or ceramic tiles" versus "earth, sand, or dung" as floor materials, and "latrine with slab or ventilated improved pit latrine" versus "no facility, open pit, field, or latrine without slab" for latrine type. Regional-level variables were counties and agro-ecological zones (Table 4.1).

4.4.2.3 Multilevel analysis

A multilevel analysis was used to test the overall associations between individual-level, village-level, and division-level social capital, women's participation in agricultural decision-making, and the variation between divisions. Multilevel models on 206 individuals (level 1) were nested within 127 villages, that were in turn nested within 18 divisions (level 2).

The village-level was not an analytical level in the multilevel model because there was insufficient variation within villages, with most villages having less than six respondents. This method enabled us to estimate the associations of division, village, and individual-level indicators on women's agricultural decision-making participation. The two-level multilevel linear regression analyses with random intercept models, were fitted using the maximum likelihood estimation to estimate model parameters. The model is defined as:

$$Y_{ij} = \beta_1 + \beta_2 X_{ij} + \beta_3 Z_j + u_j + \varepsilon_{ij} ,$$

Where Y_{ij} is the dependent variable representing participation in agricultural decision-making by woman in the household and village (i), and in the division (j). X is a vector of individual level variables, Z is a vector of division level explanatory variables. u_j is the random intercept for division j ; ε_{ij} is the residual. Seven models were used to specify the relationship between women's agricultural decision-making, different dimensions of social capital, and interactions at the individual and division levels.

Model 1, as a null model, has no social capital indicators. It has only control variables: women's education, women's age in years, household asset index tertile, gender of household head, fixed effects for agro-ecological zones LM4 and LM5, as well as Makueni and Machakos counties, which are present in models 1 to 8.

Model 2 is Model 1 plus bonding social capital indicators.

Model 3 is Model 1 plus bridging social capital indicators.

Model 4 is Model 1 plus linking social capital indicators.

Model 5 is Model 1 plus village-level indicators.

Model 6 is Model 1 plus division-level indicators.

Model 7 includes all indicators in the multilevel linear regression: Model 1 in addition to bonding social capital, bridging social capital, linking social capital, village-level, and division-level indicators.

Models 8 to 10 examine interactions with village characteristics.

Model 8 is Model 1 plus two bonding social capital indicators, two village indicators, and their four interaction terms (between the two bonding social indicators and the two village indicators).

Model 9 is Model 1 plus three bridging social capital indicators, two village indicators, and their six interaction terms.

Model 10 is Model 1 plus two linking social capital indicators, two village indicators, and their four interaction terms.

Models 11 to 16 examine interactions with division characteristics.

Model 11 is Model 1 plus two bonding social capital indicators and one division indicator (the proportion of respondents completed at least primary education in each division) and their two interaction terms.

Model 12 is Model 1 plus two bonding social capital indicators and another division indicator (the proportion of households in the lowest tertile asset index in each division) and their two interaction terms.

Model 13 is Model 1 plus three bridging social capital indicators and one division indicator (education) and their three interaction terms.

Model 14 is Model 1 plus three bridging social capital indicators and another division indicator (asset index) and their three interaction terms.

Model 15 is Model 1 plus two linking social capital indicators and one division indicator (education) and their two interaction terms.

Model 16 is Model 1 plus two linking social capital indicators and another division indicator (the asset index) and two interaction terms.

We tested for multicollinearity, and selected the explanatory variables for the regression models by assessing Akaike Information Criterion (AIC), and theoretical considerations to balance between minimizing omitted variable bias and an over-specification of models. No significant correlation was found at the 1 percent significance level between social capital indicators at the household level (Appendix 4.1). Therefore, we used separate indicators: two indicators to measure bonding social capital, three for bridging social capital, and two for linking social capital, rather than constructing summary indicators, to measure the three social capital

dimensions at the household-level (Kim *et al.*, 2006). There was multicollinearity at the 1 percent significance level between division-level compositional social capital variables and household-level social capital variables (Appendix 4.2). Division-level compositional variables of social capital, literacy prevalence, and poverty prevalence were centered to minimize the effects of multicollinearity in subsequent regression analyses.

We tested for interactions of social capital dimensions within the individual level and across the division level. Within the household level, we tested how linking social capital modified the associations of bonding social capital on women's participation in agricultural decision-making; and how linking social capital modified the association of bridging social capital on women's decision-making. Across levels, we tested how village-level indicators modify the associations between outcome and individual bonding, bridging, and linking social capital. We tested how composite social capital indicators and other socio-economic indicators at the division-level modify how individual bonding, bridging, and linking social capital associate with women's decision-making.

A second set of statistical analyses tested how village characteristics modified the association between bridging social capital indicators and the diversity of information or training received by women. Linear regression with the outcome as an ordinal variable examined the range of community sources women received information or training from. The independent variables were the presence of a chief's office at the village, the presence of a general market place, and social capital indicators: whether respondent attended a public meeting and the total number of memberships in groups that foster bridging social capital and their interaction terms. More specifically:

Model 17 regresses the range of community members which women received information from to the presence of village characteristics.

Model 18 regresses the range of community members which women received information from to bridging social capital indicators.

Model 19 regresses the range of community members which women received information from to village characteristics, bridging social capital indicators, and their interaction terms.

Model 20 regresses the range of community members which women received training from to the same independent variables as Model 17.

Model 21 regresses the range of community members which women received training from to the same independent variables as Model 18.

Model 22 regresses the range of community members which women received training from to the same independent variables as Model 19.

4.4.3 Limitations

While the paper aims to provide a broader and more nuanced picture of how social relations influence women's bargaining position on the farm, the study has a number of limitations. We lacked data on women's leadership within the community to better capture the potential benefits and ramifications of women's individual linking social capital compared to household linking social capital. Our data did not contain additional information on the frequency or level of engagement within community groups to help differentiate groups that fostered bonding from bridging social capital. The results from a cross-sectional analysis can only infer associative relations rather than causality between the measures of social capital dimensions and women's participation in agricultural decision-making. Despite these limitations, the study provides rigorous evidence and corroborations that further our understanding of social capital dimensions and their relation to gender power dynamics within smallholder farming contexts.

4.5 Results and discussion

Our results reveal that different dimensions of social capital have varying degrees of influence on Kamba women's access to agricultural resources, as measured by their participation in agricultural decision-making. The findings indicate that not only does household-level social capital matter, but compositional factors also have critical influences on women's access to productive resources when they interact with household and individual social capital. The descriptive results of our social capital indicators are presented in Table 4.2. Table 4.3 presents the results from the multilevel linear regressions Models 1 to 7. Tables 4.4 and 4.8 report the results of the cross-level interactions with village and division characteristics, revealing how contextual and compositional variables can influence the association between social capital and women's decision-making. Table 4.9 summarizes the statistical and qualitative results concerning the role of bonding, bridging, and linking social capital.

4.5.1 Descriptive results

Descriptive results show that, on average, respondents reported participating in two to three agricultural decisions in the past season (mean=2.81 SD=2.61). Over 95 percent of the respondents reported that they had attended or contributed to a local fund-raiser and 92 percent had attended a community public meeting in the past 12 months (Table 4.2). Approximately 70 percent of the respondents reported voting in the most recent national election and 20 percent participated in political campaign activities. More than half of the women in the sample reported being a member of at least four community groups with members from similar backgrounds, and at least one community group with members from different backgrounds. In the following section, we discuss the various relationships between the different dimensions of social capital and women's intra-household decision-making in the context of Kamba smallholder agriculture.

Table 4.2 Descriptive results for three levels of variables

Individual-level	N=206		Village-level		N=127		Division-level		N=18		%	SD
Participation in agricultural decision-making			Road access				Average percent of households within a division with:					
Low (0 to 3)	144	65.20	No during rain seasons		46		High bonding social capital		High bonding social capital		73	9.3
High (4 to 8)	77	34.80	Yes during rain seasons		80		High bridging social capital		High bridging social capital		70	5.2
Memberships in bonding groups (above median >4)			Chief or assistant chief's office				High linking social capital		High linking social capital		20	9.5
Low	119	57.80	No		86		Primary education or above		Primary education or above		82	14
High	87	42.20	Yes		41		Lowest tertile of household asset index		Lowest tertile of household asset index		51	14
Attended or contributed to fund-raisers			Alcohol and mirra stand									
No	9	4.40	No		93							
Yes	197	95.60	Yes		34							
Memberships in bridging groups (above median >1)			General market									
Low	113	54.90	No		56							
High	93	45.10	Yes		71							
Attended public meetings			Community groups and programs available									
No	17	8.30	0 to 9		17							
Yes	189	91.70	10 to 19		93							
Voted in the recent national election												
No	61	29.60	20 to 29		16							
Yes	145	70.40	30 and above		1							
Participated in campaign activities												
No	164	79.61										
Yes	43	20.39										
Had household member in local administration or governmental office												
No	162	78.64										
Yes	44	21.36										

4.5.2 Bonding social capital and women's decision-making

Our findings showed that the accumulation of bonding social capital has a positive association with women's participation in agricultural decision-making (Table 4.3, Model 2). First, respondents described informal arrangements and co-dependence between neighbours that facilitated greater access to natural capital.

For example, respondents described shared activities that range from keeping livestock, monitoring crop growth, and providing security for farm plots that are far from the homestead. Second, respondents reported that their participation in community groups, which foster bonding social capital, expands their access to collective knowledge and experience with a spill-over transfer of effective technologies to non-group members. Kiptot and colleagues (2006) reported that farmers received peer-to-peer (non-group) dissemination of soil conservation knowledge and technology primarily from relatives, group members, friends, and neighbours in western Kenya. This transfer of knowledge and resources was also reported by Mucioki and colleagues (2016) in the transfer of indigenous pearl millet seed varieties from elder women to younger women in Tharaka-Nithi, Kenya. Such exchanges embedded within traditional social relations can reduce the risks of poor harvests when planting new crops in resource-scarce settings. It can also reinforce bonding social capital. Third, our findings showed that bonding social capital enhances women's access to mental health support. Respondents reported mutual motivation and accountability in arduous agricultural labour among labour-sharing group members and sharing of emotional concerns while working in farming groups. Fourth, similar to other capital assets, we found that previously accrued bonding social capital can contribute to future social safety nets for marginalized groups, such as the infirmed, the sick, and the widowed who are often constrained physically from labour-sharing and from participating in most social group networks.

For example, one of our respondents was an HIV positive woman who lived in Kathamboni village for more than forty years. She could not physically dig terraces with a labour-sharing group, yet her previous group members registered her into the group in her absence in order to maintain her eligibility to receive food assistance. Here, bending the rules applied to the HIV-positive respondent who previously accumulated social capital.

As some women in patrilocal communities leave their natal family upon marriage, they are faced with the task of establishing new bonding social capital with their husband's family, new neighbours, associative groups, and leaders in the community (Larance, 2001). One of the respondents explained her process of meeting new neighbours:

You know when you go to Malili, there is a new farmer or a new person in that place. The first thing you can do: you can relax, and be through with [visit] the neighbour you have found there. Just, you just go to a place, start speaking to him. And in Malili, we are not so squeezed, you find the neighbour is 200 metres from your place. You start joining, speaking with him, because you don't know him, he doesn't know you, we start a relationship. Sometimes you find you are friends. You are neighbours (Female participant, 2013).

Our findings align with Bruegel's theory of social capital that solidaristic social networks can also enhance "a degree of power that enables them to challenge the status quo" (Franklin, 2005, p. 2), seen among group members who bend rules to help the most vulnerable members access food assistance. The transformative potential of bonding social capital, especially for women, can help them obtain their basic needs for survival and livelihood outcomes (Bourdieu, 1989; Bruegel, 2005; Ostrom, 2000). Beyond "getting by" in the semi-arid farming communities,

Table 4.3 Multilevel linear regressions of women's participation in agricultural decision-making and social capital indicators

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	β	β	β	β	β	β	β
Bonding social capital							
Memberships in bonding groups		0.229* (0.121)					0.245* (0.135)
Contributed to local fund-raisers		2.113** (0.870)					2.022** (0.853)
Bridging social capital							
Memberships in bridging groups			-0.055 (0.145)				-0.147 (0.161)
Attend public meetings			0.902 (0.649)				0.574 (0.618)
Voted in the recent national election			0.429 (0.436)				0.156 (0.422)
Linking social capital							
Participated in political campaigns				-0.228 (0.439)			-0.405 (0.422)
Had household member in local administration or governmental office				-0.296 (0.443)			-0.288 (0.443)
Village characteristics							
Chief or assistant chief's office present				0.312 (0.427)			-0.005 (0.425)
Alcohol and mirra stand present				-1.026** (0.459)			-0.974** (0.438)
General market place present				-0.084 (0.426)			-0.012 (0.428)
Total number of community groups and government programs available				-0.008 (0.051)			0.011 (0.052)
Division-level social capital							
Mean Proportion of respondents with high bonding social capital						0.015 (0.020)	-0.014 (0.022)
Mean Proportion of respondents with high bridging social capital						0.129*** (0.045)	0.130*** (0.046)
Mean Proportion of respondents with high linking social capital						0.047* (0.026)	0.050* (0.026)

Division-level variables							
Proportion of respondent completed primary education						0.040** (0.017)	0.041** (0.017)
Proportion of households with wealth index in the poorest tertile						-0.002 (0.014)	0.002 (0.015)
Control variables							
Maternal education							
Higher than Primary (ref.)							
Completed Primary (Std. Grade 8)	-0.393 (0.391)	-0.470 (0.386)	-0.353 (0.391)	-0.364 (0.394)	-0.462 (0.387)	-0.420 (0.379)	-0.513 (0.371)
Lower than Primary	-0.329 (0.514)	-0.457 (0.498)	-0.363 (0.522)	-0.327 (0.513)	-0.533 (0.517)	-0.028 (0.521)	-0.307 (0.533)
Women's age (years)	0.086*** (0.027)	0.071*** (0.027)	0.070** (0.030)	0.087*** (0.027)	0.087*** (0.027)	0.092*** (0.026)	0.077*** (0.029)
Highest asset tertile (ref.)							
Middle asset tertile	-0.278 (0.420)	-0.264 (0.408)	-0.210 (0.423)	-0.274 (0.420)	-0.118 (0.425)	-0.167 (0.414)	0.135 (0.422)
Lowest asset tertile	-0.208 (0.466)	-0.137 (0.454)	-0.113 (0.476)	-0.245 (0.467)	-0.014 (0.472)	-0.183 (0.469)	0.048 (0.475)
Male-headed household (ref.)							
Female-headed household	0.458 (0.434)	0.518 (0.433)	0.478 (0.432)	0.409 (0.437)	0.449 (0.431)	0.372 (0.422)	0.344 (0.424)
Machakos County (ref.)							
Makueni County	-0.176 (0.407)	-0.068 (0.353)	-0.166 (0.397)	-0.147 (0.400)	-0.247 (0.403)	-1.215** (0.536)	-1.152** (0.538)
Agro-ecological zone							
Lower Midland 3 (ref.)							
Agro-ecological zone Lower Midland 4	0.718* (0.402)	0.815** (0.347)	0.753** (0.383)	0.780* (0.399)	0.518 (0.406)	1.163*** (0.383)	1.207*** (0.402)
Constant	0.067 (1.004)	-2.511** (1.252)	-0.563 (1.099)	0.102 (1.001)	0.524 (1.237)	0.133 (0.975)	-2.570* (1.447)
Level 2 Random Intercept							
Constant	-1.135 (1.135)	-17.833*** (6.552)	-1.381 (1.710)	-1.259 (1.436)	-1.196 (1.412)	-23.384*** (6.135)	-23.340 (2244.555)
Level 1 Residual							
Constant	0.908*** (0.051)	0.890*** (0.049)	0.903*** (0.052)	0.908*** (0.052)	0.892*** (0.052)	0.876*** (0.049)	0.831*** (0.049)
Observations	206	206	206	206	206	206	206
AIC ¹	983.80	977.13	986.72	987.08	984.86	977.44	981.02

1 AIC = Akaike Information Criterion

Significant levels at $p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Robust standard error described in parenthesis

Bourdieu (1989) differentiated social capital by the degree of potentially transformative power to “get ahead”, which we also observed in the facilitation of bridging social capital in agricultural knowledge flow.

4.5.3 Village characteristics facilitate bridging and linking social capital

We hypothesized that social capital among heterogeneous individuals was more likely to result in the exchange of information, knowledge, and adoption of innovations. In turn, women who are better informed are also more likely to participate in decision-making. Women’s social capital is particularly important in acquiring information as it serves in part to compensate for lower levels of natural capital (e.g. land), physical capital (e.g. agricultural equipment), or financial capital compared to men. We found that bridging social capital has a positive association with women’s participation in agricultural decision-making when the women also lived in a village with a market place or a chief’s office (Table 4.4, Model 9). Are women with high bridging social capital making more decisions because they have better access to diverse information to inform their decisions? We used a list of twelve types of community members (Section 4.4.2.1) to gauge the diversity of information sources from which respondents received information in the past twelve months. Table 4.5 shows the percentage of respondents who reported receiving information or training from different types of community groups. Similarly, we gauged the diversity of community members from whom respondents received training assistance. Women reported receiving information primarily from neighbours, extended family, and church members. They reported receiving training assistance primarily from farmer groups, agricultural extension officers, and women’s groups (Table 4.5).

Our results showed that when women lived in a village with a market place and they attended public meetings, they were more likely to receive information from a wider range of

members within their community (Table 4.6, Model 19). Similarly, women who reported attending public meetings as a proxy for their bridging social capital were associated with receiving more diverse sources of training assistance in the presence of a general marketplace in the village (Table 4.7, Model 22). Receiving training and information through women's informal social networks may help to circumvent a number of constraints women face in order to attend formal training workshops organized by NGOs or government extension services, such as their eligibility for attendance, the financial means for transportation, the time away from child care and domestic responsibilities, or the permission from an authority within the family.

Complementary to the market place, the chief's office provides a physical and legitimate gathering place for formal informational exchange. Village members with better access to the chief or local village administration may receive resources from higher strata of social, economic, or institutional status, such as from a governmental extension office or an international NGO. They may also provide training and resources that were not readily available to members in the same strata. We expected that a greater access to a chief's office would enhance women's access to training through the potential formation of linking social capital. Indeed, our analysis indicated that women who had a high number of association memberships in villages that had a chief's office were also associated with receiving training from a greater diversity of community members (Table 4.7 Model 22). When women had access to such training opportunities, qualitative evidence pointed to how bridging and linking social capital with support from local administration and NGOs facilitates knowledge dissemination and livelihood improvements. For example, women expressed how training in poultry keeping, immunization, and management had diversified their livelihood strategies. The NGO also legitimized these women's skills with the presentation of training certificates, which highlights

the importance of cooperation between formal donor organizations and informal community grass-root networks in fostering linking social capital. Beyond access to training, we observed that living in a village with a functioning local administrative body brought women more opportunities to diversify their livelihood strategies. One committee member explained how the relationships built from her participation in a water-dam committee had led to connections with the village administration who granted her group permission to establish a tree nursery in a small region near the dam. However, having a chief's office in the village is only a proxy for a well-functioning village administration composed of chiefs, village elders, and other local administrators. Information and news can spread quickly if leaders take advantage of existing spatial-social networks in the village, such as providing store-keepers with information to disseminate at a highly frequented corner store. In contrast, when local leaders are not adequately serving the villagers, for example due to favouritism or low competence, community members who are well-connected might not experience benefits from bridging and linking social capital. Together, the statistical and qualitative evidence points to the high potential of women's existing bridging and linking social capital when social and community structures support it. This finding highlights "the significant contribution of geographical location on individuals' perceptions of and participation in, social capital creation" (Healy, 2007, p. 112) but also asserts that women who have lower access to formal knowledge networks (Kiptot, 2006) may also actively seek and engage in knowledge flows via their informal social networks.

4.5.4 Linking social capital and division characteristics

In contrast to bonding and bridging social capital, we found negative associations between household linking social capital and women's decision-making agency on agricultural resources (Table 4.3, Model 4, Table 4.4, Model 10). In particular, when households reported having one

Table 4.4 Summary of associations between household-level social capital dimensions and women's participation in decision-making, modified by village characteristics

Bonding Social capital	Model (8) β	Bridging Social capital	Model (9) β	Linking Social capital	Model (10) β
Chief or assistant chief's office	-0.150 (1.056)	Chief or assistant chief's office	0.181 (1.732)	Chief or assistant chief's office	-0.542 (0.514)
Market place	-2.062 (1.224)	Market place	-0.014 (1.529)	Market place	-0.361 (0.521)
Memberships in bonding groups	0.021 (0.179)	Memberships in bridging groups	-0.242 (0.306)	Participated in political campaigns	-1.267** (0.577)
Contributed to fund-raisers	1.563 (0.843)	Attended public meetings	2.079** (1.010)	Had household member in local administration or governmental office	-0.279 (0.750)
		Voted	-0.304 (0.735)		
Interactions					
Memberships (bonding) X chief's office	0.472 (0.265)	Memberships (bridging) X chief's office	0.353 (0.341)	Participated in campaign X chief's office	1.219 (0.994)
Memberships (bonding) X Market place	0.094 (0.271)	Memberships (bridging) X market place	0.132 (0.365)	Participated in campaign X market place	1.179 (0.826)
Contributed to fund-raiser X chief's office	-1.794 (0.956)	Attended meeting X chief's office	-0.481 (1.560)	Had household member in local administration X chief's office	1.818 (1.301)
Contributed to fund-raiser X market place	1.471 (0.988)	Attended meeting X market place	-1.257 (1.327)		
		Voted X chief's office	-0.325 (0.952)	Had household member in local administration X market place	-0.506 (0.941)

All regression models controlled for lower-order indicators of interactions, women's education, women's age, household asset tertile, gender of household head, county, and agro-ecological zone
Significant levels at $p < 0.05$ **, $p < 0.01$ ***
Robust standard error described in parenthesis

Table 4.5 Percentage of women reported receiving information and training assistance from diverse groups

	Percentage of women received	
	Information	Training
	%	%
Neighbours	84	46
Extended family	74	42
Relatives in Kenya	49	19
Clan	34	14
Women's Groups	68	47
Men's Groups	23	16
Farmers' Groups	62	53
Church members	75	48
CHW ¹	52	31
NGOs ²	35	31
Agricultural Extension Officers	58	50
Family outside Kenya	9	4

1 CHW stands for community health workers

2 NGOs stands for non-governmental organizations

Table 4.6 Associations between bridging social capital and information received, modified by village characteristics

Model	(17)	(18)	(19)
Outcome: Diversity of community groups from which respondents received information	Village characteristic β	Bridging social capital variables β	With Interactions β
Community indicators			
Chief's office	-0.115 (0.434)		1.342 (1.164)
General market place	-0.025 (0.424)		-3.580*** (1.289)
Bridging social capital indicators			
Attended public meetings		0.512 (0.674)	-1.100 (0.756)
Membership (Bridging groups)		0.405*** (0.143)	0.133 (0.271)
Interactions			
Chief's office and attended meetings			-1.784 (1.098)
Chief's office and memberships			0.313 (0.339)
Market place and attended meetings			3.065** (1.249)
Market place and memberships			0.323 (0.329)
Constant	6.321*** (0.320)	5.159*** (0.554)	7.183*** (0.687)
Observations	206	206	206

Robust standard error described in brackets

p -value <0.05 **, p <0.01 ***

Table 4.7 Associations between bridging social capital and training received, modified by village characteristics

Model	(20)	(21)	(22)
Outcome: Diversity of community groups from which respondents received training	Village characteristic	Bridging social capital variables	Interactions
	β	β	β
Community indicators			
Chief's office	-0.273 (0.452)		0.071 (1.217)
General market place	-0.384 (0.431)		-4.898*** (1.389)
Bridging social capital indicators			
Attended public meetings		-0.020 (0.733)	-3.160*** (1.081)
Membership (Bridging groups)		0.561*** (0.153)	0.389 (0.275)
Interactions			
Chief's office and attended meetings			-1.330 (1.180)
Chief's office and memberships			0.839** (0.355)
Market place and attended meetings			4.612*** (1.384)
Market place and memberships			-0.063 (0.336)
Constant	4.320*** (0.349)	3.123*** (0.763)	6.806*** (1.026)
Observations	206	206	206

Robust standard error described in brackets

p -value <0.05 **, p <0.01 ***

of its members working in the local village administration or government agency, women in these households had a lower likelihood of participating in agricultural decision-making. In households where a member other than the female respondent held a leadership position within the community, their status might lead them to take greater control over other household members' preferences and decisions. As Andriani and Christoforou (2016, p. 7) explained, Becker's (1974) theory of social interactions posited, "the head of the family voluntarily internalizes his external actions for the benefit of the family, which also represents his own benefits". However, such a 'benevolent dictator' may suppress women's voices in resource allocation if the head deems their decision-making outcomes unfavourable compared to his own choices (Becker, 1981; Kabeer, 2010).

As Kabeer (1997) pointed out, other theories of intra-household dynamics co-exist. For example, how increases in women's education and entry into non-farm labour market influence their bargaining position (Agarwal, 1997; Mammen & Paxson, 2000). Alternatively, Sen's (1990) "co-operative-conflict" model offers a hypothesis that women may gain a mixture of satisfaction from achieving self-preferences and from devoting resources to the preferences of others, in our case, to members in the household who hold leadership positions within the community. Our interviews with men and women highlighted that traditional and religious norms served to reinforce traditional values of male headship in households. A common analogy we heard among Kamba women explains:

Women, men say that they are weak assets and the man is the head. But now, they [women], are the neck, and there's no way the neck can speak unless the head has spoken. So the men have authority to tell and give permission (July 24th, 2013).

However, we found evidence of influence by the broader context on how linking social capital functions within family relations. Similar to Holvoet (2005, p. 86), that “in general, households that are better off and have a higher position within the society tend to apply gender norms more strictly”, we found that the negative association between households with a member in a higher position in the community and women’s lower participation in agricultural decision-making was lessened when the households resided in a poorer division (Table 4.8, Model 16). The proportion of households within the division that were in the lowest tertile of the household asset index modified the association between having a household member in the local administration and the women’s participation in decision-making ($\beta=0.077$ SE=0.038 $p<0.05$) (Table 4.8 Model 16). Findings showed that women’s predicted participation in decision-making in a household that had a member who was a local administration or government office was higher when the divisions’ prevalence of impoverished households was higher (Figure 4.4). Poorer communities may have more relaxed expectations of gender roles where all household members struggle to contribute to livelihoods and survival. We observed an exchange when a husband who has a community leadership role openly denigrated his wife (who is also a chairwoman in her church) in front of interviewers:

Husband asked wife: “Have you got that she has told me?”

Wife: “No”

Husband asked the wife and daughter in-law: “You went to school for no reason?”

Wife: “We forgot the one [English] she is speaking, We understand the other one [Kiswahili] but her, we don’t understand.”

Research Assistant: “How much do you sell? How much do you get at the end of harvest?”

Wife: “We get like ten thousands [Shillings].”

Husband: “Let me answer for her, when they get this tomatoes the yield can be very big and when they have so much, the price can go very low... which mean what they do not have ... a correct record for this year. ... not exactly as what she has said. More than twenty thousand.” (Interview July 10th, 2013)

Beyond economic indicators, the aggregate education level of the population also correlated with the surrounding societal views. We used the proportion of women completing primary school in the division as a proxy of division-level literacy prevalence. Based on educational homogamy, we assumed men’s education level will be similar, if not higher, than the women’s education level within the same household (Nielsen & Svarer, 2009). Figure 4.5 demonstrates that women’s predicted probability of participating in agricultural decision-making is low in households that have a member in the local or government administration within divisions with low rates of primary school education. However, such households also have a greater positive correlation between women’s participation in decision-making and the division’s aggregate education level compared to the correlation observed with households that reportedly did not have a member in the local administration. This result supports Lin’s (2001) strength of position proposition, where a household’s stock of linking social capital can enable it to benefit even more from increased societal human capital, such as division-level literacy prevalence.

We posited that the household heads’ view of gender roles, and their openness for gender equity, depends in large part on the prevailing societal views. The household head’s views, then, may engender very different dynamics within the household. However, general education is closely correlated with poverty in rural settings as shown in the two cross-scale findings, making interpretations of the influence of linking social capital on women’s disempowerment difficult.

4.5.5 Compositional social capital and interaction with education

Our findings also provide insights to the importance of compositional social capital when considering gradual and long-term changes to women's intra-household decision-making. Previous research has explored how contextual and compositional social capital can affect health outcomes, such as self-rated health, health-seeking behaviour, and mortality (Dean *et al.*, 2014; Kawachi *et al.*, 1997; Kim *et al.*, 2006; Subramanian *et al.*, 2002; Story, 2014). Our study extends this work to livelihood processes in agrarian contexts, such as women's agricultural decision-making that impacts household food and nutrition security (Malapit *et al.*, 2015).

We tested whether the variation observed in women's participation is attributed to the division-level random effects in the multilevel regression models, but did not find significant difference between divisions. This could be due to homogeneity in the ethnic Kamba culture and similar livelihood activities across the divisions. However, from the fixed effects analysis, we found that aggregate bridging social capital at the division-level, was significantly and positively associated with women's participation in agricultural decision-making (Table 4.3, Models 6 & 7). This suggests that there are potential synergies from bridging social capital beyond what was observed at the individual, household, and local community levels.

In contrast, aggregate bonding social capital did not significantly associate with women's participation in decision-making. This could be due to the influence attributed to bonding social capital being predominantly captured at the household level, with little additional impact observed from aggregate bonding social capital at the division-level. This finding is in line with Story's (2014) study of social capital and utilization of health care services, where he posited that communities with higher levels of bonding ties do not provide additional help to individuals who already have strong individual bonding social capital. Although we did not observe a significant

association with the division-level bonding social capital in our study, this does not necessarily imply an absence of broader bonding social capital effects.

Although girls' educational attainment is an important factor for women's empowerment, our findings suggested that educational empowerment does not readily translate to women's bargaining power within the household. Our results found no significant association between women's participation in decision-making and their formal schooling (Table 4.3, Models 1 to 7). Surprisingly, we found that the division's aggregated indicator of education had significant positive associations with women's participation in decision-making ($\beta=0.040$ $SE=0.017$ $p<0.05$) (Table 4.3, Model 6 & 7). This finding supported the notion that distal factors measured at the division level correlated significantly to women's intra-household decision-making. It is also very unlikely for reverse causation to occur in this case: that is, for women's level of participation in farm decision-making in the last season to result in their formal education attainment. Higher education attainment of the general public at the division-level can be conducive to an exchange of new ideas, non-traditional attitudes, and broader discussions on male and female preferences on the farm. In contrast, women's education at the individual level may not be sufficient to encourage decision-making without a broader supportive context as indicated in our findings (Table 4.3). When validating these results with Kamba farmers, women farmers explained the Kamba proverb: "A thought in the head does not influence the outcome of a case unless it is spoken out". It conveys the common frustrations women experienced, when they acquired new farm knowledge but are unable to share their knowledge in a household where power relations might discourage such discussions.

To build on this result, we again found women's bonding social capital came into play. Unlike "model" farms where new agricultural technologies, such as tree grafting and a water

retention pit system, can be visible to a passerby, changing attitudes towards gender roles and shifts in intra-household bargaining and decision-making are gradual, iterative processes, often kept behind closed doors. If expressed, these dynamics are more likely conveyed through private exchanges among friends and neighbours who have existing norms of trust and reciprocity, both considered strong characteristics of bonding social capital (Putnam, 1993). In our case study, we found that increased division-level educational attainment significantly augmented the already positive association between bonding social capital and the predicted likelihood of women's participation in agricultural decision-making (Table 4.8, Model 11). In a division where men's and women's education levels are higher, we assumed that shifts in intra-household bargaining would be more preferential to women. Women who have high bonding social capital are likely exposed to accounts of intra-household negotiation processes from their friends and neighbours, which our analysis indicated are associated with greater participation in agricultural decision-making. It is possible that women who tend to engage in agricultural decision-making are also the women who engage in other bonding social capital activities that are all encompassing of household and family-level engagement. However, in our sample, over 95% of the respondents reported to have engaged in bonding social capital activities, but less than 35% of the respondents reported a high level of participation in agricultural decision-making (Table 4.2). Figure 4.6 indicates that women with higher bonding social capital, measured in the number of memberships in community groups that foster bonding social capital, are associated with greater increases in their participation in farm decision-making per unit percentage increase in the division's education level. Our quantitative and qualitative findings are summarized in Table 4.9. Findings suggest that there was a status quo bias (Cordaro & Desdoigts, 2016) towards hierarchical gender power dynamics, which factored into women's low participation in

Table 4.8 Associations between household-level social capital dimensions and women's participation in decision-making, modified by division characteristics

Model	Bonding social capital	(11) β	(12) β	Bridging social capital	(13) β	(14) β	Linking social capital	(15) β	(16) β
Household-level	Memberships in bonding groups	0.209 (0.111)	0.222 ** (0.112)	Memberships in bridging groups	0.045 (0.144)	-0.050 (0.145)	Participated in political campaigns	-0.159 (0.441)	-0.148 (0.447)
	Contributed in fund-raisers	2.340 *** (0.477)	2.209 *** (0.449)	Attended public meetings Voted	0.933 (0.615) 0.478 (0.407)	1.045 (0.571) 0.536 (0.413)	Had household member in the local administration	-0.043 (0.443)	-0.178 (0.467)
Division-level	Education ¹	-0.082 (0.045)		Education	-0.016 (0.039)		Education	0.019 (0.020)	
	Poverty ²		-0.031 (0.042)	Poverty		0.057 (0.050)	Poverty		0.004 (0.016)
Interaction with Division-level variables	Memberships in bonding groups X Education	0.020** (0.009)		Memberships in bridging groups X Education	0.015 (0.010)		Participated in political campaigns X Education	-0.013 (0.030)	
	Contributed in fund-raisers X Education	0.035 (0.040)		Attended public meetings X Education	0.032 (0.036)		Had household member in the local administration X Education	0.051 (0.028)	
	Memberships in bonding groups X Poverty		0.006 (0.008)	Voted X Education	-0.002 (0.028)		Participated in political campaigns X Poverty	-0.063 (0.033)	
	Contributed in fund-raisers X Poverty		0.006 (0.031)	Attended public meetings X Poverty		-0.007 (0.012)	Had household member in the local administration X Poverty	0.077 ** (0.038)	
				Voted X Poverty		-0.018 (0.050)			
						-0.031 (0.030)			

¹ Division-level proportion of respondents with at least primary education

² Division-level proportion of households in the poorest asset tertile

Robust standard error described in brackets
p-value <0.05 **, p<0.01 ***

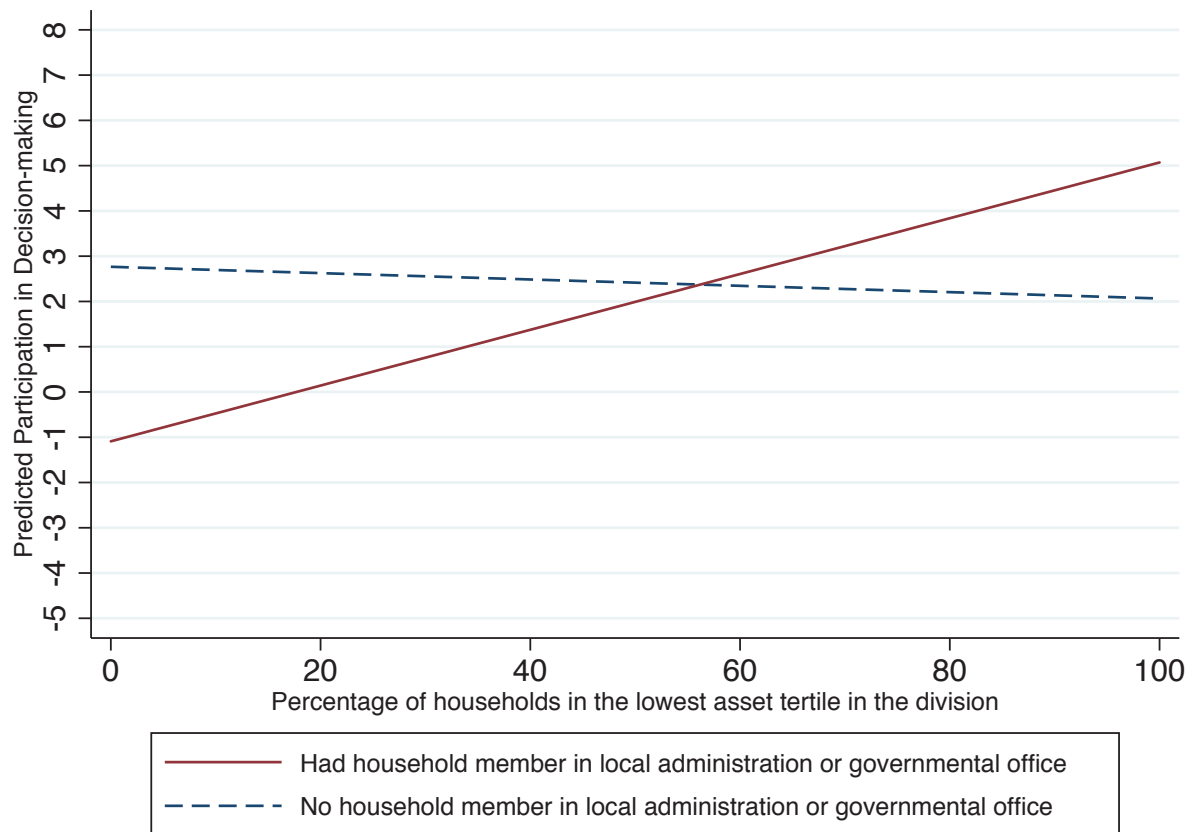


Figure 4.4 Associations between women’s predicted participation in decision-making and the poverty levels in division interacted with linking social capital

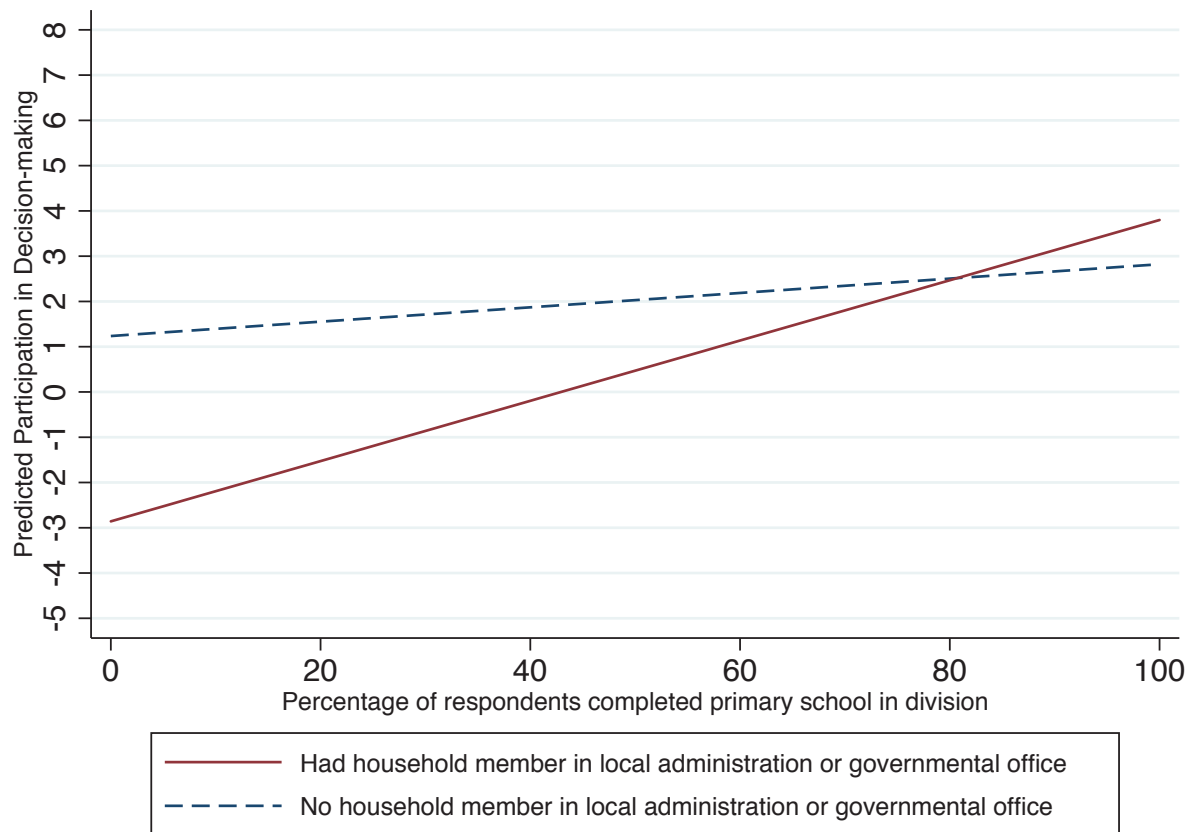


Figure 4.5 Associations between women's predicted participation in decision-making and the education level in divisions interacted with linking social capital

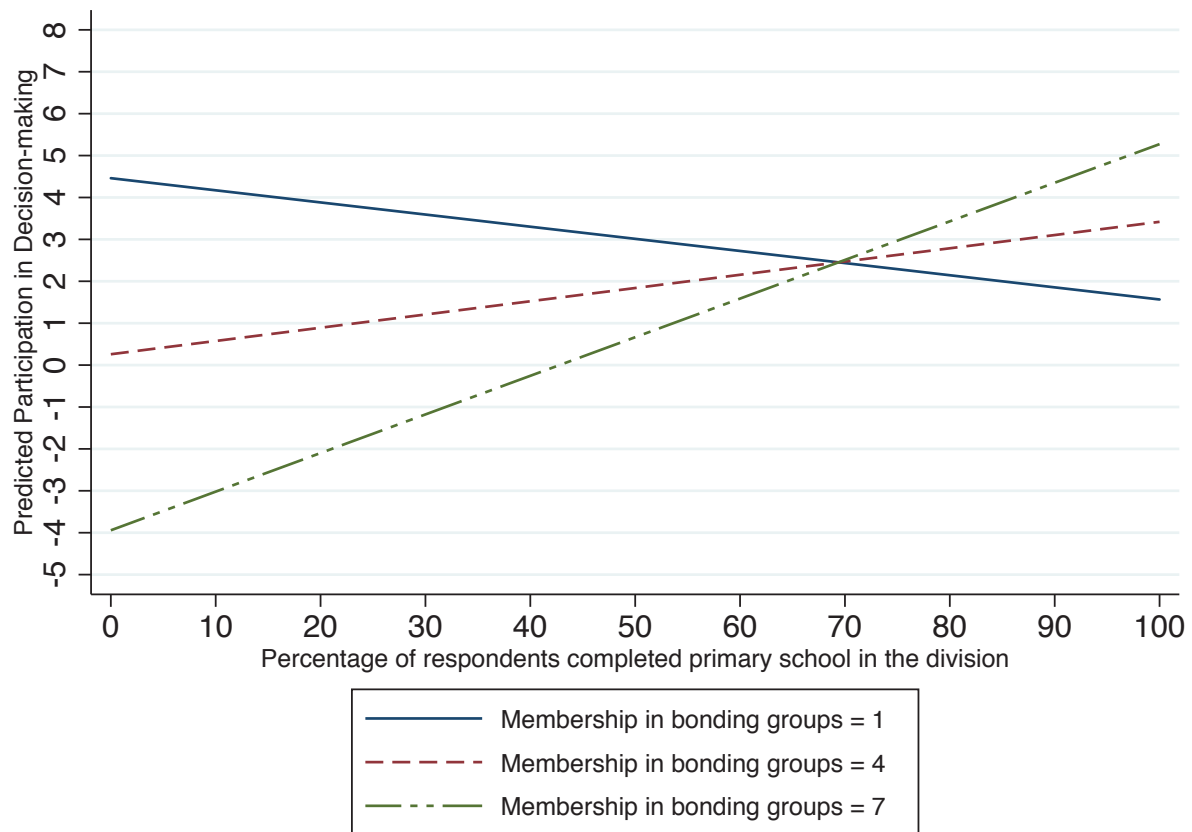


Figure 4.6 Associations between women's predicted participation in decision-making and the education level in divisions interacted with bonding social capital

decision-making in domestic and agricultural domains (Samuelson & Zeckhauser, 1988). A Beckarian model of intra-household decision-making suggests that given women's share of contribution to agricultural labour in semi-arid smallholder systems should reflect women's share of participation and autonomy in agricultural decision-making. However, changes in intra-household power relations and processes of decision-making are gradual and complex (Molyneux, Murira, Masha & Snow, 2002). We propose that bonding social capital that builds trust relations can help facilitate diffusions of gender-sensitive attitudes and behaviours and improve women's involvement in resource allocation decisions.

4.6 Conclusion

This study builds on our understanding of social capital dimensions, particularly bonding, bridging, linking social capital and highlights the diverse ways women used social capital dimensions to enhance their intra-household bargaining positions. It illustrates that women actively used their formal and informal community networks to gain access to information and training, and to shift culturally established gender norms when supported by social and structural contexts in the division. We demonstrate how gaining linking social capital in the household may come at a cost, constraining women's bargaining positions with regard to agricultural and livelihood resources. Moreover, this study underscores the synergetic impact of division-level aggregate bridging social capital on women's participation in decision-making. Together, the different dimensions of social capital can be used to enhance women's access to agricultural resources and the accumulation of other livelihood capital assets.

Additional research is needed to further understand under what social conditions linking social capital can empower social groups and women when operating within a developing area context where corruption is less closely regulated. Beyond structural social capital, future

research also needs to explore how cognitive social capital, such as tribal identity and institutional confidence, can be used to galvanize agrarian development. Mapping how information, gender attitudes, and behavioural shifts occur through informal social networks may shed light on who the key actors and groups within a community or rural agrarian settings are (Bodin & Crona, 2009; Rist, Chidambaranathan, Scoabar, Wiesmann & Zimmermann, 2007). Similar uses of socio-spatial networks are underway, such as expanding training for hairdressers from rural Guinea to the seven major cities, in order to dispense family planning and contraceptive advice at most popular salons (Maclean, 2016). Future research could contribute to the effectiveness of utilizing social loci within networks to galvanize changes in attitudes towards gender roles, and gender equity in access to agricultural resources, including land.

The separation between the state and the domestic spheres poses barriers for gender-sensitive resource policy implementation. Recognizing that formal forums may be less effective or inappropriate for discussing culturally sensitive issues related to gender power dynamics, this paper provides insights into the informal networks women use in diffusing information. Our findings imply that greater policy attention to enhance the capacities of village administrators, building infrastructure for well-organized market places, and promoting greater access to and quality of higher education could have cross-scale impacts on household gender equality. Such efforts have the potential to foster the creation of social capital that can help shift the broader societal attitude towards more egalitarian gender relations.

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Table 4.9 Summary of quantitative and qualitative findings

Bonding social capital	
Quantitative findings	
Higher levels of bonding social capital has a significant association with greater women's participation in agricultural decision-making	Quotes ¹ 1a
Qualitative findings	
- Building and maintaining bonding social capital through frequent exchanges with neighbours, contributions in self-help groups - Labour-sharing activities increase women's intra-household bargaining power when incoming resources depends on the women in the household who maintain those relations - Acquiring bonding social capital through building close ties with neighbours - Increasing membership with community groups increases the person's access to collective knowledge, collective experience, farm labour, farm security, and other livelihood resources (natural, physical, financial capital) that may reduce the risks of failure in decision-making - Bonding social capital provides emotional support, such as mutual motivation during arduous agricultural labour, accountability among group members, and comfort in stressful periods - Bonding social capital provides a social safety net for marginalized groups, such as the infirmed, the sick, the widowed, who may not be able to contribute money or labour in normal community groups	1b 1c 1d
Negative aspects of bonding social capital reported	
- Strong bonding social capital within the family may suppress views alternative to status quo - Women reported having forwent their entitlement to productive resources, such as land tenure, in order to maintain harmony within the nuclear and extended family	1e

¹ Quotes found in Appendix 4.3

Table 4.9 Summary of quantitative and qualitative findings (continued)

Bridging social capital		Quotes ¹
Quantitative findings		
Higher level of bridging social capital has a significant association with greater women's participation in agricultural decision-making when the village has a chief's office or a market place		
Qualitative findings		
Information and announcements can spread quickly when leaders identify focal points in the village and take advantage of spatial-social networking (e.g. a highly frequented corner shop)	2a	
If the village administration, chiefs, or village leaders are not serving the villagers, bridging social capital may not lead to potential livelihood improvements	2b	
Women reported the heavy investment in time for attending regular meetings often conflict with domestic responsibilities and jeopardizes their relationship with head of household		
Linking social capital		
Quantitative findings		
Increased linking social capital is significantly associated with women's lower participation in agricultural decision-making, but on average in poorer or more educated divisions dampen those negative associations		
Qualitative findings		
Women who are members of NGO sponsored development groups receive agricultural training and certificate (e.g. poultry keeping) to build capacity and confidence in livestock management	3a	
Groups are more likely to have higher access to natural resources, such as a piece of plot of land next to a water dam when village administrators help facilitate such endeavors	3b	
Negative aspects of linking social capital		
Households with members in local authoritative positions might maintain a more distinct hierarchy in gender roles and expectations, potentially reducing equitable participation in decision-making across gender	3c	
Linking social capital, when misused, can lead to greater resource access through corruption	3d	

¹ Quotes found in Appendix 4.3

Table 4.9 Summary of quantitative and qualitative findings (continued)

Cross-scale interactions	
Quantitative findings	Quotes ¹
Higher aggregated level of education at the division-level has a significant association with women's increased participation in agricultural decision-making, while an increase in years of maternal education does not have a significant association with women's increased participation in agricultural decision-making	
Qualitative findings	
- Traditional gender relations are threatened by an increasing number of women with higher education, increased earning, and a lower dependence on men as the main source of income - Conducive intra-household relations provide space for discourse in agricultural planning, innovation, and productive resource allocation	4a 4b
Community cohesion and unity	
Quantitative finding	
Very high percentage of reciprocal contribution in local fund-raisers	
Qualitative finding	
Values of collective action widely accepted, supported in customary and religious beliefs	5a
Customary and national identity	
Qualitative findings	
- Kamba identity has higher priority than constitutional values, which are seen as White and related to British colonization - Kamba identity is congruent with a gender hierarchy in decision-making	5b

¹ Quotes found in Appendix 4.3

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Appendix

Appendix 4.1 Correlation coefficients between indicators of bonding, bridging and linking social capitals

Bonding Social Capital Indicators

	Membership in bonding groups
Attended or contributed to fund-raisers	0.145

Bridging Social Capital Indicators

	Membership in bridging groups	Attended public meetings
Attended public meetings	0.052	
Voted in the recent national election	0.158	0.076

Linking Social Capital Indicators

	Participated in campaign activities	
Household member an official or Member of local administration	0.03	

Appendix 4.2 Correlation coefficients between division-level composition social capital and household social capital indicators

Bonding Social Capital Indicators

	Proportion of respondents with high bonding social capital in division
Membership in bonding groups	0.256 ***
Attended or contributed to fund-raisers	0.245 ***

Bridging Social Capital Indicators

	Proportion of respondents with high bridging social capital in division
Membership in bridging groups	0.218 ***
Attended public meetings	0.167
Voted in the recent national election	0.002

Linking Social Capital Indicators

	Proportion of respondents with high linking social capital in division
Participated in campaign activities	0.219 ***
Household member an official or Member of local administration	-0.115

Appendix 4.3 Quotes from research participants that support social capital themes

Section	Quotes
1a	“You know when you go to Malili, there is a new farmer or a new, say, just say a new person in that place. The first thing you can do: you can relax, and be through with the neighbour you have found there. Just, you just go to a place, start speaking to him. And in Malili, we are not so squeezed, you find the neighbour is 200 metres from your place. You start joining, speaking with him, because you don’t know him, he doesn’t know you, we start a relationship. For some times you found you are friends. You are neighbours” (Female farmer, 2013).
1b	“We saw people planting and getting a good harvest and so we started to plant ... She is not a member, but she heard about zai pits, so she has asked someone to dig the zai pits for her at a cost” (Woman farmer, 2013).
	“When we mix [in groups] there are some people like you, who are coming there [to the group meetings] to educate them, and even [when I] am not there, I can feel missing [missed out], because new things are so good mm” (Woman farmer, 2013).
	<i>When asked do you feel groups are useful</i> “Yes, I feel mm I feel, because when we, when a person meets with others, he can do many [things], and know many much many mmm, even when you are arranging things there [in the group’s farm], you can know what to arrange [in] your [farm]” (Woman farmer, 2013).
1c	“And even in the group, if I don’t have the energy, when they are through with theirs [digging] they come and help me” (Woman farmer, 2013). “When working as a group, you motivate each other to work, but when you are alone working, you get tired quickly” “Yeah, you can work for long in a group and also you can share ideas. Like, if you work with people, and you have some things [on your mind] you can talk to people” (Woman farmer, 2013). “In a group, we motivate each other than being alone; but when we are many, you can see that your friend is doing well and [I] try also to do well in the process” (Woman farmer, 2013).
1d	“When I asked them [to come help me dig terraces] they do refuse. They said I get satisfied by being given food while not working.” “How did you respond?” “I told them it is okay because I don’t go without food. [I] am given. And I was satisfied. and I love them so much, because even when they [were] writing a new register, when [I] am absent, they reported my absenteeism [registered for me], and I cannot be left out” (an HIV positive woman who have lived in Kathamboni for 40 years, date needed).

Section	Quotes
2a	“We were told by the assistant chief. He is the one who announced [there was a meeting]. He told the woman whom you found me with. He told her because she stays there. She has a shop and we were with her” (Woman farmer, 2013).
2b	“[AMREF] came again and they said that the widows will be registered, and I was not registered. We used [to be given] at the beginning of the month on the 5th. and then in the following month they would give it to us on the 30th. We were given a lot of food because I used to go home with a <i>debe</i> [20 liters] of flour. I used to get 25 kg of maize. Since we were given that food, it is now three years. And then they came again last year and then the people who were doing the registration had a lot of favouritism. They even included people who have working husbands. And they were the ones who were picking people and I was not registered. And most of the women here are widows and they were not considered. We were not given and then we would carry for them and then they would give us just a little. The ones who used to get food are the wives who lost their husbands and the husbands who lost their wives” (Woman farmer, 2013).
	“We are usually given that one from the government from the village elder, the one from this area. Metevu is from the other side. But I can’t remember his name. But we don’t take that one [food aid] from the village elder. We just heard that they took the food last week, but we were not informed about it” (Woman farmer, 2013).
3a	"We grow, we went and trained about poultry keeping. [That] is where I started my knowledge. We were told to go and practice, also we have the certificate. And we plant green grams when it rains and we have been given the shamba [farm] by person to plant and when we harvest, we share and also we sell" (Woman farmer, 2013).
3b	“We were given the permission by the members of the borehole that we normally work together in the activities of the water dam. They gave us permission to establish the nursery.... We have planted trees and other things which are beneficial to us. Like those ones they have planted kales and they sell them and get money. They also use the kales as their own food” (Woman farmer, 2013).
3c	Husband to wife: Have you got that she has told me? Wife: No Husband asked the wife and daughter in-law: You went to school for no reason? Wife: We forgot the one she is speaking, we understand is the other one but hers we don’t understand Research Assistant: How much do you sell? How much do you get at the end of harvest? Wife: We get like ten thousands Husband: let me answer for her, when they get this tomatoes the yield can be very big and when they have so much, the price can go very low. So some time they (continute) sell a crate for six hundred, one crate six hundred. They produce a lot that they even take to Kathonzweni markets by a vehicle, which mean what they do not have is a correct record for this year I have produce this and am trying to let them to be doing so they get more not exactly as what she has said. More than twenty thousand (Husband and wife, 2013).

3d	“According to what we were explained [by the NGO] before, he brought the water pump, the white man doesn’t want things for one people, he wants the group, so I find that its difficulty to mobilize the group, because they are not willing to do what I did. I mobilized people and explained to them to come and member themselves to join me to pretend we are working as group... I told them to form a group and to pretend to be members of group, then we took photo to the muzungu [British] and we were given the pump. But I don't refuse them [from] fetch[ing] water [from the pump]” (male informant, August, 2013).
4a	Male informant 1, “When they [women] earn more than the man, they become very arrogant. They can make you do everything in the house and you are the husband *laugh* you know there [is] something *laugh* the customary law [says] a woman should do this and this. But when they have money, they will turn it opposite. The man, you will cook, the man, you will wash the house, you will wash the children, you will wash the clothes. Simply because she is earning” Male informant 2, “ You will come home earlier” Male village leader, “Yeah, you should not come later than this time. Just because they earn more than you” (Male participants at men focus group, 2013).
4b	Kikamba Proverb: “A thought in the head does not influence the outcome of a case unless it is spoken out.”
5a	Kikamba Proverb: "One finger cannot kill a louse."
5b	Interviewer, “Is there negotiation between you and the husband?” Female informant 1, “No negotiation. We don’t have power to negotiate” Female informant 2, "Women, men say that they are weak assets and the man is the head. But now, them [women], is the neck, and no way the neck can speak unless the head has spoken. So the men have authority to tell and give permission” (Female participant at women focus group, 2013).
	“You know we are Kamba and we have the constitution. But the men who have married us are conservative and when we try to talk to them, they tell us to behave as Kambas and not British *laughter* to follow the old tradition” (Woman talking about daughter’s land inheritance in focus group, 2013)

Preface to Chapter 5

In Chapter 4, I highlighted how social capital has various associations with women's participation in agricultural decision-making, which are significantly influenced by distal social conditions. In Chapter 5, I concentrate on relationships within the household using a quantitative statistical analysis of the same survey data used in Chapter 4. I examine the associations between childhood nutritional growth measures and women's participation in agricultural decision-making. I provide empirical evidence that has implications for breaking the cycle of undernutrition in rural underweight women in relation to gender-equitable decision-making dynamics within the household. The chapter is written in a style intended for a journal article, co-authored with Dr. Gordon Hickey.

CHAPTER 5

GENDERED ASSOCIATIONS BETWEEN AGRICULTURAL DECISION-MAKING AND CHILD NUTRITION IN SEMI-ARID KENYA

Abstract

There has been a paucity of empirical studies that examines women's agricultural decision-making and household nutrition in the chronically food-insecure semi-arid Kenya. This cross-sectional study uses a household survey of 221 mother and child pairs conducted in Machakos and Makueni Counties to explore the associations between childhood nutritional growth measures and women's and men's participation in agricultural decision-making. In 2012, anthropometric measures of weight-for-age, height-for-age, and weight-for-height ratios of children six to 36 months old were collected. Mothers were revisited in 2014 to contextualize nutritional data with information on household members' participation in agricultural decision-making. Households were stratified into four groups based on childhood anthropometric z-scores. Kruskal-Wallis H test was used to test for significant differences in members' participation in agricultural decision-making across the four groups. Overall, 33 percent children were stunted, three percent were wasted, and nine percent were underweight. A significant positive association between child nutritional growth and women's participation in agricultural decision-making was observed. A more gender-equitable process in decision-making between men and women has a positive association with child nutritional growth. Significant associations were observed among households within the lowest asset tertile, among male-headed

households, among daughters, and among children six to 16 months old. The findings have implications for breaking the cycle of undernutrition in rural contexts.

Keywords: Anthropometry; Autonomy; Child growth; Food security; Gender; Women's empowerment

5.1 Introduction

Undernutrition is one of the most important factors that contributes to approximately three million child deaths and morbidity in developing countries each year (Black *et al.*, 2013). Undernutrition during the prenatal period and the first 1,000 days of life can have lasting negative impacts on physical and cognitive development across life stages (Bhutta *et al.*, 2013; Carletto, Ruel, Winters, & Zezza, 2015; Connolly-Boutin & Smit, 2016; Halim, Spielman, & Larson, 2015). Despite tremendous international and national efforts, household undernutrition present significant and enduring challenges to public policy, especially in many agrarian societies (Solomons, 2005; Victora *et al.*, 2008; Walker *et al.*, 2007). In particular, Kenya's arid and semi-arid lands (ASAL) are regions of chronic nutrition insecurity, where household food consumption is predominantly based on small-scale and subsistence farming. Kenya's ASAL have a high prevalence of poverty and undernutrition (Table 5.1), partly due to low agricultural yields, increasing pressure on land and productive resources, low adoption of agricultural innovations, high vulnerability to rising food prices in "lean" seasons, and extreme climatic stresses (Hickey, Pelletier, Brownhill, Kamau, & Maina, 2012; WFP, 2016). As a result, significant policy, research, and development attention has been directed towards addressing household food and nutritional security in the region, primarily through efforts to increase the

Table 5.1 National trends in undernutrition prevalence of children under five in Kenya,
1993-2014

Indicator	1993 KDHS ¹	1998 KDHS	2003 KDHS	2008-09 KDHS	2014 KDHS
Stunting (%)	39.9	37.7	35.7	35.3	26.0
Wasting (%)	6.7	6.9	6.0	6.7	4.0
Underweight (%)	18.7	18.0	15.8	16.1	11.0

1 KDHS: Kenya Demographic and Health Survey

Source: Kenya Demographic and Health Surveys 1993; 1998; 2003; 2008-09; 2014

quality, quantity, and diversity of smallholder agricultural production and household food consumption. Although reductions in food insecurity have been reported in Kenya and sub-Saharan Africa more broadly (WFP, 2016), significant household food insecurity and childhood undernutrition rates remain in the ASAL (Black *et al.*, 2013; KNBS, 2015).

Research on agriculture and household food security has been highlighting the importance of intra-household resource allocation dynamics between men and women as critical to understanding, and potentially addressing, the limitations of public policy and programmatic interventions (Bryce, Coitinho, Darnton-Hill, Pelletier, & Pinstump-Andersen, 2008; Doss *et al.*, 2011; Meinzen-Dick, Brown, Feldstein, & Quisumbing, 1997; Walker *et al.*, 2007). Considerable research has explored the relationships between childhood nutrition and social determinants of health, such as mother's education (Bryce *et al.*, 2008; McPhie, Skouteris, Daniels, & Jansen, 2014) and household socio-economic status (Casanova *et al.*, 2013; Van de Poel, Hosseinpoor, Speybroeck, Van Ourti, & Vega, 2008). Systematic reviews have found that, in general, maternal autonomy and empowerment have positive associations with childhood nutritional outcomes, not without context-specific inconsistencies across different measures of autonomy and across regions (Carlson, Kordas, & Murray-Kolb, 2015; Cunningham, Ruel, Ferguson, & Uauy, 2015; Richards *et al.*, 2013; Smith, Ramakrishnan, Ndiaye, Haddad, & Martorell, 2003). The majority of these studies have measured women's autonomy around decisions of food consumption, household expenditure, access to health services, mobility, contraceptive use, attitudes towards domestic violence, and financial resources, such as household income, individual credit, and employment (Carlson *et al.*, 2015; Cunningham *et al.*, 2015). However, using Kabeer's (2010, p. 437) definition, empowerment can be understood as "the processes by which those who have been denied the ability to make choices acquire such an ability". Carlson (2015) also noted that

as women are generally expected to be responsible in the domains of domestic expenditure, food preparation, and child-feeding, high levels of autonomy in these domains may not strongly indicate women's empowerment. Moreover, common measurements of livelihood outputs, such as household income, have often been used with minimal consideration of gender.

In this study, we do not adopt a unitary household model (Becker, 1981), which assumes that capitals within a household are similarly endowed across genders (Scoones, 2009). Rather, we draw on non-cooperative models (Lundberg & Pollak, 1994) that view household member or members who control household resources control their intra-household distribution and inefficient distribution behaviours are possible (Lundberg, Pollak & Stearns, 2016). Until recently, there has been little evidence concerning women's decision-making in the spheres of agricultural production and livelihoods (Alkire *et al.*, 2013; Malapit, Kadiyala, Quisumbing, Cunningham, & Tyagi, 2015). Although there have been calls for multi-sectoral approaches in designing nutrition-sensitive policies and interventions (Casanovas *et al.*, 2013; Garrett & Natalicchio, 2011; Pinstруп-Andersen, 2013), there is relatively little evidence on how intra-household decision-making dynamics relate to household nutrition security in the context of smallholder agriculture (Evers & Walters, 2000; Piwoz & Viteri, 1985). Understanding gender dynamics, not only in making domestic decisions but also in making agricultural decisions, is critical when undernutrition alleviation is a priority (Meinzen-Dick *et al.*, 1997). Recognizing the critical relationships between female labour participation in subsistence and commercial agriculture and food insecurity in many sub-Saharan African countries (Lado, 1992), this paper aims to explore the relationships between childhood nutritional growth measures, as an indicator of household food security, and women's participation in agricultural decision-making in the smallholder and subsistence agricultural production systems of the ASALs.

5.2 Conceptual framework

Figure 5.1 presents a causal loop diagram depicting the theoretical pathways through which child nutritional growth is expected to associate with a parent's participation in agricultural decision-making. The figure shows that there are two main reinforcing feedback loops. The initial pathway of the first feedback loop (R1) expects that proper child nutritional growth reduces the child's susceptibility to illnesses, such as diarrhea, pneumonia, malaria, and measles (Caulfield, de Onis, Blössner, & Black, 2004). In turn, it reduces the parent's time and expenditure in seeking health care services, which increases the parent's time on the farm and his or her knowledge and experience in agriculture. The gained experience increases his or her credibility in the household in terms of agriculture and child-rearing, and is expected to increase the person's participation in agricultural decision-making. The second reinforcing feedback loop (R2) expects proper child nutritional growth to increase the parent's confidence in care-giving and child feeding behaviours, increasing their credibility in the household overall. The parent's credibility, in turn, increases their participation in productive decision-making. The feedback from the parent's participation in agricultural decision-making to child nutritional growth involves increasing the agricultural knowledge of the participant in agricultural decision-making, who is also the primary provider of childcare and food. In that capacity, there is greater consideration and planning from the provider for nutritious food crops grown on the farm. This increases the likelihood that food crops with diverse micronutrients and protein content are available from the farm and consumed by children to further promote their nutritional growth.

By describing these mechanisms with a causal loop diagram, the expected relations, including the intermediary and mediating factors, can be more clearly rationalized and explored. Such mediating factors include: household's wealth, mother's body mass index (BMI), mother's

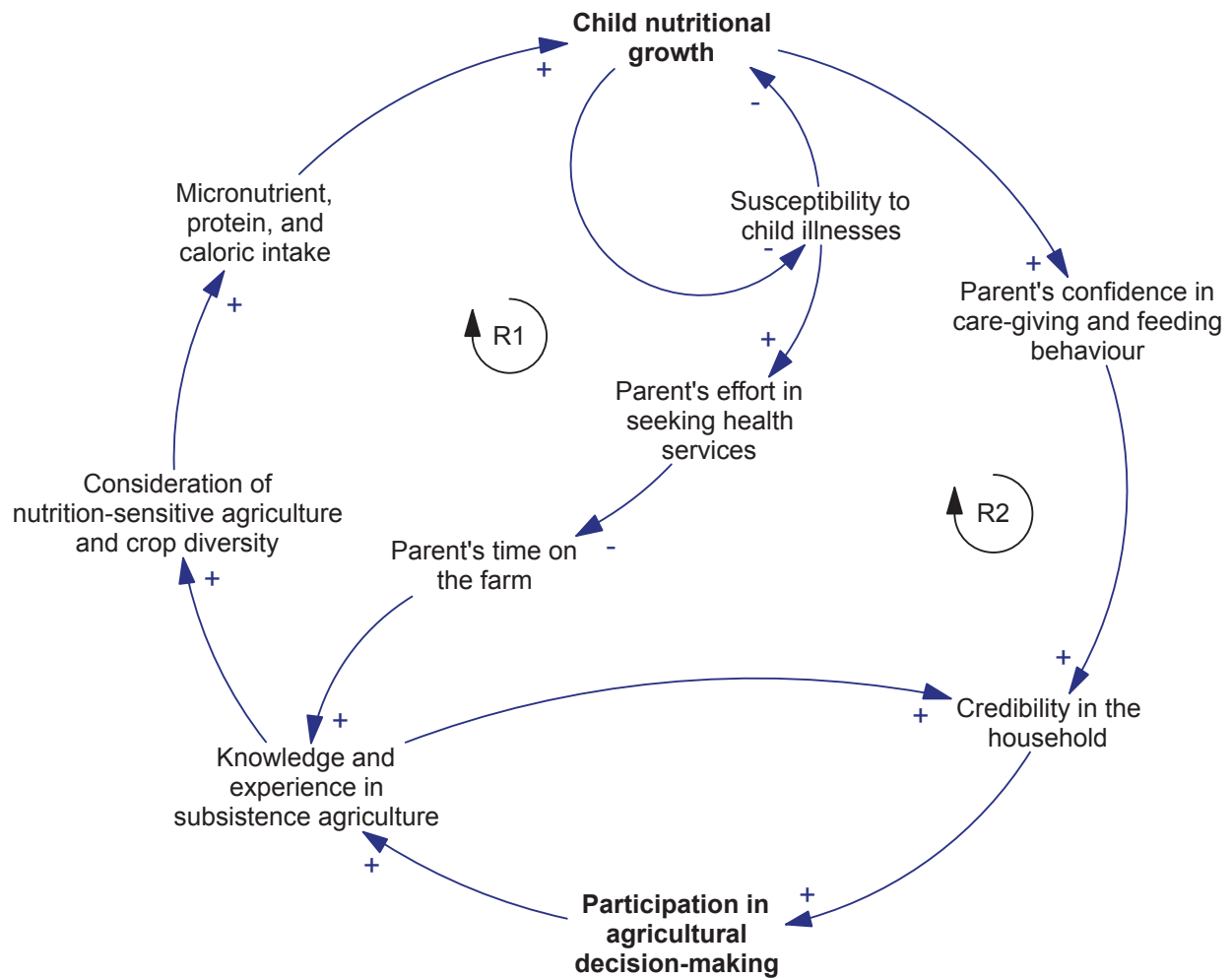


Figure 5.1 Causal loop diagram of reinforcing feedback loops between child nutritional growth and parent's participation in agricultural decision-making.
 Note: A plus sign (+) indicates that a change in one variable has an effect in the same direction on another variable. A minus sign (-) indicates that a change in one variable has an effect in the opposite direction on another variable. *Source:* author (2017)

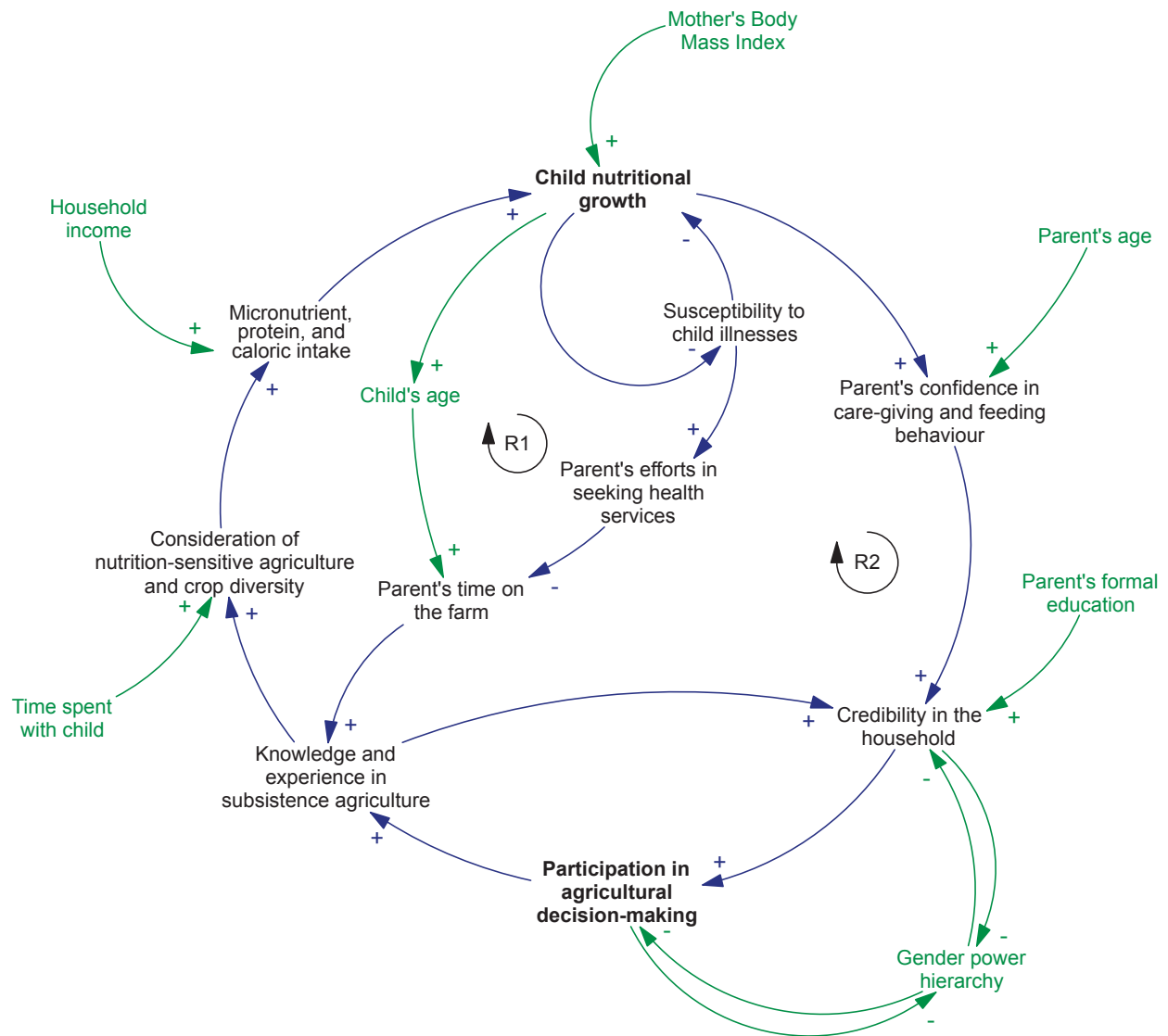


Figure 5.2 Causal loop diagram between child nutritional growth and participation in agricultural decision-making with mediating factors.
 Note: Blue arrows depict conceptual feedback loops. Components in green depict potential mediating factors. *Source:* author (2017)

age and education attainment, child's age, and gender hierarchy measured via gender of the household head and gender of the child (Figure 5.2). The diagram depicts “parent” instead of “mother” to indicate the primary care-giver of the child, which suggests that the amount of time the parent spends with the child, regardless of gender, increases the likelihood that nutritional food crops are considered in the seasonal planning on the farm. We test whether these feedback loops are empirically observed for both genders in the household.

5.3 Participants and methods

5.3.1 Study population

The research was undertaken in Machakos and Makueni Counties, located in eastern Kenya, where a high and variable prevalence of childhood undernutrition and food insecurity has been recorded in the past decade (Table 5.2) (KNBS, 2015). Both counties are predominantly inhabited by Kamba smallholders that lead agro-pastoral livelihoods. The Kamba people face many pressures in the region including high fertility rates and high under five mortality rates linked to infectious diseases and seasonal and acute stresses. Households generally rely on subsistence and cash crop agriculture, supplemented with livestock and dairy production, casual labor, beekeeping, and small-scale trading of artisanal crafts for additional income (Juma & Ojwang, 1996). In more arid regions in the ASAL, smallholders' livelihoods depend more readily on pastoralism (Jaetzold, Schmidt, Hornetz, & Shisanya, 2006). Kamba livelihood activities are often supported by the collection of forest products for firewood, charcoal, herbal medicine, wild-edible food, and traditional alcoholic brews (Kagio & Musembi, 2013), which demonstrates a high reliance on the surrounding natural resources.

The Kamba community observes polygamous and monogamous marital unions within a patrilineal society (Tiffen, Mortimore, & Gichuki, 1994). High rates of fertility and non-marital

Table 5.2 Comparison of children's undernutrition prevalence in Machakos and Makueni Counties, Kenya

Indicator	2003 KDHS ¹ Eastern Province ⁵	2008-09 KDHS Eastern Province	2012 KEMRI ² Survey		2014 KDHS	
			Machakos County	Makueni County	Machakos County	Makueni County
Stunting (%)	32.5	41.9	35.9	29.6	26.5	25.1
Wasting (%)	4.2	7.3	1.9	3.5	6.5	2.1
Underweight (%)	21.4	19.8	9.4	8.7	8.1	10.2
Sample N	888	881	106	115	502	369
Age	U5 ³	U5	U3 ⁴	U3	U5	U5

1 KDHS: Kenya Demographic and Health Survey

2 KEMRI: Kenya Medical Research Institute

3 U5: Under five years

4 U3: Under three years

5 Data available by provinces prior to Kenya's change to county administrative system in 2010

childbearing, as well as the HIV/AIDS pandemic in the 1990s and 2000s, have resulted in intergenerational family structures (Nyambedha, Wandibba, & Aagaard-Hansen. 2003; Omariba, 2006). Predominant religious beliefs are Catholic and Protestant Christianity. The fear of curses remains a common part of Kamba people's belief system, particularly relevant within family dynamics (Hobley, 2010).

5.3.2 Data source

In 2012, the Kenya Medical Research Institute (KEMRI) administered a household survey in Machakos and Makueni Counties that collected anthropometric growth measures of children and women, as well as socio-demographic and biological variables, detailed in Section 5.3.3 (WHO, 2006). Figure 5.3 provides a flow-chart representation of a three-step sampling design. Seventy-two farmer groups were randomly selected from district lists of registered farmers' groups across the two counties. From the farmers' groups, 324 households that met the inclusion criteria of having a non-pregnant woman aged 15 to 46 years old with children six to 36 months old were included in the sampling pool. After random selection and recruitment, 277 mother-child pairs were assessed with a response rate of 90 percent. The survey was carried out during the "long rain" season in May and June, with low crop production reported in the ASAL in April 2012, correlated with early cessation of rain seasons during the 2011-2012 drought across the Horn of Africa (Kenya Ministry of Agriculture, 2012). The household survey was approved by the KEMRI ethics review board.

In 2014, we revisited the same sample of mother-child pairs for a separate survey concerning agricultural decision-making in the household to contextualize the nutritional findings. However, two different household resource allocation theories have indicated that the variability of decision-making involvement within the household is low and changes occur

gradually (Davis, 1976; Wilk, 1989). Particularly, households that have large authority differences between the men and women, a highly differentiated division of labor, and household members who received below post-secondary education (similar to the majority of rural Kamba households sampled) are reported to have low variability in participation in household decision-making (Davis, 1976). Building on these theories, our study assumes that changes to participation in decision-making among men and women in the household were not significant across the two-year survey interval.

The attrition rate due to a mother's death, migration, or end of marriage was less than nine percent, resulting in 252 women from the 2012 sample being surveyed. Female caregivers to non-biological children were excluded. The final dataset contained 221 mother-child pairs available for analysis. Figure 5.3 presents a sampling flow chart for the surveys completed in 2012 and 2014. Surveys took place in participants' homes, were administered in the local Kikamba dialect, and lasted approximately 50 minutes. All women provided written consent at the time of data collection. Up to three attempts were made to interview the respondents if they were previously not present. The McGill University Research Ethics Board approved the follow-up survey.

5.3.3 Indicators

Variables of interest were childhood weight-for-height z-scores (WHZ), height-for-age z-scores (HAZ), and weight-for-age z-scores (WAZ). The WHZ ratio measures children's thinness, the HAZ ratio measures children's tallness, and the WAZ ratio is a composite score of the first two. Standing height, or lying down length for children below two years, was measured using a standardized UNICEF stadiometer. Measurements were recorded to the nearest 0.1 cm. Weight was measured using UNICEF's Seca 762 classic mechanical medical weighing scale.

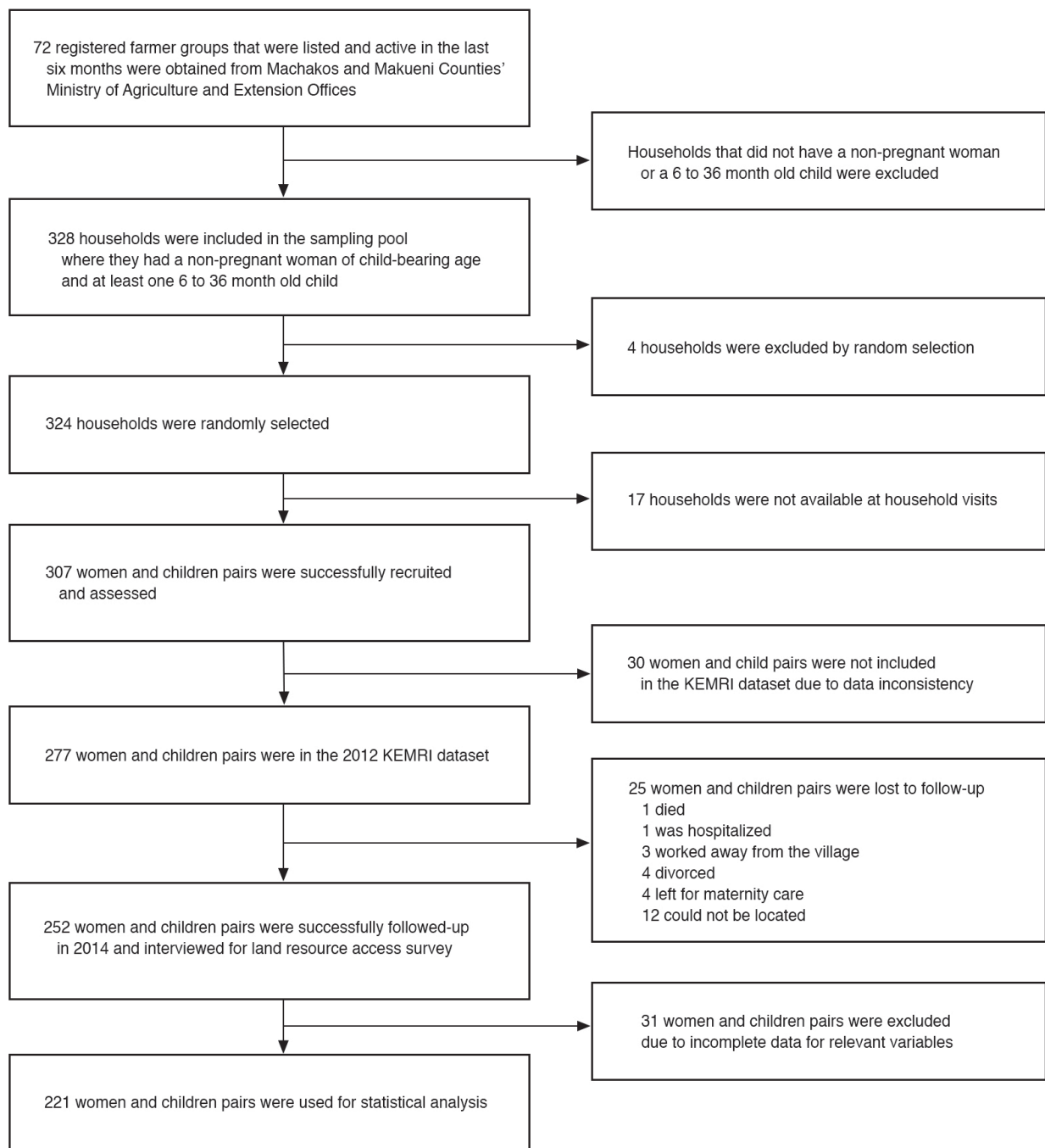


Figure 5.3 Sampling flow chart for household surveys in 2012 and 2014.
Source: author (2015)

Participants were weighed without shoes and with minimal clothing to the nearest 0.1 kg. Children who needed to be held by their mother had the mother's weight tared prior to being measured together with the child (KEMRI, 2013). Standardized z-scores were calculated by normalizing measures with the WHO reference population's childhood median growth measures. Children with z-scores at two standard deviations below the WHO reference median were considered wasted, stunted, or underweight (WHO, 2006). Stunting reflects chronic or recurrent inadequate nutritional intake over an extended period, usually associated with poor socioeconomic conditions, poor maternal health and nutrition, inappropriate infant and young child feeding and frequent illness. Wasting reflects recent and severe weight loss due to inadequate nutrition intake, acute infectious disease, such as diarrhea, which has led to weight loss before the measurement administered by the survey. Underweight reflects the effects of both acute and chronic undernutrition (WHO, 2017). The continuous variables WHZ, HAZ, and WAZ were stratified into four strata: (1) below -2; (2) -2 to below -1; (3) -1 to below 0; and (4) 0 and higher for subsequent statistical analyses.

The dependent variables of interest were participation in agricultural decisions by women, more precisely, the child's mother, and by men in the household. Questions concerning farm activities in the past 12 months were asked: "In the past season, who decided to: "buy specific seeds", "prepare the lands", "start weeding", "spray chemicals", "apply manure", "plant trees", "build terraces"? and "can you alone decide to sell the harvest from this land?" The first seven questions were constructed based on preliminary qualitative results of seasonal or permanent agricultural decisions commonly reported by Kamba farmers. The eighth question was added to reflect the critical factors of timing and market prices that farmers have been reported to regularly consider in order to enhance their access to land resources. Some farm decisions are

strongly related to crop diversity (e.g. decisions to buy specific seeds or to plant fruit trees); however, the components of the decision-making index were equally weighted to capture the extent of women and men's agency and decision-making dynamics on agricultural productive livelihoods, rather than which agricultural decision correlates the most with crop diversity and, ultimately, child nutrition. From the questions, a positive response was counted if the respondent reported being one of the household members who made the decision (from a list of ten possible household member and an option to specify someone not on the list). For example, if a respondent reported that the "husband", "father-in-law", "mother-in-law", and "respondent" decided to apply manure in the last season, the positive response, 1, denoted the respondent participated in the decision regarding manure application. If the "respondent" was not among the members who made the decision, the response was 0. Eight responses were then summed to create an agricultural decision index score out of eight. Men's participation in decision-making was calculated using the same eight questions and data collection procedure. Men's decision participation was based on the female respondent's self-report as male head of household or male spouse were often away from the homestead. Based on the same response example given above, a positive response, 1, would be counted, representing "husband" and "father-in-law", participated in making decisions regarding manure application. Although data from men and women would have provided opportunities to examine gender parity and to cross-validate responses, understanding gender parity was not the intended focus of the study.

The difference in women's and men's participation was created as a proxy indicator of the distribution of intra-household decision-making. We subtracted the men's scores from the women's scores in each household, which resulted in a negative score if the men made more decisions than women and a positive score if the reverse was true. We categorized the variable

into “men made five or more decisions than women”, “men and women made comparable number of decisions (-4 to +1)”, and “women made two or more decisions than men”. These cutoff points were adjusted based on a skewed distribution that men, on average, were reported to make more decisions than women.

Other indicators from the 2012 survey used in the study were: maternal age in years, maternal BMI, marital status, women’s highest level of education, child’s age in months, child’s sex, whether the child has received deworming drugs, gender of the household head, household’s access to electricity, and household asset index. The household asset index was calculated as a summation of consumer durables and housing stock from 13 types of assets⁴ (Moser & Felton, 2007). Counties and agro-ecological zones were included to test for regional variations. Table 5.3 presents the ordinal and categorical variables, as well as their frequencies in the study sample.

5.3.4 Statistical analysis

A cross-sectional dataset with 221 mother-child pairs was used for statistical analysis after households with missing data ($n = 31$) were excluded from the dataset. We approached the statistical analysis in five major steps. First, we tested for independence of strata across three sets of anthropometric z-scores using Pearson’s chi-squared tests (Table 5.4). Potential co-determinant variables tested were: maternal BMI, marital status, mother’s education, mother’s age, child’s age, child’s sex, whether the child was dewormed, gender of household head, access to electricity, county. Second, we proceeded to use the Kruskal-Wallis H test to test whether

⁴ Assets used to construct the household asset index were: clock, radio, television, mobile phone, solar panel, bicycle, motorcycle, animal cart, vehicle, boat, corrugated iron material used for roof, cement or ceramic tiles used for floor, and latrine with a slab or ventilated improved pit latrine.

Table 5.3 Descriptive statistics on women's access, anthropometry, and socio-demographic indicators

Independent Variables of Interest		
	Frequency N=221	Percent (%)
Childhood nutritional measures		
Height-for-age z-score		
Below -2 (stunting)	72	32.58
-2 to -1	73	33.03
-1 to 0	47	21.27
0 and above	29	13.12
Weight-for-height z-score		
Below -2 (wasting)	6	2.71
-2 to -1	33	14.93
-1 to 0	82	37.10
0 and above	100	45.25
Weight-for-age z-score		
Below -2 (underweight)	20	9.05
-2 to -1	67	30.32
-1 to 0	90	40.72
0 and above	44	19.91
Dependent Variables of Interest		
Women's participation in agricultural decision-making (0 to 8)		
	Mean	(SD)
	2.82	(2.59)
	Frequency	Percent (%)
Low (0 to 3)	144	65.20
High (4 to 8)	77	34.80
Men's participation in agricultural decision-making (0 to 8)		
	Mean	(SD)
	5.00	(2.60)
	Frequency	Percent (%)
Low (0 to 3)	67	30.32
High (4 to 8)	154	69.68
Comparison score between women and men (-8 to 8)		
	Mean	(SD)
	-2.17	(4.58)
	Frequency	Percent (%)
Men make more decisions (-8 to -5)	81	36.70
Men and women make similar number of decisions (-4 to 1)	90	40.70
Women make more decisions (2 to 8)	50	22.60

Control variables	Frequency N=221	Percent (%)
Mothers' age (years)		
15-28	70	31.67
29-33	77	34.84
33-46	74	33.48
BMI (categorized)		
Underweight (BMI < 18.5 kg/m ²)	32	14.50
Normal	146	66.10
Overweight or obese (BMI ≥ 25 kg/m ²)	43	19.50
Mothers' highest formal education level attained		
Higher than Primary	79	35.70
Completed Primary (Standard 8)	100	45.20
Lower than Primary	42	19.00
Mothers' marital status		
Never married	16	7.20
Married	196	88.70
Divorced/separated/widowed	9	4.10
Child age categories (months)		
6 – 16	64	28.95
17 – 26	79	35.75
27 – 36	78	35.30
Child's sex		
Female	115	52.00
Male	106	48.00
Household asset index		
Highest asset tertile	70	31.70
Middle asset tertile	89	40.27
Lowest asset tertile	62	28.05
Gender of household head		
Male	173	78.30
Female	48	21.70
House had electricity		
No	216	98.20
Yes	4	1.80
Land acquired from male household-head		
Yes	157	71.00
No	64	29.00
Agro-ecological zone		
Lower Midland 4	111	50.20
Lower Midland 5	110	49.80

Table 5.4 Relationships between categorical social-demographic variables and three child nutritional growth measures

N = 221	WAZ ¹			HAZ		WHZ	
	<i>df</i>	<i>X</i> ²	<i>p</i>	<i>X</i> ²	<i>p</i>	<i>X</i> ²	<i>p</i>
Maternal BMI	6	6.522	0.367	3.212	0.782	18.847	0.004***
Marital status	6	4.516	0.607	3.891	0.691	11.694	0.069
Mother's education	6	10.149	0.119	2.120	0.908	2.679	0.848
Mother's age	6	10.205	0.116	10.287	0.113	3.095	0.797
Child's age	6	11.224	0.082	10.033	0.123	13.292	0.039**
Child's sex	3	0.979	0.806	2.722	0.436	2.144	0.543
Child was dewormed	3	6.328	0.097	1.154	0.764	2.751	0.432
Household head's gender	3	0.654	0.884	0.140	0.987	5.946	0.114
Household asset index	6	11.579	0.072	15.213	0.019**	4.773	0.573
Electricity	3	2.377	0.498	7.442	0.059	6.856	0.077
County	3	1.386	0.709	1.740	0.628	4.460	0.216
Agro-ecological zone	3	1.762	0.623	1.395	0.707	1.024	0.796

1 WAZ (weight-for-age z-scores), HAZ (height-for-age z-scores), WHZ (weight-for-height z-scores) divided into 4 strata: i) less than -2.0 ii) -2.0 to less than -1 iii) -1.0 to less than 0, and iv) 0 and above
Significant levels at ** $p < 0.05$, *** $p < 0.01$

there was a statistically significant difference in the participation of decision-making by women across the strata of WAZ, HAZ, and WHZ. Similarly, Kruskal-Wallis H tests were used to detect statistically significant differences in men's participation in decision-making and gender difference in participation between men and women across strata of WAZ, HAZ, and WHZ at a 90% confidence level. The non-parametric Kruskal-Wallis H test is considered suitable to detect distributional differences of ordinal variables that do not meet the normality assumption between two or more groups. Third, of the samples that had at least one stratum different from another, we used Dunn's Pairwise Comparison to test which two strata were statistically different. The tests were conducted at a 95% confidence level adjusted with a Bonferroni correction.

Based on the results from steps one to three, in step four we employed two levels of stratification. We selected variables that were potential confounders indicated by the Pearson's chi-squared tests ($p < 0.05$) calculated in the first step and by social-determinants of health literature (Martorell & Harbicht, 1986; Onyango, Tucker, & Eisemon, 1994). These variables were gender of the household head, household asset index, maternal BMI, maternal education, maternal age, child's age, child's sex, and whether the child received a deworming drug in the past six months. Each stratum contained a subset of the sample size and was tested separately using the Kruskal-Wallis H test for significant differences in women's participation in decision-making across childhood WAZ categories. Similarly, the comparison scores between men's and women's participation were tested across childhood WAZ categories. These were selected based on detected significant associations in the previous Kruskal-Wallis H tests from the third step. By stratifying potential confounders into classes, we assumed that the variation of the confounder within each stratum was sufficiently minimized such that the associations observed were only between the two variables of interest. For example, stratifying children's

ages into ten-month intervals assumed that children from age six to 16 months would possess similar characteristics, but different from children aged 17 to 26 months or 27 to 36 months. In step five, we conducted Dunn's Pairwise Comparisons in specific confounders' stratum that indicated statistical associations between women's participation in decision-making and childhood WAZ categories. Specifically, the sub-strata tested were male-headed households, mothers with normal BMI, children six to 16 months old, children who were female, and children who did not receive drugs for intestinal worms in the past six months. Male-headed households were households where the self-defined household head in relation to the respondent was reported male from the KEMRI survey household member roster. They were commonly "father-in-law", "father-by-birth", or "husband" in the research sample. The mean and 95% confidence intervals of women's and men's participation, and stratification by one confounder and by childhood WAZ z-scores were graphed using Stata (version 14.0).

5.3.5 Assumptions, limitations, and validity

The research was conducted based on several assumptions to address data and methodological limitations. The cross-sectional data had different variables collected from two different time periods. Childhood nutritional measures were collected in 2012 while responses of agricultural decision-making were collected in 2014. The investigation assumed that feedback mechanisms exist when children's nutritional measures can influence women's participation in decision-making and in reverse, women's participation in decision-making can influence children's nutritional measures. Evidence from the cross-sectional case study cannot be inferred as a generalizable causal relationship. The stratification method assumes that within each stratum, the relationships between the confounders and the variables of interests are sufficiently eliminated, leaving the associations observed to be the associations between childhood

nutritional growth measures and the level of participation in decision-making. However, to ensure sufficient sample size within each stratum, we limited the stratification of confounders to a maximum of three classes. For example, child's age in months was stratified into three classes: 6 to 16 months, 17 to 26 months, and 27 to 36 months. Although a child's physiological growth within the 6 to 16 month age group varies, the sample size in our analysis did not allow for stratification into smaller age intervals. Similarly, a small sample size limited our analysis to two levels of stratification. We were therefore unable to control for more than one confounder at a time. We used equally weighted components to construct the agricultural decision index while being cognizant that customarily, certain agricultural responsibilities may be gender-specific. However, we do not believe that these limitations detract from the key findings and their policy implications. Triangulations with multiple indicators were used to minimize measurement errors and systematic recall bias inherent in observational studies.

5.4 Results

5.4.1 Descriptive results

Table 5.3 presents the descriptive statistics from the 221 mother-child pairs. Thirty-three percent of children suffered from stunting, three percent from wasting, and nine percent from being underweight, similarly reported by Bukania *et al.* (2014). Sixty-five percent of mothers reported having a below-mean level of participation in agricultural decisions. Women's mean decision index score was 2.8 decisions and men's mean decision index score was 5.0 decisions. Comparing the participation of decision-making between men and women, we found that in 40 percent of households, men and women had a comparable ratio of participation in decision-making and in 23 percent of the households surveyed, women reported participating more than men (Table 5.3).

5.4.2 Associations between childhood nutritional growth and participation in agricultural decision-making

The statistical results were organized into four main findings. First, we demonstrated a significant association between childhood nutritional growth measures, specifically the WAZ measure, and gender dynamics in agricultural decision-making in the household. We found that there were significant differences in women's participation in agricultural decision-making across the four ranges of childhood WAZ measures [Kruskal-Wallis $X^2(3, N = 221) = 7.275, p = 0.064$, Table 5.5]. Women with children in the highestest WAZ category ($WAZ > 0$) reported higher participation levels than women with children that had lower WAZ scores ($-2 \leq WAZ < -1$) [Dunn's Pairwise Comparison Bonferroni-adjusted $p=0.022$, Table 5.6, Figure 5.4]. In comparison, no significant association was found between men's reported participation in agricultural decision-making and childhood nutritional measures [$X^2(3, N = 221) = 4.051, p = 0.256$, Table 5.5, Figure 5.4]. In addition, we calculated the difference between men's and women's participation scores as a proxy measure of decision-making dynamics within the household. Greater negative scores indicated men participated in more agricultural decisions than women. Scores close to zero indicated men and women had similar participation scores. In households where children scored between -2 and -1 WAZ, we found that the difference between men and women's participation score was significantly greater (mean = -3.06, SD = 4.69) than in households where children were in the highest category ($WAZ \geq 0$) (mean = -0.977, SD = 4.82) (Dunn's Pairwise Comparison Bonferroni-adjusted $p = 0.043$, Table 5.6, Figure 5.4).

We also tested the association between women's reported participation in decision-making and childhood WAZ, adjusting for gender of the household head. We found a significant positive association within male-headed households [Kruskal-Wallis $X^2(3, N = 173) = 9.361, p = 0.025$,

Table 5.7] but not in female-headed households [Kruskal-Wallis $X^2(3, N = 48) = 0.709, p = 0.871$, Table 5.7, Figure 5.5]. This result aligns with the results from the comparison score of men and women. In male-headed households, childhood nutritional growth had a positive association with greater participation in women's agricultural decision-making and more balanced decision-making participation between men and women.

Second, our results revealed that women's participation in decision-making can have critical implications for the undernutrition cycle between mothers and daughters. Women's BMI was found to be a co-determinant for child nutritional growth measures (Table 5.4) and women's participation in decision-making (Table 5.7). We adjusted for maternal BMI by stratifying women into three categories: those who had normal BMI ($18.5 \text{ kg/m}^2 \leq \text{BMI} < 25 \text{ kg/m}^2$), those who were underweight ($\text{BMI} < 18.5 \text{ kg/m}^2$), and those who were overweight or obese ($\text{BMI} \geq 25 \text{ kg/m}^2$). We found a significant association between children's WAZ and women's participation among women with a normal BMI [Kruskal-Wallis $X^2(3, N = 146) = 8.339, p = 0.040$, Table 5.5, Dunn's Pairwise Comparison Bonferroni-adjusted $p = 0.026$, Table 5.6, Figure 5.6] and among overweight or obese women [Kruskal-Wallis $X^2(3, N = 43) = 9.370, p = 0.025$, Table 5.7]. However, a negative association was observed among overweight or obese women and their children's growth measures. Furthermore, we stratified the children by gender to adjust for confounding as national stunting and underweight prevalence in Kenyan girls increased, while boys' decreased, especially from 2003 to 2008-09 after the global food price crisis occurred (Matanda, Mittelmark, & Kigaru, 2014). Selective gender differences in allocation of nutrition and health resources to children have been reported in other rural settings (Behrman, 1988; Pande, 2003). The general positive association between childhood WAZ measures and women's participation in decision-making was also found among female children [Kruskal-Wallis $X^2(3,$

$N=115$) = 7.104 $p = 0.069$, Table 5.7, Dunn's Pairwise Comparison Bonferroni-adjusted $p = 0.027$, Table 5.8, Figure 5.7] but not among male children [Kruskal-Wallis $X^2(3, N = 106) = 1.703$ $p = 0.636$, Table 5.7]. Among households in the poorest asset tertile, we found a similar significant positive association [Kruskal-Wallis $X^2(3, N = 62) = p = 0.042$, Table 5.7, Dunn's Pairwise Comparison Bonferroni-adjusted $p = 0.016$, Table 5.8, Figure 5.8]. Taken together, these results have implications for the perpetuation of undernutrition in women's life cycles, which we discuss in Section 5.5.

Third, we found that the mother's age and child's age were related to the women's level of participation in agricultural decision-making. Older mothers (34 to 46 years old) reported significantly higher participation than younger mothers (15 to 28 years old and 29 to 33 years old) [Kruskal-Wallis $X^2(2, N = 221) = 18.427$, $p = 0.0001$, Figure 5.9]. However, after adjusting for the mother's age, we did not find significant association between child WAZ measures and women's participation in decision-making. We observed that women with older children (27 to 36 months old) reported a higher level of participation in agricultural decision-making than women with young children (6 to 16 months old) [Kruskal-Wallis $X^2(2, N = 221) = 10.109$, $p = 0.006$, Table 5.7, Figure 5.10]. After adjusting for child's age by stratification, a significant association remained between child's WAZ measures and women's participation in decision-making among children six to 16 months old [Kruskal-Wallis $X^2(3, N = 64) = 10.828$, $p = 0.013$, Table 5.7] and 17 to 26 months old [Kruskal-Wallis $X^2(3, N = 79) = 7.549$, $p = 0.056$, Table 5.7]. Specific pairwise differences can be found in Table 5.8 and Figure 5.10. Although caring for children when they are very young can constrain women's participation, we found that particularly salient associations between childhood nutritional growth and women's participation exist in the early months of childhood, especially when the mother complements breastfeeding

Table 5.5 Means and differences of women's participation in agricultural decision-making across childhood nutritional growth measures

N = 221		Women's Decision-making		Men's Decision-making		Comparing scores (Women's minus Men's)	
WAZ ¹	N	$X^2(3)$	<i>p</i>	$X^2(3)$	<i>p</i>	$X^2(3)$	<i>p</i>
	221	7.275	0.064*	4.051	0.256	6.581	0.087*
	n	Mean	SD	Mean	SD	Mean	SD
Below -2	20	3.100	2.972	4.250	2.653	-1.150	5.489
-2 to -1	67	2.284	2.527	5.343	2.683	-3.060	4.687
-1 to 0	90	2.767	2.380	5.089	2.406	-2.322	4.039
0 and above	44	3.636	2.796	4.614	2.789	-0.977	4.820
HAZ	N	$X^2(3)$	<i>p</i>	$X^2(3)$	<i>p</i>	$X^2(3)$	<i>p</i>
	221	0.734	0.865	2.759	0.430	1.137	0.768
	n	Mean	SD	Mean	SD	Mean	SD
Below -2	72	2.764	2.592	5.125	2.567	-2.361	4.754
-2 to -1	73	2.685	2.619	4.918	2.676	-2.233	4.138
-1 to 0	47	2.979	2.549	4.617	2.507	-1.638	4.748
0 and above	29	3.069	2.711	5.483	2.654	-2.414	5.068
WHZ	N	$X^2(3)$	<i>p</i>	$X^2(3)$	<i>p</i>	$X^2(3)$	<i>p</i>
	221	4.222	0.239	2.248	0.523	4.556	0.207
	n	Mean	SD	Mean	SD	Mean	SD
Below -2	6	2.833	3.251	4.000	2.530	-1.167	5.707
-2 to -1	33	2.394	2.669	5.394	2.549	-3.000	5.062
-1 to 0	82	2.524	2.415	5.085	2.654	-2.561	4.500
0 and above	100	3.210	2.656	4.850	2.583	-1.640	4.403

1 WAZ: weight-for-age z-scores, HAZ: height-for-age z-scores, WHZ: weight-for-height z-scores
Significant levels at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.6 Dunn's tests of distributional differences in women's participation in agricultural decision-making across childhood weight-for-age z-scores

	Women's decision-making					
	<i>RM-CM</i> ¹	<i>p</i>	<i>RM-CM</i>	<i>p</i>	<i>RM-CM</i>	<i>p</i>
WAZ ²	Below -2		-2 to below -1		-1 to below 0	
Below -2						
-2 to below -1	-1.117	0.793				
-1 to below 0	-0.245	1.000	1.388	0.496		
0 and above	0.871	1.000	2.677	0.022**	1.607	0.324

Comparison score (Women's minus Men's Decision-making)						
	<i>RM-CM</i>	<i>p</i>	<i>RM-CM</i>	<i>p</i>	<i>RM-CM</i>	<i>p</i>
WAZ	Below -2		-2 to below -1		-1 to below 0	
Below -2						
-2 to below -1	-1.476	0.419				
-1 to below 0	-0.643	1.000	1.347	0.534		
0 and above	0.365	1.000	2.446	0.043**	1.399	0.486

1 *RM-CM*: row mean minus column mean

2 WAZ: weight-for-age z-scores

p-values are adjusted with a Bonferroni correction

Significant levels at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

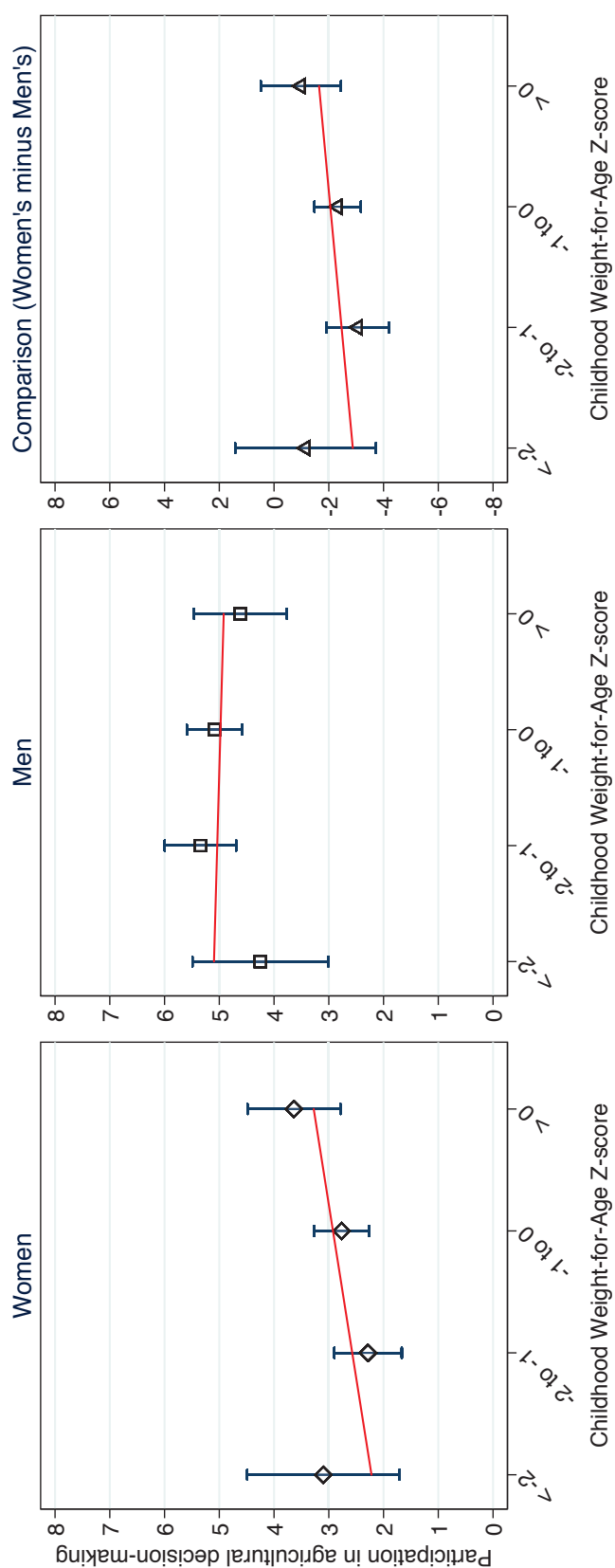


Figure 5.4 Mean participation in agricultural decision-making across childhood weight-for-age z-scores in women and men. Note: Diamond-shaped markers represent women. Square markers represent men. Triangle markers represent the difference in participation. The whiskers depict a 95% confidence interval. The red line is the predicted participation from a linear regression of reported participation and childhood weight-for-age z-score categories.

Table 5.7 Kruskal-Wallis H tests of distributional differences in women's participation in agricultural decision-making across childhood weight-for-age z-scores and potential confounders

Stratification 1 Variable	Stratification 2 Childhood Nutrition	Within Stratum 1		Between Strata	
		$X^2(3)$	p	$X^2(df)$	p
Gender of Household Head					
Male (n=173)	WAZ ¹	9.361	0.025**	0.252	0.616
Female (n=48)	WAZ	0.709	0.871	$df = 1$	
Household asset					
Highest tertile (n=70)	WAZ	3.843	0.279	1.074	0.585
Middle tertile (n=89)	WAZ	0.740	0.864	$df = 2$	
Lowest tertile (n=62)	WAZ	8.220	0.042**		
Mother's BMI					
Normal (n=146)	WAZ	8.339	0.040**	8.466	0.015**
Underweight (n=32)	WAZ	5.324	0.150	$df = 2$	
Overweight or obese (n=43)	WAZ	9.370	0.025**		
Mother's education					
Higher than primary (n=79)	WAZ	1.790	0.617	2.439	0.295
Completed primary (n=100)	WAZ	5.267	0.153	$df = 2$	
Lower than primary (n=42)	WAZ	2.998	0.392		
Mother's age (year)					
15-28 (n=70)	WAZ	0.429	0.934	18.427	0.0001***
29-33 (n=77)	WAZ	4.026	0.259	$df = 2$	
34-46 (n=74)	WAZ	3.818	0.282		
Child's age (month)					
6-16 (n=64)	WAZ	10.828	0.013**	10.109	0.006***
17-26 (n=79)	WAZ	7.549	0.056*	$df = 2$	
27-36 and above (n=78)	WAZ	1.601	0.659		
Child's sex					
Female (n=115)	WAZ	7.104	0.069*	0.707	0.4003
Male (n=106)	WAZ	1.703	0.636	$df = 1$	
Child was dewormed					
No (n=105)	WAZ	5.384	0.146	0.165	0.684
Yes (n=116)	WAZ	3.687	0.297	$df = 1$	

¹ WAZ: weight-for-age z-score divided into 4 strata: i) below -2 ii) -2 to below -1 iii) -1 to below 0, and iv) 0 and above

Significant levels at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.8 Dunn's test of distributional differences in women's participation in agricultural decision-making across childhood weight-for-age z-scores

Sub-Strata	WAZ ²	RM-CM ¹	p	RM-CM	p	RM-CM	p
Male-headed households (n=173)	Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 -0.786 0.127 1.413	Below -2 1.000 1.000 0.473	-2 to below -1 1.454 3.055	0.437 0.007***	-1 to below 0 1.946	0 0.155
Lowest tertile households asset (n=62)	WAZ Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 -0.045 0.569 2.063	Below -2 1.000 1.000 0.117	-2 to below -1 0.950 2.781	1.000 0.016**	-1 to below 0 2.145	0 0.096*
Mother, normal BMI (n=146)	WAZ Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 1.019 2.103 2.308	Below -2 0.924 0.106 0.063*	-2 to below -1 1.719 1.958	0.256 0.151	-1 to below 0 0.549	0 1.000
Mother, BMI ≥ 25 kg/m ² (n=43)	WAZ Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 -2.153 -2.800 -1.499	Below -2 0.094* 0.015** 0.401	-2 to below -1 -0.527 0.992	1.000 0.963	-1 to below 0 1.830	0 0.202

(continue)

Table 5.8 (continue)

Sub-Strata	WAZ	RM-CM ¹	<i>p</i>	RM-CM	<i>p</i>	RM-CM	<i>p</i>
Child 6 to 16 months old (n=64)	Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 0.285 1.104 2.373	Below -2 1.000 0.809 0.053*	-2 to below -1 1.152 2.870	0.748 0.012**	-1 to below 0 2.203	0.083*
Child 17 to 26 months old (n=79)	Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 -1.866 -0.721 -1.181	Below -2 0.186 1.000 0.713	-2 to below -1 2.434 0.917	0.045** 1.000	-1 to below 0 -0.904	1.000
Female child (n=115)	Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 -0.687 0.294 1.218	Below -2 1.000 1.000 0.670	-2 to below -1 1.582 2.618	0.341 0.027**	-1 to below 0 1.387	0.497
Child was not dewormed (n=105)	Below -2 -2 to below -1 -1 to below 0 0 and above	Below -2 -0.863 -0.773 0.335	Below -2 1.000 1.000 1.000	-2 to below -1 0.208 2.012	1.000 0.133	-1 to below 0 1.988	0.141

¹ RM-CM: row mean minus column mean

2 WAZ: weight-for-age z-scores

p-values are adjusted with Bonferroni correctionsSignificant levels at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

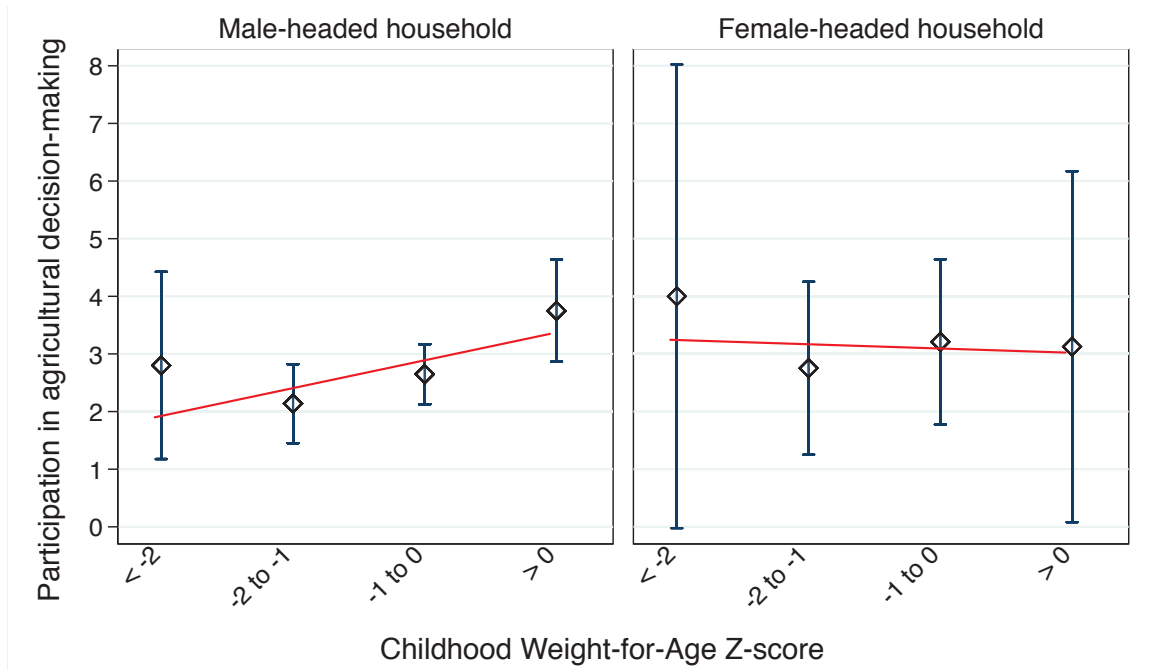


Figure 5.5 Women's mean participation in agricultural decision-making stratified by childhood weight-for-age z-scores and by gender of household heads.

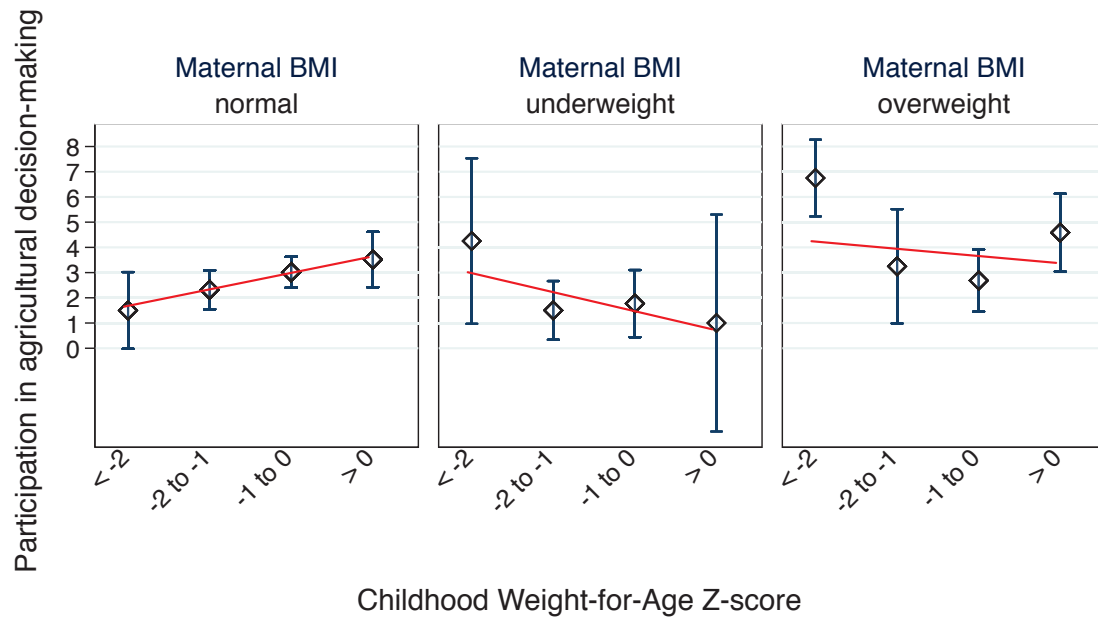


Figure 5.6 Women's mean participation in agricultural decision-making stratified by childhood weight-for-age z-scores and by women's body mass index (BMI).

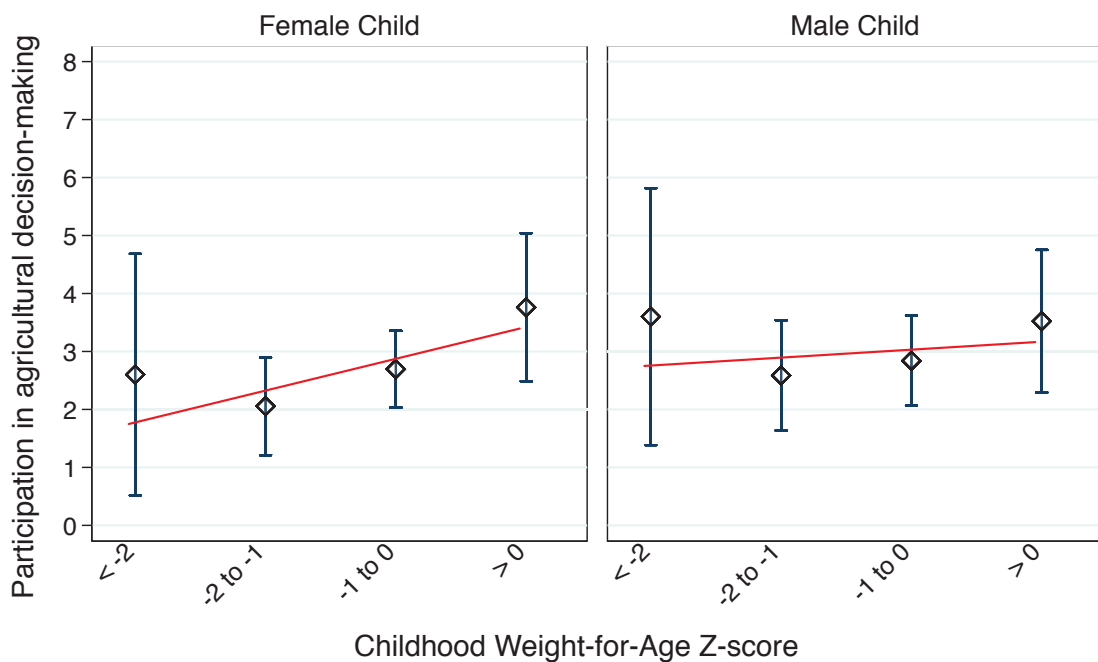


Figure 5.7 Women's mean participation in agricultural decision-making stratified by childhood weight-for-age z-scores and by child sex.

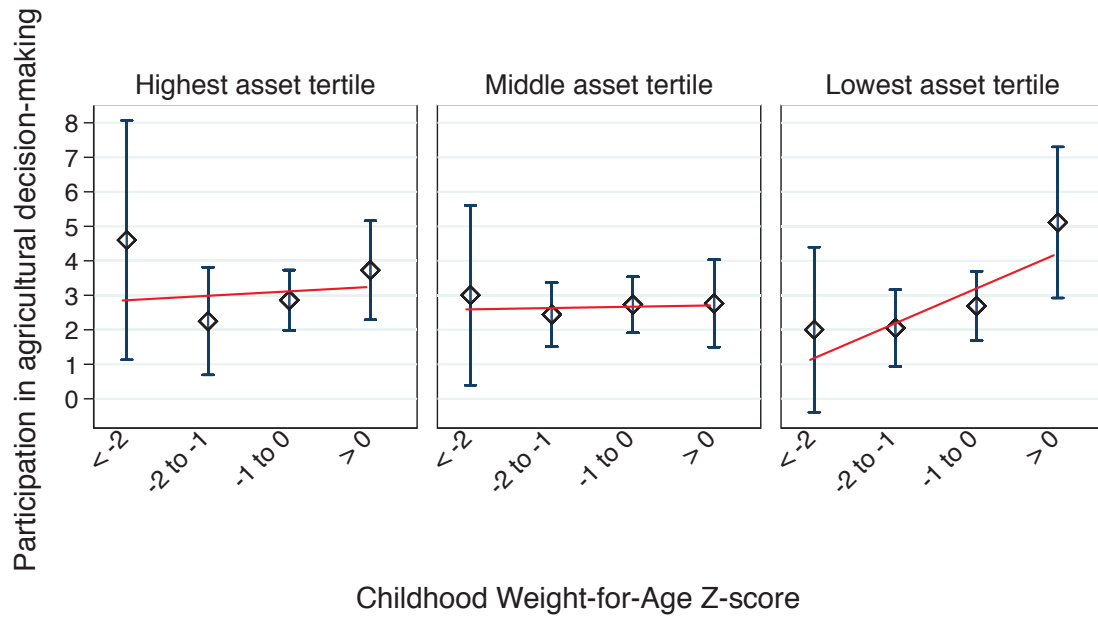


Figure 5.8 Women's mean participation in agricultural decision-making stratified by childhood weight-for-age z-scores and by household asset tertiles.

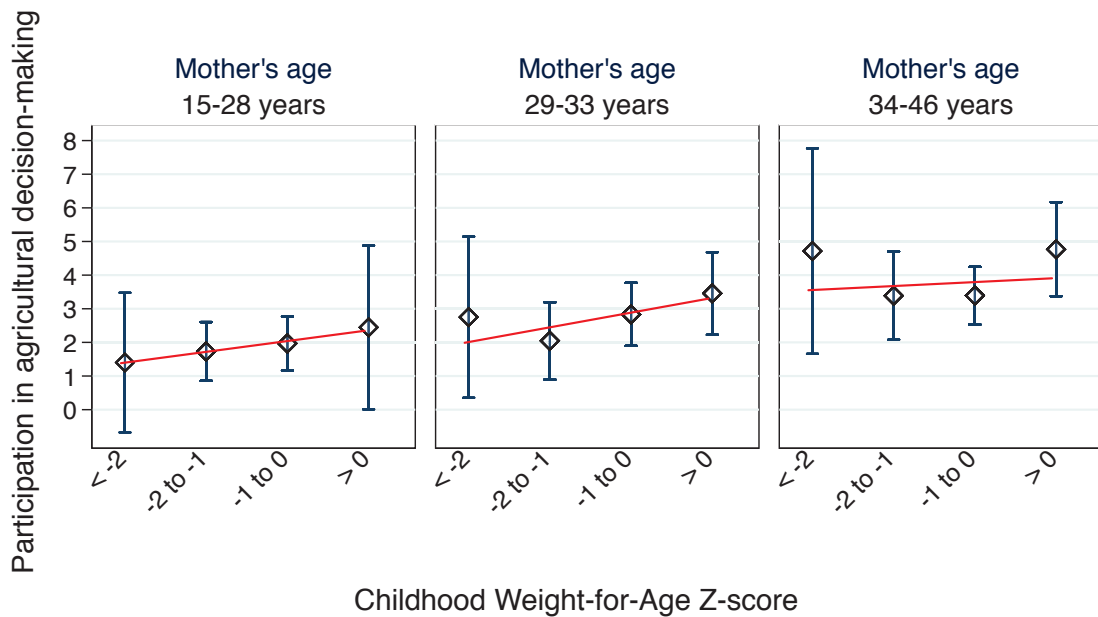


Figure 5.9 Women's mean participation in agricultural decision-making stratified by childhood weight-for-age z-scores and by mother's age.

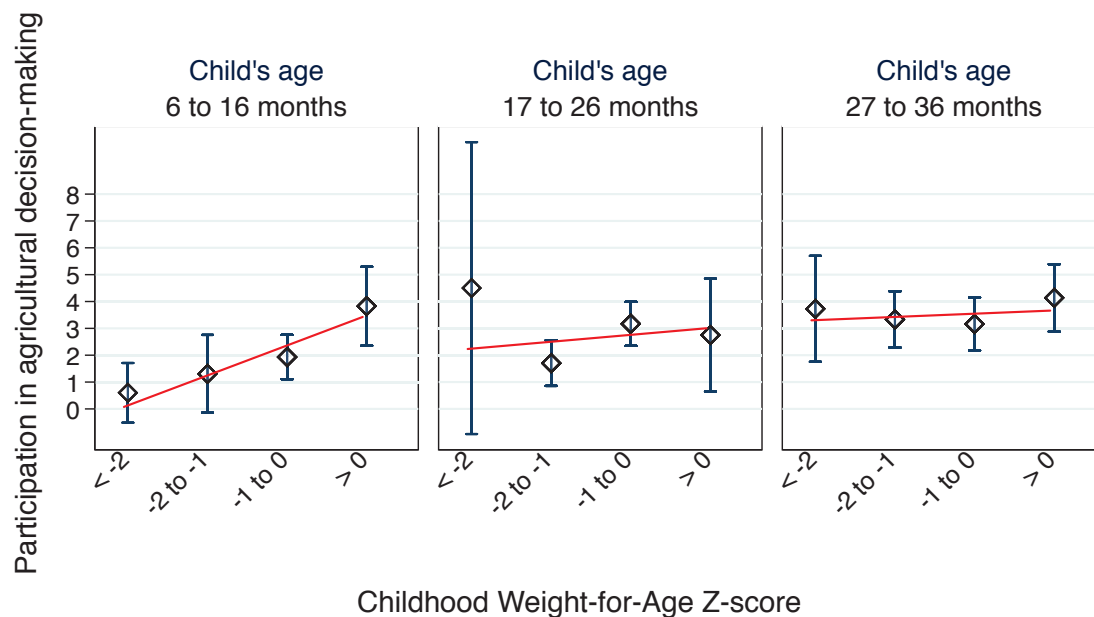


Figure 5.10 Women's mean participation in agricultural decision-making stratified by childhood weight-for-age z-scores and by child's age.

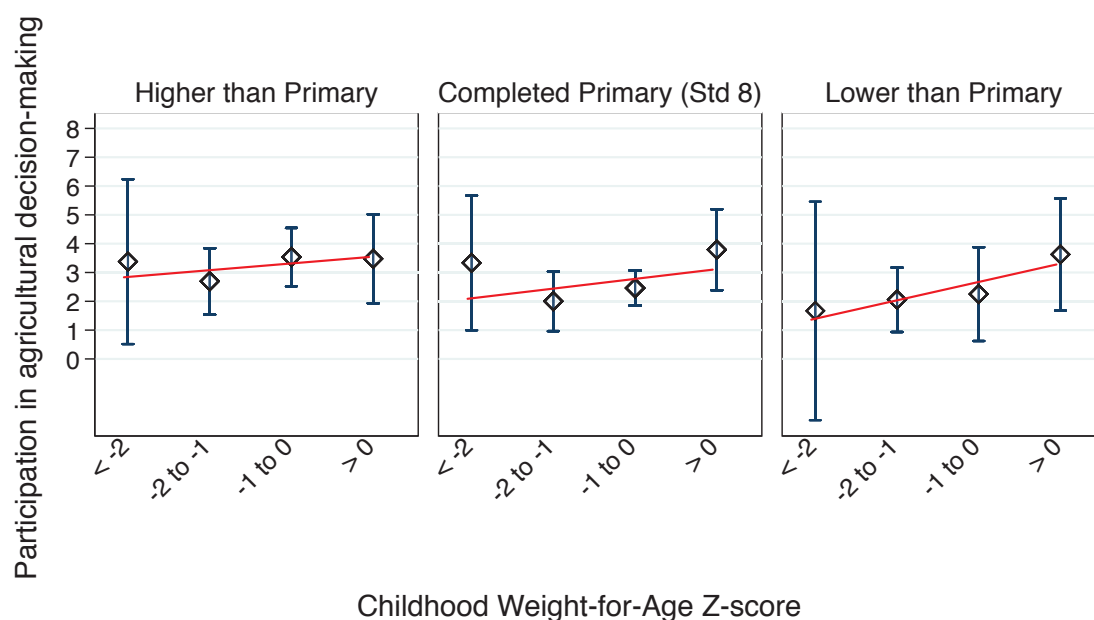


Figure 5.11 Women's mean agricultural decision-making participations stratified by childhood weight-for-age z-scores and by maternal education.

with weaning food after the child is six months old.

Fourth, we tested whether women's education attainment could be a potential confounder of women's participation in decision-making and children's WAZ scores. A variable must be associated with childhood WAZ measures *and* women's participation in decision-making to be considered a potential confounder. We did not find a significant association between women's education and nutritional growth measures of WAZ, HAZ, or WHZ (Table 5.4) nor a significant association between women's education and their participation in decision-making (Kruskal-Wallis H-test $X^2(2, N = 221) = 2.439, p = 0.295$, Table 5.7, Figure 5.11]. These findings contribute to our understanding of complex social-determinants of child nutrition.

5.5 Discussion

The findings have four major implications. First, our study found a significant positive association between childhood WAZ measures and women's participation in decision-making. However, we did not observe an association in childhood HAZ and WHZ measures. Previous reviews of women's autonomy and child nutrition suggested that the WHZ ratio is more closely associated with women's autonomy in child-feeding behavior, whereas the HAZ ratio is more closely associated with mother's autonomy in maternal and child health access and the child's exposure to diseases (Carlson *et al.*, 2015). The WAZ ratio is the composite indicator of the first two, which is an overall measure of childhood nutritional growth. It reflects both the daily fluctuation of body weight and chronic growth conditions associated with poor long-term nutritional intake. National nutritional data indicates that maximal prevalence of low WAZ was among children aged 24 to 35 months, with rural children having a higher prevalence of underweight (13%) than urban children (7%) (KNBS, 2015). National nutritional records (Table

5.1) also indicated that child nutritional growth fluctuated at a greater range, especially in arid and fragile agronomic regions (Nubé & Sonneveld, 2005).

Second, our study suggests that women's participation in agricultural decision-making varies with the child's nutritional growth measures. Here, it is possible that child nutritional performance provides affirmation to mothers who are participating in agricultural decision-making to gain further confidence in voicing their concerns regarding food crops that will become available for domestic use. Poor child nutritional performance, to the degree that the child is underweight, may delegitimize a mother's ability to provide nourishment (Mukuria, Martin, Egondi, Bingham, & Thuita, 2016; Mwangome, Prentice, Plugge, & Nweneka, 2010). Children with undernutrition are also more prone to illnesses that might occupy the mother's attention, potentially lowering their participation in agricultural decision-making (Colvin *et al.*, 2013). The negative relationship can also be understood in cases where women who are more involved in farm management have less time and attention to care for sick children, exacerbating their nutritional growth, as we observed in female-headed households. A reverse mechanism is possible where women incorporate their preferences as care-givers, food providers, and agricultural producers as they make agricultural decisions. Women engaging in agricultural decision-making may consider crop and dietary diversity within the home. We argue that both mechanisms are likely present in a reinforcing feedback loop. Here, the feedback mechanism enables the well-nourished children to enhance women's participation in decision-making on the farm, which influences dietary and nutritional food intake. Having poorly-nourished and sick children reduces women's participation in farm decision-making, constraining the inclusion of women's preferences in the subsistence crops grown on the farm.

Our results also showed that a feedback mechanism appears to be missing between childhood nutritional status and men's participation in agricultural decision-making. Men's effort in smallholder and subsistence agricultural production is critical to a household's livelihood outcome. However, our results suggest that the benefits of this effort may not be observed in childhood nutritional growth. Men's preferences, reflected in their agricultural decisions, may be aimed towards increasing household income, for example, by investing in cash crop cultivation in large portions of their fields, or intensifying the use of agricultural inputs and labour in weeding to increase crop yields (Doss, 2002; Kevane, 2012). However, an increased household income may not trickle down to improving their children's dietary intake and nutrition. Rather, increased income is often associated with increased caloric consumption and access to health care services (Chuma, Okungu, & Molyneux, 2010; Ochako, Fotso, Ikamari, & Khasakhala, 2011). This finding suggests that gender differentiation in preferences related to agricultural production can have a direct association with children's nutritional growth, one of which is possibly through availing diverse diets from nutrition-sensitive agricultural practices (Doss, 2002; Meinzen-Dick *et al.*, 1997). Although nutritional improvements are evident among smallholder communities that are working to overcome constraints in their agricultural yield and household food security (Evers & Walters, 2000), sustained policy efforts remain critical, especially in the ASAL, to reduce the high prevalence of stunting and underweight (KNBS, 2015). This also corroborates observations that women are often more likely to spend a higher proportion of additional income, whether from harvest or non-farm activities, on domestic consumption and inputs into their children's health and nutrition (Quisumbing, Brown, Feldstein, Haddad, & Peña, 1995).

The significant association found between well-nourished children and balanced participation in decision-making between men and women, and the significant association found in male-headed households but not in female-headed households indicated that two mechanisms are likely at play. First, women's observation of children in childcare informs women's preferences in their agricultural decision-making. Second, a more gender-equitable decision-making dynamic among men and women within male-headed household is likely related to better child nutritional growth. In female-headed households, findings showed that women's participation in agricultural decision-making did not significantly differ across children's nutritional growth measures. Although women's preferences can also be reflected in their agricultural decision-making within female-headed households, the potential benefits are offset by limitations that female-headed households normally face. The feedback mechanism suggested in our conceptual framework (Figure 5.2), where women's decision-making is informed by children's nutritional growth conditions, may be secondary to the economic constraints often experienced in female-headed households. Poorer access to livelihood capitals, such as smaller and less fertile land parcels, credit, information, off-farm household income, and shortage in farm and child-rearing labour, likely contribute to lower agricultural productivity, lower nutritional food intake, and a higher prevalence of child stunting (Onyango *et al.*, 1994). In contrast, the process of planning and joint decision-making with other household members can reduce trial and error in livelihood activities (Kabeer, 2010). In male-headed households, our findings align with previous literature on child health care seeking (Molyneux, Murira, Masha, & Snow, 2002), and rural credits and savings (Ashraf, 2009), indicating improvements in childhood and household wellbeing when mothers were more actively involved in decision-making. Higher levels of participation in decision-making observed in female-headed households may be driven

by need, such as in households with widows or single mothers. Policy and programmatic efforts that encourage women to participate more and men to welcome women's participation can contribute to changing the gender power hierarchies within households.

Cognizant that there are traditional allocations of gender roles on various farm activities, our measure of dynamics in intra-household decision-making cannot be interpreted in absolute terms. Research has previously shown that women tend to under-report their household decision-making power relative to reports given by their husbands (Becker, Fonseca-Becker, & Schenck-Yglesias, 2006). Our data did not contain self-reports of participation in decision-making by men. This could have been compared with women's self-reported responses for data validation. Furthermore, the comparison score between men and women cannot differentiate households with men and women who both had low participation (e.g. men's index score = 2 and women's index score = 2) or both had high participation (e.g. men's index score = 8 and women's index score = 8). These two types of households would have comparison scores close to zero but different decision-making dynamics or agricultural productivity. Our data did not have sufficient detail to unpack these possibilities.

Second, our study found significant relationships between childhood nutritional measures and participation in decision-making by women with a normal BMI. This association is not observed among underweight women. This finding has potentially important implications for the cycle of undernutrition that continues from mothers to daughters. Maternal undernutrition is known to contribute to fetal growth restriction and increases the risk of stunting in children (Black *et al.*, 2013). Although we lacked a sufficient sample size of underweight women to test for statistical significance, our data revealed that a similar cycle may exist in rural semi-arid Kenya. Among mothers who were underweight, 13 percent had underweight children (WAZ

<-2), compared to eight percent among mothers with a normal BMI and nine percent among overweight or obese mothers. However, we found that a male child's nutritional growth measures did not vary significantly with women's participation in agricultural decision-making. This finding aligns with the reported systematic gender-bias in intra-household food allocation for boys in the Kamba region of Mwingi and Makueni districts in eastern Kenya (Ndiku, Jaceldo-Siegl, Singh, & Sabaté, 2011), where female children were reported to consistently have lower food intake than male children. Furthermore, parents with a gender preference towards sons have been reported to more likely have more children until their preferred daughter-to-son ratio is met (Kevane, 2012). Averaging across households with this gender preference, girls will more likely have more siblings than boys, possibly resulting in lower expenditure per child in these households. Our results from the stratification by household asset levels and, separately, by child sex supported this interpretation. The feedback relationship observed between women and child nutritional growth is significant among the most marginalized groups, households in the lowest asset tertile, and young girls. In our research sample, female children with optimal nutritional growth measures were associated with mothers who reported having high participation in agricultural decision-making. This evidence has implications for potentially breaking the undernutrition cycle prevalent among women and girls in marginalized households with limited assets or agricultural resources.

This study also identified that the mother's age and child's age were important confounders to the observed associations. While we adjusted the age variables by stratification, residual confounding might be present within each stratum. Nevertheless, there are policy implications from the two-level stratification analysis. We found that older women are associated with greater participation in decision-making. Studies have previously found that women's livelihood assets

and intra-household bargaining power were associated with women's age and education in Ethiopia (Mabsout & van Staveren, 2010) and in Bangladesh (Quisumbing & de la Brière, 2000). Research from Africa, Asia, Latin America (Aubel, 2012), and in Kenyan Kamba communities (Po & Bukania, 2016) on grandmothers' roles in children's nutrition support our findings concerning women's participation in decision-making. Moreover, among older children, we found an associated greater participation in women. Children six to 16 months old are commonly breastfed and consume weaning food. In comparison, older children in our study likely required less attention from their mothers, enabling mothers to re-engage in agricultural production and increase their participation in farm decision-making. After adjusting for children's ages, a significant association between their WAZ measure and women's participation in decision-making among the youngest age group remained. The finding suggests that there is a critical time frame when the feedback mechanism may be differentially pertinent to very young children and implies that dietary diversity available at the household is critical when children begin to consume weaning food.

There is already a substantial body of literature linking social determinants, such as women's education, to improvements in women's status and bargaining power. However, our results did not find a significant association between children's nutritional growth measures and their mother's formal education. Evidence on the effects of formal education on early childhood nutrition, mortality, and health service use has been inconsistent (Appleton, Hoddinott, & Mackinnon, 1996; Basu & Stephenson, 2005; Bicego & Boerma, 1993). Interestingly, Basu and Stephenson (2005) discussed how resource-constrained education systems often teach students to respect and obey authority figures, disproportionately suppressing women's opportunities to think critically and independently. Correspondingly, observable child and maternal health benefits

from delayed childbirth and increased income-generating opportunities may not be observed until women reach post-secondary education. Complementary to formal education, efforts in sharing applied knowledge on drought resistant crops, dietary diversity, and maternal child health by non-governmental organizations, government extension services, or informally within farmers' groups in their communities of practices may be more influential in enhancing household food and nutrition security. The interplay between education, culture, and decision-making is extremely complex. The result concerning maternal education raises questions that will require further examination in future research.

Women's involvement in agricultural decision-making is a pertinent measure of their empowerment in small-scale subsistence farming communities. Our results shed light on some of the complexities and feedback mechanisms regarding intra-household decision-making within smallholder agricultural livelihoods and childhood nutrition. Further research is needed to better understand the changing family dynamics occurring within rural households, including the emergence of proxy female-heads in households where men are working away from the homestead. More nuanced measures of headship are developing to capture this family dynamic (Mason, Ndlovu, Parkins, & Luckert, 2015). Future food security policies can benefit from a greater consideration of the gender biases in household food allocation. Programmatic efforts are needed to sensitize men's agricultural preferences to more closely reflect household nutritional needs. Gender transformative approaches (Evans, 2014; Njuki, Kaler, & Parkins, 2016), such as educational programs that encourage collaborative and equitable decision-making processes between men and women can contribute to greater adoption of nutrition-sensitive agriculture in rapidly changing social contexts.

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CHAPTER 6

GENERAL DISCUSSION AND CONCLUSION

6.1 Summary

The purpose of this research was to improve our understanding of the relationships between the social and institutional elements affecting women's land resource access and household food and nutritional security among the Kamba smallholder communities of semi-arid Kenya. The conceptual framework for this research, outlined in Chapter 1 (Section 1.4.5), drew largely from scholarship on the sustainable livelihoods approach and theories concerning natural resource access, social capital, and social-ecological resilience.

In Chapter 2, I demonstrated that although Kamba women's access to land resources is often tenuous, their challenges are heterogeneous across life stages. Kamba women reported using various relational access mechanisms, such as labour-sharing among neighbours, farmer groups, and family members, to create multiple sources of labour supply, especially when they become less physically able to cultivate land in old age. However, I also revealed the resilience of the customary land tenure system to women having a new formal constitutional right to inherit land. Local gender norms and land relations appeared to influence women's independent land ownership to a greater extent than their formal legal entitlement or financial capacity to buy land.

In Chapter 3, through the comparative study of two grandmothers in Kambaland, I focused on the livelihood assets that grandmothers possess to facilitate access to land resources within their communities. I found that their stock of social capital through familial and community networks facilitated their land tenure security and accumulation of financial capital. In skipped-generational households where grandparents raise their grandchildren, the narratives of

the two grandmothers showcased how structural poverty across generations can be intertwined with autonomy in land resource use.

Based on my research findings from the case study regarding women's use of relational access mechanisms (Chapter 2) and grandmothers' social capital (Chapter 3), I further investigated the relationships between social capital and women's participation in agricultural decision-making in Chapter 4. Drawing from a sample of households in Machakos and Makueni Counties, my findings indicate that women's bonding social capital had a significant association with their participation in agricultural decision-making. Furthermore, the presence of a market place in a village facilitated informal information exchange, while the presence of a chief's office facilitated women in acquiring information and training. These results demonstrate that there are often cross-scale interactions. Although I found a negative association between linking social capital and women's participation in decision-making, the negative relationship was weakened when the administrative division where the women resided had a high prevalence of poverty.

There also appeared to be a feedback mechanism between children's nutritional growth and women's participation in agricultural decision-making, which was not observed among Kamba men (Chapter 5). The feedback between women and children was observed among households led by men, but not among households led by women, which may suggest the presence of more equitable gender power dynamics between men and women. I also found that women's participation in agricultural decision-making was protective of girls' nutritional growth measures, which could have implications for breaking the cycle of undernutrition among women and their daughters. Based on the results of Chapters 2, 3, 4, and 5, I now discuss the major themes that emerged from this dissertation.

6.2 Major themes

Noting the common themes emerging throughout this dissertation provides an opportunity to further our theoretical understanding of panarchy within social-ecological resilience theory, namely: nested adaptive cycles, memory, and cross-scale interplay.

6.2.1 Nested systems

Panarchy has been described as a heuristic model of nested adaptive cycles emphasizing cross scale interplay. Systems nested across different scales are exemplified through revolt and memory (Gunderson & Holling, 2002). Revolt can simply be understood as disturbances and changes from a lower-scale of a nested system triggering changes at a higher-scale, an interaction initiated from lower to the higher scales (Folke, 2006). An example would be where the revolt of a few individuals triggers a population-wide revolution. In contrast, memory can be understood as a top-down interaction, where components from systems at a higher-scale guide the functioning of systems at lower scales. One example here could be the transfer of indigenous seed varieties from mothers to daughters (Mucioki, Johns, & Mucioki, 2016), where older generations represent systems at a higher scale, and newer generations represent systems at a lower scale. The seed varieties that store the biological material from a mother's successful harvest in a previous season is transferred to a plot of her daughter, which contains different system characteristics, such as soil composition, seasonal rainfall, and agricultural inputs. Yet the seeds are passed on for the purpose of improving the daughter's chances in her future harvest.

Systems react to disturbances slowly at higher scales, while systems that are nested within are faced with smaller disturbances that occur more rapidly (Fath, Dean, & Katzmair, 2015; Folke, 2006). Borrowing the nested characteristics of panarchy found in social-ecological resilience thinking, and the conceptual framework presented in Chapter 1, I visualize Kamba

women's land resource access at three nested scales (see Figure 6.1). First, the system in the highest scale consists of the social-ecological systems present in semi-arid Kenya. Characteristics at this scale change slowly, for example, soil erosion and fertility decline are observed over decades. Soil fertility depletion is countered incrementally by national conservation efforts or legume cultivation, the application of manure or chemical fertilizer, or letting the field lie fallow (Leigh, 2002).

Second, cultural values, institutional processes, and organizational structures are nested within the broader social-ecological system and evolve at a moderate speed. For example, Kamba's customary laws on land succession have been practiced for many generations. The norms are rarely challenged. However, women's education and entry into formal labour markets are changing interpretations of customary laws. Cross-scale interplay can be observed from the impacts of broader political changes, such as the Kenya's independence in 1963, or the sharp increase in food prices in 2008, on the social-ecological system (an upward impact) and on household livelihoods (a downward impact). Such disturbances offer opportunities for an influx of innovation during the process of restructuring: breaking existing rules and establishing new rules within the system (Fath, Dean, & Katzmair, 2015; Walker, 2006).

Third, systems at the lowest nested scale involve household livelihood systems, with system components including livelihood assets, resource access mechanisms, intra-household negotiation, and the feedback relationships with food and nutritional security. The household system is impacted by systems in the higher scales: for example, the administrative process for land registration constraining women's independent accumulation of natural capital, and the broader impact of the drought across the Horn of Africa in 2011 and 2012 affecting household crop and livestock production (Opiyo, Wasonga, Nyangito, Schilling, & Munang, 2015).

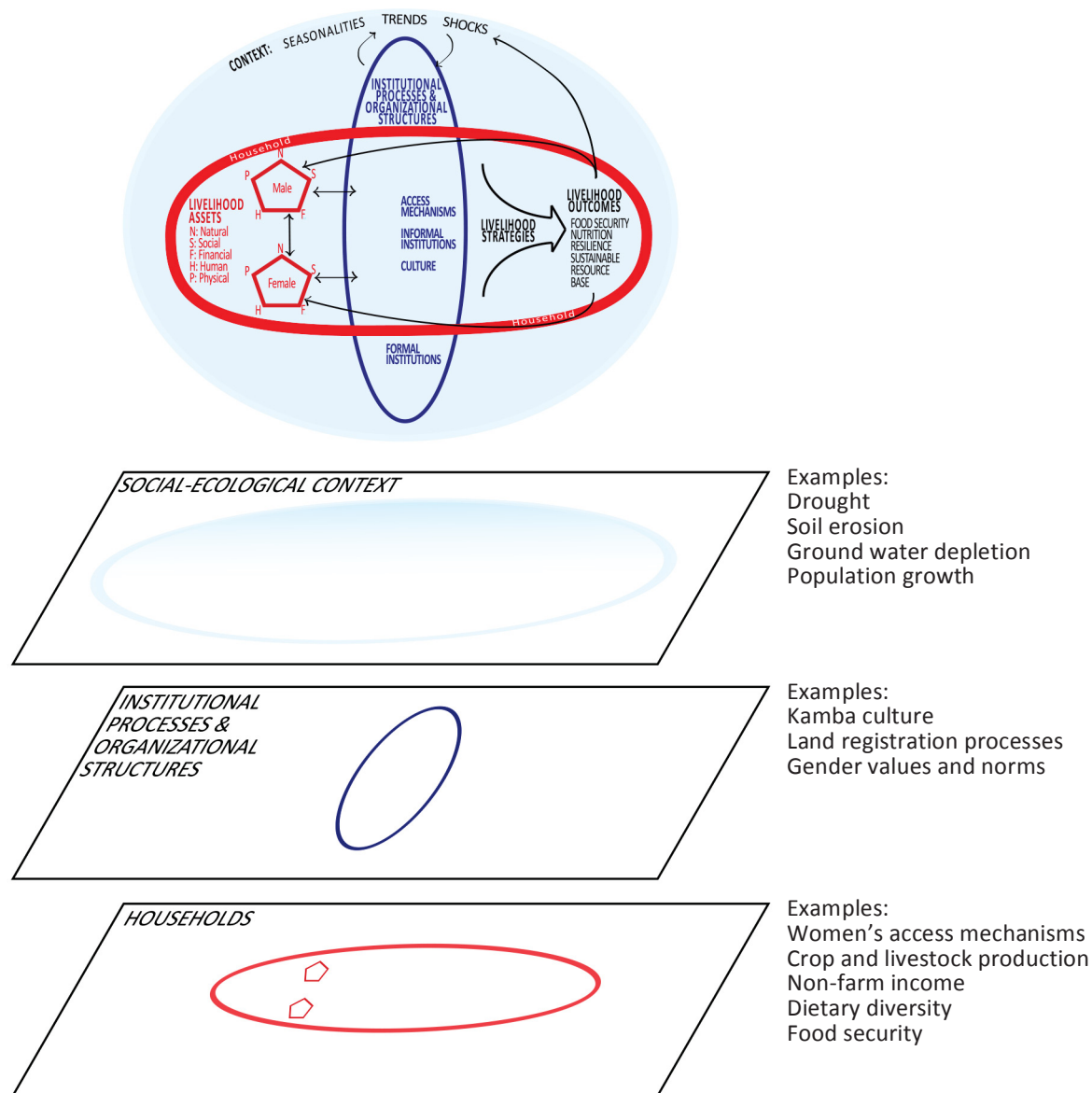


Figure 6.1 Conceptual framework across scales: the social-ecological context, institutional processes and organizational structures, and households.
 Note: Households are nested within institutional processes and organizational structures, which are nested within a social-ecological context. *Source:* author (2017)

Changes to livelihood outcomes, such as household income and the nutritional status of children, have the potential for the most rapid changes. In the semi-subsistence agricultural systems under study, changes in agricultural production can occur from season to season; the flow of non-farm income can fluctuate from job to job.

Considering the different livelihood components at different scales helps situate policy objectives and program efforts within the complex social-ecological system. For example, enhancing women's empowerment through formal education and increased political representation aims to change the status quo of institutional structures and processes and, at an individual level, improve a woman's opportunities for better employment. Enhancing women's empowerment through establishing space for informal dialogue in the village, and placing recognizable value in women's traditional ecological knowledge while supporting their practices, can also have implications across multiple scales.

6.2.2 Memory

The theme of memory in the context of panarchy also emerged in the chapters of this dissertation. Within social-ecological systems, memory can be observed when components from previous phases of the adaptive cycle influence the controls and functions of the present system (Gunderson & Holling, 2002; Wilson *et al.*, 2017). In ecological systems, an example of memory is forest regeneration after a fire. The genetic information stored in the seeds and soil that are left after a forest fire, and the plants and animals from the surrounding area, facilitate forest recovery. In the case of social-ecological systems, resource users add a dimension of preparedness and response to disturbances to the system by drawing on memory (Fath, Dean & Katzmaier, 2015).

In social systems, resilience has been theorized as the ability to re-organize, learn, or adapt to disturbances (Folke, 2006; Smit & Wandel, 2006). The success of the relatively fast-moving

reorganization phase to recover from disturbances largely depends on sufficient livelihood capitals being conserved and the decisions made in previous phases. In the Kamba case study (Chapter 2), a “large stock of resources from which [they] can pull during a crisis, both in terms of organizations and their relationships” (Fath *et al.*, 2015, p. 26) is exemplified by women’s entitlement to land inheritance from their natal family and efforts to prepare for, cope with, recover from, and adapt to shortages of land resources through multiple types of access mechanisms. For grandmothers (Chapter 3), the conserved capital not only bolstered resilience in times of disturbance, but also contributed to their grandchildren’s lives. A land succession policy that aims to improve gender equality could be used to help build the resilience of women’s land resource access across generations.

Memory in the context of panarchy is often characterized as the linkages between broader, slower changing systems, and smaller, more rapidly changing systems (Gunderson & Holling, 2002). The vicious metabolic cycle of an underweight women giving birth to a low birth weight child, who is more likely to mature as stunted and underweight, provides a negative example of memory. Programs that strive to improve children’s nutrition can address the household scale of a complex system. For instance, relatively fast improvements can be observed in an individual child after nutrition intervention, but social and institutional elements related to the stagnation of nutritional development in the larger population are slower to change. Policy and programmatic efforts seeking to improve household food and nutritional security have the potential to be designed to target slower-changing elements of the system, such as gender attitudes around intra-household decision-making, along with improving individual conditions and household livelihoods in a concerted effort to develop nutritional resilience within a community. This aligns

with existing recommendations on promoting nutrition-sensitive agriculture in smallholder systems (Jaenicke & Virchow, 2013; Pinstrup-Andersen, 2013; Webb & Kennedy, 2014).

6.2.3 Cross-scale interplay

A third characteristic of panarchy is the presence of cross-scale interplay, such as the bilateral flow of information across scales (Gunderson & Holling, 2002; O'Brien & O'Keefe, 2010). Having both traditional top-down forms of information flow, such as government-appointed chiefs and agricultural extension officers sharing information with farmers, and bottom-up information flows, such as farmers' co-operatives sharing their experiences of crop disease with agricultural officers at the Department of Agriculture, are institutional structures relevant to the development of resilient systems. Focusing on the context of semi-arid rural Kenya, this dissertation revealed a third type of information flow that is influenced by cross-scale interplay. In Chapter 4, bonding social capital among women was found to encourage a horizontal flow of information to members and non-members of farmer groups. In this case, Kamba women's bonding social capital can encourage women's participation in decision-making by sharing nuanced experiences of intra-household negotiation with extended family and neighbours whom they trust. Such diffusion of information is not usually publicized in farmer groups, or captured systematically in information and advice networks (Baird, Jollineau, Plummer, & Valenti, 2015; Kiptot, Franzel, Hebinck, & Richards, 2006).

Sharing experiences of intra-household negotiation among women has the potential to shift cultural norms, gender attitudes, and behaviours. Although a horizontal flow of information occurs within one scale of the multi-scalar system (i.e. among individuals sharing strong ties), I found it is also influenced by slow-changing system elements, especially traditional gender values and norms at the community level. Furthermore, regional education levels facilitate

women's participation in intra-household decision-making. Results indicate that such an interplay between regional, village, and household system components are present and, if better taken into account in policy and programmatic efforts, may facilitate more effective interventions in smallholder contexts.

6.2.4 Limitations in combining the Sustainable Livelihoods Approach and Social-Ecological Resilience

By embedding the sustainable livelihoods approach within social-ecological resilience theory, the research presented in this dissertation illustrated common themes of nested systems, memory, and cross-scale interplay in Kamba smallholder systems. However, there are several limitations to this conceptualization. First, by depicting nested systems as discrete, the levels of organization are over-simplified. The boundary of complex social-ecological systems in reality is less defined, with system elements that potentially exist at multiple scales. Second, the historical context is not clearly or accurately accounted for. The Kamba people's history is a part of Kamba modern culture and thus influences the social-ecological system at a greater temporal scale than could be accounted for in my research. Third, further attention is needed to address cross-scale system disturbances. For example, drought impacts a vast area of Kenya and has the ability to change the social-ecological system, the institutional structures, and household systems at different rates. As another example, technological interventions are rapidly changing the social-ecological system and impacting actors across scales and at different magnitudes. Further application of this adapted conceptual framework to other smallholder systems and other types of resource access is needed to better address these limitations. Nonetheless, this dissertation informs future public policy options to address slow, moderate, and fast-changing cycles within complex social-ecological systems.

6.3 Future research directions

This research presented insights on the relationships between women's land resource access and household food security in the Kamba communities of arid and semi-arid Kenya. It also generated new questions for further research.

First, longitudinal qualitative research with Kamba communities will allow tracking of the gradual changes in customary institutions, perceptions, and access mechanisms concerning women's access to land resource access. As the constitutional changes from 2010 are in the process of being transformed into legislation, policies, plans, and programs, such research has the potential to contribute to engaging local communities on gender dimensions in land succession, especially in the context of existing customary laws. This would require evaluating new legislation and its implementation in different contexts. Furthermore, a systematic analysis of the cases ruled by local customary tribunals concerning how women have since been gaining legal access to, or are being denied legal access from, land succession would be beneficial. This would offer a more concrete understanding of the interplay between formal and informal land institutions.

Second, this dissertation explored structural social capital dimensions within smallholder agrarian systems. Expanding upon this, the investigation of cognitive dimensions of social capital would be valuable. Cognitive social capital refers to the values and perceptions of groups and individuals as they build relations with one another, such as perceptions of support from public services, shared values and norms, trust, and reciprocity (Grootaert & van Bastelaer, 2001; Narayan & Cassidy, 2001). In understanding how the social structure and roles of various community groups can contribute to enhancing smallholders' livelihoods, future research aiming to understand complementarity among social groups and actors could add valuable insight to

questions of collective action, civic engagement, and the role of local networks in resource governance.

Third, future research could also consider experience-based measures of food security, in order to better capture mild to severe stages of food insecurity before they are manifested in children's growth performance. Some of these indicators, such as the Food Insecurity Experience Scale developed by the Food and Agricultural Organization (Ballard, Kepple, & Cafiero, 2013) or the Coping Strategy Index within the Comprehensive Food Security and Vulnerability Assessment developed by the World Food Program (WFP, 2009), have already been validated, designed to capture early-stages of cognitive distress regarding food insecurity, compromises in the quality and variety of food, shortages of energy intake, and hunger. Additional longitudinal research tracking women and children's nutritional measures, agricultural choices, and crop and dietary diversity would allow further testing of the feedback mechanisms submitted in this dissertation.

Fourth, the social-ecological system and resilience applications explored in this dissertation would benefit from being further examined using methods designed with foundations in systems theory. For example, dynamic modeling has the potential to not only examine the positive and negative feedback mechanisms found in Chapter 5, but also to connect social and ecological factors and their cross-scalar interactions. Such research has the potential to contribute to an improved understanding of the social levers, bottlenecks, and thresholds within smallholder agricultural systems and provide more systemic forecasts of a system's resilience when future shocks and stresses increase in severity and frequency.

6.4 Conclusion

This dissertation had four objectives: to determine how smallholder women access land resources under local institutions (Chapters 2 & 3); to describe the livelihood assets and strategies that smallholder women use to access land resources across their life stages (Chapters 2 & 3); to identify the relationships between smallholder women's social capital and their access to land resources (Chapter 4); and to examine the relationships between child nutrition and smallholder women's access to land resources (Chapter 5).

My findings in Chapter 2 suggest that the confluence of customary values and formal processes in land resource access constrain women's independent access to land resources. Having land resources that are not dependent on marital status has the potential to enhance women's adaptive capacity to sudden ruptures in informal land relations. Sensitizing decision-makers to gender-sensitive concerns and operational barriers in land resource access may help lessen the constraints facing Kamba women. A life-stage perspective can assist in minimizing unintended policy impacts when decision-makers view women's challenges as heterogeneous across their life stages and across generations.

Chapter 3 illustrates the importance of understanding livelihood resource needs and strategies of women in old age who support households with changing family structures, such as skipped-generation households. Policies that can facilitate and support the practice of traditional ecological knowledge, especially by grandmothers, has the potential to enhance household livelihood sustainability. Chapter 4 draws out the relationships between women's participation in decision-making and three dimensions of social capital and analyzes their interactions with regional context. The findings suggest that national and county government efforts to elevate regional education levels, build the capacity of local administrators, and facilitate knowledge

diffusion in safe and functional market places, can have distal but important impacts on women's access to land resources.

Chapter 5 indicates that a gender-equitable decision-making dynamic among men and women is likely related to improved child nutritional growth. Future food and nutrition security policies may further consider incorporating gender transformative approaches, such as educational programs that encourage collaborative and equitable decision-making processes between men and women, not only concerning child feeding practices and health care access, but also nutrition-sensitive agriculture. The feedback loops found in Chapter 5 support the call by the International Food Policy Research Institute (Meinzen-Dick *et al.*, 2011) for more concerted policy and programmatic efforts in reducing undernutrition through the agriculture-gender-nutrition nexus.

Finally, in Chapter 6 I present the concept of panarchy in the context of nested social-ecological systems to highlight how efforts to enhance women's diverse access to land resources can contribute to building adaptive capacity and shifting slow-changing gender values and norms related to household nutrition. Together, the findings presented in this dissertation add to the growing body of research supporting gender-transformative and social-ecologically appropriate approaches to enhancing women's access to land resources in diverse smallholder agricultural systems.

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