Leveraging livelihoods for a food secure future

Smallholder farming and social institutions in southwest Ethiopia

Doctoral thesis by Aisa O. Manlosa

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dedicated to my mother and grandmother
Daisy and Paula
who worked the land
and by their example, helped me see a bit better what agency means
and why it matters to have more of it

Preface

This dissertation contains five chapters. The first chapter opens with a brief conceptual background, a summary, and a synthesis of the dissertation. The second chapter presents the types of livelihood strategies in the study area and how these strategies are associated with capital assets and food security outcomes. The third chapter focuses on the challenges faced by smallholder farming households, their coping strategies, and how these impact on their capital asset base and their abilities to respond to future challenges. The fourth and fifth chapters both focus on the social structures and institutions in which smallholder farming livelihoods are embedded. The focus of the fourth chapter are the gender-related changes in the study area and how the concept of leverage points can be adopted to inform gender transformative approaches which seek to address underlying drivers of gender inequalities. The fifth chapter deals with one of the underlying drivers – that is, social norms that limit people of different genders and socioeconomic backgrounds, affecting their participation in smallholder farming livelihoods and their abilities to be food secure.

In each chapter, I included either a background or a conceptual framework section that provides definitions of key terms and explains concepts used, in slightly more detail. A list of references can be found at the end of each chapter. Supplementary materials are also provided for three of the five chapters. All photos used in this dissertation were taken by me.

It is my hope that this research work will contribute evidence and insights to conversations and debates surrounding farming livelihoods, food security, and gender equality; and inspire further thinking for how to re-situate human agency as the core of livelihoods research and practice.

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Abstract

This dissertation examines how smallholder farming livelihoods may be more effectively leveraged to address food security. It is based on empirical research in three *woredas* (districts) in the Jimma Zone of southwestern Ethiopia. Findings in the chapters that follow draw on quantitative and qualitative data. In this research, I focus on local actors to investigate how they can be better supported in their roles as agents who have the ability to improve their livelihoods and achieve food security. This general aim is operationalized through three research questions that are addressed in separate chapters. The research questions are: (i) How do livelihood strategies influence food security?; (ii) What livelihood challenges are common and how do households cope with these?; and (iii) How do social institutions, in which livelihoods are embedded, influence people's abilities to undertake livelihoods and be food secure?

Using quantitative data from a survey of randomly selected households, I applied a number of multivariate statistical analysis to determine types of livelihood strategies and to establish how these strategies are associated with capital assets and food security. Here I view livelihood strategies as a portfolio of livelihood activities that households undertake to make a living. The predominant livelihood in the study area was diversified smallholder farming involving mainly the production of crops. Food crops such as maize, teff, sorghum, and in smaller quantities – barley and wheat, were primarily produced for subsistence. Cash crops namely coffee and khat were primarily produced for the market. Based on our analyses, we found five types of livelihood strategies to be present along a gradient of crop diversity. Food security generally decreased with less crops being part of the livelihood strategy. The livelihood strategies were associated with households' capital assets. For example, the livelihood strategy with the most number of crops had more access to a wider range of capital assets. They had larger aggregate farm field size, and were more involved in learning with other farmers through informal exchange of information and knowledge. The status of food (in)security of each household during the lean season was measured using the Household Food Insecurity Access Scale (HFIAS). A generalized linear model established that the type of livelihood strategy a household undertook significantly influenced their food security. Other significant variables were educational attainment and gender of household head. The findings contribute evidence to the benefits of diversified livelihoods for food security, in this case, the combination of diverse food crops and cash crops.

Smallholder farming in southwest Ethiopia is beset with process-related and outcome-related challenges. Here, a process-related challenge pertains to the lack of different types of capital

assets that people need to be able to undertake their livelihoods, while an outcome-related challenge pertains to lack of food. The most frequently mentioned process-related challenges were associated with the natural capital either as lack in necessary ecosystem services or high levels of ecosystem disservices. Farming households typically faced the combined challenges of decreasing soil fertility, land scarcity, die-off of oxen due to diseases, and wild animal pests that raided their crops and attacked their livestock. Lack of cash was also common and this was associated with an inability to access goods and services that households needed to address other problems. For example, lack of cash prevented households from buying fertilizers or replacing the oxen they lost to diseases. Confronted with multiple and simultaneous challenges, households coped by drawing on more readily accessible capital assets in order to address a lack. This process is here referred to as capital asset substitution. The findings indicate that when households liquidate a physical asset in order to gain cash which they then use to address other challenges, the common outcome is an erosion of their capital asset base. Many households reported having to sell their livestock to buy fertilizers, as required by the government, without seeing an increase in their harvest. The same process of liquidating capital asset to purchase food particularly during the lean season, also led to erosion of capital assets. On the other hand, when households drew on their social capital to address the challenges, they tended to maintain their capital asset base. The local *didaro* system is one such example in which farming households with adjacent farm fields synchronize their cropping timing and pool their labor together to address the problem of wild animal pests. Human capital, for example, in the form of available labor was also important for coping. Protecting and enhancing natural capital is needed to strengthen the basis of livelihoods in the study area, and maintaining social and human capitals is important to enable farming households to cope with challenges without eroding their capital asset base.

Smallholder farming in southwest Ethiopia is embedded in a social context that creates differentiated challenges and opportunities amongst people. Gender is an axis of social differentiation on which many of the differences are based. Since the coming into power of the currently ruling Ethiopian political coalition, important policy reforms have been put in place to empower women. This includes the formal requirement that wives' names are included in land certificates. Local residents reported notable changes related to gender in the last ten years. To make sense of the changes, we adapted the leverage points concept which identifies places to intervene in a system with different depths and effectiveness for changing the trajectory of a system. Using this concept, we classified the reported changes as belonging to the domains of visible gaps, social structures, and attitudes. Importantly, changes within these domains interacted, suggesting that changes facilitate further changes. The most prominent driver of the changes observed was the government's emphasis on empowering

women and government-organized interventions including gender sensitization trainings. The changes toward more egalitarian relationships at the household level were perceived by local residents to lead to better implementation of livelihoods, and better ability to be food secure. The study offers the insight that while changing deep, underlying drivers (e. g. attitudes) of systemic inequalities is critical, other leverage points such as formal institutional change and closing of certain visible gaps can facilitate deeper changes (e. g. attitudes) through interaction between different leverage points. This can inform gender transformative approaches.

While positive gender-related changes have been observed, highly unequal gender norms still persist that lead to women as well as poor men being disadvantaged. Social norms which provide the basis for collective understanding of acceptable attitudes and behaviors are entrenched in people's ways of being and doing and can therefore significantly lag behind formal institutional changes. For instance, daughters in southwest Ethiopia continued to be excluded from land inheritance because of long-standing patrilineal inheritance practices. This impacted on women's abilities to engage in smallholder farming in equal footing as men. Norms influenced practices around access and control of capital assets, decision-making, and allocation of activities with important implications for who gets to participate, how, and who gets to benefit. Landless men also faced distinct disadvantages in sharecropping arrangements where people involved often have unequal socioeconomic status. Processes that facilitate critical local reflections are needed to begin to change unequal social norms and transform smallholder farming to becoming more inclusive and egalitarian spheres.

To more effectively leverage smallholder farming for a food secure future, this dissertation closes with four key insights namely: (1) Diversified livelihoods combining food and cash crops result in better food security; (2) Enhancing natural and social capital is a requisite for viable smallholder farming; (3) Social and gender equality are strategically important in improving livelihoods and food security; and (4) Institutions particularly social norms are key to achieving gender and social equality. Because the livelihoods-food security nexus depend on people's agency in their livelihoods, this dissertation concludes that livelihoods should be recast as critical spheres for expanding human agency and that conceptual development as well as formulation of suitable tools of measurement be pursued.

Chapter I

“Human beings are the agents, beneficiaries and adjudicators of progress, but they also happen to be – directly or indirectly – the primary means of all production. This dual role of human beings provides rich ground for confusion of ends and means in planning and policy-making. Indeed it can – and frequently does – take the form of focusing on production and prosperity as the essence of progress, treating people as the means through which that productive process is brought about rather than seeing the lives of people as the ultimate concern and treating production and prosperity merely as means to those lives. ”

Amartya Sen

Chapter I

Smallholder farming livelihoods as spheres for expanding human agency

Aisa O. Manlosa

(Synthesis of the Dissertation)

Abstract

Livelihoods of smallholder farmers are a strategic area for ending hunger at a global scale. However, with smallholder farmers comprising some of the poorest and most food insecure demographic groups, there is urgent need to rethink how smallholder farming livelihoods may be more effectively leveraged to create a food secure future. This chapter is an overarching synthesis based on publications and manuscripts subsequently presented as individual chapters. Using a mixed-methods approach that involved over 500 local residents, I applied a livelihoods perspective to investigate livelihood strategies in southwestern Ethiopia. In particular, I investigated how smallholder farming households and individuals in these households could be better supported in their role as agents who are able to improve their livelihoods and achieve food security. To address this, I characterized livelihood strategies, coping strategies to livelihood-related challenges, and social institutions within which livelihoods are embedded. Key insights from the research are: (1) Diversified livelihoods combining food and cash crops result in better food security; (2) Enhancing natural, social, and human capitals is a requisite for viable smallholder farming; (3) Social and gender equality are strategically important in improving livelihoods and food security; and (4) Institutions particularly social norms are key to achieving gender and social equality. Because the livelihoods-food security nexus rests on people's abilities to choose and to take action – that is, their agency particularly in their livelihoods, this research closes with a call to recast livelihoods in general, and smallholder farming livelihoods in particular, as critical spheres for expanding human agency. This direction which is relevant to both research and practice, requires further conceptual development as well as the formulation of suitable tools of measurement.

Introduction

Livelihoods of smallholder farmers are a strategic area for ending hunger at a global scale. Smallholder farming provides more than half of the food that feeds the world (Graeub et al. 2016). It is also the livelihood on which significant fractions of the populations in the so-called Global South depend (Riesgo et al. 2016). Paradoxically, many of those who depend on smallholder farming face food insecurity (Lemke et al. 2016). Despite the multi-faceted nature of challenges in smallholder farming, solutions provided are often focused on technologies and markets with little to no engagement of the contextual conditions which ultimately determine how effective solutions will be and who will benefit (Kantor 2013). People's agency or their ability to choose and act in relation to their livelihoods is shaped by these broad contextual conditions and is central to the improvement of livelihoods and attainment of food security. Community, household, and individual levels are important scales for starting to understand factors affecting agency. This dissertation uses a place-based research to examine such contextual conditions and determine how smallholder farming livelihoods may be more effectively leveraged to create a food-secure future. Specifically, this dissertation is guided by the question *How can smallholder farming households, and individuals within these households, be supported in their roles as primary agents who are able to improve their livelihoods and achieve food security?* I used a livelihoods perspective to examine smallholder farming in southwest Ethiopia and determine factors which enable or constrain local people. Here I summarize findings from four chapters which consist the dissertation, synthesize key insights based on the findings, and close with an outlook for the livelihoods-food security nexus.

A socially embedded livelihoods perspective

Livelihoods are the primary means through which people are able to continuously and consistently secure benefits necessary to meet a range of needs – whether for food, fuel, clothing, shelter, and non-material needs including a sense of dignity, identity, and self-efficacy (Chambers 1988, Scoones 1998, de Haan and Zoomers 2006). These situate livelihoods as an activity with economic ends and political relevance. At the same time, livelihoods are also social arenas where community life is enacted, and immediately personal due to its salience in day-to-day living (Sakdapolrak 2014). I mention these different aspects because the common conception of livelihoods as technical and neutral production and income-generating processes has been central to discussions about the limits of the widely-

applied Sustainable Livelihoods Framework (de Haan and Zoomers 2006, van Dijk 2011). This has prompted calls for a more socially embedded and politically informed conceptualizations of livelihoods (Arce 2003, van Dijk 2011, Sakdapolrak 2014). Arguably, how livelihoods are conceptualized reflects on how policies are formulated to support the attainment of certain development outcomes. A neutral, contextually detached understanding of livelihoods is likely to lead to interventions concerned only with the relationships between inputs and outputs. While important, narrowly targeted interventions (e.g. fertilizers), have been found insufficient to alter patterns of inequalities (Kantor 2013). In most biomass-based economies in the Global South, smallholder farmers continue to comprise a significant fraction of the poorest in the population (Dasgupta 1996). Technology and market-oriented solutions have tended to benefit richer farmers than poorer ones (e. g. Ergano Gunte 2016). Such patterns have also been found in the fisheries sector (Coulthard et al. 2011). An investigation of the fishery value chain in the Barotse Floodplain in Zambia emphasized that the involvement of individuals in local livelihoods and the distribution of benefits are influenced by institutions as well as unequal power relations (Rajaratnam et al. 2016). Similar insights have been generated from researches in the agriculture sector (Riesgo et al. 2016, Chappell 2018). Scholars have stressed that failure to understand and engage with underlying social dynamics could result in poor development outcomes or the exacerbation of existing inequalities (Farnworth et al. 2013, Hillenbrand et al. 2015, Njuki et al. 2016). These, along with numerous other examples, point to the exigency of understanding the processes and outcomes of local livelihoods as being contextual and socially contingent, inasmuch as they are material and economic (van Dijk 2011, Sakdapolrak 2014). Such an understanding is useful for prioritizing development policies and designing interventions that have higher chances of success, are able to disrupt long-standing patterns of social inequality, and are able to facilitate processes of empowerment (Kantor 2013, Ribot 2014).

The livelihoods-food security nexus

In this dissertation, I view food security as directly linked with secure and sustainable livelihoods. Conversely, food insecurity results when livelihoods are precarious and unable to generate the benefits that households require to meet their needs (e. g. Negash and Niehof 2003, Thornton et al. 2011, FAO 2018). This view is premised on the idea that there is no substitute to the role of local sustainable livelihoods as a means to achieve food security. I argue that the manner in which the livelihood-food security nexus is conceptualized has a profoundly important implication for how smallholder farming livelihoods are leveraged for food security (e. g. Patel et al. 2015, Gartaula et al. 2017). In the absence of a socially

embedded perspective as briefly introduced above, smallholder farming livelihoods are replaceable processes that can and should be superseded by other production processes which have higher efficiency, higher production capacity, and higher income generation. This has provided justification for the industrialization of agriculture, the attendant consolidation of small farms, and displacement of many smallholder farmers in different parts of the world. Conversely, a view of livelihoods that embeds the latter in social context not only provides a less incomplete view of relevant factors to consider, but also resituates livelihoods within the matrix of daily life and frames it as an indispensable arena in which people are actors who decide, act, and generate outcomes that are important to their daily living – that is, people are agents in their livelihoods (van Dijk 2011). Within livelihoods, these decisions and actions may be strategic, that is, concerned with the setting of goals and acting on those goals to take advantage of opportunities and increase the benefits they generate. Decisions and actions may also be concerned with responding to certain challenges in a way that minimizes loss and maintains livelihoods. With the exemption of feminist scholars however, few explicitly perceive livelihoods as critical spheres for agency, and less so, the link between livelihoods and food security as an issue of agency. However, the success of most livelihoods often depend on whether people are able to envision the kind of life they want to live, and whether they have the capital assets (or resources more broadly) and the opportunities to act and follow through or adjust a pathway towards those goals. Many of the problems associated with livelihoods such as a lack in capital asset or constraints in infrastructure (Bebbington 1999, Rakodi 1999) are ultimately significant because they reduce the set of choices available to people and the scope for potential action – that is, a reduction in agency. Food insecurity, whether due to a changing climate or land scarcity, results as a reduction of agency or human capability to meet their needs. To engage with the concept of agency in livelihoods however, it is important to unpack the different strands that constitute it. As a preliminary contribution, this dissertation first considers local livelihood strategies as a means to understand what local people do and how these are influenced by different configurations of and dynamics in relation to capital assets (see Chapters II and III). Agency in livelihoods are also constituted by institutions, whether formal or informal, which underlie patterns of access to capital assets and more broadly determine choices and actions (Hillenbrand et al. 2015). Other institutions, while not directly concerned with livelihoods, can impact on agency in livelihoods by influencing not only capital assets, but also opportunities, roles, and voice in decision-making, among others (see Chapters IV and V). Situating agency as a core of the livelihoods perspective can potentially expand the scope of analysis beyond the immediate concern of material inputs and outputs, enable a focus on expanding human abilities to meet needs particularly of those who are disadvantaged, and more directly speak to issues of justice (sensu Coulthard et al. 2011).

Study area

The research that underlies this synthesis chapter was conducted between 2015 and 2017 in the southwestern part of Ethiopia. The study area provides an interesting context to investigate owing to a predominance of smallholder farming livelihoods, a high local reliance on natural resources, and dynamic formal and informal institutional settings. In Ethiopia, about 85% of the population relies on agriculture for their livelihoods. A significant fraction of this is involved in subsistence and rain-fed production (Gebre-Selasie and Bekele 2012). With the promise of improving livelihood opportunities for the poorest and of addressing food insecurity, the Ethiopian government's agricultural development policy prioritizes agricultural intensification and commercialization. Moreover, while Ethiopia retains entrenched practices that disadvantage women, the country is active in developing and implementing policies to pursue gender equality and the empowerment of women. Ethiopia's gender-related rules have important bearing on livelihoods and food security.

The thesis research was carried out in six *kebeles* (smallest administrative unit in Ethiopia) (see Figure 1.1) located in three *woredas* or districts. Of the six *kebeles*, three had high natural forest cover, two had low forest cover, and one had no remaining natural forest cover. Four *kebeles* were within coffee-growing altitude and two were primarily above coffee-growing altitude. The area has high natural productivity relative to other parts of Ethiopia because of the high amount of rainfall it receives. The year consists of the seasons commonly called *bira* (harvest time), *bona*, *arfasa*, and *gana* (lean time). The majority of households typically engage in various livelihood activities especially farm-related activities. Non-farm livelihood activities are also present but less common. Some households have family members who have migrated to the Middle East for work but a number had been sent back due to unauthorized migration. Physical infrastructure is very limited at the *kebele* level, with the majority not having access to electricity and water system. Transport is a challenge because of remoteness and topography, and locals use horses and donkeys to move heavy agricultural products. However, in terms of access to education and health services, local residents have perceived an improvement in the previous years. Additional descriptions of the study area can be found in the following chapters.

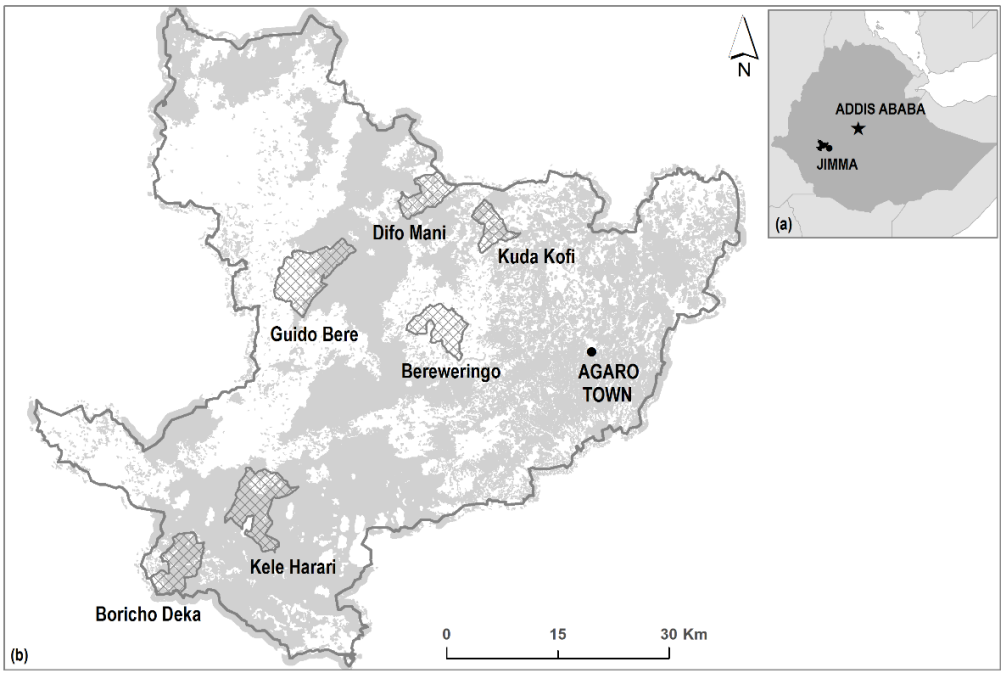

Figure 1.1 (a) Map of Ethiopia showing location of the study area. (b) *Kebeles* (checkered areas) comprising the area studied. The *kebeles* differed in the remaining forest cover, altitude, and the proximity to economic centers.

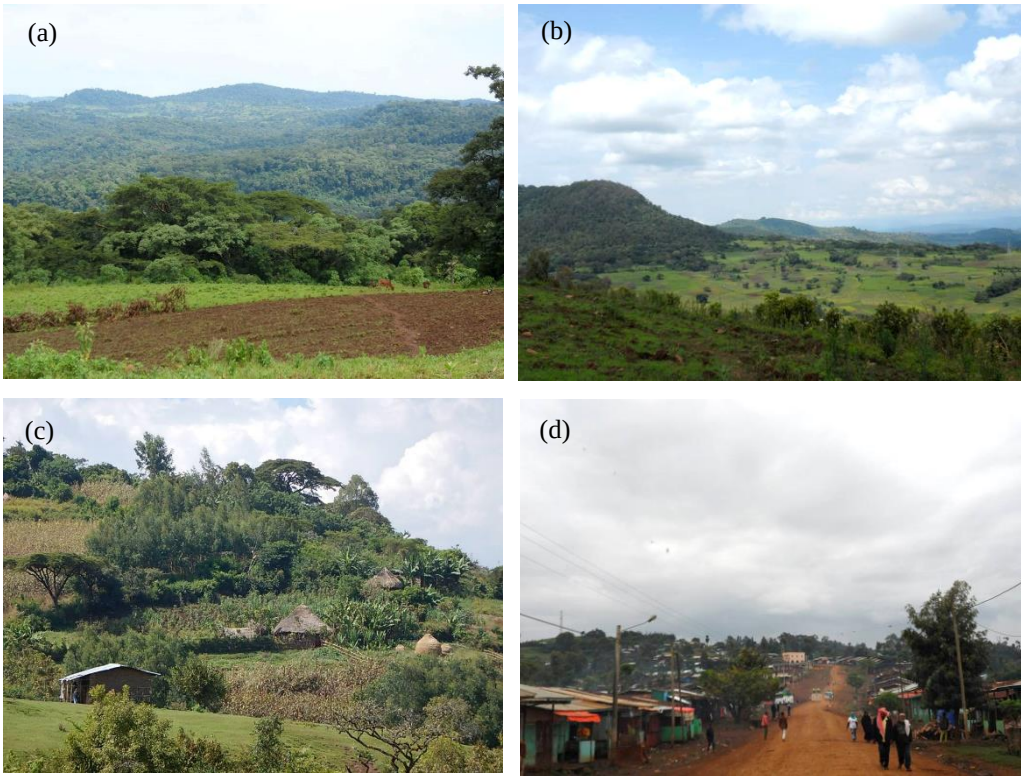

Figure 1.2 Photos show (a) farmland near a forested area, (b) a typical view of the landscape, (c) local houses, farms, and gardens, and (d) one of the towns in the study area.

Aims

The general aim of this dissertation was to determine how smallholder farming livelihoods may be more effectively leveraged to address food insecurity. Owing to the central importance of local actors and context as explained above, I focused on how local actors can be better supported in their roles as primary agents who have the ability to improve their livelihoods and achieve food security. The general aim was operationalized through three questions which were investigated using place-based empirical research and addressed in the chapters that follow.

1. *How do livelihood strategies influence food security? (Chapter II)*
2. *What livelihood challenges are common and how do households cope with these? (Chapter III)*
3. *How do social institutions in which livelihoods are embedded influence people's abilities to undertake livelihoods and be food secure? (Chapters IV and V)*

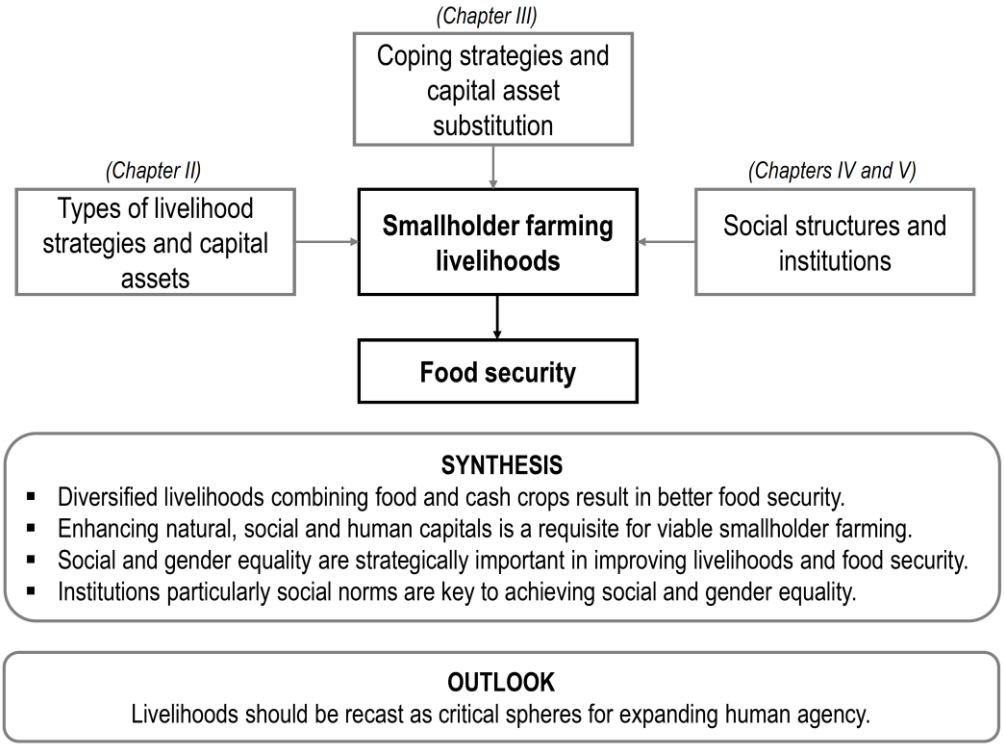

Figure 1.3 Framework of the dissertation specifying research foci and key insights generated.

Within the broad purview of the Sustainable Livelihoods Framework (Scoones 1998), my investigation engages more closely with the concepts of capital assets and institutions. For this dissertation, I applied a mixed methods approach. The quantitative component of this investigation used a survey of randomly selected households to provide a cross-sectional

characterization of livelihoods, capital assets, and food security to determine their associations. The qualitative component used focus group discussions and interviews to draw local narratives and generate nuanced understanding of the social context. Specific methodologies used to address the research questions are explained in detail in individual chapters. The section that follows provides an extended summary of the individual chapters and is structured according to the three research questions identified (see Figure 1.3 for the structure). The latter half of the chapter distills key insights from the chapters to provide a synthesis and formulates an outlook for the nexus between livelihoods and food security.

Summary of included chapters

Chapter II provides a grounded characterization of livelihood strategies in the study area and shows how these strategies are associated with capital assets and food security outcomes. This chapter draws from quantitative data generated through a survey of 365 randomly selected households from six *kebeles.* The survey instrument consisted of four sections, namely: (1) general household characteristics; (2) livelihoods; (3) capital assets; and (4) food security. A number of multivariate statistical analysis were applied to identify livelihood strategies and determine associations with capital assets and food security outcomes. The approach enabled a nuanced identification of a livelihood gradient in an area where the vast majority of the population depends on smallholder farming for their food and income.

The livelihood strategies of nearly all households surveyed were characterized as diversified smallholder farming. The strategies consisted of a range of livelihood activities but were distinguishable based on distinctive combinations of food crops and cash crops. The livelihood strategies identified (in order of decreasing food security) were: 'three food crops, coffee, and khat' (n=68); 'three food crops and khat' (n=59); 'two food crops, coffee, and khat' (n=78); 'two food crops and khat' (n=88); and 'one food crop, coffee, and khat' (n=44). The five livelihood strategies identified had significant associations with certain types of capital assets. Results from the multinomial logistic regression indicated that aggregate size of a household's farm fields, having a coffee plot, number of livestock owned, and number of farm tools were significantly associated with types of livelihood strategies. Disaggregating the associations according to livelihood strategies, we found that households that had the livelihood strategy 'three food crops, coffee, and khat' had higher access to a wider range of capital assets. They had larger farm fields, more informal exchange of information and knowledge with other farmers, more farm tools, and more access to honey and mobile phones. On the other hand, households that had the livelihood strategy 'one food crop, coffee, and khat' had less access to capital assets. In terms of their association with food security

outcomes, livelihood strategies with more diverse crops had better food security relative to strategies with less diverse crops. In addition, food security was also significantly associated with the educational attainment and gender of the household head. The results provide evidence that establish the importance of diversity in livelihood strategies, in this case, diversity of food crops. To enable households to shift to livelihood strategies with better food security outcomes, local households need to be supported to improve their access to capital assets such as land, and farm-related learning opportunities. Investments in education and the promotion of gender equality are also required.

Smallholder farmers in southwest Ethiopia often encounter a range of challenges that require them to cope. Challenges could be process-related, which here we defined as a lack in one or a number of capital assets that households need to be able to undertake livelihoods. Challenges could also be outcome-related pertaining to food shortage. ***Chapter III*** considers the coping strategies that households deployed when faced with livelihood-related challenges. Here we conceptualized coping strategies as involving capital asset substitution mechanisms in which households draw on one or a combination of capital assets available to them, in processes of substitution, in order to address a lack. Types of substitution mechanisms included in coping strategies could either erode or maintain the capital asset base of a household. For this chapter, I conducted content analysis on qualitative data from open-ended questions in the survey with 365 respondents and from semi-structured interviews with a subset of 30 household heads.

The most frequently mentioned problems encountered by the households were high incidence of crop-raiding by wild animals (related to natural capital), and a persistent lack of cash (related to economic capital). Other frequently mentioned challenges were also related to natural capital such as lack of oxen for plowing due to die-off from livestock diseases, lack of farmland, and low soil fertility. Such challenges were often encountered by households simultaneously and they coped by deploying a range of coping strategies. For example, to address the problem with wild animal pests which raided their crops and attacked their livestock, households increased farm labor input by increasing the duration of time spent in the field and by getting other household members such as children to spend time guarding. Another coping strategy was the *didaro* system, a community level collaborative arrangement in which households with adjacent farm fields agreed to synchronize their planting time and type of crop planted in order to facilitate the pooling of labor for guarding against wild animal pests. The *didaro* is one of the most important strategies for coping with the increasing incidence of wild animal attacks. Other strategies that similarly drew on social capital included informal loan either in the form of coffee or cash, and various sharing arrangements such as sharecropping and shared livestock-rearing. As is common elsewhere, households

also coped by liquidating capital assets. One of the ways that households attempted to cope with low soil fertility was by selling livestock and using the money to purchase inorganic fertilizers. When households faced food shortages, they coped also by selling livestock, engaging in wage labor to generate cash, or by taking out a loan. The different strategies with which households coped with process-related or outcome-related problems involved reconfiguring the way they used and combined the capital assets they had access to. Drawing on social capital and human capital (what we call "intangible" types of capital assets) were the most common substitution mechanisms reported. In most cases, these mechanisms facilitated the maintenance of a household's capital asset base. On the other hand, liquidating physical capital asset to generate economic capital asset (what we refer to as "tangible" capital assets) to address a problem typically associated with the natural capital, was often reported to result in an erosion of capital asset base. Drawing on rich local narratives from people's lived experiences, this chapter highlights the importance of natural capital as a source of ecosystem services vital to making smallholder farming viable as well as being a source of ecosystem disservices that need to be mitigated. It also underscores the need to strengthen and protect social and human capital to enable households to continue to deploy coping strategies that do not necessarily erode their capital asset base.

Chapters IV and V provide an in-depth engagement with the dynamic social context within which Ethiopian smallholder farming livelihoods are embedded. Findings in these chapters are similarly based on qualitative data from key informant interviews, focus group discussions, and semi-structured interviews with women and men coming from a better-off and a worse-off socioeconomic background. ***Chapter IV*** focuses on gender and applies a leverage points perspective to systematically analyze gender-related changes observed by local residents in the last ten years. Important changes were reported following policy reforms and government interventions aimed at empowering women and promoting gender equality. These include changes in the domain of *visible gaps* including an increase in women's participation in public meetings and trainings, involvement in conservation activities, involvement in livelihood activities, improvement in mobility, decreased incidence of hitting, and participation in Ethiopia's adult education program. Changes in *formal and informal institutions* were also reported ranging from government policies that recognize and promote women's rights, to a more widespread practice of shared decision-making in households. There had been a perceived shift in *attitudes* towards women with some reporting an improvement in levels of trust between married couples, and others stating a more positive view of women as capable of managing a farm, making farm-related decisions, and leadership. A key insight from this chapter pertains to important interactions between the three leverage points visible gaps, structures, and attitudes – in particular, how changes in one

leverage point can facilitate changes in other leverage points. This suggests that while so-called 'deep' leverage points such as social norms and attitudes are important because they determine the overall trajectory of a social system, so-called 'shallow' leverage points are equally important because they contribute to creating conditions for deeper changes. To support processes of transformative change in relation to gender, we call attention to the importance of researching interactions between leverage points to complement existing researches that investigate gendered visible gaps, social structures, and attitudes in isolation.

Chapter V further examines the embeddedness of smallholder farming livelihoods in social structures and institutions, and how these shape people's abilities to improve their livelihoods and be food secure. The chapter focuses on how prevailing social norms in relation to access and control of capital assets, decision-making, and allocation of activities can disempower individuals, particularly women and worse-off men. For example, here I describe how despite policy reform on land registration now requiring the inclusion of wives' and children's names, daughters continue to be excluded from inheriting farmland because of long standing inheritance practices. I trace how this practice is linked with unequal access and control of capital assets within conjugal relationships by placing young women in a position where they enter marriages with less capital assets to command, relative to their husbands. In this area, women's abilities to access land are typically predicated on their relationships with men. While young women did have access to the coffee plots of their parents through which they collected coffee and earned cash, they experienced losing access to these plots when they got married because of the expectation that their access would be through their husbands. In terms of decision-making, local residents perceived an increase in the proportion of households in which husbands and wives jointly decide on matters concerning their livelihoods. This increase was attributed to an improvement in awareness about gender equality. However, on further probing, we found that most of what local residents described as joint decision-making was rather nominal and often involved sharing of information rather than strategic deliberation. Women were typically only able to make decisions on their own in relation to food, that is, by allocating how much of the harvest should be set aside for consumption and how much could be sold. The allocation of various activities was also gendered. The exclusivity of ploughing as a male activity often resulted in women's dependence on men's labor. Disempowering norms were also encountered by men, albeit in a different manner. In addition to gender as an axis of inequality, socioeconomic status also influenced participation in and benefits from livelihoods. Due to a widely experienced lack in capital assets such as land, livestock, and in some cases labor, much of the area's livelihoods depended on sharing arrangements such as sharecropping. Sharing arrangements provided people with access to resources that they otherwise lacked. In these arrangements however, differently valued

capital asset contributions led to differences in power to make decisions, with implications for the food security of farmers' families. Notwithstanding the constraints posed by unequal social norms, people from different genders and socioeconomic backgrounds perceived a general increase in their sense of agency due to broader societal changes such as better access to education. This last chapter calls for more engagement with social norms in livelihoods research to better understand and facilitate desirable change in social and gender relations.

Synthesis: priority areas for leveraging smallholder farming livelihoods for a food secure future

The efficacy of smallholder farming livelihoods as a lever to end hunger amongst millions of people depends on a range of enabling and constraining factors. Based on findings from empirical research in southwest Ethiopia, I set forth four key insights for how smallholder farming livelihoods may be more effectively leveraged for a food secure future. Specifically, these insights emphasize how local actors may be better supported as agents who are able to improve their livelihoods and able to achieve food security (and perhaps, other aspects of their well-being that were not covered in this study).

1. Diversified livelihoods combining food and cash crops result in better food security

In Ethiopia, the current government envisions a transformed agricultural sector that is characterized by "assured surpluses at all times; growing dominance of marketed produce over subsistence consumption, value-addition to farm produce through agro-processing; commercialization of agriculture, including its dominant smallholder segment; institutional development of value chain players; and support to policies and institutions to sustain all these other changes." (Chipeta et al. 2015). While Ethiopian policy towards agriculture development and food security acknowledges that different agroecological zones in the country would be suited to different crop types, and identifies the maintenance of agricultural biodiversity as a target outcome (Chipeta et al. 2015, Ethiopia National Planning Commission 2016), the policy does not indicate support for current patterns of crop diversification in smallholder farming livelihoods. Rather, an increasing dominance of marketed produce is preferred. This institutionally supported trajectory will likely have a negative impact on the food security of numerous households that depend on a combination of diverse crops for their livelihoods (e. g. Gebrehiwot et al. 2016).

Our findings suggest that the logic behind the livelihood strategies of farming households may not necessarily be driven by the goals of increasing production and profitability, though

these are also desired. Rather, livelihoods are foremost, underpinned by capital assets and the goals that are attainable within households' configurations of capital assets (Rakodi 1999). While livelihoods change due to multiple interacting factors, government policies and investments can be made more inclusive and supportive of smallholder farmers by building on existing local livelihood strategies and amplifying benefits from these strategies. Specifically, this means recognizing that diversified subsistence food production plays an important role in conjunction with cash generation, and investing resources to amplify food security benefits from these local livelihood strategies (Fafchamps 1992, Rogan 2018). Potentially beneficial action points may include introducing and scaling up agroecological practices to increase diverse food production without compromising the natural environment, expanding information package and the suite of services delivered by development agents to better inform diversified crop production, and improving crop storage systems in households, among others. Improving farmers' access to capital assets to enable households with low food security to transition to livelihoods with better food security outcomes is needed. This can involve efforts to more effectively tackle land scarcity, wild animal pests, and low soil fertility, among others. Livelihood strategies are dynamic and the future livelihoods of many smallholder farming households may differ from current strategies, as new livelihood opportunities emerge. However, farming households need to be supported to gain the capacity for taking advantage of new opportunities by strengthening the currently beneficial complementarities between diverse food crops and cash crops.

2. Enhancing natural, social, and human capitals is a requisite for viable smallholder farming

Sustainable management of natural capital and increasing farmers' abilities to cope with livelihood-related challenges should be strategically prioritized in planning for livelihoods improvement. Findings of this study indicate that challenges in smallholder farming were mostly related to natural capital, either in terms of a lack in ecosystem services or high levels of ecosystem disservices. For example, crop raiding by wild animal pests (e. g. baboons) were reported to result in significant loss in crop harvest which in turn impacted on food crops available for the households. This, in combination with a range of other challenges, limit the efficacy of smallholder farming livelihoods as a vehicle for achieving food security. Managing natural capital for an enhanced provision of ecosystem services and a reduction of ecosystem disservices will be important for maintaining viable farming livelihoods. In addition to action points mentioned above, public investments and modern agroecological approaches that complement existing farming practices to reverse decreasing soil fertility are urgently needed. Accessibility of veterinary services could be enhanced to prevent further die-outs of remaining livestock. Suitable livelihood diversification options outside farming may

be further developed to reduce increasing pressure on limited land. In sum, a two-pronged approach that reduces the source of livelihood-related problems by protecting the natural capital base and increases capacities to cope using substitution mechanisms that maintain capital asset base is required. Ensuring that social cohesion is not eroded by various changes such as increasing rates of out-migration and enhancing human health and access to education should be prioritized.

3. Social and gender equality are strategically important in improving livelihoods and food security

The equality of gender relations within a household intertwines with the effectiveness in which households are able to leverage their livelihoods to be food secure. Local residents associated improved gender relations with better implementation of livelihood strategies and better ability to be food secure. Better implementation of livelihood strategies was perceived as an outcome of shared decision making and collaborations between women and men.

Here the evident increase in women's participation in local public meetings and trainings does not necessarily indicate that they are now able to influence decisions and shape directions commensurate to the extent that men do at the community level. Even at the household level, where joint decision-making processes are now perceived to be more prevalent, many of the decisions that women were able to participate in were practical decisions. These do not necessarily alter unequal positions of power (Risman 2005). Because of its inherent importance and its beneficial effect on livelihood outcomes, gender equality should be targeted as a strategic outcome in livelihoods improvement and not as something separate or as add-on (Njuki et al. 2016).

4. Institutions particularly social norms are key to achieving social and gender equality

Gender and other forms of social equality are integral to successful smallholder farming livelihoods and consequently, food security (Lemke 2016). When social and gender equality are taken as a fundamental basis for policies and interventions, approaches to improving smallholder farming livelihoods are more likely to involve, effectively address the distinct challenges of, and benefit disadvantaged groups (Farnworth et al. 2012). However, achieving social and gender equality of itself, is one of the most persistent and significant challenges of our time (UN General Assembly 2015). Our study contributes evidence to the role of social relations and social norms in constituting inequalities. Our study shows that achieving social and gender equality requires more than closing visible gaps or implementing formal rules, but requires working on established ways of thinking and doing which normalize and render invisible daily enactments of inequalities (Manlosa 2018). Because social norms are "normal", they are often left unquestioned and unchallenged (Wacquant 2004). The majority

of interventions to improve livelihoods either does not engage with the constraining effect of social norms or accommodates these norms, entering the mold so to speak, and reproducing patterns of inequality. Policies and projects that focus on livelihoods are important vehicles for addressing unequal social norms because livelihoods are not only strongly governed by norms, but also because changes in this area are closely linked with well-being improvements of household members. Furthermore, livelihoods are a crucial entry point for fostering change in social norms because the generation, distribution, and eventual concentration of capital assets (or resources) from livelihood processes are needed by marginalized social groups to gain leverage for negotiating and changing their disadvantaged positions (Bebbington 1999, de Haan and Zoomers 2006).

Outlook for the smallholder farming livelihoods and food security nexus: focus on agency is required

Among Rocha's (2007) five pillars of food security (i. e. availability, accessibility, adequacy, acceptability, and agency), agency tends to be absent in most food security discourses (Chappell 2018). This is an important lacuna because as Rocha (2007) explains, the first four pillars of food security cannot be achieved without agency. In interpreting agency, Chappell (2018) cites Ribot (2014) to define agency as consisting of substantive citizenship or "the ability to influence those who govern", and substantive democracy as when "that influence results in response". This view of agency as political influence and efficacy is critical to establishing food systems rooted in social justice and able to end hunger. Based on the findings of this dissertation, here I discuss a complementary perspective on agency as it relates to people's ability to choose and take actions to realize their choices (Kabeer 1999) particularly as these relate to livelihoods. Under this perspective, agency is similarly viewed in terms of influence and efficacy. However, I apply this interpretation to the day-to-day process of making a living as a necessary complement to agency in political spheres. I distill the insights generated from this dissertation to the argument that *smallholder farming livelihoods can be more effectively leveraged for a food secure future if these livelihoods are understood as critical spheres for expanding people's agency.* Below, I briefly substantiate what I mean by this, and provide a few actionable points for how this may be done.

The Sustainable Livelihoods Framework (Scoones 1998), despite its widespread influence and application, had been met with critiques (see Arce 2003, van Dijk 2011, Sakdapolrak 2014 for synthesis of critiques) and calls for a re-energized livelihoods approach (Scoones 2009). Other developments in livelihood research include the ideas of livelihoods trajectories (Bagchi et al. 1998), focus on transnational linkages (Bebbington and Batterbury 2001),

pathways and styles (Sakdapolrak 2014), and archetypes (Oberlack et al. 2016). As Appendini (2001) puts it, fundamentally, livelihoods research is about searching for more effective methods to support people and communities in ways that are more meaningful to their daily lives and needs. The statement implies the primacy of local people's context, which I take to include their challenges, opportunities, means, reasoning, goals – their lived experience. The purpose of livelihoods research is therefore broader in scope than determining more efficient means of increasing production or income, though these can also be useful angles of investigation if embedded within a framework of equality and social justice. Rather livelihoods research is intended to understand the multifaceted context and conditions in which individuals and social groups set their livelihood goals and take action. Such an understanding should shed light on factors and their interactions, which either constrain or enable people's goals and actions. Necessarily, a livelihoods perspective should engage with complexity, consider the broader social-ecological system of which livelihoods are a part, focus on process, and aim for an increase in people's ability to set goals and take action (or agency in livelihoods) as a targeted outcome. Situating agency at the center of livelihoods thinking can help ensure that policies and interventions particularly towards smallholder farming livelihoods do not treat the latter merely as means to defined ends, but as one of the spheres where agency is either maintained, increased, or eroded (sensu Nussbaum and Sen 1993).

Livelihoods are an important arena for agency because of certain points. First, it is the sphere in which capital assets are invested or grown. Control over capital assets is needed for the exercise of agency because the ability to choose is often contingent on whether people have the necessary capital assets (Kabeer 1999). For example, the choice to engage in farming depends on whether people have access to land or livestock. Without these, engaging in farming cannot be considered a possibility. Second, the ability to engage in and generate benefits from livelihoods has been linked with increased influence in livelihood decision-making (Kabeer 2005, Danielsen et al. 2018). While the relationship is not straightforward and some studies have shown that contributing income does not necessary lead to women gaining a greater voice and influence (Mabsout and van Staveren 2010), other studies have also shown that engagement in livelihoods have led to an increase in women's bargaining power (Danielsen et al. 2018). Third, some of the factors that deter people from exercising a choice are experienced within livelihoods. For example, male farmers in southwest Ethiopia are prevented from engaging in other livelihood activities because of wild animal pests. This problem precludes them from undertaking actions that could have a beneficial impact on their food security but which they do not have the ability to pursue.

Livelihoods, therefore, are strategic spaces for expanding human agency. Unless this is adopted as a point of departure, it is likely that narrow-spectrum solutions such as increasing productivity through agricultural intensification and increasing income through commercialization will continue to dominate policies and interventions. While increasing productivity and income is an important requirement for struggling households with low harvest and income levels, numerous analyses have shown that food insecurity is a result of a confluence of complex factors and that ultimately, these factors whether economic or environmental, limit people's abilities to undertake livelihoods in a way that generates the benefits they require for a flourishing life. Thus, to leverage livelihoods for addressing food security, it must be orientated towards expanding the agency of individuals – both as a means and as an outcome of secure and sustainable livelihoods. Such an orientation expands the focus from a merely instrumentalist view and shifts the focus to human capabilities (Nussbaum and Sen 1993). An agency-oriented view of livelihoods also provides a sufficiently broad basis to engage with matrices of social inequalities and unequal power dynamics in which material processes of production are embedded. Critiques have identified these as a gap in the Sustainable Livelihoods Framework. The extent to which individuals are able to benefit from their livelihoods is tightly linked with the extent to which they are able to exercise agency over the dispensation of their livelihoods. With the recent resurgence of food insecurity in Africa and South Asia (FAO 2018) despite accelerated efforts for agricultural intensification and industrialization, there is an urgent need to rethink the links between livelihoods and food security, and to reframe livelihoods not only as processes to generate food and income, but fundamentally, as critical spaces for the expansion of agency of which secure food and income are the results.

Finally, there are practical steps that may be taken to bring forward an agency-centered livelihoods perspective. Drawing on insights discussed above, the first point is to respect local livelihood strategies. In southwest Ethiopia for example, the practice of diversified smallholder farming offered the benefit of complementarity between food crops and cash crops. This kind of logic in the face of challenges that are immediately real to small scale farmers (e. g. process-related challenges) are often missed in top-down approaches. Related to the first point, the second is to build on local realities and strengths of local livelihood strategies. The third is to focus on reducing the need to cope and on increasing resilience. The fourth is to move social equity and justice to the center of livelihoods policies and interventions. The fifth is to expand impact assessments for livelihoods development to capture agency as a priority outcome. Further conceptualization and operationalization of agency or capability as a core can add more theoretical depth to the livelihoods approach and

increase its salience and usefulness at a time when the world is faced with rapid and large-scale challenges, in which the most vulnerable and poorest stand most to lose.

Conclusion

Smallholder farming livelihoods are the primary avenue for many individuals, households, and communities to meet their needs and build the life they envision. While playing a strategic role for ending food insecurity, these livelihoods are beset with challenges which limit their contribution to realizing a food secure future. I gleaned insights for how contributions of smallholder farming to realizing a food-secure future may be improved. Diversified livelihoods, particularly the complementary combination of food and cash crops matter for household food security. When households have good access to a range of capital assets, they are able to pursue livelihood strategies that work best for their food security as exemplified by the number of households in this study which undertook the most diversified 'three food crops, coffee, and khat' strategy. Households with less access to capital assets still diversified their livelihoods but to a less degree and with lower food security as an outcome. Thus improving people's access to capital assets while enabling them to undertake the strategies that best work for their context is vital. Most of the challenges faced by smallholder farmers manifest in the day-to-day as a lack in capital assets. Types of capital assets are not equal and some are more fundamental to faming livelihoods than others. While farmers can cope with a lack through coping strategies that substitute types of capital assets, natural capital constitutes a fundamental basis that cannot indefinitely be replaced. Prolonged substitution of natural capital leads to erosion of capital asset base which reduce people's abilities to engage in viable farming. Thus enhancing natural and social capital is a requisite for viable smallholder farming.

Livelihoods are embedded in social contexts that determine how people participate and who benefits. In many smallholder farming contexts, gender exerts a strong influence on rules of participation and benefit distribution. Arguments for social justice and evidence of beneficial outcomes from women's participation in various types of livelihoods have led to the formulation of policies and implementation of interventions intended to promote gender equality. In the last years, gender-related changes in visible gaps, structures, and attitudes have been found to result in desirable outcomes. These provide further evidence to the strategic importance of social and gender equality for improving livelihoods and food security outcomes. Despite positive changes, unequal social norms prevail and these continue to shape people's engagement and practices related to agricultural livelihoods. Institutions, and social norms, in particular, are key areas of engagement for facilitating community-led, social change processes to achieve social and gender equality. Further research to generate better

understanding of the interactions between formal institutional change and shifting social norms are needed to identify synergies for speeding up positive change of gender relations. Such concerns could be more effectively integrated into livelihoods research if livelihoods are recast as a critical sphere for expanding human agency.

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Chapter II

"The central objective of the livelihood approach was to search for more effective methods to support people and communities in ways that are more meaningful to their daily lives and needs, as opposed to ready-made, interventionist instruments."

K. Appendini

Chapter II

Livelihood strategies, capital assets, and food security in rural southwestern Ethiopia

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Abstract

Households combine capital assets in a process involving human agency and resourcefulness to construct livelihood strategies and generate well-being outcomes. Here, we (1) characterized types of livelihood strategies; (2) determined how different capital assets are associated with different livelihood strategies; and (3) determined how livelihood strategies differed in food security outcomes. We conducted a survey in southwestern Ethiopia and used principal component and cluster analyses. We identified five types of livelihood strategies which differed mainly in the food and cash crops comprising the strategy. These were, in the order of decreasing food security: 'three food crops, coffee and khat', n=68; 'three food crops and khat', n=59; 'two food crops, coffee and khat', n=78; 'two food crops and khat', n=88; and 'one food crop, coffee and khat', n=44. The livelihood strategy 'three food crops, coffee and khat' was associated with a wide range of capital assets, particularly having larger aggregate farm field size and learning from other farmers. A generalized linear model showed that livelihood strategies were significantly associated with food security outcomes. Particularly, a high number of food crops in a strategy was linked with relatively high food security. In this context, diversified livelihood strategies primarily through having a mix of food crops for subsistence, in combination with cash crops for income, are important for food security. This suggests a need to rethink dominant policy narratives with narrow focus on increasing productivity and commercialization as primary pathway to food security.

Introduction

Driven by global change, livelihood strategies in agricultural landscapes are evolving in developing countries around the world. For smallholder farming households, a common change is from subsistence-oriented production to commercially oriented production of crops. Such a shift is actively encouraged by some governments (e.g. Gebrehiwot et al. 2016; Vongvisouk et al. 2014) on the grounds that it will improve food security through economic growth. However, outcomes of such a change have been mixed so that the ways in which different livelihood strategies influence household food security in different settings is less clear (Lang and Barling 2012). Understanding how livelihood strategies, particularly different combinations of food crops and cash crops, influence the food security of smallholder farming households is important for identifying and supporting sustainable development trajectories of traditionally subsistence-oriented or semi-subsistent agricultural landscapes.

For smallholder farming households, two plausible pathways of crop production have been advocated to increase food security, namely: (1) cash crop production (e.g. Achterbosch et al. 2014); and (2) crop diversification (Lin 2011), with high productivity in either of these pathways being considered as an important factor. Maxwell and Fernando (1989) defined cash crops as all marketed surplus, non-staple agriculture, non-food agriculture, and export agriculture. Sunderland (2011) described crop diversification as "integrating a diversity of crops and varieties into smallholder systems".

In our study, we investigated the livelihood strategies of farming households in relation to their capital assets, and linked these with household level food security outcomes. We considered different combinations of livelihood activities, which, in the context studied, primarily consisted of food crops and cash crops. We focused on Ethiopia where, in 2015, about 81% of the population lived in rural areas and mainly relied on agriculture for their livelihoods (World Bank 2016). We selected southwest Ethiopia, an area with high biodiversity, large tracts of Afromontane forests (Hylander et al. 2013), and home to the wild gene pool of Arabica coffee (*Coffea arabica*), which generates the largest foreign exchange for the country (FAO 2016). Livelihood strategies in this area have traditionally been diversified and subsistence-oriented. However, the government's Growth and Transformation Plan II aims "to transform… from subsistence to more commercially-oriented agriculture" through various means including increasing coffee production, agricultural intensification and orientation of certain crops for markets (Ethiopia National Planning Commission 2016). Within government circles, this trajectory from subsistence to commercial orientation is perceived as promising potential benefits for food security. Yet, a critical investigation of this

is important because elsewhere, trajectories of livelihoods towards cash crops have been associated with simplification of livelihoods or reduction of livelihood diversity, and shifts in diets (Nichols 2015). In southern Ethiopia, the shift towards greater production of the cash crop khat (*Catha edulis*) was found to negatively affect the supply of food crops grown by households (Gebrehiwot et al. 2016).

Against this context of changing livelihoods and government incentives, our objectives were to (1) develop an empirically grounded characterization of existing livelihood strategies in the study area; (2) determine how different types of capital asset are associated with different livelihood strategies; and (3) examine how the identified livelihood strategies differ in terms of food security outcomes. Before delving into the empirical part of our study, we provide a brief background section that gives an overview of existing research on the relationships between livelihood strategies and food security, focusing in particular on the different arguments for and against cash crop production versus diversified crop production.

Background on the relationships between livelihoods and food security

Determining how food security can be achieved has been a long-standing subject of scholarly and policy debates. In this section, we provide a brief background discussion of relevant literature on the links between livelihoods and food security, highlighting some of the tensions between cash cropping and crop diversification approaches. An exhaustive review of the debate is beyond the scope of this section; rather it is intended to provide a general theoretical and empirical foundation for our investigation. We first outline developments in livelihoods research and then transition into the more specific debate on how different kinds of livelihoods relate to food security.

Sustainable livelihoods thinking has contributed rich understandings of the ways individuals, households, and social groups in different contexts exercise agency and use their capital assets to produce outcomes necessary for sustenance and well-being (de Haan and Zoomers 2006; Levine 2014). The seminal work by Chambers and colleagues (Chambers 1987; Chambers and Ghildyal 1985, Chambers and Conway 1992) emphasized placing people at the center of scientific inquiry into poverty, food security, and environmental degradation and gave rise to livelihoods thinking. Subsequently, certain principles of livelihoods thinking were operationalized through the formulation of the Sustainable Livelihoods Framework (Carney 1999; Scoones 1998), or in short, the "livelihoods approach". The livelihoods approach has been widely used for systematically analyzing livelihoods and their relationships with well-

being outcomes, both in rural and urban areas. Often, the critical question is how different livelihood strategies generate different outcomes for individuals, households, or groups in terms of incomes, nutrition, caloric intake, or other well-being measures (e.g. Frison et al. 2011; Martin et al. 2013). In rural areas particularly, the multi-faceted nature of agricultural livelihoods, the dynamism of contexts, temporality, and the element of human agency responding to and acting on accessible capital assets make it challenging to generalize which livelihood strategies generate the best outcomes for human well-being. Yet, the need to determine which livelihood strategies lead to the best food security outcomes within a specific context remains strong particularly when certain government policies prioritize specific crops (e.g. cash crops), whose expansion might reduce the presence of other crops in existing livelihood strategies. A better understanding of the food security outcomes associated with different livelihood strategies is particularly important in semi-subsistence landscapes. Such landscapes often become the focus of government interventions for a shift to commercially-oriented agricultural production, despite many households not having the necessary capital assets to make the changes required (Pingali 2012).

Improving food security through the cash crop pathway is premised on the production and marketing of cash crops (or of commercially-oriented food crops) to generate financial income that farming households can use not only to purchase food, but also to accumulate capital assets necessary for further improving their livelihoods (Govereh and Jayne 2003). This pathway ultimately aims to address poverty, which is an important cause of food insecurity (Smith et al.2000). Cotton production in Gokwe North District, Zimbabwe (Govereh and Jayne 2003) and palm oil production in Indonesia (Sayer et al. 2012) exemplify the potential economic benefits (and indirectly food security benefits) resulting from intensive engagement in cash crop production. However, consequences are not always positive particularly for the poor; and diverging outcomes have been observed for different community groups. For example, the cash crop sugarcane was found to have a positive effect on food security in Ethiopia, but cotton production in Ghana resulted in lower food security among growers (Lam et al. 2017). In Sulawesi, Indonesia, Belsky and Siebert (2003) found that food self-sufficiency will likely decline with conversion of food-crop focused swidden fields to cocoa farms. In northern Vietnam, intensified and commercialized agriculture linked with cash crops also suggested the emergence of "new food insecurities and vulnerabilities" (Bonnin and Turner 2012). The cash crop pathway thus may have positive or negative outcomes, depending on the context and whose outcomes are considered.

The crop diversification pathway may benefit food and nutrition security primarily by enabling households to have direct access to staples and other types of food crops (Jones et al. 2014; Powell et al. 2015). It decreases dependence on markets as sources of food and

therefore reduces exposure to fluctuations in market prices (O'Brien and Leichenko 2000) – this can be important particularly for the poor whose financial lack constrains their ability to effectively respond to market stresses and shocks. Food crop diversification also enables households to spread risks over different crop types so that failure in one does not lead to the collapse of the entire livelihood strategy (Ellis 2000). In the Bolivian Andes, production of diverse food crops for subsistence was found to be a plausible approach for improving household and children's diets (Jones 2014). In Kenya, agricultural diversity consisting mostly of food crops was found to be positively related with nutrient adequacy ratios (M'Kaibi et al. 2015). In a multiple country study, the number of food crops was found to have a positive and inverted U-shaped relationship with dietary diversity indicators (Pellegrini and Tasciotti 2014). That is, dietary diversity increased with crop diversity up to a point and then began to decrease. However, in most studies it remains unclear whether the positive effects of crop diversification resulted directly from consumption of the food crops, or through selling them.

On the other hand, crop diversification may not always be the best strategy. Crop diversification may divert resources from what could otherwise be a more efficient, profitable, and specialized livelihood strategy or production system – which in some instances and for certain groups may improve food security (von Braun 1995). Subsistence-based diversification strategies also do not primarily facilitate income generation. This is important because higher income from agricultural production has been found to be associated with improved food security (e.g. Salazar et al. 2015). Similarly, Sibhatu and Qaim (2018) found that subsistence production contributed less to dietary diversity than cash income. Such mixed outcomes across different contexts suggest that pathways towards food security need to be grounded in a contextualized understanding of existing livelihood strategies.

The construction of livelihood strategies can be seen as the outcome of an actively negotiated process where households consider available capital assets, achievable household goals, and options for realizing these goals within the limits of capital assets (Rakodi 1999). Analyzing existing livelihood strategies and outcomes in a specific context is primal because context shapes the opportunity structures within which livelihoods are constructed (Bebbington 1999). For example, how well an area is connected to markets, and the extent to which transportation facilities are accessible, may influence the livelihood strategies in an area (Acheampong et al. 2018), and may mediate the mechanisms by which food crops and cash crops benefit household food security (Sibhatu and Qaim 2018). Moreover, the ability of households to engage in a type of livelihood strategy is influenced by the types of capital assets they have access to (Scoones 1998; Rakodi 1999). We hypothesized that differentiated

access to capital assets such as land, livestock and social capital enable or constrain types of livelihood strategies.

Material and Methods

Study area and field sampling

We studied six *kebeles* (smallest administrative unit in Ethiopia) situated in three *woredas*, or districts, in Jimma Zone, Oromia Region, Ethiopia. *Kebeles* were selected along an altitude and forest cover gradient to capture a variety of livelihood strategies (Table S2.1). The highlands of southwest Ethiopia receive an average of 2275 mm of annual rainfall, with a rainy period from February to November (Kidanewold et al. 2014). By international standards, food security is low (Ethiopia CSA and WFP 2014) particularly during the lean season from June to August every year. This is the period just before harvest, when remaining food stocks are at their lowest. The number of households in the *kebeles* ranged from 322 to 1222. According to records, in total there were 4081 households in the six study *kebeles*. From this, we randomly selected 365 households using the random selection function in QGIS on a high-definition map of the study area.

Survey tool and concepts used

We used a survey questionnaire for data collection. This was implemented with the assistance of two trained enumerators. The survey tool was translated to the local language *Aafan Oromo* and back-translated to English to ensure that the integrity of the original meaning was maintained. It was pre-tested in a pilot study in August 2015, and revised before the data collection period, which ran from November 2015 to January 2016. The final questionnaire consisted of four sections, namely: (1) general household characteristics; (2) livelihoods; (3) capital assets; and (4) food security (see Supplementary Material 2.1).

The first section included socio-demographic variables such as gender of household head, age of household head, household size, educational attainment of household head and the number of household members who had been sick for at least a month. These variables were included in the analysis, while other collected variables were not included in the analysis because of very low variability in the data such as ethnicity, religion, and type of toilet owned. The second and third sections were guided by the Sustainable Livelihoods Framework. We defined livelihoods as being comprised of the strategies and assets required to make a living (Scoones 1998). For the second section, we defined livelihood strategies as the combination of different livelihood activities that households engaged in, including those from which

households earned in cash, and in kind (Loison 2015). We asked about all types of livelihood activities to determine the composition of livelihood strategies. Our questions covered different types of crops, production of milk, honey and other agricultural products, petty trade and engagement in activities that paid wages (see Table S2.2 for the full range of livelihood variables included). Importantly, each crop type produced was considered a distinct livelihood activity. For the third section, we considered capital assets as the building blocks from which households constructed livelihood strategies. Here, questions related to various capital asset variables belonging to one of five capital asset types (i.e. economic, human, natural, physical, and social). Some examples under economic capital assets were access to credit and having a coffee plot. For human capital, we included questions on health and access to information or knowledge through formal or informal channels (Table 2.1). The fourth section on food security was a modified version of the Household Food Insecurity Access Scale (HFIAS) (Coates et al. 2007; Maxwell et al. 2013). Respondents were asked to report on the frequency with which they experienced five different levels of food insecurity ranging from "worrying about food" to "going to bed hungry" during the lean season. The frequency of each experience was scored: zero (not experienced), one (rarely, about once or twice a month), two (sometimes, about three to ten times a month), or three (often, estimated more than ten times a month). The scores enabled us to derive a total HFIAS score ranging from 0-15 for each household, with smaller values indicating high food security and higher values indicating low food security. Between two months and five months had passed since the end of the lean season from the first household to the last household surveyed. This recall period was longer than used in most other studies. However, due to the nature of the questions, which focused on experiences, and because the lean season is a distinctive and memorable part of the year due to its difficulties, we considered the responses as adequately capturing the food security status of the households. To statistically confirm this, we designed our model to detect effects from temporal proximity of each survey date to the lean period, by incorporating survey date as a variable in the model used. Modified versions of the HFIAS have been found to be a robust tool to assess food security in other parts of Ethiopia (Gebreyesus et al. 2015). The survey was implemented such that the first half of the sample in each *kebele* was completed during the first half of the field work. We then returned to every *kebele* to complete the survey in the second half of the field work. In addition to the survey, we also took field notes to record qualitative observations concerning the broader context such as physical infrastructure, market access, and livelihood problems, and gained insights from informal conversations with local residents.

Table 2. 1 List of capital asset variables included in analysis and how each variable was measured.

Type of capital asset	**Variable**	**Measurement**
Economic	Access to credit	0 – No, 1 – Yes
	Ownership of coffee plot	0 – No, 1 – Yes
	Ownership of khat plot	0 – No, 1 – Yes
Human	Learning farming-related information from development agents	0 – No Yes, Frequency 1 – Rarely 2 – Seldom 3 – Often
	Learning farming-related information from other farmers,	0 – No Yes, Frequency 1 – Rarely 2 – Seldom 3 – Often
	Family farm labor	Number of family members that help in the farm
	Access to information about new technology and market prices	0 – No Yes, Frequency 1 – Rarely 2 – Seldom 3 – Often
	Highest educational attainment of household head	0 – No education 1 – Adult education or special education 2 – Grades 1 to 6 3 – Grades 7 to 12 4 – Grades 13 and above
	Health using as proxy presence or absence of household members who got sick continuously for more than a month in the last one year	1 – Yes 0 – No
Natural	Access to surrounding natural resources such as forests and water	0 – No, 1 – Yes
	Perception on environmental change in the immediate landscape, whether positive or negative	0 – No change or worsening 1 – Improving
	Perception on soil fertility	0 – Bad 1 – Medium 2 – Good
	Access to trees for the production of honey	0 – No, 1 – Yes
	Access to eucalyptus	0 – No, 1 – Yes
	Size of farm fields	Total size in hectares
	Size of home garden	Total size in hectares
	Land rights (whether having a land certificate or not)	0 – No, 1 – Yes
Physical	Length of travel time to get from house to market	Minutes
	Livestock and poultry owned	Number of livestock and poultry
	Mobile phone owned	Number of mobile phones
	Farm tools owned	Number of farm tools

Type of capital asset	Variable	Measurement
Social	Membership to farming organization	0 – No, 1 – Yes
	Presence or absence of individuals or organizations to turn to for help with livelihood problems	0 – No, 1 – Yes
	Presence or absence of individuals or organizations to turn to for help with shortage in food or cash income	0 – No, 1 – Yes
	Ability to speak out regarding management of nearby natural resources	0 – No, 1 – Yes
	Sharing or borrowing of livestock	Number of livestock used (i. e. for farming) which was either borrowed or within a livestock-sharing arrangement
	Sharecropping	Number of crops that were produced through sharecropping arrangements

Data analysis

We processed the data in R (R Development Core Team 2008). As a first step, we explored the distribution and variability of data. Variables with very low variability across the households were excluded from the analysis. For the variables that were selected for inclusion in the analysis, we identified cells with missing data and applied an imputation process called multiple imputation chained equations through the 'mice' package in R (Van Buuren and Groothuis-Oudshoorn 2011). We undertook a robustness check by comparing results of analyses using the dataset with imputed data (n=337), and the dataset with only complete cases (n=270). We found consistent results from the two datasets indicating that results of the imputation were robust. A total of 337 questionnaires were used for the final analysis. We then visually inspected distributions of the continuous data and log-transformed skewed variables to meet requirements of normality for multivariate analyses.

Qualitative data from field notes were used to provide a descriptive background of the local context. For the analysis of livelihood strategies (objective 1), we used (1) cluster analysis using a Euclidean distance matrix and combined this with (2) principal component analysis (PCA)[1]. We applied Ward hierarchical clustering because this yielded a clear group structure and better interpretability of results than other clustering methods. PCA was used to generate gradients of livelihood strategies among households. We graphically combined the results

[1] Analysis involved continuous harvest data for all main crops except khat for which we were limited to using presence-absence data due to a lack of reliable data on both harvest and income. We ran PCA analysis without the variable khat to check robustness of results. We found that results with and without khat were very similar (correlation in a symmetric Procrustes rotation of 0.9962). This suggests that including khat as a binomial variable did not unduly influence the results.

from these two techniques to check the robustness of groups of households generated from the cluster analysis in ordination (PCA) space (see Table S2.2 for variables used).

Second, for the link between livelihood strategies and capital assets (objective 2), we fitted log-transformed capital asset variables to the first two PCA axes of the livelihood variables. Specifically, using the 'envfit' function in R (Oksanen et al. 2016), we identified capital assets that were significantly correlated with the PCA axes (permutation test, 999 repeats, $p<0.01$). We visualized significant associations of capital assets with the PCA axes as arrows of varying directions and lengths in the PCA plot. This enabled us to interpret the association of different types of capital assets with different livelihood strategies. As a further step, using multinomial logistic regression, we tested for relationships between livelihood strategies as a categorical response variable against capital asset variables with significant associations from the envfit analysis (multinom function from the nnet package) (Venables and Ripley 2002). Thus only a subset of capital asset variables in Table 2.1 were used in the multinomial logistic regression. We emphasize that, like all regression models, this analysis helped to uncover significant associations between livelihood strategies and capital assets, but was not a direct test of causal links.

Third, to determine whether food security measured through HFIAS scores responded significantly to the types of livelihood strategies and socio-demographic variables such as the gender of household head, age, household size, number of ill household members, and educational attainment of the household head (objective 3), we ran a generalized linear model using a quasi-Poisson error distribution to account for overdispersion. We also included survey date and *kebele* as additional explanatory variables to filter out any possible effects of temporal or spatial variability in relation to when and where the data were obtained (see Supplementary Material 2.2 for mathematical formula). Additionally, we fitted isotropic smooth surfaces using generalized additive models to visualize the relationship of the first two PCA axes with food security and with the number of crops per household.

Results

Description of local context

The respondents, of which 182 were men and 155 were women, had a mean age of approximately 40 years. On average, they attended school for between one and six years. Households had an average of six members (see Table 2.2 for household characteristics by livelihood strategy). The majority of households engaged in smallholder farming as their main

livelihood. The most common livelihood activities involved production of food crops namely maize, sorghum and teff. Barley and wheat were also produced but in lower quantities (Table 2.3). These food crops were produced mainly for subsistence, with a range of 93-100% of harvest reported as used for consumption. The crops coffee and khat were the main sources of cash. Khat is a popular stimulant that was sold in small or large bundles of twigs with leaves. There were other livelihood activities in the area including the cultivation of home gardens, production of legumes, production of milk, cheese, butter and honey for household consumption and the local market, selling firewood, selling eucalyptus trees, and engagement in farm labor and non-farm labor for wages.

Table 2.2 Household characteristics and capital assets summarized by livelihood strategy.

Variables (mean ± standard deviation where applicable)	**Three food crops, coffee and khat**	**Three food crops and khat**	**Two food crops, coffee and khat**	**Two food crops and khat**	**One food crop, coffee and khat**
Household characteristics					
Household type (proportion of FHH – female-headed households, MHH – male-headed households)	FHH – 9 MHH – 91	FHH – 8 MHH – 92	FHH – 6 MHH – 94	FHH – 8 MHH – 92	FHH – 7 MHH – 93
Age of household head (yrs)	41 ± 16	40 ± 15	44 ± 16	39 ± 15	41 ± 16
Education of household head (ordinal categories)	1 ± 1	1 ± 1	0.6 ± 0.9	1 ± 1	1 ± 1
Household size (nr)	6.2 ± 2.9	6.5 ± 2.8	6.1 ± 2.5	5.9 ± 2.4	5.8 ± 2.3
Ill health members (nr)	0.3 ± 0.6	0.3 ± 0.5	0.4 ± 0.6	0.4 ± 0.7	0.3 ± 0.5
Capital assets					
Ownership of coffee plot (proportion of yes/no)	Yes – 99 No – 1	Yes – 22 No – 78	Yes – 100 No – 0	Yes – 20 No – 80	Yes – 91 No – 9
Total size of farm fields (ha)	0.9 ± 0.5	1.1 ± 0.7	0.8 ± 0.4	0.7 ± 0.3	0.3 ± 0.3
Sharecropped fields (nr)	1.5 ± 1.3	2.2 ± 1.4	1.6 ± 1.1	1.7 ± 1.3	0.5 ± 0.7
Livestock owned (nr)	3.2 ± 2.6	5.1 ± 4.5	3.6 ± 2.6	4.0 ± 3.1	2.0 ± 1.2
Learn from other farmers (proportion according to frequency)	Never – 35 Rarely – 22 Seldom – 22 Often – 21	Never – 42 Rarely – 17 Seldom – 25 Often – 15	Never – 53 Rarely – 14 Seldom – 20 Often – 13	Never – 60 Rarely – 8 Seldom – 26 Often – 6	Never – 64 Rarely – 11 Seldom – 16 Often – 9
Learn from development agents (proportion according to frequency)	Never – 26 Rarely – 25 Seldom – 37 Often - 12	Never – 46 Rarely – 22 Seldom – 22 Often – 10	Never – 37 Rarely – 21 Seldom – 22 Often – 20	Never – 52 Rarely – 19 Seldom – 21 Often - 8	Never – 23 Rarely – 20 Seldom – 41 Often – 16
Perception of the quality of change in environment (proportion of positive/negative)	Positive – 63 Negative – 37	Positive – 37 Negative – 63	Positive – 54 Negative – 46	Positive – 48 Negative – 52	Positive – 80 Negative – 20
Farm tools owned (nr)	2.1 ± 2.4	1.6 ± 2.0	2.2 ± 2.1	1.2 ± 1.7	1.2 ± 1.6

Variables (mean ± standard deviation where applicable)	Three food crops, coffee and khat	Three food crops and khat	Two food crops, coffee and khat	Two food crops and khat	One food crop, coffee and khat
Access to honey in the forest (proportion of yes/no)	Yes – 31 No – 69	Yes – 27 No – 73	Yes – 26 No – 74	Yes – 16 No – 84	Yes – 23 No – 77
Mobile phone (proportion of yes/no)	Yes – 41 No - 59	Yes – 34 No – 66	Yes – 33 No – 67	Yes – 25 No – 75	Yes – 39 No – 61

Note: For some variables, "nr" means number, for example number of sharecropped fields, or number of livestock owned. For education of household head, "ordinal categories" refer to ordinal categories of educational attainment in which No education = 0, Adult education or special education = 1, Grades 1-6 = 2, Grades 7-12 = 3, and Grades 13 and above = 4.

Table 2.3 Main crops, mean harvest (kg) per household, percentage of harvest used for subsistence and percentage of harvest sold. Khat is an important livelihood variable. However, because respondents were unable to give reliable data on quantity of harvest or income due to mechanism of harvest and selling, we used presence-absence data for this variable.

Main crops	Mean harvest (kg) per household ± standard deviation	Percentage of harvest used for subsistence	Percentage of harvest sold
Maize	285 ± 459	93	7
Teff	100 ± 153	98	2
Sorghum	84 ± 157	95	5
Barley	11 ± 37	99	1
Wheat	10 ± 39	100	0
Coffee	170 ± 320	23	77
Khat	*131 households had khat*	*Some khat was used by the households*	*Most khat was produced for the local market*

Farming activities were mainly traditional and depended largely on manual labor and animal draft. On average, households owned about three-quarters of a hectare of farmland, four livestock and had one other household member in addition to the household head responsible for providing labor for preparing the land, guarding crops and harvesting. Common livelihood problems such as lack of farmland, livestock and labor were typically addressed through sharecropping arrangements. An average of two fields for each household were sharecropped fields. Most households had limited connection to markets either for selling their produce or purchasing goods. At the *kebele* level, there were two types of markets. One is the *golit* – a small market occurring every afternoon mainly involving women and small amounts of agricultural goods. The *gaba* is a larger market occurring once a week, involving both men and women. On average it takes 103 minutes to get from a house to a *kebele's* main market area. Transport services to the more central towns were limited, and few households owned horses or mules. Access to credit was also limited. Some households used informal credit

channels such as borrowing coffee or cash from neighbors, friends or kin to address a shortfall.

Typologies of livelihood strategies

Different combinations of cash crops and food crops distinctively defined the livelihood strategies of households. Households typically produced multiple crops, three on average. Based on the cluster analysis we identified five livelihood strategies, which differed based on the livelihood activities or the key crops that composed each strategy (Figure 2.1; also see Fig S2.1 for dendrogram). In the order of best to worst food security outcomes, the first livelihood strategy was characterized mainly by the food crops maize, teff and sorghum, and cash crops coffee and khat ('three food crops, coffee and khat', n=68). This was followed by the strategy consisting mainly of food crops maize, teff and sorghum, and khat ('three food crops and khat', n=59). These two strategies with the best food security outcomes notably included three food crops, with the difference of the first strategy having two cash crops and the second having only one cash crop.

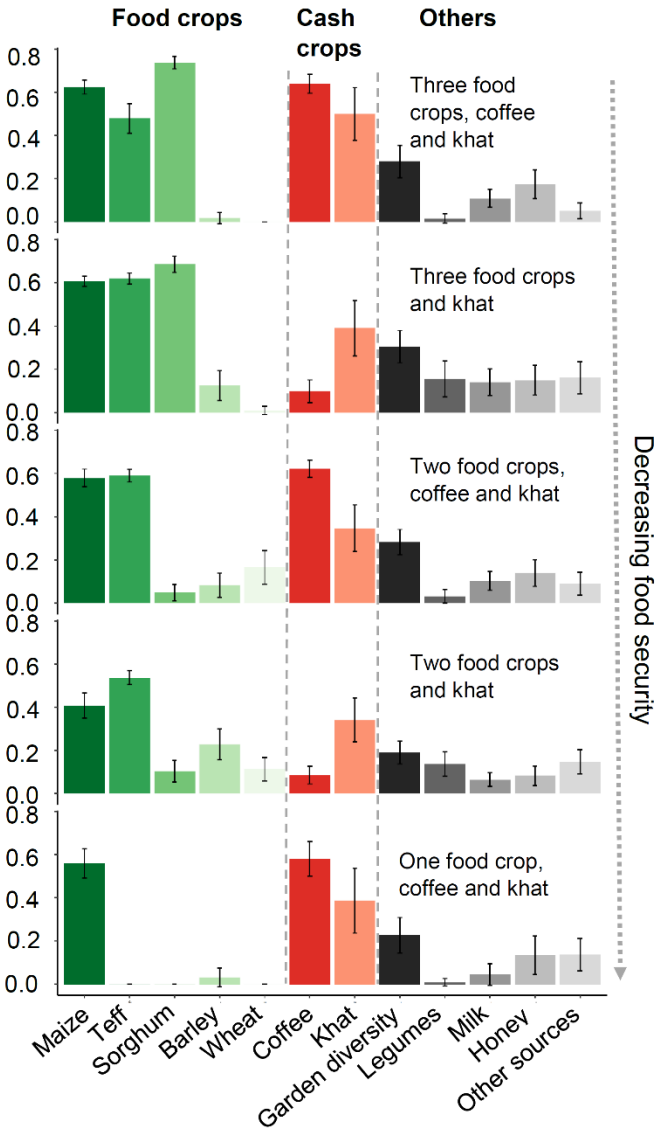

Figure 2.1 Livelihood profiles. The x-axis shows livelihood activities in the study area. The y-axis indicates livelihood components. Values for the y-axis such as harvest were log-transformed and then scaled between 0 and 1 for comparability (see Supplementary Material 2.3 for measurement of each livelihood variable). Error bars indicate 95% confidence intervals

The next strategy consisted mainly of the food crops maize and teff, and involved coffee and khat ('two food crops, coffee and khat', n=78). This was followed by the strategy consisting mainly of maize, teff and khat ('two food crops and khat, n= 88). The final livelihood strategy with the lowest food security had only maize as food crop, and coffee and khat ('one food crop, coffee and khat', n=44). Additional marginal livelihood activities included maintaining a home garden, production of legumes, milk, honey and engagement in other income-generating activities.

Clustering of households according to livelihood strategies corresponded well with the PCA ordination plot suggesting robustness of groupings (Figure 2.2a). Each point in Figure 2.2a

represents a household and each symbol (and color) represents a specific livelihood strategy. The nearness of households with the same livelihood strategy in the PCA plot indicates consistency of groupings between cluster analysis and PCA. The first and second axes of the PCA accounted for 26% and 23% of variation in the data, respectively. The first principal component had the highest correlations with the variables 'coffeeyield' (0.85), 'maizeyield' (0.35), and 'sorghumyield' (0.27). The second principal component had the highest correlations with 'sorghumyield' (-0.84), 'teffyield' (-0.40) and 'coffeeyield' (0.31) (Table 2.4). These correlations in the PCA indicated by the longer arrows (Figure 2.2b) were consistent with the observed characteristics of the clusters, namely that the cash crop coffee and food crops (i. e. sorghum, maize and teff) comprised the distinguishing features of the livelihood strategies (see Fig S2.2 for the full visualization of livelihood activities).

Table 2.4 Livelihood activities and PCA loadings.

Livelihood variables	**Principal component 1**	**Principal component 2**
maizeyield	0.35	-0.15
teffyield	-0.077	-0.40
sorghumyield	0.27	-0.84
barleyyield	-0.17	0.042
wheatyield	-0.089	0.056
coffeeyield	0.85	0.31
khat	0.020	-0.0028
gardendiversity	0.079	-0.051
legumes	-0.13	-0.068
milk_liter	0.028	-0.054
honey_kg	0.10	-0.045
oth.income	-0.022	0.0022

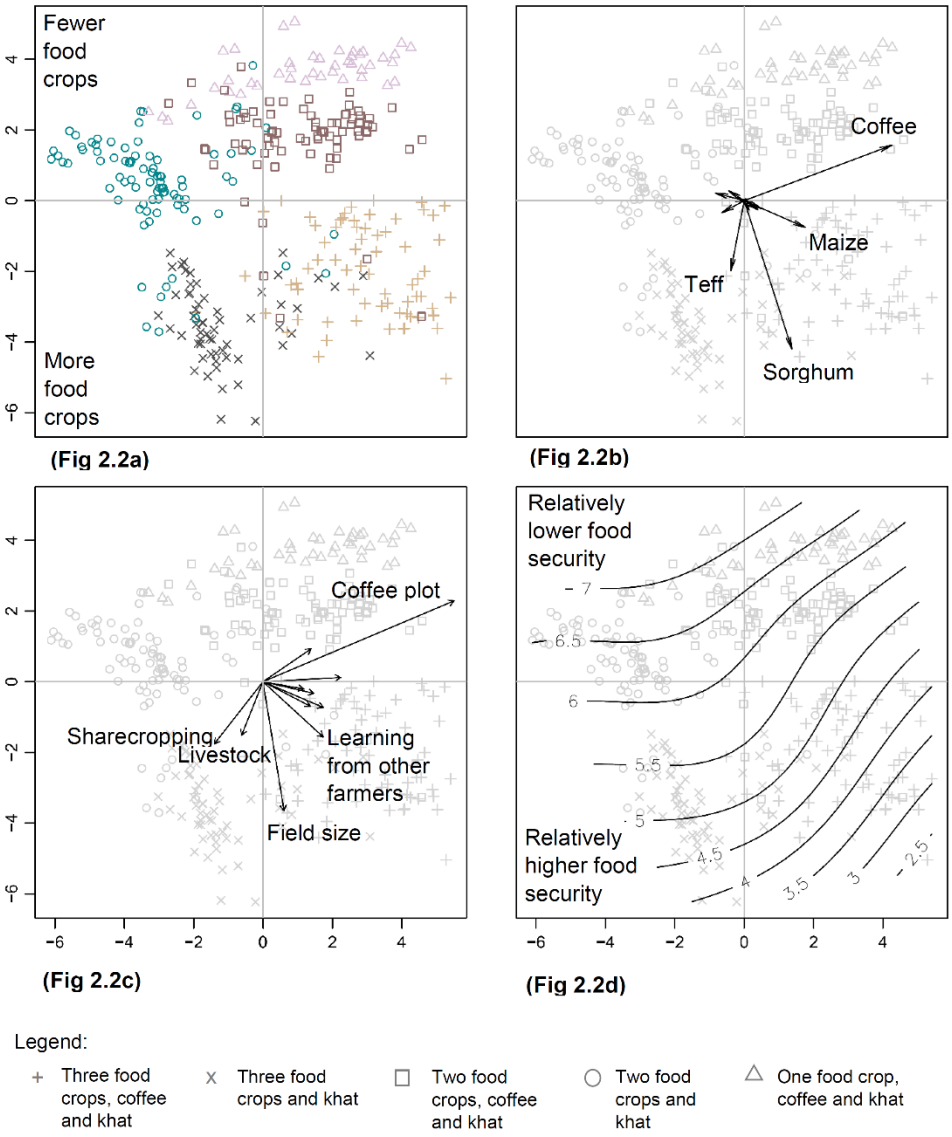

Figure 2.2 Ordination plots of livelihood strategies with associated capital assets and food security outcomes. Underlying all four panels are the combined principal component analysis (PCA) and the cluster analysis of livelihood variables with each data point representing a household and a corresponding livelihood strategy indicated by a symbol. The x-axis always depicts the first principal component (26% explained variation) and the y-axis the second principal component (23% explained variation). **2.2a)** Distribution of households by livelihood strategies in the ordination space of the PCA. **2.2b)** PCA plot of livelihood activities highlighting the variables that most strongly correlated with the first two axes. Longer arrows suggest stronger correlations with PCA axes. **2.2c)** Asset variables that are significantly correlated with the PCA axes at $p<0.01$ (permutation test). Longer arrows also suggest stronger correlations with PCA axes. **2.2d)** Gradient of food security (measured by HFIAS scores) corresponding with the livelihood strategies

Associations between capital assets and livelihood strategies

In general, 'coffeeplot' and 'fieldsize' were the capital assets with the strongest associations with the livelihood strategies (Figure 2.2c, see Fig S2.3 for the full visualization of capital assets and associations with PCA). This suggests that the ability of households to undertake the production of food crops and cash crops was strongly associated with their access to coffee plot and the size of their farmland. This was consistent with the multinomial logistic regression, which tested for relationships between livelihood strategies and capital assets and identified significant relationships with 'fieldsize' ($p<0.001$), 'coffeeplot' ($p<0.001$), 'livestock' ($p=0.005$), and 'farmtools' ($p=0.03$) (Table 2.5).

Table 2.5 ANOVA table of multinomial logistic regression applied to capital asset variables against livelihood strategies.

Capital assets	LR Chisq	Degrees of freedom	P-value
livestock	14.72	4	0.0053**
mobilephone	1.87	4	0.76
farmtools	11.07	4	0.025*
learn_DAs	5.18	4	0.27
learn_farmers	5.94	4	0.20
sharecrop	7.58	4	0.11
coffeeplot	227.10	4	<0.001***
envichange	6.26	4	0.18
accesshoney	5.13	4	0.27
landrights	1.37	4	0.85
fieldsize	77.49	4	<0.001***

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 ' ' 1

In Figure 2.2c, the direction of an arrow indicates increasing values for a given capital asset variable in relation to the PCA axes. The length of an arrow indicates the strength of correlation. The plot indicates that capital assets differed in their association with the livelihood strategies ($p<0.01$). The strategies involving three food crops were associated with having larger fields. The strategy 'three food crops, coffee and khat' had higher access to a range of capital assets. For example, they were more involved in learning with other farmers through informal exchange of information and knowledge. They also tended to have farm tools, access to honey, and mobile phones more than households with other livelihood strategies (see Fig S2.3 for the full range of significant capital asset variables). The livelihood strategy 'three food crops and khat' (lower left hand corner) had higher engagement in sharecropping and had more livestock. The strategies 'two food crops, coffee and khat' and 'one food crop, coffee and khat' were strongly characterized by ownership of coffee plots (upper right hand corner)[2]. Households undertaking these strategies also learned farming

[2] The widespread practice of sharecropping, including in coffee production, meant that there were households that harvested coffee but did not own coffee plots. We therefore included 'coffeeplot' in our examination of the links

techniques through the government's development agents and had the perception that the condition of the environment had been improving. The strategy 'two food crops and khat' (upper left hand corner) did not show strong positive association with any particular capital asset. In summary, livelihood strategies with coffee were associated with having access to coffee plots. Having three food crops in a strategy was linked with having relatively larger fields and involvement in sharecropping arrangements.

Food security and explanatory variables

Food security, as measured by HFIAS scores, was significantly associated with the types of livelihood strategies at p=0.03 (Tables 2.6 and 2.7). Moreover, Figure 2.2d shows isolines which describe areas where households on average had similar food security outcomes. This visualization shows that households undertaking livelihood strategies with a higher number of food crops (lower right hand corner) were more food secure than those with a lower number of food crops (upper left hand corner).

Table 2.6 Independent variables tested against Household Food Insecurity Access Scale (HFIAS) score, a measure of household food security, and their expected relationships with food security. Low HFIAS scores mean households are more food secure, while high scores mean households are less food secure.

Independent variables	**Type of variable**	**Expected relationships**	**References**
Livelihood strategy	Categorical	Households with more diverse livelihood strategies will tend to be more food secure.	Pellegrini and Tasciotti 2014
Gender of household head	Categorical	Male headed-households will tend to be more food secure due to systematic gendered privilege.	Quisumbing et al. 2015
Age of household head	Discrete	Households with older household head will tend to be less food secure due to reduction in available labor.	Zakari, Ying and Song 2014
Education of household head	Ordinal	Households with more educated household head will tend to be more food secure due to better knowledge, connections, and opportunities.	Ogundari 2014
Number of ill household members	Discrete	Households with more ill household members will tend to be less food secure because of reduction in available farm labor and/or medical expenses.	Espitia, Lissbrant and Tamara 2018
Kebele	Confounding/ categorical	*Kebele* will have no significant effect	---
Survey date	Discrete	Survey date will have no significant effect	---

between capital assets and livelihood strategies. That ownership of 'coffeeplot' turned out to be a predictor of coffee strategies was expected, but it was not necessarily inevitable due to sharecropping arrangements.

Table 2.7 ANOVA table of generalized linear model. The response variable is household food security measured through Household Food Insecurity Access Scale (HFIAS) scores. The independent variable livelihood strategy is a categorical variable that represents the five livelihood strategies identified (i. e. 'three food crops, coffee and khat', 'three food crops and khat', 'two food crops, coffee and khat', 'two food crops and khat', and 'one food crop, coffee and khat').

Independent variables	Sum of squares	Degrees of freedom	F value	P-value
Livelihood strategy	25.82	4	2.66	0.032*
Gender of household Head	11.68	1	4.81	0.029*
Survey date	1.76	1	0.73	0.39
Age of household head	1.52	1	0.62	0.43
Educational attainment of household head	24.67	1	3.39	0.018*
Household size	0.41	1	0.17	0.68
Number of ill household members	0.58	1	0.24	0.63
Kebele	22.70	5	1.87	0.099
Residuals	750.21	309		

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 ' ' 1

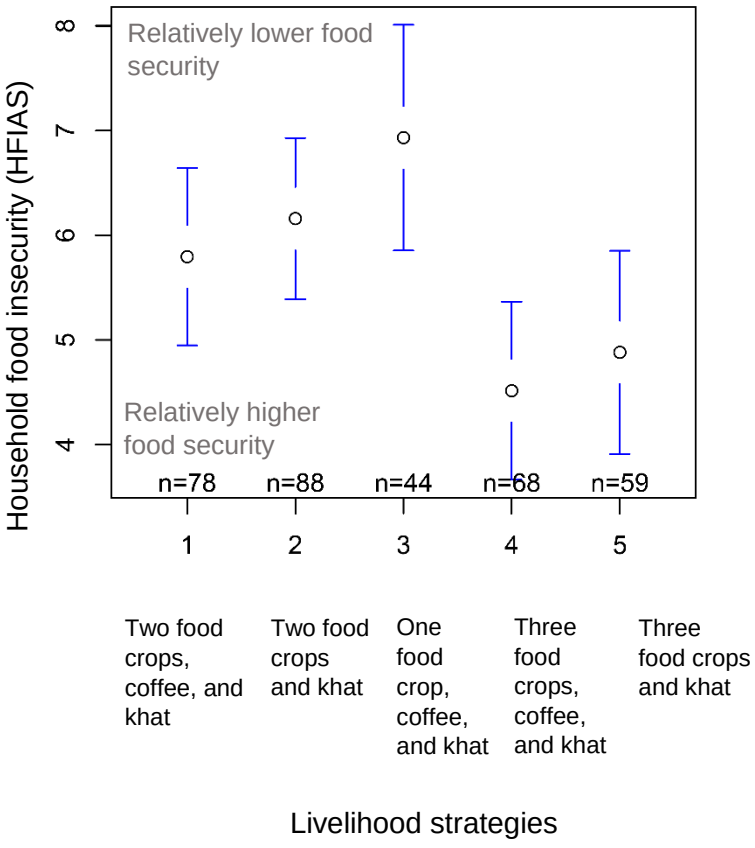

Fig 2. 3 Plot of means of HFIAS scores by livelihood strategy. Error bars indicate standard error.

Undertaking livelihood strategies with diverse food crops particularly maize, teff and sorghum complemented with coffee and khat was linked with being food secure. Having only maize, or maize and teff, even in combination with coffee and khat, was associated with lower food security. Livelihood strategies with more food crops were, on average, associated with higher food security outcomes (Figure 2.2d, Figure 2.3 and Fig S2.4). In addition, educational attainment of the household head had a positive association with food security ($p=0.02$). Gender of household head was also significantly associated ($p=0.03$). Male headed-households tended to have better food security than female-headed households. Other explanatory variables tested in the model, including survey date, age of household head, household size, number of ill household members, and *kebele* did not show any significant association.

Discussion

Our study identified five types of livelihood strategies following a gradient in composition of food and cash crops. Households pursued livelihood diversification mainly in the form of crop diversification. This is somewhat at odds with the trajectories envisaged in agricultural policies in Ethiopia and other developing countries, which prioritize production of cash crops (and food crops for commercial purposes) as a pathway for development and food security. The dissimilarity between these identified local livelihood strategies and the strategies endorsed and supported by policies is notable (Arce 2003) because evidence on the food security benefits of livelihood shifts to cash crop production has been varied and conflicting. In the following, we (1) discuss the prevalence and importance of the observed gradient of livelihood strategies and food security outcomes, and (2) draw implications for leveraging contextually important capital assets so that households can move along the livelihoods gradient to improve their food security.

Gradient of livelihood strategies and food security

Ellis (2000) discussed the importance of livelihoods diversification in a context characterized by precarious conditions and a need for survival. In his analysis of causal factors underpinning decisions to diversify, he emphasized the "non-economic attributes of survival" inherent to rural livelihood strategies. We conjecture that for households in southwest Ethiopia, the feature of diverse crops in the livelihood strategies may be motivated not so much by economic profitability and capital asset accumulation but by the basic need to ensure households' direct access to food.

The observed importance of diverse food crops in local livelihood strategies is consistent with the findings of Fafchamps (1992), who observed the critical importance of staple consumption for survival. Comparing large and small farmers in the so-called Third World setting, the author found observable difference in crop preferences with large farmers preferring cash crops and small farmers preferring food crops. For small farmers, food self-sufficiency through food crop production was found to be the best approach for assuring food security, even when food markets were present. A recent study in the Eastern Cape, South Africa, also found that household food production for the purpose of household consumption resulted in lower levels of hunger. Although wage income was considered important, household food production was critical for addressing the immediacy of food security concerns (Rogan 2018). Similarly, in our study, cash crops played an important role in income generation. Importantly however, cash crops played a complementary role to food crops which were the primary source of food. With combinations of diverse food and cash crops, households in southwest Ethiopia were able to take advantage of what Ellis (2000) termed "complementarities between crops". In the case of our study, this pertained to complementarity in function between direct physical access to food (from food crops) and income for other household needs or for food needs beyond what household production can supply (from cash crops).

Our study showed that combinations of food crops and cash crops, particularly diverse food crops, were important for the food security of households. Comparing the two livelihood strategies with the strongest contrast in food security status (i.e. 'three food crops, coffee and khat' and 'one food crop, coffee and khat') suggests that households that tend to be more food insecure could theoretically increase their food security by increasing the diversity of food crops they produce (Figure 2.2d). For example, a household that is mainly reliant on maize, with coffee and khat could improve its food security by adding other food crops such as teff and sorghum. This underscores a pathway to food security that is distinct from the market-oriented pathway of the Ethiopian agricultural policy. It is a pathway that emerges from the semi-subsistence production and consumption practices of the households in the area. In a study in Malawi, Radchenko and Corral (2018) found varied effects of agricultural commercialization on nutritional outcomes for households in different tiers of the population – benefitting some and harming others. Malawian households were likely to focus on food crops when they expected food insecurity and malnutrition. However, under conditions of weaker market barriers, households were likely to choose cash crops. These findings may also explain the preponderance of diverse food crops in southwest Ethiopia, which has been similarly characterized by seasonal food insecurity (Ethiopia CSA and WFP 2014) and limited market access. Findings by other researchers have also identified market access and

infrastructure (e.g. transportation) as important contextual factors that influence the choice and outcomes of crop production (Fafchamps 1992; Radchenko and Corral 2018). A limitation of our household level investigation was that we did not include a systematic analysis of these contextual factors and the logic underpinning households' strategies in view of these factors. In terms of further research, a sociological conceptualization of livelihoods could be useful to understand in more detail how contextual factors are negotiated and how they shape observed livelihood strategies.

Supporting local livelihoods: leveraging contextually important capital assets

Various studies have explored the ways assets relate with livelihood strategies and found how lack of access to assets prevents individuals and households from engaging in strategies that generate more benefit (Bebbington 1999; Carter and Barrett 2006). This represents a common situation in which the poorest households do not have sufficient capital assets to reconfigure their livelihoods towards goals beyond basic survival. In our study area, households that had larger areas of farmland were able to engage in the strategy that had high diversity in food and cash crops, which subsequently generated better food security outcomes. They also had access to a wider range of capital assets. Supporting households to pursue livelihood strategies with diverse food and cash crops thus should be cognizant of the need to address shortages in capital assets.

Most notably, the field size that households were entitled to, turned out to be strongly correlated with livelihood strategies. Presently, land ownership in Ethiopia rests with the government and individuals hold usufruct rights to land. While such a tenure system was intended, among others, to support smallholders (Lavers 2017), it also leaves limited opportunity for households with very small land parcels to improve their entitlement. Households that were able to pursue livelihood strategies with three food crops, had on average, a hectare of land in contrast with households that undertook the strategy 'one food crop, coffee, and khat' with only a third of a hectare. The challenge of small land holdings is likely to further increase due to rapid population growth, with smaller parcels of land being inherited by each subsequent generation (Gebrehiwot et al. 2016). This may further preclude both present and future generation of farmers from engagement in the type of diversified livelihood strategy associated with the least food insecurity. Detailed recommendations on the complex and contentious issue of land scarcity are beyond the scope of the paper. At a basic level, however, and in view of land-grabbing in various parts of Ethiopia (Ango 2018), opening space for debate at the policy level, and exploring options for land sufficiency at the household level should at least be taken up; possibly alongside culturally appropriate efforts to address population growth. In relation to land access, sharecropping arrangements emerged

to be an important means of accessing land in our study area. Households that were engaged in livelihood strategies involving one to two food crops and had lower food security, were not as much engaged in sharecropping as those producing three food crops. Investigating the factors that underlie Ethiopian sharecropping arrangements including input contribution, risk distribution, and benefit distribution may be an important step for understanding and exploring contextually suitable options for strengthening and embedding equity in these arrangements.

Furthermore, food security was not only influenced by livelihood strategies, but also by other household characteristics such as gender and educational attainment of the household head. Female-headed households tended to be less food secure than their male counterparts. This is in line with findings from gender and development research that examined systematic inequality around access and control of capital assets (Quisumbing et al. 2015) and decision-making processes (e. g. Sumner et al. 2017) causing serious disadvantage among female heads of households. In other parts of Ethiopia, women's social ties have been found to be less linked to the formal economy (Torkelsson 2007); and they have less control and access to important assets such as land and labor (Quisumbing et al. 2015). Improvements to gender equality thus emerge as an important precondition for achieving food security (Njuki et al. 2016).

Unlike other studies, we found no significant relationship between household size and food security. This could be because, in this context, household size is important for labor, but may also be negatively related to food availability because of more household members to feed (e. g. Feleke et al. 2005; Akinboade and Adeyefa 2018). Age of household head was similarly not significantly related to food security. Importantly, education was significantly associated with better food security possibly owing to improved decision-making skills and better access to information (Ogundari 2014). In summary, our findings thus suggest that access to land, fair sharecropping arrangements, gender equality, and education are foundational requirements for food security in southwest Ethiopia.

Conclusion

Based on the observed farming practices in the study area, diversified production of both food and cash crops should be encouraged to improve food security. Policies that seek to promote food security of smallholder farming households would do well to recognize and support the complementarities between food crops and cash crops rather than impose a narrowly framed economic growth narrative that can potentially erode these complementarities. This is not to

say that the cash-based approach is not beneficial, but rather that conditions necessary for enabling poor households to capture the benefits of the cash-based approach need to be present if such an approach is to be prioritized. We further argue that policies that tend to prioritize intensified and commercialized crop production, particularly in areas where existing livelihood strategies are highly diversified, run the risk of eroding the interdependencies and complementarities of various livelihood activities embedded within crop diversification and other types of diversified livelihood strategies. Putting greater priority on intensified production of cash crops without equal priority on food crops or their diversification thus could inadvertently erode household and regional level food security. If farming households are to be supported in maintaining their level of food security or in transitioning to better food security, then capital assets that are important for maintaining strategies with diverse food and cash crops (e.g. three food crops, coffee and khat) should be given priority attention. Supporting farming households to shift towards livelihood strategies associated with better food security outcomes should consider the elements embedded in households' current strategies and support them in accessing those capital assets they need to expand the sphere of their means and goals (Rakodi 1999).

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SUPPLEMENTARY MATERIALS

Table S2.1 *Kebeles* comprising the study area, corresponding altitude, and forest cover. The primary altitude range within which coffee is grown in this region is below 2000 m above sea level (asl) (Lemessa, Hambäck, and Hylander 2015).

Kebele	***Woreda*/ district**	**Altitude range (m asl)**	**Median altitude (m asl)**	**Forest cover (%)**	**Total number of households**	**Number of households included in analysis**
Borco Deeqaa	*Geeraa*	1500 - 2180	1768	72	802	68
Kellaa Hareerii	*Geeraa*	1600 – 2900	2274	79	322	28
Qudaa Qufii	*Gumaay*	1600 – 2210	1839	39	512	41
Barahaa Waraango	*Gumaay*	2120-2600	2248	0	1222	98
Gidoo Barii	*Saxammaa*	1780 - 2230	2045	32	691	59
Difoo Maanii	*Saxammaa*	1520 - 1980	1745	33	532	43

Table S2.2 List of livelihood activities included in multivariate analyses and corresponding measurement in the production period preceding the survey.

Livelihood variables	**Measurement**
Barley	Yield (kg)
Coffee	Yield (kg)
Honey	Quantity collected (kg)
Home garden diversity	Number of plants in home gardens with important use
Khat	Presence-absence data
Legumes	Combined quantity of beans and peas (kg)
Milk	Quantity collected per day (liters)
Maize	Yield (kg)
Others	Combined presence-absence data on engagement in non-farm wage labor, farm wage labor, receiving remittance, engagement in petty trade, and selling of livestock
Sorghum	Yield (kg)
Teff	Yield (kg)
Wheat	Yield (kg)

Supplementary Material 2.1

Survey questionnaire

Interviewer ID: _____ Date survey was conducted:_____

Surveyed during Pilot Study? O Yes O No

Note to interviewers: The contents that are italicized are for you, they are not to be asked or read aloud to the respondents.

(If surveyed in pilot, follow this spiel.) I am/We are part of the team from Addis Ababa University and Leuphana University in Germany studying food security and biodiversity. Some of our colleagues may have visited you some weeks or months ago and explained what the project is about. You may remember that they asked you if you were willing to be part of this study and you agreed. I would like to thank you for agreeing to be part of this. I am here because I wanted to talk with you about your livelihood, the diversity of crops you use, and the food security condition of your household. I would like to have a better understanding of the relationships between these. If it is alright with you, I would like to ask you to be part of this survey. It will include some general questions about your household, about your livelihoods, crops you grow, and the food items that your household uses. The whole survey will take about an hour or a little bit more. If there are questions that you don't want to answer, you are free not to answer them. Also, you are free to end this interview anytime you wish to, although I would really appreciate hearing your thoughts about all the questions I have. I would like to assure you that we will not use your name or the name of your community in any future publication coming out of this study. We cannot say that you or your community will directly benefit from the results of this study, but the study can generate information that may help us understand issues of food security and livelihoods better. Do you have any questions before we start? If not, we can start.

(If not surveyed in pilot, use this spiel instead.) I am/We are part of the team from Addis Ababa University and Leuphana University in Germany studying food security and biodiversity. The student doing this research seeks to understand how livelihoods of people affect the food security of their households, and how biodiversity also affects food security. I would like to gather information from six kebeles in this region, and your household is one of those that were randomly chosen *(explain a bit more about why selection was random and how they were randomly selected)*. If it is alright with you, I would like to ask you to be part of this survey. It will include some general questions about your household, about your livelihoods, crops you grow, and the food items that your household uses. The whole survey will take about an hour or a bit more. If there are questions that you don't want to answer, you are free not to answer them. Also, you are free to end this interview anytime you wish to, although I would really appreciate hearing your thoughts about all the questions I have. I would like to assure you that we will not use your name or the name of your community in any future publication coming out of this study. We cannot say that you or your community will directly benefit from the results of this study, but the study can generate information that may help us understand issues of food security and livelihoods better. Do you have any questions before we start? If not, we can start.

Witness (*write who else is present as witness that the respondent gave his/her consent to do the survey*): _____

1. ***Household Profile*** (*For households that were surveyed during the pilot study, some of the information in this section have already been collected. They are marked with asterisks. Do not repeat the questions, but try to confirm their previous answers by saying "You had been asked some questions in a survey by other team members of this research a few months ago… and just mention some of the answers they already gave and ask if these are right.)*

1.1 Name *(**Do not ask**, only write if the person introduces himself or herself)*:	1.2 Sex: O Female O Male	*1.3 Age:
*1.4 Religion: O Muslim O Orthodox O Protestant O Catholic O Others, _____	*1.5 Marital Status: O Single O Married O Divorced O Widowed	1.5.1 If married, type of household: O Monogamous O Polygamous
1.5.2 If marriage is polygamous, how many wives does the household head have: O 1 O 2 O _____	*1.6 Household Size: _____ *Note: A household is made of people that live together in one house and share a meal.*	*1.7 Number of dependent children: _____ *(Children that don't have spouses and kids of their own and no earning yet.)*
*1.8 What grade of education did you complete? _____ And how about your spouse? _____	*1.9 When did you settle in this particular spot? O _____ (Ethiopian year) O A long time ago but I cannot recall O Always been here O Born here, left, and came back on _____	*1.10 If respondent was not born in the kebele, ask from where he or she was: O Within Oromia O Other: _____
*1.11 Did your parents live in this region? O Yes O No If no, from where? _____	1.12 Do you have children who dropped out of school within the last three years? O Yes If yes, how many: _____ O No	1.13 Is there any member of this household who has been repeatedly or continuously ill within the last three years? *(ill for a long time, for example continuously sick for nearly one month)* O Yes If yes, how many: _____ O No

*1.14 How many farm fields do you farm in? *(including home garden, crop fields owned, and fields where person is sharecropping)* _____	1.15 What is the area of land your household farms? Home garden: _____ Sharecropping: _____ *Field 1: _____ *Field 2: _____ *Field 3: _____ *(in hectare or oxen days but be sure to ask how many oxen days is equivalent to 1 ha; for fields 1-3 or more, specify crops planted. For households included in pilot study, skip the fields with asterisk)*	1.16 How far is the nearest source of drinking water? *(Use time required to get there.)* _____
1.17 What type of toilet does your household have? O Pit latrine O Hole O We go outside O Others _____	1.18 (Do not ask, infer if possible.) Ethnicity: O Oromo O Amharic Others:_____	

Part 2. Livelihood Strategies and Crop Diversity

(Recall time for questions in this part: present year)

2.1 What are the crops that you produce? *(Check those that apply and ask the next questions. Write down if there are others.)*

***Crops produced**	***Improved or not?** **0 – No** **1 – Yes**	***Quantity of average harvest before consumption and selling *(either in kilograms or quintal)***	**Indicate if from sharecropping farm (SF), own farm (OF), homegarden (H), and forest (F)**	**How much is consumed?**	**How much is sold?**	**Where sold?** **trader (T)** **market (M)** **community (C)**	**What is the cash income estimate from selling?**
O Coffee							
O Maize							
O Teff							
O Sorghum							

O Wheat							
O Barley							
O Khat							

2.2 Are there other plants that women specifically produce and earn from?

Plants produced	**Quantity of average harvest**	**How much is sold?**	**What is the cash income estimate from selling?**
O Cabbage			
O Onion			
O Pepper			
Others:			

2.3 Are there other farm, off-farm, or non-farm activities that members of the household engage in which generate cash or other forms of income (e. g. free use of oxen, free use of land, free use of farming equipment, free food)? *(Check those that apply and ask follow up questions.)*

***Other income-generating activities**	**Who are involved? (husband (h), wife (w), children (c))**	**What is the proportion sold? / How much is the income?**
O Livestock: selling milk		/
O Livestock: selling meat		/
O Livestock: selling live animal		/
O Beekeeping/selling honey		/
O Making and selling handicraft		/
O Operating a store/small business/petty trade		/
O Wage labor in other farms		/

O Non-farm wage labor (e. g. construction work)		/
O Sell of firewood/charcoal		/
O Remittance		/
O Others, write below		/
		/
		/
		/
2.3a Are you collecting these materials? Check if yes.[3]		
	How much?	**Sources (OF – own farm or F - forest)**
O Honey	Last harvest (kg):	
O Eucalyptus	Nr. of trees standing:	
O Wood for plow, hoe, axe, spade	Nr. Of plows __, hoes __, axes __, spades__ last year	
O Fuel wool	Nr of loads per week:	

2.4 In some households, some crops are set aside for consumption. *(*You mentioned some crops which you consume..*) Are there other plants in your home garden or farm fields which you also collect and consume as food?*

Other plants eaten	**Frequency of eating (S – when it is the season; AY – it is available all year round and we eat when available; NOF – it is available all year round, but we only eat it when there is no other food to eat)**
O Avocado	
O Mango	
O Banana	
O Taro	
O Enset	
O Anchote	
O Beans	
Others:	

[3] Ecosystem bundle question.

2.5 What is the proportion of the total cash income of your household that is spent on food?
_____

2.6 How does your household get majority of its food during the different seasons in a year? *(Place the letter of choice in the table below. It is possible to indicate two answers for every season.)*

A. We buy most of our food.

B. We produce most of our own food.

C. We borrow from neighbor like when we don't have injera for today, we borrow a little and pay tomorrow.

D. We get most of our food from exchange of products with others.

E. We receive most of our food from others.

Bira	**Bone**	**Arfasa**	**Gana**

Part 3. Capital Assets

In this next part, we will talk about the resources that you are able to use for your livelihood.

3.1 Are there other members in your household who are able to help you work in your farm plot?

O Yes If yes, how many? _____ O No

3.2 Are you able to learn new farming techniques from DAs, extension workers, or NGO programs?

O Yes If yes, how often? O Rarely O Seldom O Often O Always

O No

3.3 Are you able to learn new farming techniques from fellow farmers?

O Yes If yes, how often? O Rarely O Seldom O Often O Always

O No

3.4 Do you have access to information about new technologies and market prices of agricultural goods?

O Yes If yes, how often? O Rarely O Seldom O Often O Always

O No

3.5 Are you an active member of a farming organization or a seller's association?

O Yes O No

3.6 If you want to invest on your livelihood, are there people (e. g. relatives, neighbors, friends) or organizations that you can borrow money from?

O Yes If yes, from who?

_____

O No

3.7 If you encounter problems in your livelihood such as pest infestation, are there people (e. g. relatives, neighbors, friends) or organizations that you can turn to for help?

O Yes If yes, who or what organization? _____

How do they help?

_____

O No

3.8 If there is a shortage of cash earning or of food in your household, are there people (e. g. relatives, neighbors, friends) or organizations that you can turn to for help?

O Yes If yes, who or what organization? _____

How do they help?

_____

O No

3.9 Do you use natural resources such as forests and water?

O Yes

O No

3.10 Are you able to participate in activities related to making decisions for using the forests and water?

O Yes If yes, do you think you are able to say what you want to say?

_____

O No

3.11 Do you think there have been changes in the quality of the natural resources nearby such as forests, water, and soil?

O Yes If yes, how has it changed? O Become better O Become worse

O No

3.11a How is the fertility of your soil without fertilizers? O good O medium O bad

3.12 Do you think that changes in natural resources nearby affect your livelihood or the availability of food for the household?

O Yes O No

3.13 How far is the nearest market where you can sell your products? _____

How about the nearest market where you can buy food and other household needs? ___

3.14 What is the status of your ownership of land?

A. I own a certificate.

B. I received it as inheritance.

C. Others: _____

3.15 Does your household own any of the following items? Can you tell me how many of each your household owns?

Physical resources	**Quantity/number owned**	**If you don't own these, can you access them through people you know? Write 0 for No, and 1 for Yes.**
*Oxen		
*Cow		
*Cattle (also indicate how many are for beef fattening)	( )	
*Goats		
*Sheep		
*Horse		
*Chicken		
*Mule		
Non-mechanized farm equipment (e. g. machete, hoe, plow made of wood and pulled by oxen)		
Mechanized farm equipment (e. g. tractor)		
Vehicle (e. g. motorbike, bicycle)		
Cellphone		

Part 4. Household Food Security

	No	**Yes**	**Rarely**	**Sometimes**	**Often**
4.1 In the period June-August, did you worry that your household would not have enough food?	O		O	O	O
4.2 In the period June-August, have you ever had to eat enset or a food you did not like because there was nothing else to eat?	O		O	O	O
4.3 In the period June-August, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	O		O	O	O
4.4 In the period June-August, did you or any household member have to eat fewer meals in a day because there was not enough food?	O		O	O	O

4.5 In the period June-August, did you or any household member go to sleep at night hungry because there was not enough food?	O		O	O	O

Part 5. Household Dietary Diversity

5.1 What foods have you eaten in the last one week?

	Food Items	**Approximately how often did you eat these last week?** **(Rarely – one time last week, Sometimes – 2-4 times last week, Often – 5-7 times last week)**
Breakfast		
Lunch		
Dinner		

5.2 Can you recall what other foods in addition to what you just identified you ate last week?

Other foods eaten	**Approximately how often did you eat these last week?** **(Rarely – one time last week, Sometimes – 2-4 times last week, Often – 5-7 times last week)**
O Eggs	
O Beef	

O Chicken	
O Milk	
O Nuts	
O Rootcrops: _____	
O Fruits: _____	
Others:	

Part 6. Constraints

6.1 Can you tell me about the biggest problem you have about your livelihoods and what you do to try and mitigate them? *(If they talk about wild animals raiding their farms, take note of that, and then ask if there are still other problems.)*

(Ask the following questions, only if it is not yet 1 hour and 10 minutes since start of interview

6.2 Which place(s) in the landscape do you like because of its beauty? Please explain why.

6.3 Which place(s) in the landscape do you use for recreation and relaxation? Please explain why.

That completes the survey. Thank you very much for sharing your time and this valuable information with us. Do you have any question for us before we close? Again, thank you and I wish you a good day.

(The interviewer should answer this after the interview.)

What is it about this household that is interesting and which I might want to come back for? And how do I find this household again?

_____
_____

Supplementary Material 2.2

Mathematical formulas for the generalized linear model and log transformation of livelihood variables

A generalized linear model was used to test the effect livelihood strategy, household characteristics, *kebele*, and survey data on the dependent variable HFIAS score (food security measure). The formula is as follows:

$$\log(\text{hfiasscore}_i) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + \beta_8 x_{8i} + \beta_9 x_{9i} + \beta_{10} x_{10i} + \beta_{11} x_{11i} + \beta_{12} x_{12i} + \beta_{13} x_{13i} + \beta_{14} x_{14i} + \beta_{15} x_{15i} + \beta_{16} x_{16i} + \beta_{17} x_{17i}$$

with x_1=1 if livelihood strategy type is 2 (otherwise 0), x_2=1 if livelihood strategy type is 3 (otherwise 0), x_3=1 if livelihood strategy type is 4 (otherwise 0), x_4=1 if livelihood strategy type is 5 (otherwise 0), x_5=1 if sex=male (otherwise 0), x_6=date, x_7=age, x_8=1 if education cluster is 1 (otherwise 0), x_9=1 if education cluster is 2 (otherwise 0), x_{10}=1 if education cluster is 3 (otherwise 0), x_{11}=household size, x_{12}=number of ill household members, x_{13}=1 if kebele=GBW (otherwise 0), x_{14}=1 if kebele=GQH (otherwise 0), x_{15}=1 if kebele=GQQ (otherwise 0), x_{16}=1 if kebele=SDM (otherwise 0), x_{17}=1 if kebele=SGB (otherwise 0)

The variables used for the multivariate analysis were log-transformed to meet requirements of normality. The formula is shown below:

$$y_{ij} = w_{1i}*\text{gardendiversity}_j + w_{2i}*\text{milk}_j + w_{3i}*\text{honey}_j + w_{4i}*\log(\text{maizeyield}_j+1) + w_{5i}*\log(\text{teffyield}_j+1) + w_{6i}*\log(\text{sorghumyield}_j+1) + w_{7i}*\log(\text{coffeeyield}_j+1) + w_{8i}*\log(\text{wheatyield}_j+1) + w_{9i}*\log(\text{barleyyield}_j+1) + w_{10i}*\text{khat}_j + w_{11i}*\text{otherincome}_j + w_{12i}*\log(\text{legumes}_j+1)$$

With w denoting weights and for i=1,…,12 principal components and j=1,….,337 households

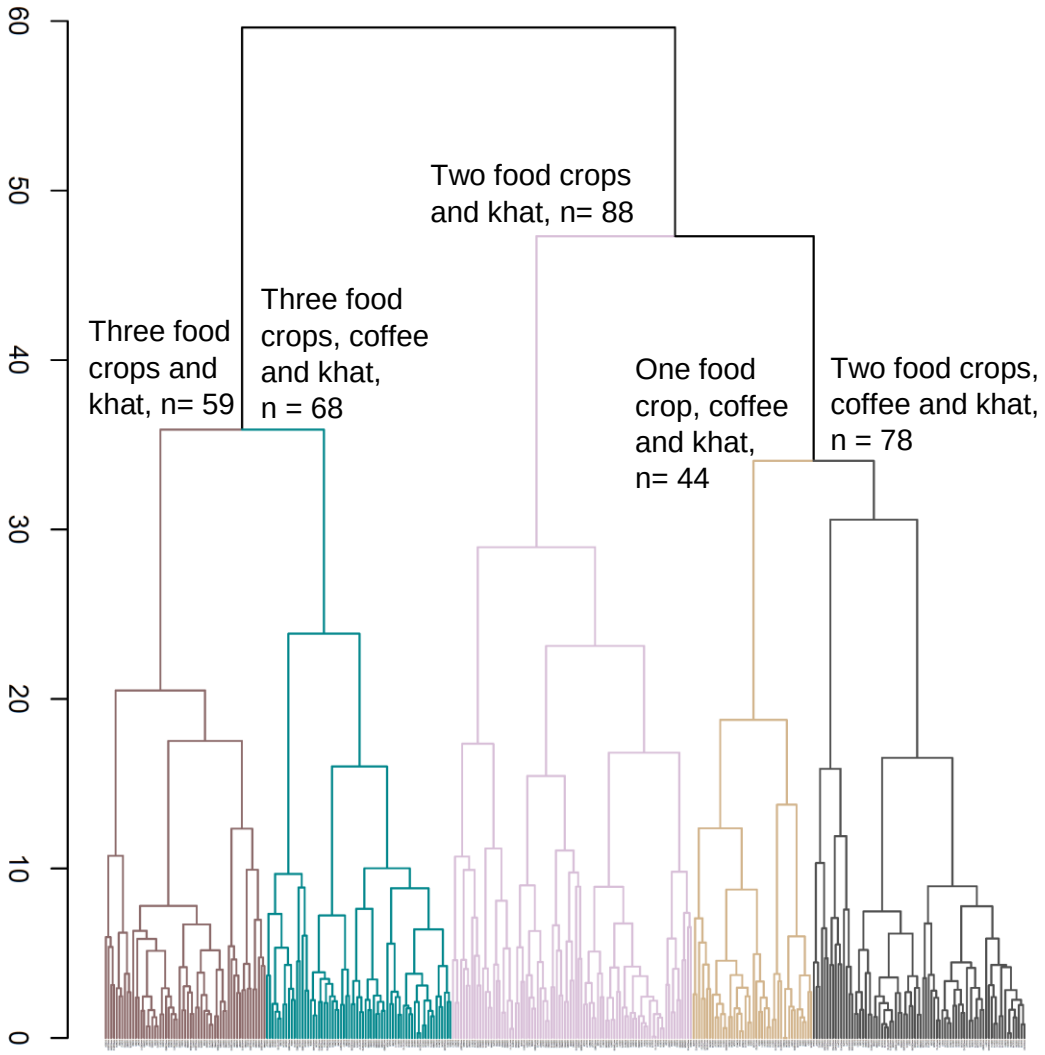


Fig S2.1 Full dendogram of livelihood strategies from cluster analysis. For the livelihood activities that compose each cluster or livelihood strategy, see Figure 2.1.

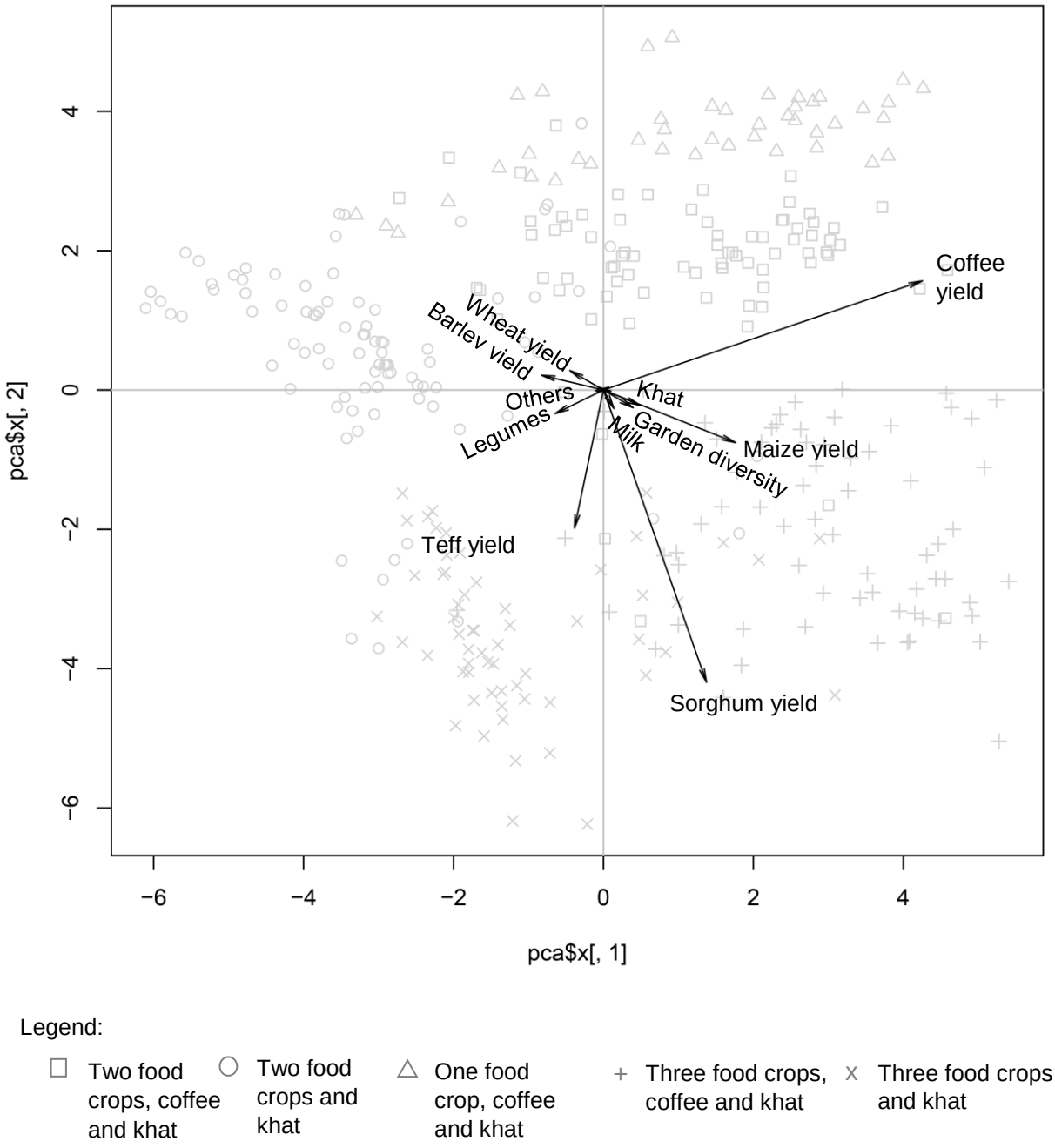
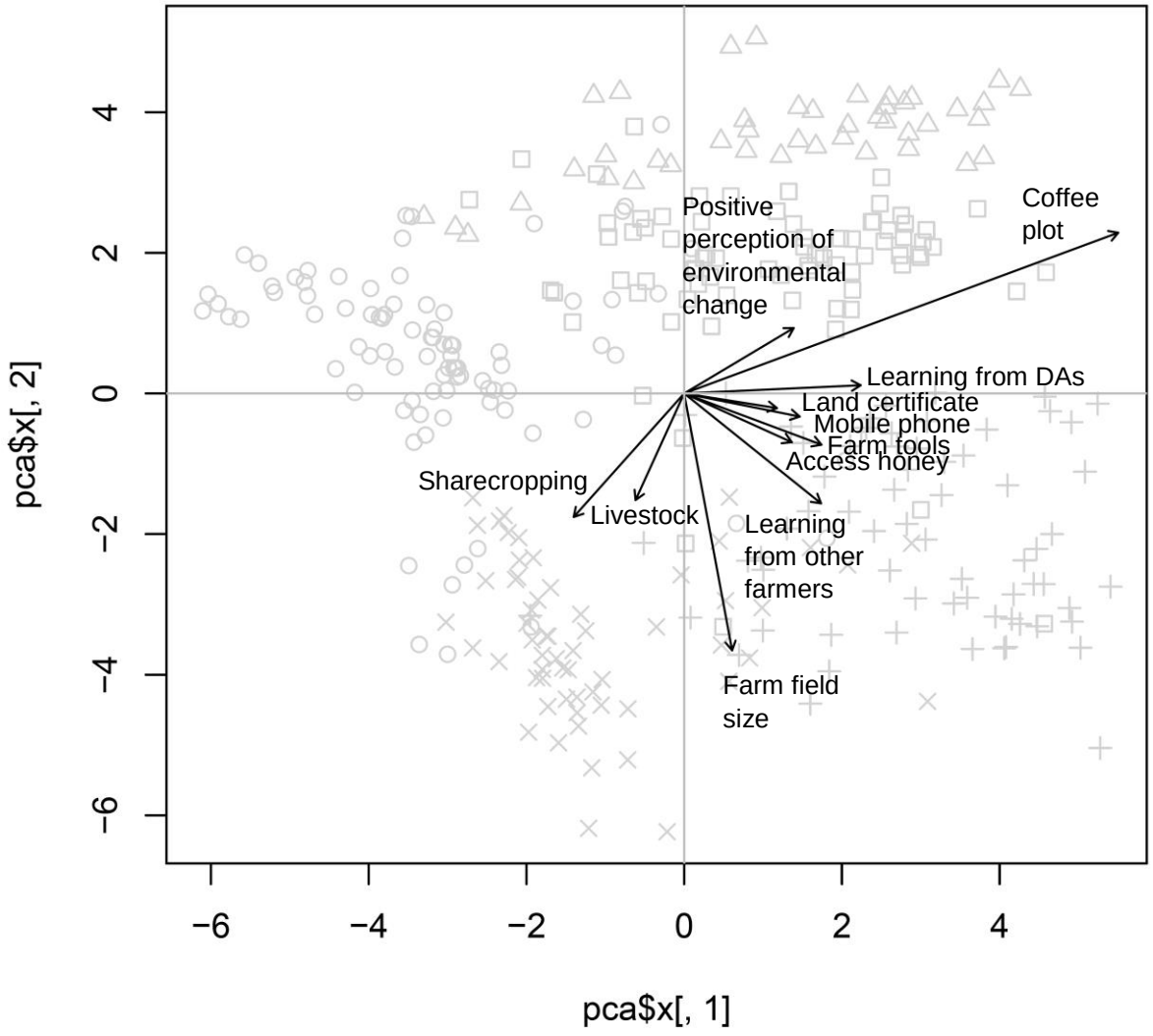


Fig S2.2 PCA plot of livelihood activities. The symbols indicate the livelihood strategies that households belong to. The first and second axis of the PCA accounted for 26% and 23% of variation in the data, respectively. The first principal component had the highest correlations with the variables 'coffeeyield' (0.85), 'maizeyield' (0.35), and 'sorghumyield' (0.27). The second principal component had the highest correlations with 'sorghumyield' (-0.84), 'teffyield' (-0.40) and 'coffeeyield' (0.31).



Legend:

□ Two food crops, coffee and khat ○ Two food crops and khat △ One food crop, coffee and khat + Three food crops, coffee and khat x Three food crops and khat

Fig S2.3 The full range of capital asset variables that correlated significantly with the PCA axes at $p<0.01$. Different capital assets have a strong association with certain types of livelihood strategies. For example, livelihood strategies with more food crops are linked with having a bigger farm field relative to others in the area, and having access to more types of capital assets.

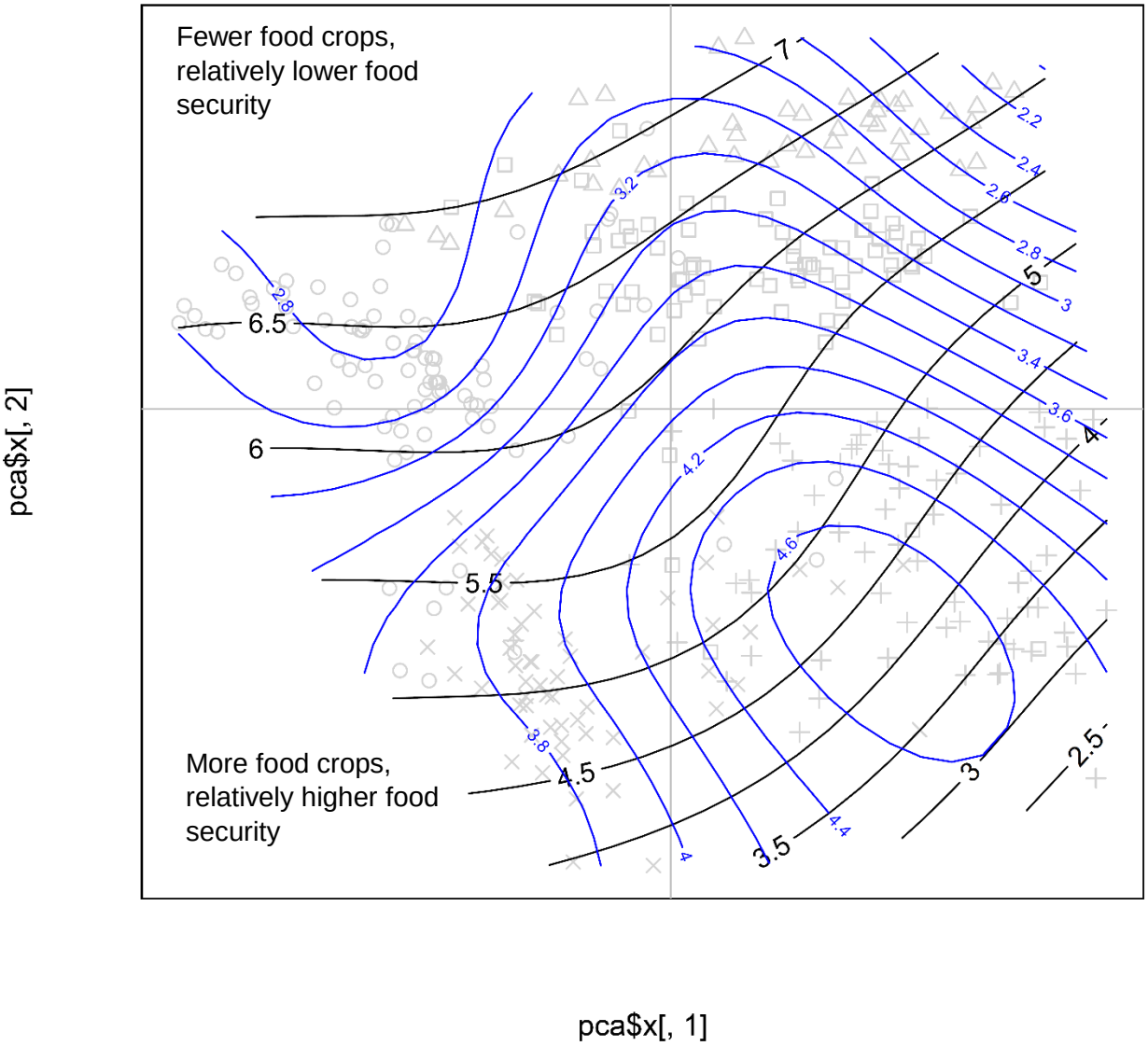


Fig S2.4 Visualization of the gradient of food security as measured by HFIAS scores and number of crops in specific livelihood strategies. The black contour lines are the HFIAS scores. High HFIAS scores indicate low food security and low HFIAs scores indicate high food security. The blue contour lines indicate the number of crops. Households with higher number of crops have higher food security.

Chapter III

"… narratives can be seen as a means of explaining change processes and responses, and to gain insights into diverse meanings and mental models. They ultimately constitute a translation of complexity rooted in the lived experience of different people, in different places."

Katrina Brown

Chapter III

Capital asset substitution as a coping strategy

Practices and implications for food security and resilience in southwestern Ethiopia

Aisa O. Manlosa, Jannik Schultner, Ine Dorresteijn, and Joern Fischer

(Manuscript)

Abstract

We investigated the case of smallholder farming households in southwestern Ethiopia and analyzed how coping strategies and mechanisms of capital asset substitution influenced the capital asset base, and consequently, the capacity of households to be food secure and resilient in the future. Our analysis drew on qualitative data from 365 responses to an open-ended section of a livelihoods survey, thirty semi-structured interviews, and field notes. The most frequently mentioned livelihood challenges relate to natural capital. The widespread challenge of lack in economic capital was also viewed in terms of enabling or constraining ability to address problems with the natural capital. Drawing on social and human capitals were highly important for coping and these were evident in the widespread practice of sharing arrangements such as sharecropping, livestock-sharing and *didaro*. The pooling together of human capital assets particularly labor was instrumental in facilitating these collaborative arrangements. Drawing on social and human capitals tended to maintain the capital asset base of households. Coping strategies that involved drawing on economic and physical capitals such as the purchase of inorganic fertilizers to address low soil fertility tended to erode capital asset base. The results imply the need to recognize natural capital as a fundamental basis for smallholder farming livelihoods, and therefore also a basis for food security and resilience. The strengthening of social and human capitals such as local collaborative arrangements, health, and education, should be supported in policies and interventions that seek to improve the food security and resilience of households.

Introduction

Approximately 800 million people worldwide are food insecure, with a clear rise in numbers in sub-Saharan Africa and a possible increase globally (FAO et al., 2015; FAO et al., 2017). Ending hunger and malnutrition continues to be an important challenge as evidenced by its prominent position among the UN Sustainable Development Goals (UN General Assembly, 2015). While the means for achieving universal food security remain contested (Lang and Barling, 2012; Tomlinson, 2013), the importance of local solutions has frequently been recognized. Food security and malnutrition are inextricably entwined with other pressing global challenges such as poverty, inequality, social justice, environmental degradation, biodiversity loss, and climate change (e. g. Kerr, 2012; Misselhorn et al., 2012, Schipanski et al., 2016; Fischer et al., 2017). Drawing on diverse knowledge, concepts and approaches from a range of disciplines is therefore imperative to understanding the conditions within which food insecurity, in conjunction with other challenges, is experienced (Glamann et al., 2015).

Especially in Africa, many people affected by food insecurity are smallholder farmers (AGRA, 2014; FAO et al., 2015). Smallholder farming livelihoods are regularly exposed to different shocks and stresses (Pelletier et al., 2016). In particular, environmental challenges associated with soil fertility (Tittonell and Giller, 2013), insufficient water availability (Turral et al., 2011), insect and mammal pests (Ango et al., 2014) and climate change (Morton, 2007) affect farming livelihoods. Such impacts reduce agricultural production and, consequently, cause seasonal or prolonged food insecurity. While some technological measures to address environmental effects on farming livelihoods exist (e.g. fertilizers, pest-resistant varieties, water storage systems), issues of access, environmental justice and underlying socio-political dynamics bring to question the long-term efficacy and sufficiency of technology-oriented approaches (Loos et al., 2014). At the same time, locally established ways of adjusting livelihood strategies, though traditionally known to be valuable and effective, may also prove to be limited in the face of an unprecedented magnitude and rate of environmental change.

The often co-occurring but distinct livelihood challenges that smallholder farming households face can be distinguished as relating to the processes and outcomes of farming livelihoods. Here we consider process-related challenges as those involving capital assets necessary for the construction of livelihoods – that is, such challenges relate to the extent to which households are able to draw on various means to make a living. In addition, outcome-related challenges are those that directly impact the well-being of individuals and households – for example, acute food shortage is a direct challenge, irrespective of which livelihood strategies led to it. In this study, we considered the five types of capital assets in the Sustainable

Livelihoods Framework (SLF) – namely economic, human, natural, physical, and social capital. We investigated how households coped with a lack in any of these assets as well as with acute food shortages. We recognize that food shortage is influenced by a complex set of factors interacting across scales (Leventon and Laudan, 2017). Here, we chose to focus on the household level, and investigated food security or its absence as an outcome of a number of factors that converge in the process of households pursuing livelihood strategies. When faced with either process-related or outcome-related challenges, households act as agents who deploy certain strategies in order to cope (Brown and Westaway, 2011). Most coping strategies involve drawing on one or a combination of capital assets (Carter et al., 2004) through processes of substitution. A typical example is when households liquidate livestock to generate cash (Adimassu et al., 2014).

The concept of capital asset substitution (see Beckerman (1995) and Daly (1995) for the debate on weak vs strong sustainability) has been used to analyze types of capitals and their interrelationships in production processes (particularly natural capital and human-made capital), and to derive implications for sustainability. Using capital asset substitution as a lens offers a relevant vantage point in the analysis of livelihoods and their outcomes because it reveals the dynamics of how households respond to or cope with livelihoods-related problems, particularly in the context of smallholder farming. Also, by highlighting the relationship between natural capital and human-made capital, the concept of capital asset substitution links analysis at the household scale to the state of the broader landscape. Questions that arise include: How does the state of the natural environment affect the capacity of smallholder farmers to produce sufficient food? Or conversely, do livelihoods that enable capital asset accumulation result in the conservation or degradation of the natural environment? Despite capital asset substitution being a common feature of smallholder farming livelihoods for coping during difficult times, analysis has been scarce on the links between livelihoods, types of capital asset substitution, food security outcomes, and implications for the resilience of households in the face of livelihood challenges and food shortage. A better understanding of the role and outcomes of capital asset substitution in the context of coping strategies, in turn, may reveal hitherto unrecognized nuances in the conditions and processes underlying food security and resilience at the household level.

We situated our investigation in a smallholder, largely subsistence-oriented agricultural landscape in southwestern Ethiopia. The combination of a strong reliance of local livelihoods on natural capital and widespread lack of financial capital place the lived experiences of most households (sensu Brown, 2015) in this landscape at the intersection of issues such as environmental degradation, food security and resilience. In this paper, we sought to answer: (1) How do smallholder farming households cope with the process-related challenge of

shortages in capital assets and with the outcome-related challenge of an actual food shortage? (2) How do coping strategies involve mechanisms of capital asset substitution? (3) How do different types of capital asset substitution influence a given household's state of capital assets, and what are implications for future food security and resilience? Through this work, we seek to make a holistic contribution to the food security discourse. Particularly, our perspective can be situated within an emergent social-ecological strand (e.g. Brown, 2015) that engages with the complexity inherent in smallholder farming livelihoods and their lived experience of food (in)security.

Conceptual Framework

Complexity (i.e. multiple factors, cross-scale interactions, diverse individual contexts) and dynamism inherent in the lived experiences of farming households present challenges for empirically analyzing links between livelihood challenges (i.e. capital asset-related, food shortage), coping strategies and capital asset substitution, food security and resilience. In this section, we present a conceptual framework drawing on each of these distinct but interrelated concepts to illustrate our hypotheses and to structure our subsequent analysis (Figure 3.1).

First, we considered capital assets as the assemblage of resources material or otherwise that households combine to make a living and generate well-being (Scoones, 1998; see also Bebbington, 1999; Carter and Barrett, 2006). Drawing on the SLF, we considered capital assets as the building blocks on which individuals and households exert agency in the process of constructing their livelihoods. These serve as critical determinants of what smallholder farming households are able and unable to do. Without sufficient capital assets, households face challenges in the process of constructing livelihoods, and are potentially prevented from engaging in viable livelihood strategies (Barrett, 2006). A low capital asset base typically enables livelihoods with only low returns, posing challenges to growing the capital asset base and escaping poverty (Carter and Barrett, 2006). Capital assets have a pivotal importance in any analysis dealing with people's livelihoods. Consistent with this body of theory, we recognize that the dynamics surrounding access to capital assets are situated within a broader context (de Haan and Zoomers, 2005), including environmental and economic trends, institutional and political context, and differences in individual agency. However, in this paper, we focused primarily on capital assets (and not the broader context) because shortages in one or in a combination of assets experienced at the household level create process-related challenges that limit the efficacy of livelihoods in generating desirable outcomes such as food security, with potential repercussions for resilience.

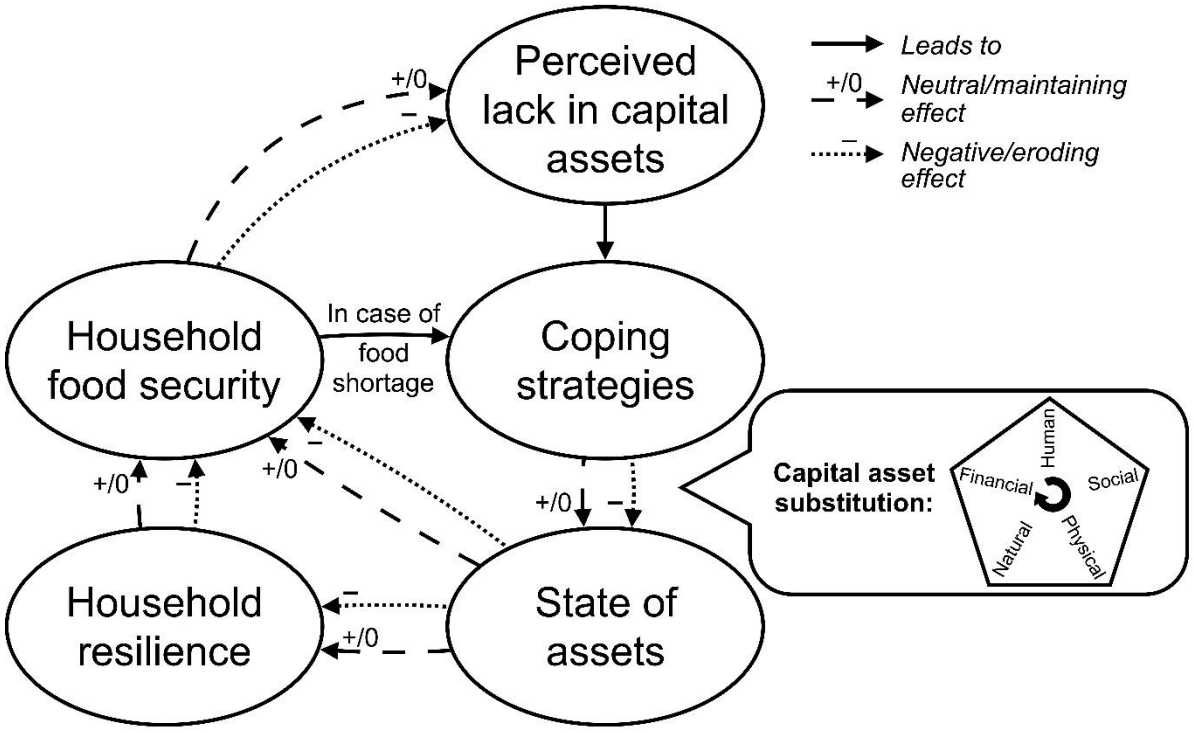


Figure 3.1 Conceptual framework of the study. Households that face shortages in capital assets face difficulties in constructing livelihoods. In response, households employ coping strategies – that is, they deploy short-term, reactive measures to mitigate the negative effect of a lack in either capital assets or food. In addition, food shortage, irrespective of whether it is caused by an unviable livelihood strategy or shocks, also requires households to cope. Coping strategies often involve reconfiguring the use of capital assets, which we refer to as capital asset substitution. Mechanisms of capital asset substitution either maintain (+/0) or erode (-) the capital asset base of a given household. This, in turn, has important implications for household resilience and food security, with feedback on the capital assets households draw on to construct livelihoods.

Second, we conceptualized households as actors and agents who actively respond to lack in capital assets or a potential food shortage. Such responses were considered coping strategies – that is, a set of reactive, short-term actions that households implement to alleviate the negative effects of challenges (Nelson et al., 2007). For many smallholder households, the

need to cope is often a fixture in daily life. We unpacked coping strategies through the lens of capital asset substitution (Daly, 1995). Rakodi (1999), in analyzing livelihoods through the lens of a capital assets framework, described substitution as a means of "compensating for the declining availability or quality of natural capital by increasing inputs of physical capital which are either produced or purchased". For example the financial remittance coming from a remote family member who migrated for work is the substitute for the labor of that household member (Rakodi, 1999). In the context of our study, we defined capital asset substitution as the process in which households lacking one or several types of capital assets instead draw on more readily accessible capital assets of a different type. The process of coping, in turn, may involve several steps or asset conversions before the actual need is addressed. For example, addressing scarcity of fertile land may involve applying inorganic fertilizer, a process that involves using economic capital (money) to purchase physical capital (fertilizer) as a response to a problem with a natural capital asset (soil fertility). As discussed to this point, capital asset substitution is primarily reactive, that is, a response to shortage in a specific capital asset. We acknowledge that there are situations where substitution is a proactive decision taken to increase the efficiency of a particular livelihood (e.g. substituting human labor through farm machinery). However, in this paper we focus on coping strategies, and hence limit our analysis to reactive asset substitution.

Third, we considered household food security[4] as a key outcome of livelihoods, which continuously enables all household members to lead an active and healthy life (see Pinstrup-Andersen, 2009 for exposition). While there are other aspects of human well-being that would be interesting to analyze, in a food insecure setting, we considered this as the most foundational component. Finally, we included household resilience in our framework. Drawing on Béné et al. (2016), we defined this as a household's capacity to continue functioning in challenging situations – namely, in the context of this study, when facing shortages in capital assets or food.

The starting point for our analysis is the set of actual challenges that smallholder farming households reported being confronted with – which related mostly to issues around capital assets. Challenges associated with capital assets, in turn, are generally experienced differently by poor and better-off households, such that the poor are perpetually faced with the need to cope while also having limited options for coping. The ability to successfully master the process of asset substitution, in turn, is closely linked with challenges related to the outcome of food security – that is, households with insufficient assets or an inability to substitute

[4] "Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO 2002).

between assets are also likely to face food shortages. When livelihoods do not generate sufficient food, coping strategies to address the food shortage become exigent. We hypothesized that depending on the type of capital asset substitution deployed, coping strategies could either maintain (or improve) a households' capital asset base or erode it (Figure 3.1). In the aftermath of deploying a coping strategy, the resulting state of capital assets (i.e. maintained/grown vs. eroded) subsequently affects resilience and food security. Growth in capital assets may occur when a household has moved beyond the state of merely coping to a position where it is capable of taking advantage of opportunities for growth – a characteristic of viable livelihoods. Erosion of assets may be linked with a loss of resilience because of a reduced capacity to respond to shocks. Similarly, those with fewer assets tend to be food insecure because of limited economic or physical access to food. Collectively, this gamut of relationships influences the starting point at which smallholder farming households construct livelihoods in the next production-consumption cycle. Those whose coping strategies facilitated the maintenance of capital assets can continue to construct livelihoods using these assets, whereas those whose capital assets were eroded are left with a reduced asset base (and hence reduced food security and resilience) for the next production-consumption cycle.

Methods

Study site, sampling and data collection

We selected an area within Jimma Zone, Oromia Region in the southwestern part of Ethiopia consisting of six *kebeles* (smallest administrative unit in Ethiopia) in three different *woredas* (districts: Gera, Gumay, Setema). The study area is a mosaic of agricultural land with scattered trees and small to large native forest patches (Lemessa et al., 2014). These forests harbor a high diversity of flora and fauna et al. 2017). They are important for the production of the cash crop coffee (*Coffea arabica*) (FAO, 2016), as well as sources of ecosystem services such as water, firewood, construction materials, farm tools and honey (Dorresteijn et al., 2017). Common livelihood strategies in this landscape involve growing a diversity of crops including the food crops barley (*Hordeum vulgare*), maize (*Zea mays*), sorghum (*Sorghum bicolor*), teff (*Eragrostis tef*) and wheat (*Triticum sp.*), as well as the cash crops coffee and khat (*Catha edulis*). Most grains are consumed locally; most khat is traded locally; and coffee is traded both locally and to areas outside the landscape. Beans, peas, spices, milk and honey are produced for subsistence and local markets. Farm wage labor, non-farm wage

labor and migration for work are also common activities. In this area, the lean season occurs just before harvest, from June to August of each year.

We collected data on livelihood challenges from 365 randomly selected respondents to a survey on livelihood strategies. We then also used purposive sampling to select a subset of 30 households for semi-structured interviews (17 women, 13 men), with five interviewees from each *kebele*. To capture a range of diverse experiences and narratives, we interviewed a mix of male-headed and female-headed households, as well as relatively food secure and relatively food insecure households in each *kebele*. We used qualitative data from responses to the open-ended questions in the livelihoods survey and from interview transcripts. We also used field notes containing observations during three months of field work. The open-ended questions in the livelihood survey specifically requested information on livelihood problems and ways of coping. The interviews were guided by a set of questions relating to changes in livelihoods over the past years, food security, experiences during the lean season, coping strategies, and factors that enabled coping (Supplementary Material 3.1). To gain a deeper understanding of the lived experiences of the people we talked to, we probed for further details beyond the initial questions. Probing required a level of flexibility in the interviews to allow important emerging topics to be pursued in greater detail. This involved some variation in the focus of the interviews and a level of subjectivity. We considered this to be inherent to most qualitative studies where the goal is not to identify generalizable patterns but to substantiate and capture the nuances of a specific context. Preparation of survey schedule and interview guide were informed by a pilot study and pre-testing of all data collection instruments. Responses to the survey questions were written down during the actual survey. The interviews were voice-recorded, transcribed and translated into English. Prior to actual data collection, survey tool and interview guide were subjected to a two-stage translation in which these were first translated from English to *Afaan Oromo*, and then translated back to English to check that the intended meaning had been maintained. Data collection was undertaken from November 2015 to January 2016 with assistance from trained local translators.

Before starting each survey or interview, we carefully explained the purposes of the data collection activities and asked for consent from each respondent/interviewee, emphasizing that they were free to decline or withdraw anytime. We took expressions of consent in verbal form to avoid suspicion often associated in this context with signing on paper.

Data analysis

We used content analysis on our data by coding in the software NVivo (QSR International, 2015). Our coding process was iterative and dualistic in nature, involving both top-down and

bottom-up approaches (Elo and Kyngäs, 2008). The top-down approach enabled us to pre-determine general codes following the structure of the data collection instruments. This provided a level of coherence and a priori organization in the first coding round. We identified general codes such as livelihood challenges, experiences during the lean season and corresponding coping strategies. The narratives that emerged from the first coding, in combination with relevant livelihoods and food security literature, guided the development of our conceptual framework. We combined a top-down approach to coding with a more open, bottom-up approach to create space for emergent and grounded insights. We did this by creating new codes based on the themes that emerged from the responses. We then applied the framework to our data in the second and third iterations of coding (Bryman, 2012). In the second iteration, we constructed new codes to classify livelihood challenges based on the types of capital assets primarily involved (Table S3.1 for capital assets included). For example, a problem with soil fertility was classified as a problem involving a natural capital asset. We also constructed codes for different mechanisms of capital asset substitution and classified coping strategies according to the type of substitution involved. For example, coping with a lack of farmland by contributing labor in a sharecropping arrangement with another household who owned land was coded as a substitution mechanism involving human capital asset and social capital asset for natural capital asset. In addition, we considered the frequency at which types of livelihood challenges were mentioned to identify the ones most commonly encountered. After identifying different types of lack in capital assets encountered by households and instances of food shortage, and the substitution mechanisms involved in their coping strategies, we undertook a third coding iteration. In this iteration, we coded for statements that explicitly or implicitly described the effects of coping strategies and substitution mechanisms on the state of capital assets, food security or resilience. Explicit statements were statements that directly mentioned the effect involved (e.g. “We used money to buy livestock but the livestock died so our household economy decreased.”). Implicit statements did not directly state the actual effect, but provided description of the situation from which the effect could be deduced (e. g. “We sold livestock to buy fertilizer but we were unable to recover the cost.”). We classified the resulting effects as asset-eroding or asset-maintaining.

Findings

The interviewees were a mix of men and women smallholder farmers (see Table 3.1 for demographic profile). Most fields within the study area were rainfed, except for some located near bodies of water that were sometimes irrigated. Transport services existed but were

limited. Donkeys and horses were important means of transportation within the *kebeles*, particularly for heavy crops. *Kebeles* were distant from large markets, but each had a weekly market day called *gaba*, where local residents bought and sold agricultural products. Women were often involved in small afternoon markets called *golit*, where spices and some vegetables were sold in a central area of a *kebele*.

Table 3.1 Demographic profile of 365 interviewees (176 females, 189 males). (Note: Educational attainment consisted of three levels we developed from the data. Level 1 stood for participation in the Ethiopian adult education, in religious education, or in formal education from the first to the sixth grade. Level 2 is for reaching anywhere from the seventh to the twelfth grade. Level 3 is for an accomplishment higher than twelfth grade. We constructed this level to standardize our data on education.)

Socio-demographic characteristics	Mean ± standard deviation
Age	41 ± 15.4
Household size	6 ± 2.6
Educational attainment	0.83 ± 1.1
Number of household members with illness for an extended time	0.3 ± 0.6

Coping with lack of capital assets for livelihood construction

The starting point of our conceptual model was the set of capital assets, material or non-material, with which livelihood strategies were constructed (Table S3.1). Smallholder farming households faced and coped with livelihood challenges that were mostly experienced as insufficiency in quantity or quality of capital assets (Table 3.2). Many households struggled particularly with problems related to natural, economic, physical and human capital assets, while problems with social capital were less prevalent. The two most commonly mentioned problems were (1) the high incidence of crop-raiding by wild animals (a natural capital issue); and (2) a persistent lack of cash (an economic capital issue). Other prominent livelihood challenges were related to natural capital including lack of oxen for plowing due to livestock disease, lack of farmland and low soil fertility (see Supplementary Material 3.2 for details); as well as insufficient farm labor (a human capital issue). Households often encountered multiple challenges simultaneously. For instance, it was common to hear households struggling with mitigating damage from wild animal pests, while also having trouble with having little cash for livelihood inputs or household needs. Decreasing farmland available to the younger generation due to the breaking up of land for inheritance, and very limited options for acquiring land, work in concert with decreasing soil fertility to exacerbate the problem on land.

Farming households coped with the above-mentioned process-related livelihood challenges by using a range of strategies (Table 3.2). The problem of wild animal pests was addressed primarily by increasing labor input. This was in the form of one farmer spending more hours for guarding the fields day and night, or more individuals engaging in guarding, including children who had to miss school. The shared problem of animal pests also led to collaborative arrangements between small groups of farmers called *didaro*. A *didaro* is a culturally significant, bottom-up arrangement based on existing social relations and was commonly arranged between households whose fields were located adjacent to one another. Within the *didaro*, agreements were made concerning the planting of similar crops and temporal synchronization of cropping activities. This resulted in collaborative guarding, where one edge of a stretch of fields was guarded by the household whose farm occupied that edge, and another edge by another household. In this way, groups of households maximized the benefit of increasing their labor input for guarding by pooling it with that of others. Despite not reducing the problematic presence of pests, it enabled households to reduce crop losses. Men and women had different involvement in the *didaro*. Men discussed and agreed with other men regarding which crops to plant, and transmitted results of discussions back to women. At times, women who preferred a different crop had to concede to the agreed upon crop due to the livelihood limitations imposed by wild animals and the decisions already made by men.

The frequently mentioned problem of lack of cash was often associated with an inability to effectively respond to deficiencies in other types of inputs for livelihoods. Most importantly, it was associated with inability to purchase fertilizer, to access improved crop varieties and to hire farm labor which was a pressing need for households that owned land but lacked sons to work it, and was particularly critical for female-headed households. Lack of cash was addressed through several strategies including drawing on human capital, that is, providing labor on-farm or off-farm to receive wages, by taking out formal or informal loans, or by liquidating other capital assets such as livestock. Different means of accessing loans existed: the formal means of a cooperative; or the informal means of borrowing from kin or other social relations. Several local residents expressed a preference for informal loans because of greater accessibility and flexibility. Formal loans were mostly accessible in towns, which were far in most cases, required an assessment of assets to qualify, and involved paying interest – all of which made it less preferable for poor households. On the other hand, informal loans were available in the remote *kebeles* through existing relationships. For instance, informal loans in the form of coffee helped tide over cash-strapped households without the constraint of an asset guarantee and the additional burden of paying interest. The borrowed coffee was then sold, converted to cash, and repaid also by coffee. However, farmers identified changes in livelihoods that affected abilities to extend help. Reduction of

coffee prices in the market and deaths of livestock due to disease were said to have weakened help relationships by reducing the abilities of households, including the ones who were better-off, to extend assistance to others. Evidently, social relationships played a crucial role in enabling households to cope with livelihood challenges. Yet the efficacy of these relationships was also mediated by externally influenced abilities of households to extend help.

Other process-related livelihood problems such as lack of oxen, farmland and farm labor were typically addressed through sharing arrangements, of which sharecropping was the most common. In complementary sharecropping arrangements, households with labor and in need of land, farmed with households with land and in need of labor. Other farming households engaged in sharecropping not out of need for land or labor, but because of their inability to afford fertilizers, that is, they sharecropped with better-off households who could purchase fertilizers. In oxen-sharing arrangements, households needing animal draft provided labor on the farm of a household with oxen, in exchange for the use of oxen on their own farms. For food (i.e. barley, maize, sorghum, teff and wheat) and cash crops (i.e. coffee), allocation of harvest between the households participating in the sharecropping depended on the contribution each household brought to the arrangement. Typically, a contribution of land from one household and labor from another household resulted in a sharing of the harvest by half. However, when a household brought additional contributions such as oxen, fertilizer, or seeds, the division of harvest changed, with a greater fraction of the harvest going to the household that made the greater contribution. Livestock-sharing was practiced when households who acquired livestock did not have sufficient access to grazing land. Livestock were reared by another household in exchange for a share in the profit when the livestock was sold, or for ownership of a newly born calf. This enabled households without access to grazing land to surmount this constraint and also provided a way for other households to earn cash or acquire new livestock. But making a sharing arrangement was not without drawbacks. First, it necessitated that the harvest be split – perceived by some as disadvantaging them. Second, poorer households who only had labor to contribute, disproportionately bore greater risk from wild animal pests. They were also under regular threat of being replaced with another sharecropper should crop losses to wild animal pests be too high, implying potential loss of access to much needed land.

Addressing low soil fertility involved the following measures: (1) diversifying crop production; (2) constructing bunds (soil or stone); (3) planting vetiver grasses – (*Vetiveria zizanioides*), a type of grass planted for controlling erosion; (4) applying cow dung (mainly in home gardens); and (5) applying inorganic fertilizer. The use of inorganic fertilizer was often stipulated by the government so that farmers who did not apply it risked losing access to

land[5]. In some cases, this requirement had forced households to sell livestock to buy fertilizer, even if that meant losing an important capital asset. The decision-making process in such a case became one of choosing between two potential or real losses – the real loss of livestock or the possible loss of land. The government imposition on fertilizer use combined with lack of adequate knowledge on proper fertilizer application, and mismatches between the available fertilizers and soil requirements were widely perceived as failing to improve farm productivity. Thus, efforts to mitigate soil fertility had been widely reported to lead to loss in capital assets, while also not reliably improving the long-term performance of local soils.

Table 3.2 Process-oriented and outcome-oriented livelihood challenges, corresponding coping strategies, and capital asset substitution mechanisms. Only livelihood challenges for which coping strategies were mentioned were included in this table.

Type of capital asset	Challenges*	Coping strategies undertaken	Capital asset substitution mechanism
		Process-oriented livelihood challenges	
Economic	Lack of cash	Husband and wife both worked as laborers	Human → Economic
		Took out loans through formal means	No substitution
		Borrowed coffee/cash from others	Social → Economic
Human	Insufficient farm labor	Sharecropping by contributing land	Natural and social → Human
	Health problems	Sold cows	Physical → Human
		Husband and wife both worked as laborers to generate income	No substitution
	Lack of knowledge	Proactive: Training by development agents	No substitution
		Sharing of information amongst farmers	Social → Human
Natural	Wild animal pests	Changing farming area to somewhere farther from the forest edge	No substitution
		Increasing time spent for guarding crops from raids	Human → Natural
		Didaro	Social → Natural
		Engaging in non-farm livelihood activity	No substitution
	Lack of oxen/livestock	Rented oxen using crops as payment	No substitution
		Sharecropping	Social → Natural
		Sold livestock and opened a shop	No substitution
		Bought oxen again	No substitution
		Livestock-sharing	Social → Natural
	Lack of land	Sharecropping inside or outside the *kebele*	Social → Natural
		Planted diverse plants in homegarden	No substitution
	Low soil fertility (or low soil productivity)	Diversified crop production	No substitution
			Social → Natural

[5] In Ethiopia, land is owned by the government. Most of the households in the study area owned a land certificate for usufruct rights. See Crewett and Korf 2008 for details.

Type of capital asset	Challenges*	Coping strategies undertaken	Capital asset substitution mechanism
		Sharecropped with a better-off farmer who can afford to purchase fertilizers Fertilizer application	Physical → Natural Natural → Economic → Physical → Natural
		Selling livestock to buy fertilizer	Human → Natural
		Proactive coping: Training, constructing stone bunds and planting vetiver grasses	Human → Economic
		Sent daughter to work outside the country	
		Outcome-related challenges	
	Food shortage	Buying food during lean season Selling cows Consuming enset Engaging in farm wage labor, especially during lean season Using technology Drawing on savings Borrowing money Reducing food consumption Selling honey or crops Grew food in home gardens Borrowed money from neighbor Husband and wife both worked as laborers	Substitution not applicable for coping with shortage, but households did draw on various capital assets to find ways to address food shortage.

* For a full set of challenges mentioned, see Table S3.2.

Coping with food shortages

Any combination of the livelihood challenges mentioned in the preceding section was linked with potential food insecurity. Households experienced food insecurity most acutely during the lean season. In the context of our study, the direct link between livelihoods and food security or the lack thereof, can be understood by looking at the semi-subsistent[6] characteristic of food crop production combined with market-oriented cash crop production. Semi-subsistent farming here is culturally significant, and not only driven by economic factors. The cultural value of this practice is clear in a statement by a farmer: "When we harvest but buy food from the market, we don't feel like we are really farmers. But if we can look at our stored grains, we are satisfied and we feel full." Consuming crops produced from a household's own farm was highly preferred over buying food from the market. Thus here,

[6] Households consuming more than half of their harvest of the food crops barley, maize, sorghum, teff and wheat (Barnett et al. 1997).

where most food consumption comes from a household's own production, low crop production had a direct effect on whether or not households had enough food for the year.

Households that had a low harvest, and consequently ran out of food stocks, with little or no cash saved for buying food, had to find ways to cope (Table 3.2). Coping strategies included selling livestock, engaging in wage labor, or taking out a loan to generate income. However, cash purchases less food in the lean season because food prices are highest then, making accessing food through the market difficult, and generating lower wellbeing benefits per unit of money than in other seasons. Other households coped by seeking help from family or close relatives, as was often the experience of female-headed households. In most cases, the tenuous livelihoods that preceded food shortage meant that households who were trying to cope with food shortage had already deployed a set of other coping strategies before they even began trying to cope with a shortage of food. This was characteristic of the worst-off households in the area.

The experiences of better-off households during the lean season were markedly different. Their attainment of a level of food security during the lean season was predicated on an ability to proactively plan and implement a strategy to ensure sufficient food during the lean season. Better-off households typically had higher harvests than the worse-off households and consequently, had stored crops or saved cash with which they purchased food from the market when their own stocks were depleted. Some of the best-off households, particularly those involved in trading crops, even made a profit in the lean season by buying crops from different farmers during harvest season, and selling these at a higher price (sometimes even to the same farmers) later on.

Mechanisms of capital asset substitution

Responding to a lack in one or more capital assets necessary for livelihood construction or to actual food shortage, as described, involved activities that reconfigured the way households used and combined the capital assets they could access. In this way, coping strategies involved mechanisms of capital asset substitution (Table 3.2).

The most common substitution mechanisms included drawing on social capital and human capital, both intangible types of capital assets. Most asset substitutions were intended to address a problem related to natural capital assets. This was exemplified in the deployment of coping strategies mentioned in the preceding sections namely (1) *didaro* and increased hours spent guarding farms from wild animal pests (social and human capital for natural capital), (2) providing labor to access oxen (human and/or social capital for natural capital), and (3)

providing labor to access land via sharecropping arrangements (human and/or social capital for natural capital).

Households also drew on tangible capital assets either as a stand-alone capital asset in a coping strategy or in conjunction with intangible assets. Liquidating livestock or poultry to generate cash (natural capital asset converted to economic capital asset), and applying inorganic fertilizer to soils with low fertility (physical for natural) were examples of drawing on tangible capital assets. Seeking help from others by borrowing coffee or cash (drawing on social capital to access economic capital) were examples of using tangibles in conjunction with intangibles. Narratives revealed that substitution mechanisms involving tangible capital assets (e. g. economic, physical) were often associated with increasing difficulty in livelihoods, either when the capital asset expended did not result to a commensurate improvement in livelihoods, or when substitutions were required continuously. Examples included purchase and application of inorganic fertilizer without corresponding increase in harvest, and purchase of livestock that died after one or two farming cycles.

Human capital, mainly labor, played a crucial role in enabling the above-mentioned substitutions, particularly for coping with problems in natural capital. Labor facilitated exchanges of other types of capital assets – crucial in a context where access to cash (the more universal means of exchange) and physical assets were low. Labor was also important for accessing often scarce economic capital through wages. When human capital alone was not enough to cope, households often drew on social capital through existing relationships and help networks to access human capital from other households, as in collaborative arrangements such as the *didaro*.

Feedback of coping strategies to capital asset base and effects on future food security and resilience

Depending on the coping strategies and mechanisms of capital asset substitution involved, the capital asset base of households was either eroded or maintained (Table 3.3). Substitutions that involved social capital tended to maintain the capital asset base. Through collaborative arrangements and help relationships, households reported that they were able to address a lack without an associated decline in capital assets. However, though effective as a means for coping, reliance on social capital due to lack in other capital assets was perceived to limit the benefits that one can generate from livelihoods. One farmer used the metaphor of "lending my other hand to another" in describing the necessary but also limiting effect of sharecropping mainly due to the division of the harvest.

Drawing on labor as a way of coping also maintained the general state of capital assets, for those households who were capable of providing labor. However, in relation to addressing wild animal pests, the use of labor tended to erode human capital because longer time spent out in the field caused health problems. For children, it also led to time away from school, with potentially negative repercussions for the future of human capital.

In contrast to substitutions involving human and social capital, substitutions that involved replacing natural capital with tangible assets often eroded the overall asset base of a household. This was especially the case when the outcome of the process failed to generate significant improvements in yield and cash: "The land I have is enough for my family but soil fertility is a problem. The production I generate from my farmland is not enough to buy fertilizers. We had to sell a sheep to be able to buy fertilizer." Erosion of capital assets was associated with coping strategies that required continuous substitution of a capital asset without commensurate improvement in the capital asset being substituted and consequently, in the livelihood itself. This created a sink in which farming households continued to liquidate economic capital assets, or natural capital without generating benefits commensurate to the costs. This was experienced particularly in relation to soil fertility problems and death of livestock due to diseases: "We spend money to buy cows and oxen and then they die. Our assets decrease. Once the livestock are dead, we cannot buy [oxen] again because we do not have the money. This reduces our livelihood."

Eroded capital assets, in turn, had the dual effect of increasing the likelihood that farming households will face the same or bigger challenges in constructing livelihoods in the next farming cycle, thus decreasing their ability to cope with those future challenges: "The natural fertility of the land has been reduced so we cannot get much from the land. The cost of fertilizer is high. When we use it, we get little in return. That's not good. What we harvest does not let us get back the costs we spent for fertilizer so we sell livestock."

Coping strategies and substitution mechanisms that maintained the capital asset base of households did not insulate them from future capital asset-related challenges, but enabled them to hold on to their capital assets as a starting point in the next farming cycle. A viable livelihood dynamic was observed to occur only when households were not merely coping with process-oriented and outcome-oriented livelihood challenges but rather, had the means to be proactive in planning and implementing their livelihood strategies. Such was the experience of the best-off households who produced sufficient food while also generating income through cash crops. During the lean season, they had food stocks at home to consume and could access cash to diversify more profitably, for example through planting more khat.

Where the capital asset base is eroded, the capacity of households to produce food or income to purchase food, and their capacity to cope with future shocks and stresses are undermined. They are therefore, more likely to experience food insecurity at any point in the year, and even more during the lean season. Shocks such as droughts or a drop in cash crop prices may lead the households to become even more impoverished because they will be unable to protect themselves from further losses. Low resilience in the face of such shocks will impact livelihoods and wellbeing outcomes, including food security. Resilience and food security are thus closely linked, as characteristics of households that are affected by the condition of their capital asset base and the robustness of their livelihoods, and also as contributors to these two.

Table 3.3 Effects of capital asset substitution mechanisms on overall household capital assets.

Capital assets	**Substituted by:**				
Being substituted:	**Economic**	**Human**	**Natural**	**Physical**	**Social**
Economic		Maintaining (wage labor for cash)	Eroding (selling of livestock for cash)	---	Maintaining (receiving cash as help from family)
Human	---		Maintaining (sharecropping land to access labor)	---	Maintaining (*didaro* for maximizing labor for guarding fields from wild animals, *dabo* for plowing or harvesting, sharecropping to augment labor)
Natural	Eroding (purchase of fertilizer to address low soil fertility) Eroding (purchase of oxen that dies shortly after)	Eroding (increased labor input for guarding from wild animals affecting health and education) Maintaining (providing labor in exchange for using oxen)		Eroding (use of inorganic fertilizer to address low soil fertility)	Maintaining (*didaro* for guarding fields from wild animals)
Physical	Eroding (purchase of fertilizer)	---	---		Maintaining (women helping other women get crops to distant milling station) Maintaining (sharecropping to access fertilizer)
Social	---	Eroding (increased labor input in farm where *didaro* is weakening)	Maintaining (sharecropping land to access labor)	---	

Discussion

Matson et al. (2016) considered capital assets as constituting "the determinants of well-being by supporting human health, education, community and the provision of material needs". They discussed how "improvements in well-being can be traced to interactions among types of capitals" and on this basis, highlighted the need to understand interactions between capitals in any analysis of sustainability (including food security and resilience) (reviewed by Dixon, 2015). Our findings that types of coping strategies and mechanisms of capital asset substitution can either erode or maintain the capital asset base of households with important implications for wellbeing, raise questions about the constellation of capital assets that could best support smallholder farming households. To contribute initial answers, in this section we discuss: (1) the distinctiveness of natural capital and its relationship to other types of capital assets in the context of constructing smallholder farming livelihoods (relating to the most frequently mentioned problems); and (2) the roles of social and human capital assets for enabling coping.

Natural capital and its relation to other capital assets

Since the Green Revolution, much emphasis has been put on the efficiency and efficacy of technology to suspend the limits of natural resources, intensify agriculture and increase production (e. g. Pretty et al., 2011). In this context, it is usually taken for granted that higher production is beneficial and necessary for food security. But mounting evidence and substantive critiques against the environmental and social impacts of the Green Revolution have also questioned its supposed benefits (Pingali, 2012). Current processes that either transfer food production into the hands of multinationals or push for commercially-oriented agricultural intensification with little regard for the institutions and politics that underpin the distribution of benefits are similarly being questioned (Patel et al., 2015). Despite the criticisms, the focus on increasing agricultural production as a means to addressing hunger continues to dominate discourses in both policy and practice (Tomlinson, 2013). We agree that improving agricultural production plays a role in eliminating hunger, but we qualify this agreement with the proposition that it can only effectively deliver on that potential if the means of undertaking agriculture recognize and respond to the distinct processes underlying smallholder farming, on which many of the food insecure depend. For this reason, we considered it important to unpack the dynamics of interactions between capital assets in the process of livelihood construction by smallholder farmers.

The local narratives we gathered imply that the greatest threat to the sustainability of smallholder farming livelihoods is in fact the state of the natural environment – suffering from a decline in beneficial ecosystem services (e.g. soil fertility) and processes (e.g. rainfall),

as well as an increase in harmful ecosystem disservices (e.g. wild animal pests). No livelihood challenge was considered to have a more significant impact, individually and collectively, than those related to natural capital. In this context, and most likely in similar contexts elsewhere, the viability of smallholder farming is directly intertwined with the state of the natural environment (Madzivhandila et al., 2016). Evidently, while other types of capital assets are necessary for livelihoods, it is the natural capital that provides the fundamental basis for livelihood construction and generation of well-being. Lack in a number of other capital assets were described in relation to natural capital, for instance, how a lack of cash affected ability to purchase fertilizer to remedy soil fertility, or for the purchase of oxen necessary for plowing the land.

In all examples of coping strategies for addressing a problem related to natural capital, the use of other capital assets always aimed to either augment an ecosystem service that had declined, or mitigate against an ecosystem disservice that had increased. This is similar with the findings of Ango et al. (2014) who found that management decisions of farmers in southwestern Ethiopia for maintaining and planting trees are targeted at increasing or maintaining benefits and at mitigating harm. Therefore substitution as a means of coping, or perhaps more accurately, the appearance of substitution, is not a process of replacement but a process of using other capital assets to either magnify benefits from ecosystem services or mitigate ecosystem disservices. One might counter-argue that this could be expected in contexts involving poor communities where the financial and technological resources necessary to implement an effective replacement are absent, and that the issues are about access to other types of capital assets and scale of substitution, rather than the irreplaceable significance of the natural capital. Following that argument, the solution would then be to increase the access of smallholder farming households to other types of capital assets. But such a solution, while indeed important, would treat types of capital assets as equals and therefore interchangeable, ignoring the foundational function of natural capital for livelihoods and would sidestep the equally important issue of differentiated access to capital assets so critically pertinent to the struggles of smallholders (Kerr, 2012).

Researchers investigating the nexus between social and ecological systems expound on the link between ecosystems and human wellbeing (e.g. Daw et al., 2011; Dawson and Martin, 2015). In our narratives, we illustrated some of the mechanisms of these impacts on some of the poorest households. Unless the importance of an intact, healthy and functioning environment is recognized and respected as fundamental to the livelihoods of smallholders, development pathways where the poorest are left behind will be reproduced and the poorest will stand at the losing end of agricultural transitions. From our investigation, two types of coping strategies for problems with natural capital are evident – one in which smallholders

will cope with increasingly problematic natural capital and more tenuous livelihoods by deploying erosive strategies, or one in which smallholders will still be able to maintain capital assets. But with increasing magnitude of environmental degradation and other livelihood problems, even households that currently are able to maintain their assets may be less likely to do so in the future. Sustainable interactions with natural capital thus should be seen as the fundamental basis of livelihood strategies in our study system.

The importance of social and human capital assets

Despite problems with the natural environment and persistent lack of cash, social and human capital assets evidently play important roles in enabling households to generate livelihoods (e.g. Dzanja, et al., 2015; Heikkilä et al., 2016; Wossen et al., 2015). As observed in Ethiopia, by bringing together complementary capital assets through sharing arrangements (Dorresteijn et al., 2017; Lemessa, et al., 2013) some households found ways around their limitations. In this context, social capital was unique in that unlike tangible capital assets (e.g. cash) that became eroded by continual use, the use of social capital to share work and resources activated connections that could be counted on even for future needs.

Despite the general benefits of social capital at an aggregate level, social capital is not immune to being eroded. Migration of some farmers to other parts of the country or outside the country, due to declining yield (Ango et al., 2014), are slowly fraying the strength of the local *didaro*. Similarly, trends towards more production of khat instead of food crops had led to changes in social dynamics in southern Ethiopia (Gebrehiwot et al., 2016), and the same trend will likely affect social relationships in other parts of the country. The potential erosion of social capital caused by out-migration will have significant implications on the ability of those who are left to continue farming and guarding against wild animals. As mentioned in the findings, the efficacy of the social capital was also influenced by the capacity of households to extend the kind of assistance needed. The less households have available, the less they can extend help, and the less effective social capital was. Livelihoods in smallholder communities thus are embedded within circular and reciprocal social relationships.

Human capital assets, and especially the ability to work physically, are equally vital to social capital because they facilitate collaborative relationships as in sharecropping or *didaro*. In the absence of sufficient access to cash for exchanges, exchanges through labor opened ways to overcome constraints around land and oxen. Labor is linked with human health so that incidences of sickness can reduce available labor. And importantly, health is a basic measure of well-being that enables all other human functions. However, the coping strategy of increasing labor input on farms to guard against wild animals over the night had resulted in a number of illnesses. In the same way, children's involvement in guarding had caused missing

school days (Dorresteijn et al., 2017). These patterns are concerning because both health and education levels are important determinants of food security (Knueppel et al., 2010; Burchi and De Muro, 2016). By compromising health and education, in the medium and long term households may reduce their food security and resilience in exchange for being able to cope with challenges in the short term. Maintaining good health and keeping children at school thus will have to be carefully balanced with labor demands on the farm, if households are to protect their capacities to improve their standard of living in the future.

Conclusion and recommendations

In a context where natural capital is degraded, either in quality or quantity, the continuous deployment of coping strategies and subsequent feedback from these strategies characterize the normal course of livelihood construction of many smallholder farming households, especially the poorest ones. Interventions for improving food security that do not deeply engage with the lived realities of these households will risk missing those that are most prone to hunger. For example, in our study region, the forced use of expensive fertilizer that does not ultimately generate commensurate benefits is clearly not a sensible intervention. Our study highlighted the basic importance of natural capital to smallholder farming households, while also showing that intangible capital assets – especially social and human capital – were particularly important for enabling households to cope. While substitution using intangible capitals helped households get by, substitution using tangible capitals such as cash and fertilizers often required continuous input, which could not be sustained, especially by the poorest households. To improve food security and resilience, smallholder farming households need to be supported to move from a situation of always needing to cope, to a situation where they can proactively plan and implement livelihood strategies. This involves ensuring that natural capital is available to provide ecosystem services in the quantity and quality required to make smallholder farming viable. The Sustainable Development Goals articulated the goal of achieving food security without undermining natural ecosystems. To the households involved in this study, the integrity of natural ecosystems is fundamental to constructing viable and sustainable livelihoods and having enough food. Simultaneously, social capital (e.g. relationships, formal and informal networks) and human capital (e.g. health, education) need to be protected and strengthened so that households can continue to deploy coping strategies that do not erode their capital asset base. In this way, they can be enabled to further build their capital asset base, including economic and physical capital assets which are presently low for poor households.

The challenge of achieving food security is substantial, more so in some parts of the world and for some groups of people, than others. It is in these areas and amongst these people that real progress on food security needs to be claimed in future global food status reports.

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SUPPLEMENTARY MATERIALS

Supplementary Material 3.1

Interview guide questions

Notes:

- Prior to the conduct of semi-structured interviews, we had already spoken to the household heads through an earlier survey. Therefore, interviewees were already informed about the work we were doing in the *kebeles*. For this semi-structured interview, we explained our interest in asking further questions focusing on coping strategies. In the same manner as the survey, we asked for permission and interviewed only those who were willing to speak with us.
- The questions below were developed from our understanding of the context based on the survey and observing and listening while in the field. The main purpose was to gain a more contextual understanding of the way households coped with the difficulties in their livelihoods by providing space for the articulation of their own narratives. As explained in section 3.1 Study site, sampling and data collection, the list of questions below was a guide but the flow of the actual interviews differed based on what emerged as most important and relevant in the specific conversations. The probing questions were not included here as they also varied depending on the responses of the interviewees. This list therefore is mainly intended to give the reader a broad view of the topics considered during data collection.

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1. In the past ten years, has anything changed in your household's ability to feed itself? Can you tell me about it?
2. From the recent survey we conducted with your household, we learned that you produce some of the food you consume. You also told us about problems in your livelihood. Can you please tell us about your household's experience during *gana* (lean season) last year? How did you cope? What were the most important factors that helped your household go through this hungry period?
3. During *gana*, does your household tend to eat less, or do you tend to sell things, such as livestock, so you can buy food?
4. Some of the food consumed by your household is bought. Especially during *gana*, this is common among households. What are the factors that help make it easier for you to buy food? What makes it difficult?
5. What does your household do to ensure your food stock lasts for a long time? Are you satisfied with the strategy of consuming your harvest during most times of the year and buying during *gana*, or do you prefer a different strategy?

6. When you already have food, either through your harvest or through the market, or through other sources, are there factors in the household that make it difficult for everyone in the family to eat enough good quality food (e. g. household size, storage issues, wife is ill and unable to cook)?
7. Sometimes a household won't have food for the day because of various reasons. For example, there is no electricity in the milling station. How does your household cope with this?
8. We heard from many households in this *kebele* that there are problems with lack of land, lack of oxen and lack of labor. One common way people here address this is by sharecropping. Can you tell us a bit about how people in this *kebele* decide who to sharecrop with?

Supplementary Material 3.2

Additional narrative on lack of farmland, soil fertility, and livestock disease

The livelihood challenges faced by the farming households are numerous, complex and interacting. With limitations in writing space in the results section, the narratives had to be kept succinct. But should there be interest for more information, we include here a more expanded narrative of some of the most commonly mentioned livelihood challenges. We did not include here challenges with wild animal pests and lack of cash as they were given a more detailed treatment in the paper.

Lack of farmland is a widespread concern in the study area and is linked with the equally important concern on declining soil fertility. Lands are accessed mainly through bequest by men, and through marriage by women. There are other means of access such as sharecropping discussed at length in the results section, renting and granting by government authority such as the *kebele* administration. Land is owned by the government and therefore excluded from transfer of ownership through privately selling. In the past, farming households expanded their farming area by encroaching into forests. The government's policy of forest protection, while recognized by locals as important, was also perceived as a limit for accessing land and was associated by others with the possibility of losing access to their land should the government decide to expand protected area. One farmer provided an insight for understanding the problem of land scarcity and its link with soil fertility. "My father farmed this land, and his father before him. Over the years, as land is handed down by inheritance, the sons receive smaller and smaller areas of land, with more and more people in the family depending on it. And because our land is small, we need to produce from it in order to feed our family. We cannot leave it to fallow like our ancestors did. In the past they would be able to fallow the land by going to farther areas and farming there. But now, there are already people farming in those areas." The need to produce food on a small piece of land, with no option to farm elsewhere as was the case in the past, prevented farming households from taking measures to maintain or increase soil fertility without relying on inorganic fertilizers.

Livestock is an important capital assets, as in many other agricultural or pastoralist settings. Its values are multifaceted – economic as a material that can be sold for cash, physical as animal draft, and cultural as being intrinsically valuable to ways of living and identities. In the past, households were described as owning more livestock than they do now. In the time of our survey, households owned on average, 4 animals (including livestock and small ruminants). The poorest would occasionally own 1 or none at all, requiring them to either sharecrop or to give their labor in exchange for access to oxen for equal number of days. One

interviewee looked back and said that some households who came from other places and settled in his *kebele* some two decades ago brought as much as 20 oxen and that this was common. Over the years however, ownership of oxen had been on decline. One of the reasons cited was the prevalence of livestock diseases. Some households attempted to regain the loss by using cash from coffee to buy new oxen. But death of newly bought oxen after one or a few planting season had led to impoverishment of some households who expended money but were unable to regain the cost. Government facilities for treating sick livestock exist, but often in areas far from the *kebele*, involving transportation costs as well as medicine costs that make access prohibitive to poor households. As a widespread problem, this has been communicated by local residents to *kebele* and *woreda* administrations without effective response and action as yet.

Table S3.1 Capital assets that emerged from narratives and were included in analysis.

Types of capital assets	**Items**
Economic	Cash
	Credit
Human	Education
	Health
	Information
	Knowledge
	Labor
Natural	Ecosystem disservice associated with wild animal pests
	Forest and associated ecosystem services such as for honey, coffee
	Land availability
	Rainfall timing
	Soil fertility
	Livestock
Physical	Distance to market
	Electricity
	Proximity to milling station
	Transportation infrastructure
Social	Help from family and friends
	Help networks such as *didaro*
	Learning from development agents
	Learning from other farmers
	Sharing or borrowing of livestock
	Sharecropping

Table S3.2 Problems with capital assets and effects on farming livelihoods

Type of capital asset	Process-related livelihood problem	Frequency of mention (from survey and interviews)	Effects on farming households
Economic	Lack of cash	116	Unable to hire farm labor Unable to buy fertilizers which are expensive Unable to create profit Unable to access improved crop varieties Decreases financial capital Unable to afford new technology
	Requirement to pay government tax which some households find difficult to afford	2	Unknown
	Incommensurability between low selling price of crops produced and high buying price of goods in market	1	Unable to afford livelihood inputs and household needs
Human	Insufficient farm labor	49	Unable to maintain multiple and distant farm fields Reduces income Reduces the amount of harvest they get from farm because of sharecropping Unable to guard farm fields from wild animals Delays sowing during planting season (particularly a problem for female heads of households)
	Health problems	31	Reduce available labor for farm Reduce availability of labor to undertake domestic activities for the household Create dependence on the able-bodied members of the family Entail costs for treatment that are difficult to afford (If wife is sick) Unable to help husband (If husband is sick) All responsibilities fall on the wife
	Lack of knowledge	9	Unable to determine the cause of decreasing land productivity Unable to use technology properly (e. g. fertilizer application which resulted to withered crops, applying fertilizer without improvement of yield) Unable to use one's potential Unable to use resources for livelihoods effectively Unable to determine which crops are suitable for a certain type of land

Type of capital asset	Process-related livelihood problem	Frequency of mention (from survey and interviews)	Effects on farming households
	Having no husband	2	Leads to a more difficult life for female household heads due to a number of factors
	Lack of education	2	Unknown
	Lack of gender equality	2	Women are constrained from undertaking certain livelihood activities Understandings between men and women differ and they do not meet The women stay at home to take care of the children and are unable to help the men in the farming livelihood
	Lack of nutrition	2	They get old quickly Leads to various health problems
	Lack of sense of agency	1	Unable to communicate livelihood problems to kebele leaders
	Large family size	1	Unable to apply a specific technology (explanation not given)
	Sadness and lack of motivation	1	Unknown
	Stress and worry	1	Unknown
Natural	Wild animal pests	118	Unable to keep multiple fields Reduce farm production Increase the labor required for guarding fields Cause missed livelihood opportunities such as gardening or raising small livestock like goats and chickens because wild animals will destroy these anyway Cause missed opportunities to use labor for other income-generating activities Influence the types of crops that farmers plant Inability to attend meetings and funerals Destroy beehives Destroy enset Result to food insecurity
	Lack of oxen	102	Limits the capacity of households to plow Food insecurity Unable to plow large areas of land
	Lack of land	87	Unable to produce sufficient food for the household
	Low soil fertility	26	Low crop productivity Food insecurity Forced to sell cows in order to buy inorganic soil fertilizer
	Changing rainfall patterns	22	When farmers start to plow and the rains fail, there is a problem. When the crops have been harvested and it rains, the crops are damaged.

Type of capital asset	Process-related livelihood problem	Frequency of mention (from survey and interviews)	Effects on farming households
	Plant disease	3	Decreases income Decreases production
	Weeds	2	Reduce farm productivity
	Birds that eat newly sown crop seeds	2	Affects production because seeds that were sown don't grow. These were dug and eaten by the birds.
	Insects affecting fruits	1	Unable to consume fruits in the backyard
	Lack of drinking water	1	Unknown
Physical	Road and transport	8	Unable to access good market for selling produce. Farmers sell in the local markets instead, but at low prices. Difficulty in transporting farm produce to market Limited market accessibility Women face difficulty in accessing milling station Difficulty in bringing sick persons to a health facility
	Lack of technology	4	Unknown
	Unreliable electricity	4	Affects availability of milling facility Affects access to information particularly on opportunities for work
	Lack of farming equipment	2	Unknown
	Bridge	1	Unknown
	Lack of own house	1	Requires renting which also requires money
	No phone network	1	---
	No milling station	1	Causes women to walk long distances with heavy loads on their backs. This takes a lot of time, and is difficult to do when a woman has just given birth or got sick.
Social	Lack of unity	4	Insufficient farm labor for guarding wild animals
	Erosion of didaro	2	Low productivity because of insufficient labor for guarding against wild animals
	No assistance from government organization	2	Problem of oxen disease remains unaddressed
	Disagreement in family	1	Unknown
	No relatives	1	Unknown
	Unable to get help from the rich	1	Unknown
	Settlers from another place don't have connections	1	Unable to get help when the household faces a problem
	Theft	1	Unknown

Chapter IV

"… both agriculture and gender are embedded in how societies and their institutions function. In the case of agriculture – whether the farming of crops or fish or the rearing of livestock – this involves acknowledging that while the sector is technical in nature, it is much more complex than this, and technical innovations and technologies alone will not improve the sector's outcomes. People practice agriculture at particular times and places. Therefore, the social relations that influence the positions, attitudes and opportunities of the people who engage in agriculture – e. g. women and men, wealthy and poor, landowners and landless – shape agricultural practices, knowledge, and outcomes."

Paula Kantor

Chapter IV

Leverage points for improving gender equality and human well-being in a smallholder farming context

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Abstract

How transformative processes could be facilitated to improve gender equality and consequently, human well-being, is a key question for moving towards a just and sustainable future. Focusing on southwestern Ethiopia where significant changes in formal institutions related to gender have occurred, we applied the concept of systemic leverage points. We show that changes in formal structures facilitated changes in perceived visible gender gaps, such as increased participation of women in public activities. These, in turn, played an enabling role for changes in community norms, and (to a lesser degree) triggered reconsideration of perceptions about women's capacities. Both women and men perceived more equal gender relations as being associated with better well-being at the household level. Our results highlight the important role of interactions between leverage points for gender equality, suggesting important insights can be gained by studying interactions, compared to when shallow (e.g. visible gaps) or deeper leverage points (e.g. social norms) are analyzed in isolation. Our study also demonstrated the general suitability of a leverage points perspective in gender research, including as an analytical frame to complement gender transformative approaches.

Introduction

Gender equality has the dual role of being a valued end in itself and a means for sustainable development (Sen 1999; UN General Assembly 2015). Despite decades of effort, gender inequality persists, both in the so-called global north and global south (Bose 2015; World Economic Forum 2017). Effecting transformative change that addresses the root causes of gender inequality remains a largely unresolved challenge (Hillenbrand et al.2015; Risman 2004). Conceptual shifts in the gender and development discourse (Razavi and Miller 1995) have critiqued the Women-In-Development (WID) approach for its narrow neoliberal focus, and for missing to engage with institutions that create and entrench patterns of advantages and disadvantages (Okali 2011). These critiques behove broadening the analytical frame through which gender should be analyzed. Few studies have systematically analyzed the roles and interactions of different domains of changes related to gender (e. g. McDougall 2017). Here we use the notion of leverage points – flagged as a potentially powerful metaphor and analytical tool in sustainability science (Abson et al. 2016; Meadows 1999) – to examine how institutional changes targeting visible gender gaps might interact with changes in norms and attitudes, potentially creating ripple effects and thereby new opportunities for navigating towards a sustainable, gender-equal future (Njuki et al. 2016).

A distinct conceptual shift in the gender and development discourse has emphasized the role of social norms, attitudes, behaviors, practices, and power imbalance as underlying drivers of (or levers for changing) gender inequality (Kantor 2013; McDougall et al. 2015). Rooted in feminist ideology, this framing underpins gender transformative approaches, applied in sectors such as health (Dworkin 2012), smallholder agriculture (Farnworth et al. 2013; Njuki et al. 2016), and aquatic agricultural systems (Cole et al. 2014b). The point of departure for this approach is the function of deep drivers shaping more visible aspects of gender inequality, as well as other types of social inequality. Inherent complexity in processes of social change suggests that deep changes occur through a confluence of factors that eventually reshape a social trajectory (Kabeer 1999). This suggests that interventions focusing on visible gaps, though not transformative per se, do play a role (e. g. Lavers 2015). Here, we sought to build a broad understanding of different leverage points for gender equality. As a complement to the gender-transformative perspective, which addresses and challenges how norms and attitudes shape gender inequalities, our investigation considers the manifold interactions between changes in formal institutions, visible gaps, and gendered norms and attitudes. We hypothesize that while transformative change requires a shift in deep drivers of gender inequality, institutional changes for addressing visible gaps and changes in such gaps can potentially contribute to processes of change in the deeper realms of norms and attitudes (Dejager and Jayasinghe 2016).

We focused on southwestern Ethiopia where the shift of government power from the Derg regime to the current government placed the promotion of women's rights on the national political agenda (Crewett and Korf 2008; Kumar and Quisumbing 2015). Within this context, we drew on qualitative data from three *kebeles* (smallest administrative unit in Ethiopia) to (i) examine gender-related changes from a leverage points perspective; (ii) determine factors driving the observed changes and identify associated household well-being outcomes; and (iii) understand interactions between shallow and deep leverage points for gender-related changes.

Conceptual framework: leverage points as interacting domains for interventions for gender transformative change

Interventions in complex systems (social systems included) are possible at different leverage points. Meadows (1999) conceptualized leverage points as places to intervene in a system, with varying levels of depth or effectiveness for changing the functioning of a system. Abson et al. (2016) distilled four realms of leverage, namely parameters, feedbacks, design and intent, in order of increasing depth. Here we defined leverage points as domains for interventions that can result in observable changes within a system. We adopted the framing by Abson et al. (2016) and translated it into a conceptual lens for analyzing factors that produce, mark and entrench gender inequality within communities (Figure 4.1).

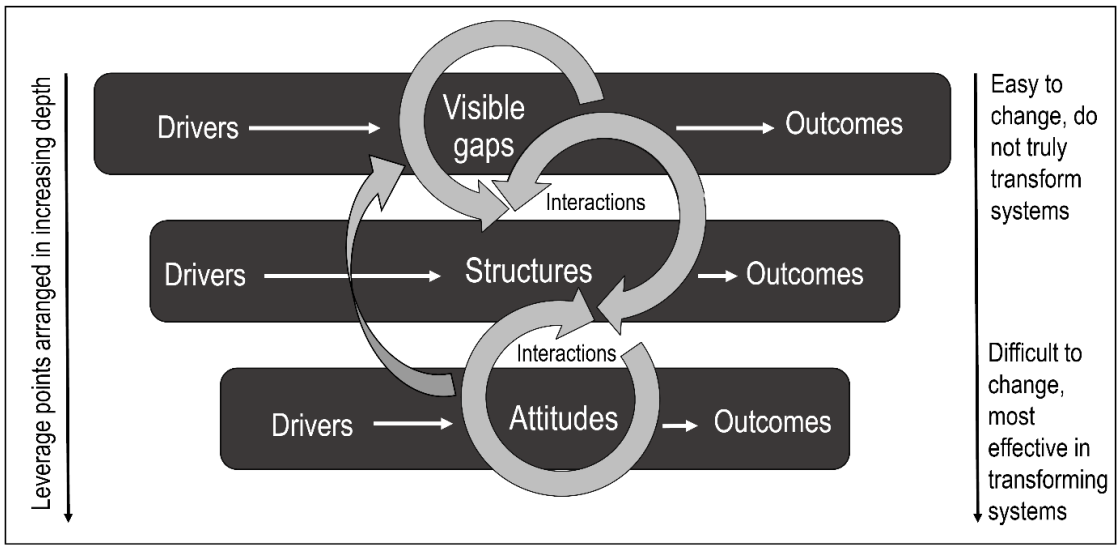

Fig 4.1 Conceptual framework of leverage points for improving gender equality and household well-being.

In the conceptualization of leverage points for sustainability, shallow leverage points are areas where "interventions are relatively easy to implement yet bring about little change to the overall functioning of a system" (Abson 2016). These include parameters and feedbacks. Parameters are tractable characteristics of a system commonly targeted by policy makers. In gender and development, these take the form of visible gaps, and are often addressed through direct interventions. Examples of visible gender gaps include gendered disparity in education (Davies and Saltmarsh 2007; Klasen and Lamanna 2009), gendered income differences (Bobbitt-Zeher 2007), and differences in the proportion of men and women participating in economic, political and other public activities (Assaad and Arntz 2004; Elson 1999; Walby 1994). Examples of interventions to address such gaps include income-generating projects for women (Chowdhury et al. 2018), or quotas (Van der Windt et al. 2018). Visible gaps are important markers of inequality, but they are symptomatic and therefore point to underlying dynamics (Kabeer 1999).

Deep leverage points are a system's structures and encapsulated intent (Abson et al. 2016). We used the term structures to refer to both formal and informal institutions or rules governing social practices (Hillenbrand et al. 2015). For example, policies are types of formal institutions, while social norms are informal rules. Intent is the deepest realm of leverage, spanning the values, goals and worldviews of actors from which the trajectory of a system emerges. Due to the limited scope of our investigation, in this realm we focused only on attitudes, which we defined as entrenched ways of thinking about men's and women's ways of doing and being (e. g. Rani et al. 2004). Finally, we also included feedbacks in our framing. Our focus here was not on feedbacks between parameters (Abson et al. 2016), but on interactions across leverage points. We aimed to understand how interventions at different types of leverage points, and different system changes, interact (e. g. Waylen 2013).

In applying this conceptual framework for analysis, we were guided by two considerations. First, our focus was empirical rather than theoretical (Risman 2004). Our understanding of leverage points and their interactions therefore was based on the most salient dynamics that emerged from the focal system. Second, we subscribed to the notion of primacy of context (Flyvberg 2001). Hence, we considered the framework as a lens to explore the socio-economic and political fabric of a given social system, with recognition of likely different dynamics in other contexts.

Methods

Our study was situated in southwestern Ethiopia and included three *kebeles* (lowest administrative unit in Ethiopia) in three *woredas* or districts, namely *Gumay*, *Setema*, and *Gera*. The area is home to the Oromo people, the largest ethnic group in the country. The majority of the population in the study area are Muslims. This strongly influences rules and practices relating to gender roles in private and public spheres and gender-differentiated inheritance practices, particularly in relation to land. Superimposed on a patriarchal socio-cultural fabric is a political will for the promotion of women's rights. This political will manifests in reform in land registration, reform in family code covering issues such as settlement of capital assets in case of divorce or death of husband (Kumar and Quisumbing, 2015), and intentional inclusion of women in activities such as livelihoods trainings and community meetings.

Our analysis drew on qualitative data from three activities, namely key informant interviews (KIIs, n=15), focus group discussions (FGDs, n=10), and semi-structured interviews (SSIs, n=15). KIIs with residents who had lived in the *kebeles* for at least twenty (20) years were designed to generate a contextual understanding of the socio-cultural and economic context. We used a well-being ladder (sensu Petesch et al. 2018) as a tool for arriving at a contextualized characterization of worse-off and better-off men and women. This elicited characteristics of individuals from various socioeconomic strata. Our questions covered livelihoods, capital assets, relationships, and broader changes in the communities. Information from the KIIs was used to inform the selection of FGD participants. In addition, the semi-structured interviews were intended to explore individual experiences in relation to the themes that emerged from the FGDs. FGDs (44 men and 41 women; Table 4.1) were designed to investigate gender dynamics in the area in the last ten years. We probed perceptions about gender norms surrounding livelihoods, access and control of capital assets, relationships and participation in public activities, among others. We also explored narratives of factors driving these changes and associated well-being outcomes at the household level. In addition, semi-structured interviews were conducted to substantiate and corroborate themes that emerged from FGDs, drawing on the narratives of individuals' lived experiences. All participants were identified through locally hired field guides aided by suggestions from other local residents. FGDs and interviews with women were conducted with a female translator, and data collection activities with men were conducted with a male translator. All conversations were recorded, transcribed and translated into English.

Table 4.1 Focus group discussions in three *kebeles*.

Kebele	**Men's FGDs**	**Women's FGDs**
Kuda Kofi	1 relatively poor 1 relatively rich	1 relatively poor 1 relatively rich
Difo Mani	1 relatively poor 1 relatively rich	1 relatively poor 1 relatively rich
Kela Harari	1 mix of poor and rich	1 mix of poor and rich

Prior to data collection, we met with community leaders and members to explain the purpose of the research. Moreover, each interview and FGD started with explaining the reasons why participants were invited to the conversation, the general themes to be covered, an estimate of time the activity would take, confidentiality, and a request for permission to record. Local residents were informed that they were free to refuse to answer any question and to leave the conversation whenever they wished to. We also communicated the study and sought permission from different levels of government (i.e. regional, *woreda*, and *kebele* levels). Ethics approval was duly obtained.

Qualitative data from the three above-mentioned activities were subjected to content analysis using NVivo (NVivo QSR 2016). In total, we did three rounds of iterative coding combining deductive and inductive approaches. In the first round, we developed a coding tree based on the main themes and structure of the data collection instruments – coding themes included broad sociocultural, economic, and political context; prevalent gender norms; and decision-making processes. The original coding tree was then expanded with new codes to capture nuances in the responses. In the second round of coding, we refined the coding tree based on the gender-related changes that emerged as the most important narratives in the data. In the third round of coding, we coded the perceived changes using leverage points as a conceptual lens to analyze the observed changes, drivers, and attendant outcomes associated with interventions, for different leverage points and their interactions. This involved classifying identified changes as a change in visible gap, a change in formal or informal structure, a change in attitude, or an interaction between leverage points.

Findings

We present our findings with respect to gender inequalities, perceived changes, factors driving changes and perceived importance for household well-being (Table 4.2). The first subsection deals with visible gaps, structures and attitudes; and the second subsection deals with interactions among these three domains. We focused on those gender-related changes

that were central to the discussions of local residents. Due to the general agreement in the narratives of better-off and worse-off men and women, we aggregated narratives from the three *kebeles* as below.

Table 4.2 Perceived gender-related changes in three *kebeles* in southwestern Ethiopia in the last ten years. (Notes: Blank spaces indicate that drivers and/or effects on household well-being were not mentioned in the group discussions and interviews; entries for each type of leverage point are arranged from higher to lower frequencies of being mentioned.)

Changes observed	Drivers	Effects on household well-being
	Visible gaps	
Women's increased involvement in similar livelihood activities as men (e.g. working in the field digging, weeding, harvesting)	Access to information through meetings and trainings; government support in accessing farm inputs such as improved coffee	Improvement in food security through women's contribution to livelihoods and better household decision-making
Women participating in public meetings and trainings	Encouragement and targeting by government workers	Improved knowledge related to livelihoods and health, improvement in general quality of life
Women involved in conservation activities	---	---
Improved mobility	Awareness of punishment for rape; gender sensitization	Ability to participate in public meetings and trainings; freedom to and sense of pride in wearing clean and good clothes; freedom to work in fields
Decrease in incidence of husband hitting wives	Gender sensitization through government efforts	---
Women participating in Ethiopia's adult education program	Gender sensitization through government efforts	Awareness about gender equality, knowledge how to use and save money, general improvement in quality of life
	Structures (formal and informal)	
Formulation of government policies recognizing and promoting women's rights (formal institution)	---	*Combination of benefits indicated below*
Shared decision-making between husbands and wives practiced in more households in the *kebeles*	Government-organized trainings and advices from government workers	Household resources are not wasted; there is diversity of perspectives and opinions in the household
Awareness about gender equality and women's rights (change in information disseminated and flow of information that now involves women)	Spread of information through government-organized trainings and meetings	Better mobility; husbands and wives making decisions and working together; more freedom for women to do activities that were not previously allowed; improved quality of life

Changes observed	Drivers	Effects on household well-being
Change in rules around access and control of capital assets (formal institution)	Government policy on land registration; knowledge about women's rights; improved relationships at the household level	Increase in household income in some households
Change in what women are allowed to do in relation to their roles (e.g. more involvement in meetings and trainings, more involvement in field activities)	Government trainings and meetings; knowledge about women's rights	---
Women are more knowledgeable about trading and livelihoods	---	Increased ability to generate savings
Women can clean themselves without being perceived as immoral	---	---
Women can save money	Information from government	---
Women can take out loans	Information from government, government program targeting women	---
Women are more proactive	Relationships within and outside households	---
Women can make decisions on their own regarding domestic matters	Advice from extension workers	---
Women have more knowledge	---	---
Women are part of community network called *shane*	Government-organizing	Improved sharing of experiences
Attitudes *(tentative but existing)*		
Emergence of trust	Gender-related trainings and advice from government workers	Loss of household money is avoided because men and women who have trust do not secretly take from their harvest or household money
The perception that women's initiative and involvement should be encouraged	Knowledge *(type of knowledge not specified)*	---
The perception that men should accept women's ideas	Knowledge *(type of knowledge not specified)*	---
The perception that men and women are equal	Trainings on gender equality, encouragement from government workers for women	---

Changes observed	Drivers	Effects on household well-being
	to be involved in livelihood activities	
Shift in perception of women as weak and incapable to women as capable of managing a farm and making farm-related decisions, and of leading	Trainings on gender equality; an emphasis on having equal numbers of men and women in meetings and trainings; awareness that gender equality is a legal right; and education	---
The perception that women should also be involved in providing advice to the government as men do	---	---

Interactions between leverage points
Government policy and interventions to promote gender equality (formal institution) → enhanced participation of women in trainings, meetings, and livelihood activities previously done by men (visible gaps) → outward demonstration of women's knowledge and competence → continued involvement builds and nurtures women's knowledge and competence → role models that provide reason for changing negative perceptions of women's knowledge and competence (attitudes)

Domains of gender inequalities and changes

Visible gaps

A clear gendered differentiation exists in the study area, both in the private sphere of the household and the public sphere of community. Visibly, this differentiation manifested in the types of activities that individuals engaged in. For example, undertaking livelihoods for the production of food or the generation of income, and representation of households in public activities such as meetings and trainings related to livelihoods, and natural resource conservation have traditionally been considered the responsibility of men. Women have traditionally been responsible for maintaining the home and caring for children. Food preparation was almost exclusively women's responsibility, and this involved heavy pounding of food crops such as teff and sorghum to separate grain, bringing crops to (an often distant) milling station, and cooking. In the words of a female interviewee: "The role of women is to deliver food to their husbands in the field."

Circumscribed responsibilities created notions of acceptable and unacceptable things to do. For example, it was common for men to be the only ones responsible for livelihood activities and this intertwined with male dominance in decision-making for the use capital assets and types of crops to plant. Women were commonly not allowed by their husbands to attend public meetings and trainings — "There was no meeting for women, no equality. Husbands did not allow women to join meetings or go elsewhere." (Female FGD participant). Such an

exclusion is crucial because community-level deliberations and transmission of information concerning important matters such as livelihoods improvement, natural resources and accessing government services occurred in those public meetings and trainings. Construction of tacit gender roles for men and women in effect privileged men's control of livelihood strategies and representation of his household to the wider community. Women's responsibilities circumscribed within the home essentially closed off opportunities for proactive and productive engagement in livelihoods and public dialogue. Low physical mobility because of responsibilities at home, fear of being raped, and the potential stigma of breaking normative rules traditionally further limited any possibility of engagement in livelihoods and formal public activities.

Exclusion from livelihoods and public activities were related. Strict responsibilities between livelihoods as men's and domestic care as women's provided justification for women's limited mobility outside the home and their absence in public meetings. Consequently, their being restricted to homes and their inability to access information and meaningfully participate in community dialogues constrained the building of their capacities and agency.

Notwithstanding this traditional situation and its continuation until today, in the last ten years, women have become more visible in public meetings, trainings related to livelihoods and natural resource conservation (i.e. not related to gender issues per se), and involvement in conservation activities such as the construction of soil terraces to prevent erosion. The change was described as: "Ten years ago, women were not involved in meetings. We had no right to decide on matters. There was no awareness. But now, we are involved in meetings and we receive advice. We are now aware about our rights and we can get involved in livelihood activities. We have a big range of rights including education, sending our children to school and being involved in important things when needed." (Female FGD participant). The importance of women's ability to appear and participate in public meetings was related with improvements in their physical mobility and participation in livelihood activities. "Women were not allowed to join meetings or go elsewhere. But now, women work in the fields as the husbands do. We wash our bodies, wear nice clothes and join meetings without restrictions by the husbands." (Female FGD participant).

In the private sphere similarly, there had been a perceived change in gendered livelihood participation. While ploughing remained strictly men's work because of the heavy labor required, more women were becoming involved in farm field activities such as digging, weeding and harvesting. In some cases, women were responsible for deciding harvest allocation for consumption, selling, and seeds. Some women managed seed-keeping. More women were proactively involved in trading and in generating income from home gardens.

"Nowadays, women work hard and improve their lives, such as through coffee propagation in home gardens and planting in the fields with men. Compared with the past, women used to stay in the house and wait for everything from their husbands." (Female interviewee).

State policy and intervention for promoting women's rights were identified as key factors driving these changes in visible gaps. Particular changes included information dissemination to increase awareness of women's rights, explicit encouragement of women to attend meetings and trainings, and emphasis on the importance of women's participation in public activities and livelihoods. One participant identified criminalization of rape as a factor supporting women's improved mobility saying: "Women were afraid to work far from their husbands because they may be exposed to the risk of rape. But nowadays, people are aware that the punishment for that is heavy. So women can freely move and work on activities to improve the quality of their lives." (Male FGD participant).

In terms of outcomes, these visible changes were perceived to be beneficial for household food security and quality of life. Knowledge acquired through these changes "contributed to how households worked, how households kept healthy, and to a general improvement in the quality of life." (Male FGD participant). According to another male participant, the mechanism for contributing to an improvement in food security was through increasing yields. This became possible because advice received from development agents encouraged women's involvement in decision-making concerning livelihood activities. A male FGD participant described the change process as follows "This came after the fall of the Derg regime and start of the current government, which initiated equality of women and men. Before, women didn't know about equality and about decision-making. Husbands controlled all. The new policy encouraged women to work as men. If they cannot plow, they can do other types of work in the fields." This was perceived to have a positive effect on the use as well as the generation of household resources. "This change positively affects the food security of households, by increasing yields and improving the quality of life. Through advice, people's understanding increases, this facilitates women's involvement in decision-making for livelihood activities. This also supports an increase of resources and income sources to live a good quality of life." (Male FGD participant). Moreover, a female FGD participant described the effect on their household as positive because "even if one's husband does not work hard, we can earn through trading and work in the fields to secure food for our families." The importance of women's involvement in public activities and livelihoods was succinctly captured in the statement "If a man works alone, it is impossible to bring development." (Male FGD participant).

Structures and rules

Clear changes in formal institution can be traced back to the shift of government power from the Derg (1974-1991) dictatorship to the ruling Ethiopian People's Revolutionary Democratic Front (EPRDF) (1991 onwards). Changes in visible gaps discussed in the preceding subsection including women's visibility in public meetings and trainings and in farm field activities were consistently attributed to government policies and interventions promoting women's rights. An example of this is requiring the inclusion of wives' and children's names in the registration of land. This provided household members a legal claim to land in the event of divorce or death of the male household head. However, whether the policy reform on land registration influenced women's livelihoods was less clear. Changes in women's livelihood involvement were mainly attributed to a clear message from the government during local meetings and trainings concerning women's equal capacities, and not necessarily to a change in formal rules concerning land entitlement. In fact, despite the presence of legal provision for women's rights to inherit land, or to retain their share of land in the event of a husband's death or divorce, the enforcement of these formal rules was still contingent on women contesting de facto access to land which sanctioned the claim of other men (sons from first wives or relatives). Retaining land after divorce or a husband's death was viewed as requiring a specific character described as "a woman who can describe her problems very well, even in front of the law. She's not shy but strong. She can get ruling from the court. So the people cannot touch her property because she has knowledge." (Female FGD participant). In terms of inheritance, without daughters staking their claims in court – and this was uniformly the case – land customarily went to sons. It was implicit to this patriarchal social arrangement that women would access land mainly through marriage. Notably, women from some of the poorest households were not aware of this policy reform, and most of the poorest households did not have land at all, closing off opportunities for the communities' poorest to directly benefit from this change in a formal institution.

Social norms that codify acceptable ways of doing and being, for men and women are collectively held and imbibed. Therefore, early shifts in informal structure are likely to be fragmented at best, involving a tension between notions of what is acceptable and what is not. Owing in part to a long history of female repression, normative changes in southwest Ethiopia are emerging as a redefinition of what women can do. There was no evidence for a parallel change in what men can do or be. However, men had been similarly involved in processes of change through the views they hold concerning what women can do in households and in communities. In our investigation, informal structures or the normative domain had the most numerous changes identified relative to other domains, though these changes were rather tentative.

Gender norms in the area, including the basic sphere of self-care, had been rather restrictive. For example, women who observed hygienic practices were perceived as being immoral. Presently however, women can practice self-care such as washing themselves and wearing clean clothes without being viewed as doing a "morally bad" action.

In terms of being informed, women's general state of knowledge and awareness was perceived to have improved due to improved access to basic and adult education and participation in public activities. Their attendance in meetings and trainings had the effect of altering the flow of information, making some information directly accessible to women, where previously, information (e.g. related to farming, health) reached women mainly through their husbands. However, while women participated more frequently in meetings and trainings, it was not clear whether their voices were equally heard, and in many cases their participation still required approval by their husbands – "We share information from the meeting to our wives and she pays attention to it. We also allow them to participate in meetings so they acquire knowledge. She can then say, 'We have to teach our families and bring about quality of life.' Ten years ago, men didn't allow women to participate in meetings." (Male FGD participant). Participation in public gatherings also provided women with opportunities to meet and establish relationships with other women, which became venues for informal sharing of experiences and ideas – activities that women valued as opportunities for learning.

Concerning roles and responsibilities in the households, strict gender lines continue to divide men and women. However, a shift in informal rules about what women can do has started to expand women's scope of activity. In relation to having greater freedom to participate in public activities and farm field activities, women are now allowed to save money, take out loans, and participate in community networks with other households. Perhaps the most significant normative shift within the households is located within the relationship between husbands and wives. A clear change was perceived in the dynamics of household decision-making, from being the sole responsibility and right of men, to one that is shared between men and women. Local residents estimated that this type of shared decision-making was practiced by about a quarter of the population ten years ago and that this had increased to about three-quarters of households in our study area. However, in shared decision-making processes, women's involvement could be either practical or strategic[7]. In many cases, men remained as the initiator of discussions and women's contribution related mainly to providing information for the households' food needs. Yet there were also examples of women taking a

[7] Strategic involvement in decision-making involves having a voice in the determination of goals, means, and valued outcomes. It involves setting directions. On the other hand, practical involvement in decision-making is less substantive and often involves providing needed information, and acquiescence to goals already set by another party (see Kabeer 1999 on agency).

more strategic role in the decision-making process by initiating discussions and negotiating the use of capital assets and livelihoods.

Factors identified as influencing these changes included government interventions as described in the subsection of visible gaps, access to information and improved knowledge, and improved relationships between men and women at the household level. The improvements in relationships were perceived to have been positively influenced by women's involvement in public meetings, trainings and livelihood activities. Women's involvement had an effect on knowledge and a sense of confidence, which in turn contributed to better communication. "We discussed prior to trainings. But after trainings, discussions were sweet and deep – it's like when someone is hungry and eats food. Something without education and training is not sweet." (Male interviewee). In terms of outcomes, shared decision-making between husbands and wives were perceived as having a positive influence on household income and were seen by both men and women to lead to a general improvement in the quality of life. The mechanism for this was described as "…the husband harvests and puts it in storage while the wife tells him the proportion of the harvest that should be enough for consumption. If he wants to sell the crops when the crops allocated for consumption is not enough, the wife can refuse and reason out that the allocation is not enough for food. Our decision and discussions are examples to our children… If there is disagreement, on one hand the wife would sell, on the other hand the husband would sell and they run out of crops. Finally, the children are left without food…" (Female FGD participant).

Attitudes

Conceptions of gender roles and responsibilities are often predicated on notions about men and women's innate characteristics. In the context of our study area, women were mainly responsible for domestic matters not merely because of a perceived caring nature but because of a perceived lack of knowledge, lack of foresight and management abilities, and lack of competence for productive engagement in livelihoods. This was exemplified by the statements "In the past, people said women can't do anything. They are weak. They have no energy, and no capacity." (Male FGD participant) and "In the past, there was no involvement in anything, they [women] were not even considered as human beings." (Female interviewee). Against the matrix of these settled ways of thinking, women who exemplified knowledge, ability, and initiative contributed to a general reshaping of how women were perceived. In fact, several male FGD participants considered that women could be leaders and should have greater involvement in providing inputs to the government for planning development. "Not only men, women too should be involved in giving advice to government and in working as men do to bring development or improvement." (Male interviewee). A relatively similar

comment but relating to the household said "As women accept men's ideas, it is better if we accept their ideas and plans. This opinion comes from knowledge." (Male FGD participant). Factors identified to facilitate such shifts in attitudes were improvement in knowledge and awareness of gender equality through trainings and government advice, and improvements in relationships between men and women through better communication. This improvement in communication was linked to an increase in shared decision-making, which in turn, was facilitated by government efforts to include women in meetings and trainings, and encouraged their participation in livelihoods. A small but significant number of women role models who showcased their abilities and generated beneficial outcomes for themselves and their households may also be providing a positive rebuttal to the dominant narrative of women being incapable. Interestingly, some women who were perceived as "doing gender" differently by taking more proactive involvement in livelihoods were migrant settlers coming from a different part of the country.

In some households where women were perceived as capable, there had been an emergence of trust between husbands and wives. However, the mechanisms at work that led to a positive perception of women's capacities are not clear. This positive perception could be present in households where men had been socialized in more gender-equal ways of thinking. On the other hand, women's display of capacities may be met with negative treatment. A response to a hypothetical scenario of a pro-active wife setting up her own livelihood in a big city was that of another man telling the husband "Are you following her? What is she doing? Who is the household head – you or her? You are foolish." (Female FGD participant).

Trust was considered beneficial for households because it prevented the loss of crops and income. In the absence of trust, men took from household resources for their personal use and women would do the same for the needs of their respective household – "Nowadays, both husbands and wives decide together how to use their capital assets. In the past, there was no agreement nor trust between men and women and money was lost." (Male interviewee). Mutual trust was perceived to facilitate working together towards shared goals and better use of household resources.

Interactions between leverage points

Above, we discussed changes in three realms of leverage – visible gaps, structures, and attitudes – and briefly introduced the drivers of these changes and their outcomes for human well-being. Overall, we found evidence that changes at different levels of depth interacted and facilitated one another. While changes at deep leverage points drive the overall trajectory of a system, our findings suggest that changes at shallow leverage points created important "sparks" that contributed to enabling conditions for deeper changes. Here, we present our

understanding of the mechanisms by which a change in formal institutions interacted with social norms and attitudes towards women in southwest Ethiopia (Figure 4.2).

The formal institutional change and interventions observed rarely explicitly challenged unequal gender norms. However, gender-aware policy reforms and interventions served to open opportunities for women to undertake actions that were otherwise socially unacceptable. Formal institutional change thus provided legitimacy to an alternative manner of doing, which previously lacked local acceptance. The tightly linked changes between formal institutions and visible gaps then apparently catalyzed a re-imagination of what women can do, albeit these new "freedoms to do" are still deeply constrained by patriarchal informal institutions. To name some tangible changes, rules concerning saving money, taking out a loan, and being part of a network of households changed. For example, where before women were not customarily allowed to hold more than 100 birr (equivalent to roughly 4 USD), they now can. "In the past, women had no right to save money – could not have more than 100 birr – but now women are involved in taking out loans from the government." (Female FGD participant).

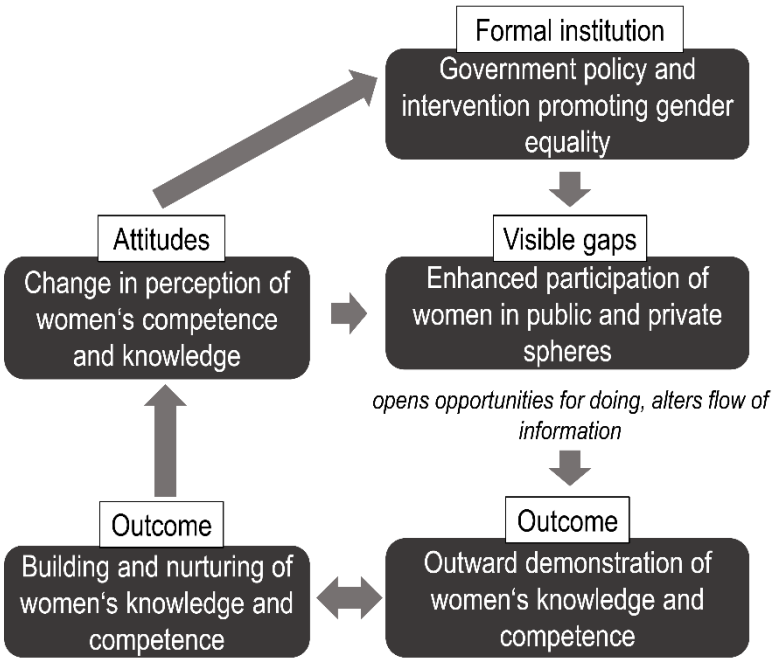

Figure 4.2 Interactions between leverage points for gender-transformative change in southwestern Ethiopia.

Crucially, as women have become more visible and able to participate in public and private spheres, their opportunities for engaging in livelihoods and participating in public activities have become more accessible. "Ten years ago, women were not involved in meetings, had no

right to decide, and no awareness. But now women are involved in meetings and they get advice. So they are aware about their rights and are involved in livelihood activities." (Female FGD participant). This is important, not so much as an ultimate marker of improvement in gender equality, but as a window of opportunity to demonstrate knowledge and capacity in areas where women traditionally had been perceived as lacking. Participation served as an antithesis to the belief that women are weak, incapable and ignorant – whether this belief was held by men, or by women themselves who had internalized this in their identity construction. "The government advised us and trained us about the equality of men and women. The government called equal numbers of men and women to meetings. They told us that women can do everything – if she can't plough the land, she can use daily wage labor to do that. For example, women who have no husbands work their fields using paid labor. They prepare seeds and fertilizers as men. The government encouraged women to work equally as men and trained both men and women about fairness. For example, a woman can be a leader or a vice chairman. This is the right given by the constitution or government. In the past, people said women can't do anything… but no." (Male FGD participant).

Moreover, as mentioned earlier but worth noting again in this section about interactions, the above-mentioned changes in visible gaps altered the flow of information, enabling women to access some information by themselves rather than through their husbands. This indicates that a change in visible gaps had an effect on structure, particularly the flow of information. Opportunities to do things differently built knowledge and competence in areas previously closed off to women such as farming livelihoods, and in turn, enabled them to further demonstrate knowledge and competence in these areas. Through this, perception about women's capacities has begun to change. This can potentially inform further changes in formal institutions (Figure 4.2).

Discussion and conclusion

Gender equality is elemental to a just and sustainable world. It is also instrumental for improved livelihoods and food security (Kerr 2005, Lemke and Bellows 2016). The need for gender transformative change that permeates social systems – from deep-seated attitudes, to social structures and processes, to the closing of visible gaps for instrumental purposes, is clear (UN General Assembly 2015). Our analysis of gender dynamics in the context of southwest Ethiopia contributes insights for facilitating transformative change. We showed that gender inequality, interventions, and corresponding changes could be observed in the domains of visible gaps, structures, and attitudes, and that interactions between these domains are crucial for ongoing systemic change (Figure 4.2). Particularly, we showed how, in a

context where there were no interventions that directly challenged gender-unequal norms, policy change and efforts to address visible gaps between men and women contributed to the creation of enabling conditions for changes in norms and attitudes. In this section, we discuss (1) the contextual significance of formal institutional change in southwest Ethiopia; (2) the role of reflection for amplifying interactions between leverage points and for orienting change towards gender equality; and (3) the added value of a leverage points perspective to assist development and research organizations to systematically engage with transformative change.

Empirical analyses of gender transformative change often involve mechanisms of change precipitated by interventions designed to target deep leverage points by identifying, addressing, and challenging those (i.e. social structures, norms, and belief systems) (e. g. Sarapura Escobar et al. 2016). An excellent example is the household methodologies (HHM) piloted by Oxfam Novib in coffee-producing villages in Uganda (IFAD 2014). Using HHM, household members worked together to develop a vision for the future, identified steps to realize the vision, and held reflexive conversations to trace factors that held households back from the kind of life they desired. Another example is a microcredit project piloted by WorldFish in collaboration with other organizations in the Barotse floodplain in Zambia to engage with unequal gender norms. Women's access to microcredit was used as a platform for understanding and challenging entrenched inequalities in gendered access and control of resources (Cole et al. 2014a). In many contexts, however, such creative and sustained interventions targeting deep leverage points are absent.

Indeed, while innovative social interventions by development practitioners and researchers are important to facilitate change, Razavi and Miller (1995) observed that the "state still remains responsible for regulating macro-level forces in a more gender-equitable manner". Locked in an autocratic and repressive regime with little scope for challenging unjust treatment for decades, liberalization of government and consequent policy reforms became one of the key drivers of gender dynamics in Ethiopia. This suggests that in certain contexts, if government institutions undergo transformation in policies, language, and practice among others, the potential to create knock-on effects at lower socio-political levels is high (Branisa et al. 2012). In our study area, the shift of formal institutions in favor of gender equality motivated changes in the belief systems of some men and women. However, Lavers (2015) cautions that while policy reforms in Ethiopia were intended for effective policy implementation including for gender equality, political concerns and evident desire of the state to dominate the Oromo ethnic group should be recognized. His nuanced analysis of the effect of land registration on community gender dynamics in Ethiopia showed that though reform affected women's land rights positively, different customary practices across different

contexts mediated the actual effects of the reform. For example, norms on labor allocation left women disadvantaged despite their recognized formal rights to land.

In our study, while gender inequality remained pervasive, positive changes were observed at shallow leverage points, which in turn expanded women's scope of freedom. The same logic underlies Dejager and Jayasinghe's (2016) reasoning as they explored how gender may be integrated in aquaculture development in Nepal. They commented that while certain initiatives may not directly challenge social norms and practices, these "can also be transformative as women take on new responsibilities and new decision-making, negotiating, and leadership roles". Moreover, households with more gender-equal relations were perceived to also have better general well-being. These households provide local examples and inspiration for change (Kandiyoti 1988). Attention to these changes does not preclude a deeper and critical investigation of the way changes in the domain of visible gaps may mask underlying inequality, or the way a change in policy may leave a social norm unchallenged, thus entrenching patterns of inequality. Indeed in our investigation, the perceived changes in informal rules were alterations of rules concerning what women are allowed to do, rather than a substantive reconfiguration of gender roles and redistribution of power. At their worst, women's expanded "freedoms to do", dispatched for altruistic purposes for household and community, may entail an increase in labor burden that further disadvantage women (e. g. Doss 2001). This is a well-known reality. Yet, alternatively, such changes can be seeds that form the basis for intentional engagement with deeper leverage points for transformation.

Interactions between leverage points suggest opportunities for amplifying desirable change and for facilitating processes that more deliberately engage with deeper leverage points. Reflection is key to this, in the form of both individual practice and collective practice through critical conversations (Sarapura Escobar et al. 2016). Reflection involves creating ample time and safe space for asking questions and coming to one's own answer concerning specific matters. In the context we studied, most of the changes observed at the level of visible gaps were a result of government intervention – something that was imposed, rather than a result of internal deliberation and local choice. Yet this process of deliberation involving articulation of what changed, from whose perspective, whether the change was beneficial or not and for whom, and why, is important for fostering local ownership of change processes (Cole 2018, personal communication). In many cases including southwest Ethiopia, external factors induce a change in practice (e.g. livelihood involvement, attendance at public meetings). Yet practices may change without necessarily altering long-held views, such as men being natural leaders, or women being ignorant and incapable. The reflexive question why – whether and why a certain change is good; whether and why a certain change should be maintained or reverted – is critical for transforming social systems. A small number of

people rethinking women's capacities for thought and action constitutes positive change, but a transformed social system implies that new ways of being and doing are embodied by the majority of people. Individual reflection can facilitate the re-thinking of gendered norms and attitudes, while collective reflections can foster debates and expand the scope of change (Galiè and Kantor 2016).

Transformative change is theorized as being multi-scalar and involving multiple stakeholders. Changes at the level of formal institutions and policies are mediated by various contextual factors before they translate into change in the lived experiences of households and individuals. On the other hand, changes located within the limited scope of individuals' lives or a group's do not lead to transformation unless higher level and more widespread structures and processes are fundamentally altered. Transformation thus involves all three elements: widespread change in what is visible, in the institutions and rules that govern and create visible conditions, and the deeply held views of individuals or organizations. Devkota et al. (2016) called attention to "the interaction between actors and structures that causes change in a dynamic and cyclical process". For a massive challenge such as transformative change towards gender equality, including its intersection with other inequality-causing factors, research and development organizations continue to be constrained by the scope and modes of operations. Most organizations seeking to address wicked problems such as food insecurity and poverty lock in on interventions at the household level. On the other hand, organizations seeking to make an impact at higher levels such as that of policy-making sometimes miss to deeply engage with households for whom policies are supposed to make a difference. The notion of leverage points provides a framework for systematically engaging with key areas for gender transformative change. It explicitly considers interactions between leverage points. This, in turn, increases the prospect that changes at the level of structures and processes will translate to changes in daily lived experiences; and conversely, that changes in individual's ways of being and doing will challenge entrenched structures of power. The over-arching goal of applying leverage points as an analytical lens for facilitating gender transformative change is not unlike the gender transformative approaches such as the one operationalized by WorldFish in the Barotse flood plain (Cole et al. 2014b). However, a key contribution of a leverage points lens is its explicit incorporation of different levels of leverage and explicit consideration of interactions between these. This provides scope for capturing both deeply entrenched inequalities and emerging positive changes. Often, positive changes are observed and measured in the service of justifying the value of an intervention. A leverage points perspective, in contrast, takes ongoing changes as the dynamic material that change-makers must work with. On the basis of our findings, we call attention to a need for further research on interactions between leverage points for gender equality, rather than a focus only on

visible gaps or only deeper leverage such as social norms. Furthermore, this study showed the suitability of a leverage points perspective for the analysis of gender-related changes – as such, it can complement more established facets of gender transformative approaches, which address and challenge social norms and attitudes shaping gender inequalities. Finally, in our study, positive changes provided counter-examples that starkly contrasted with typical gendered modes of being and doing. These provided local people the material with which to re-imagine possibilities and alternatives. These existing (albeit fragmented) changes are potential seeds for transformative change – and thus, good starting points for charting a course towards a gender-equal future.

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Chapter V

"…empowered women and men are better, more successful farmers who can make the most of the opportunities around them. We argue that there is a causal relation between more equal gender relations in the household and in the community, and better agricultural outcomes. The one underpins the other. This is a radical thing to say, because it means that the standard development interventions – more extension services, better information, more fertilizer, better machinery – will not fully achieve their goals unless women and men are on equal footing, able to make rational economic decisions unhindered by gendered norms that limit what is "appropriate" for women or for men to do, or be."

Cathy Farnworth and co-authors

Chapter V

The social embeddedness of smallholder farming livelihoods and food security

Unpacking social norms around gender and socioeconomic difference in southwestern Ethiopia

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(Manuscript)

Abstract

Smallholder farming is embedded in social structures (e. g. gender) that influence livelihood processes and outcomes. These structures shape social norms that can differentially constrain people, affecting their abilities to choose and realize desired ends in relation to their livelihoods and their attainment of food security. Despite their importance, relatively few efforts to support livelihoods improvement engage with social norms. Drawing on qualitative data from interviews and focus group discussions in smallholder farming communities in southwestern Ethiopia, we investigated how norms around gender and socioeconomic difference influence access to and control of key capital assets, decision-making, and allocation of activities. Our findings indicate that socioeconomic status influences the extent to which social norms disempower women and men, resulting in differing restrictions on their livelihoods. Notwithstanding the constraining effect of some social norms, study participants perceived an improvement in the agency of most women and men in their communities owing to broader changes in accessibility of education, health services, physical infrastructure, and awareness of gender equality. Efforts to support smallholder farming livelihoods and improve food security can benefit from integrative approaches that engage with social norms with a view to expanding people's abilities to be agents of development.

Introduction

Smallholder farmers provide more than half of global food production (Graeub et al. 2016) but are among the poorest and most food insecure demographic groups (Lemke et al. 2016; Riesgo et al. 2016). This persists despite decades of investment in policy and research. This is significant in sub-Saharan Africa where 75% of agriculture is smallholder (Herrero et al. 2017) and food insecurity has consistently increased since 2014 (FAO 2018). Smallholder farming is thus viewed as having a strategic and central role in ending food insecurity globally, and in Sub-Saharan Africa in particular (Graeub et al. 2016; Ricciardi et al. 2018). Decades of failed investments in policy have tended to focus on economic and technological instruments, without commensurate engagement with the effect of social differences on the distribution of benefits. However, to more effectively leverage smallholder farming for food security, a nuanced understanding is required of the institutions such as social norms within which livelihoods and food security are embedded (Weeratunge et al. 2012; Njuki et al. 2016). Norms associated with social structures such as gender and class are key to reversing inequitable practices in smallholder farming communities.

African smallholder farming is embedded in a range of informal and formal social institutions, that are systems of established rules, norms, and customs (de Haan and Zoomers 2006; Morton 2007; Sakdapolrak 2014). Smallholder livelihoods are commonly grounded in webs of social relations at the household and community levels (Fairhead and Leach 2006; Torkelsson 2007; van Dijk 2011). Norms, which are a form of social institution, regulate practices within social relations and shape smallholder farming livelihoods by influencing rules around access and control of resources (e.g. Johnson et al. 2016), decision-making dynamics (e.g. Sumner et al. 2016), and division of roles and responsibilities (e.g. Lenjiso 2016). For example, gender relations – from which gendered norms arise – have been repeatedly found to have an effect on access to good quality land (Burke et al. 2018), technology (Kristjanson et al. 2017), participation in value chains (Quisumbing et al. 2015), and income generation (Sunderland et al. 2014). Consequently, gender is an important axis of social differentiation considered by scholars, development practitioners, and policymakers in engaging with the social dimension of African smallholder farming (Farnworth et al. 2013; Njuki et al. 2016; Lemke and Bellows 2016).

Because social norms, such as those underlying gender relations, are deeply rooted in community life, they are difficult to change and can persist despite policy reforms (Kantor 2013). Hence, evaluations of interventions to close visible gender gaps have found that even well-designed interventions are insufficient to alter the deeply entrenched social norms that underpin inequalities (e.g. Lemke et al. 2016; Blattman et al. 2013; Burke et al. 2018).

Feminist scholars in the area of gender transformative approaches stress the importance of addressing institutional determinants of gender inequality including by considering underlying social norms and power relations (Risman 2004; Kabeer 2005; Okali 2011; Hillenbrand et al. 2015; Cole et al. 2015). Furthermore, gender intersects with other social categories such as age, class, and marital status, resulting in clear processes of disempowerment differently experienced by women and men (Winker and Degele 2011,(e. g. Bezner-Kerr 2013; Djoudi et al. 2016). Understanding how norms based on intersectional axes of social differences affect people's abilities to engage in livelihood options is critical for targeting and developing approaches to more effectively leverage smallholder farming for food security (Cole et al. 2018; Ribot 2014).

Therefore, here we focus on social norms to unpack the processes through which gender and socioeconomic difference influence people's agency. The study was conducted in southwestern Ethiopia, where the majority of people rely on smallholder farming and where changes in formal institutions aimed at empowering women have been documented, such as policy reforms on land registration and the family code (Kumar and Quisumbing 2015; Lavers 2017; Manlosa et al. 2018). These policy reforms create a situation where formal institutions aimed at empowering women exist, but where many patriarchal social norms endure (Hebo 2006; Bevan and Pankhurst 2007). In this study, we bring together gender and socioeconomic difference as two contextually relevant axes of social differentiation. Our aim was to unpack social norms and analyze how these may inhibit the agency of women and men from different socioeconomic backgrounds in the context of livelihoods and food security. Through this, we seek to contribute evidence to the necessity of engaging with social norms as a lever for addressing social inequality not only based on gender but also on other social categories. Finally, we contribute insights to gender and food security policies in Ethiopia by identifying future opportunities for engagement and for amplifying positive outcomes from relevant policy reforms.

Conceptual framework for linking social norms around gender and socioeconomic difference with agency in livelihoods and abilities to be food secure

Gender transformative approaches underscore the role of social structures and institutions as one of the important factors that determine whether communities are egalitarian or unequal (Cole et al. 2015). Social structures, here viewed as socially constructed categories such as gender, shape various institutions. Institutions are both formal and informal, which provide

the basis for shared meanings and expectations, provide coherence to social interactions, and therefore enable order and efficacy in social units (Haugaard 2008). Government policies, rules, and tax incentives are examples of formal institutions. In addition, informal social institutions also strongly shape human interactions – these include social norms (i.e. customs, beliefs, and practices) that help to determine collective understanding of what are acceptable attitudes and behaviors (Pearse and Conell 2016; Petesch et al. 2018a). Social norms are integral to community life, and are incorporated by individuals in their mental models of the world (sensu Bourdieu 1990), and as a basis for individual and collective identity. At this informal, incorporated level, norms become invisible and typically fall outside the scope of critical questioning and discussion as a form of doxa (Wacquant 2004). Rather, norms are maintained through diffusion into individual and collective ways of thinking, doing, and being. Changes in social norms can therefore lag behind changes in formal institutions (North 1990; Bevan and Pankhurst 2007). The distinctiveness of the role of incorporated norms has motivated researchers in the area of gender transformative approaches to consider these as distinct from but interlinked with formal institutions (Weeratunge et al. 2012). More broadly, the evolution of social norms has been considered as critical to address global challenges that require collective action by tipping behaviors towards virtuous cycles (Nyborg et al. 2016).

We apply the notion of norms to elicit perceptions concerning beliefs and practices that impact on women's and men's agencies in smallholder farming livelihoods and abilities to achieve food security (Figure 5.1). The argument here follows that of Farnworth et al. (2013) who asserted that empowered women and men are better, more successful farmers who can make the most of the opportunities around them. Conversely, disempowerment of women and men through various processes undermines their abilities to have livelihoods grounded in self-determination and efficacy, through which they can be food secure (Smith and Haddad 2015; Chappell 2018). Drawing on Kabeer (1999, 2005) and Vermeulen (2005), we define (dis)empowered women and men as individuals who can(not) make strategic choices and are (un)able to act in line with their choices to realize a desired end, in other words, function (in)effectively as agents. This is similar in meaning to the notion of "power to," which is associated with agency or efficacy (Chambers 2006). Our investigation on the influence of norms is informed by Kabeer's (1999) analysis of power and (dis)empowerment as involving the interlinked dimensions of resources, agency, and achievements or outcomes. Here we analyzed how normative beliefs and practices shape engagement in the areas of *access to key capital assets*, *decision-making*, and *allocation of activities*. We selected the three areas because practices within these are fundamental to exercising agency over one's livelihoods. In addition, these are known to be influenced by social norms in many smallholder farming contexts (e. g. Qureshi et al. 2015; FAO 2017; Badstue et al. 2018). In each of these areas,

we elicit information on beliefs and practices that differentially disempower worse-off and better-off women, and worse-off and better-off men[8].

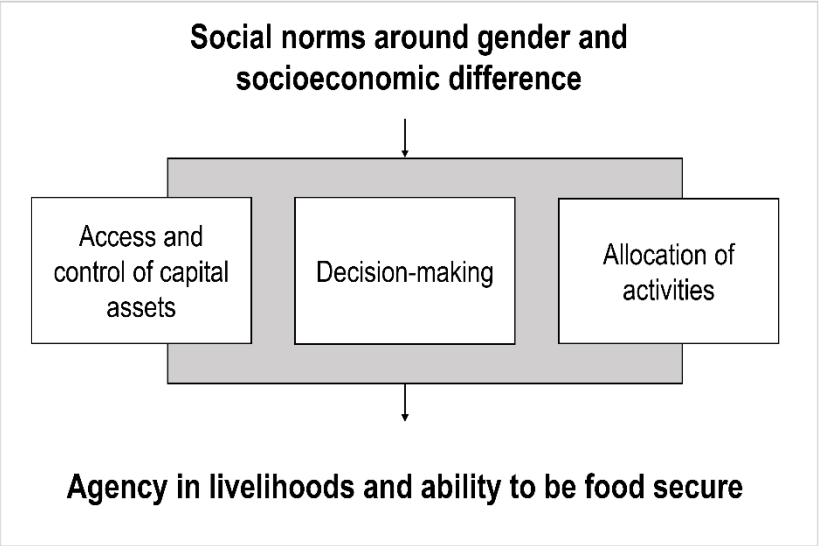

Figure 5.1 Conceptual framework linking social norms and agency in a smallholder farming livelihood context.

In terms of areas of focus, first, access to capital assets are the building blocks of livelihoods (Scoones 1998), and as such, either limit or enhance options for what is feasible (Ellis 2000). These are also considered the basis of people's abilities to be agents who not only have the power to act and reproduce, but also to challenge or change the rules that govern the control, use, and transformation of capital assets (Bebbington 1999). Allocative resources that determine principles of distribution and exchange are tightly linked with authoritative resources that determine priorities and claims (Giddens 1979; Kabeer 1999). Therefore, those with limited access and control over capital assets are not only constrained from constructing livelihoods that sustain and grow their capital assets, they also often lack the position and the means to revise the terms and conditions governing access and control. When social norms enforce a type of social closure that privileges access and control of capital assets by certain individuals on the basis of the social categories to which they belong, norms can be disempowering to other segments of the population who are closed off from the same level of

[8] When investigating socioeconomic status, we avoided using the terms rich and poor and used the broad terms "better-off" and "worse-off" to refer to individuals or groups who were relatively wealthy and relatively poor by local standards, respectively. We used these terms because they are relative and they better convey that the identification of these groups depended on context, not an external, standard metric.

access and control (de Haan and Zoomers 2006). Patterns of socially differentiated access and control of capital assets extend to decision-making dynamics through what Sen (1990) called different bargaining positions, which arise from the different relative levels of resources that people are able to command (Hart 1995). Flowing from differential ability to command capital assets, decision-making dynamics are also strongly shaped by social norms. In relations between individuals with unequal capital assets, whether at the household or community levels, those who command greater levels of capital assets often have an advantage in decision-making over those who command lower levels. Finally, we consider the differential allocation of activities within households and communities. Differential allocation of activities is important because it influences whether people are able to encounter opportunities for gaining new knowledge, skills, and networks, and whether they are able to invest time and energy in activities that are strategically important for fostering agency (e.g. engaging in community meetings). It also constrains or enables involvement in livelihood activities. Through a focus on these three areas – capital assets, decision-making dynamics, and allocation of activities – we examine entrenched processes through which social norms can act as disempowering institutions, limiting people's agency. Alternatively, changes in any of these three areas may constitute leverage points for instigating transformative change towards more inclusive and equal communities (Manlosa et al. 2018).

Methods

A case study approach was used because of its suitability to gaining an in-depth knowledge of norms at the community level (Bryman 2012). Three *kebeles* (smallest administrative unit in Ethiopia) under three different *woredas* (districts) were included in the study. At the time of the study, the estimated total number of households in the three *kebeles* was 1366. The *kebeles* share similarities in having diversified smallholder farming as the main livelihood strategy (Davis et al. 2016), high dependence on natural resources (Dorresteijn et al. 2017), and shared social characteristics, i.e. the majority of the population being of Oromo ethnicity, and practicing Islam as their religion (Ango et al. 2014).

Data collection activities included key informant interviews (KIIs), focus group discussions (FGDs), and semi-structured interviews (SSIs). KIIs were conducted with a small number of women and men who had lived in their respective *kebeles* for at least twenty (20) years (n=15). The purpose of the KIIs was to generate background information about the social and economic characteristics of the areas studied, including important changes that had occurred in the last ten years and descriptions of relatively better-off and worse-off women and men. The key informants were identified and purposively selected with the help of *kebele* leaders

and local residents. On average, the individuals interviewed had lived in their respective *kebeles* for 62 years. Information from the KIIs informed the selection of participants to the FGDs.

Twenty FGDs were conducted with four groups, namely worse-off women, better-off women, worse-off men, and better-off men, who were also purposively selected with the help of local field assistants. These groupings were identified to capture a diversity of responses from different genders and socioeconomic backgrounds. A total of 157 women and men participated in the FGDs. The FGDs were designed to facilitate discussions around norms at the community level in relation to the three themes introduced above, namely access and control of capital assets (e.g. land, livestock), decision-making dynamics, and allocation of activities. The FGD questions covered perceptions, beliefs, practices, and negotiations around these three themes, including how they changed over time, and whether changes had any effect on people's livelihoods and abilities to be food secure. In addition, we sought to understand people's perceptions of the agency of the majority of women and men in their communities. To elicit perceptions on agency, we used the so-called Ladder of Power in FGDs (Petesch et al. 2018b). The Ladder of Power is a visual (and metaphorical) tool that consists of five steps indicating the extent to which an individual is, in general terms, able to choose and realize desired ends. The bottom step signifies a position in which an individual is unable to make choices even about minor life matters, the middle steps represent positions in which an individual is sometimes able to make choices and realize combinations of minor and major life matters, and the top step represents a position in which an individual is usually able to make choices about major life matters. It is worth noting that the ladder was not intended to generate a precise measure of agency, but was intended to elicit local residents' perceptions of their abilities to choose and realize desired ends and facilitate discussion. We asked groups of women and groups of men on which step of the ladder they considered the majority of women and men in their *kebeles*, respectively, stood ten years prior to the study (2007) and during the study (2017), as well as the factors that had influenced any perceived change.

Following the FGDs, 30 semi-structured interviews were conducted to further explore the themes that emerged from group discussions, through the experiences of individuals. Interviewees were similarly selected according to gender and socioeconomic background. All activities were conducted in the local language *Aafan Oromo*, with the assistance of trained female and male translators. With consent from the participants, all discussions were recorded and transcribed.

Qualitative data were generated from the above-mentioned activities and subjected to content analysis in the NVivo software (NVivo QSR 2016). Codes were further organized according

to main themes and the social groups to which the participants belonged, for example worse-off women or worse-off men. Under each group, responses were coded based on the three broad areas of access to capital assets, decision-making dynamics, and allocation of activities. For example, norms and practices surrounding access to and control of land were coded under "access to capital assets". Descriptions of how husbands and wives decided on various livelihood and domestic-related matters were coded under "decision-making dynamics". Statements pertaining to people's roles or tasks (e.g. ploughing, weeding) were coded under "allocation of activities". These codes were then expanded inductively to further capture more specific themes that emerged from the responses. A set of codes were also created for the Ladder of Power exercise. Our findings (next section) use quotations from local residents to convey their perceptions and narratives. In line with other studies examining similar phenomena (e.g., Bezner Kerr et al. 2016), we present selected quotations that either capture different views, represent common views, or provide substantive insights through their content.

Findings

Our findings are organized into three sub-sections. The first sub-section describes gender-related norms and how they manifest in access to and control of capital assets, decision-making dynamics, and allocation of activities at the household level. The second sub-section considers how socio-economic differences intersect with gender to influence the three mentioned areas within sharecropping arrangements and other social relations at the community level. In these two sub-sections, we highlight mechanisms through which social norms can serve as disempowering structures for different groups of people. The third sub-section builds on the first two, and more broadly explores people's perceptions of agency and its changes over time.

Gendered norms and practices

Access to capital assets

Inheritance practices play a role in transmitting gendered patterns of access and control of capital assets to newly established households. Responses from women and men with different socioeconomic backgrounds indicated that farmland, which is strategically important in this farming area, is customarily passed down to sons (see Hebo 2006; Lavers 2017). As a practice, daughters do not commonly inherit land for cultivation. A female FGD participant explained: *"As a culture, women cannot inherit land except coffee and other plantation land.*

But it is possible to get it through the law." (QQRW2.15)[9]. The general agreement of the responses concerning inheritance of farmland suggests that despite the requirement to include wives' and children's names in land certificates under Ethiopia's reformed land registration policy, young women in this part of the country were excluded from opportunities to control farmland. A female FGD participant provided the underlying tacit logic for this practice, that is, women do not need farmland because they can access it through their husbands – *"It is difficult or impossible to own land. Democracy[10] has provided women with the right to learn, to share, and to participate in meetings. Discussions and shared decisions about livelihoods came after democracy. But even with democracy, it is impossible for women to have land. Women access land through their husbands, not separately from them."* (DMRW2.15) Several of the women, whether with a worse-off or better-off socioeconomic background, repeatedly mentioned that the means to acquire a farmland certificate for usufruct rights was largely limited to either divorce or widowhood. In line with this, a common experience among women was described as: *"When our husbands married us, we had no land, but husbands own land. So when a husband ploughs, the wife works on other things with him. She does not have land on her own. Only when the husband passes away will the wife have the land and pay tax to the government in her name. This is the only way women can 'own' land."* (DMRW2.17) These responses further suggest that women's access and control of farmland were highly contingent on their relationships with men. Notwithstanding this pattern, a few of the women mentioned that they were able to access the coffee plots of their parents, which provided them with opportunities to generate some cash. However, as with farmland, the coffee plots also tended to have their brothers' names. One of the female participants mentioned receiving coffee land from her parents. However, because she had to move to her husband's village, her ability to use the land was limited. In effect, farmland possessed by male heads of households typically came through family inheritance, while farmland possessed by female heads of households typically came from a prior marriage. On one hand, among some male FGD participants, there was a view that land is jointly owned with their wives. On the other hand, the more common view among most of the female FGD participants was that, land belongs to and is controlled by husbands (see Galiè et al. 2015 for similar perceptions about land ownership). This was described by a female FGD participant who said: *"When a woman marries, she loses the chance to use her parents' land. Inside the marriage, the land belongs to the husband from the beginning. It is not stated during the marriage that the wife will get her own land. So she cannot say this is my land".*

[9] Source of quotation signifying *kebele*, FGD or interview, and section in the transcript where the quote was lifted from.
[10] The FGD participant was referring to the democratic government of the Ethiopian People's Revolutionary Democratic Front which replaced the dictatorship of the *Derg* regime in 1991.

(DMRW2.22) Furthermore, according to female participants whose husbands had land, they were aware of their formal entitlement of up to half the household's farmland after divorce. They added that if widowed, the fraction of land women typically receive depends on whether she has grown-up children, especially sons who are also entitled to receive a share. One widow from a polygamous marriage reported being dispossessed of land by the elder son of a co-wife, leaving her with no means to provide for her daughter but ask from relatives or neighbors for food.

Livestock is another important capital asset in the study area. Most women and men FGD participants agreed that in practice, livestock is owned by both genders but the mechanisms for coming to own and the type of livestock owned differed. According to several female FGD participants, women typically come to own livestock through buying it using money from selling coffee or through receiving it as a wedding gift (*nika*). The *nika* was typically given in the form of a certain quantity of harvested coffee which can be sold for cash, or in the form of livestock which was perceived as an opportunity to grow their assets. The importance of the *nika* was described by a female FGD participant who said: *"Women can use this gift as their own asset, there is nothing else that women own by themselves. This can be coffee or livestock. If the livestock reproduces, it can be used very well. If it dies before reproducing, the result is empty hands."* (DMPW2.21) This wedding gift was described as solely a woman's property that should be used for her own benefit. It is typically expected to be used for the purchase of women's clothes. In various cases however, women liquidated their *nika* to support the households' livelihoods either through the purchase of farm inputs, payment of land tax, or to start their own livelihoods, for example through petty trade. This was one way through which women negotiated their disadvantaged positions in terms of capital assets, by taking advantage of opportunities that were normatively acceptable. However, a social restriction still applied to the *nika* in that if any of the livestock reproduced an ox, ownership and control reverted to the husband for use in farming. Cows for the production of butter and milk, smaller livestock such as goats and lambs, and poultry, were customarily under the management and control of women. In contrast, oxen, mules and horses, were mainly under the control of men.

Decision-making dynamics

The majority of both female and male participants perceived an increase in the proportion of households that made joint decisions on livelihood issues, from approximately one quarter of households ten years ago to three quarters of households. This change was described as *"…more women are involved in decision-making in a formal way like sitting together. This is for livelihood activities such as deciding what crops to plant, where to plant, who will do*

what. These issues now need the involvement of women" (QQPW1.17). While this change was largely attributed to better awareness of gender equality through government efforts (e.g. including women's involvement in meetings, training, and livelihoods activities), a few male FGD participants viewed difficulties from having only limited resources as a motivating factor for men and women to jointly find solutions. This increase in joint decision-making was largely perceived to be beneficial for the productivity of farms and household food security through a more efficient way of utilizing household resources stemming from an emergence of trust, increasing farm labor input through women's participation, and enabling the sharing of ideas. Moreover, the practice of joint decision-making was perceived to be more common among younger couples.

Most women and men agreed that husbands commonly initiated livelihoods-related discussions, for example by suggesting what livelihood activities to undertake, and who will do what. A male FGD participant commented *"The husband is the more influential person because from the beginning, he has more experience in farming. He raises issues to his wife and they discuss together… Even if the husband raised the issues, both husband and wife have the same right to decide. The husband plans all things, but success is with the wife."* (QQPM1.1) This was corroborated by a female FGD participant who also commented *"As my opinion, the husband is the first and then the wife. He initiates the conversations for all livelihoods then hears his wife's ideas and decide together."* Responses commonly described women's role in joint decision-making in terms of agreeing or reasoning against men's ideas, *"Most of the time, husbands come with good ideas and wives agree to that. Sometimes, a husband may not analyze the problem but the wife understands so she suggests and they decide together and husband accepts wife's idea".* (DMPW1.8) For example, a wife may suggest to undertake farming on their own instead of sharecropping with another farmer. However, a response encountered several times was that a wife would not challenge her husband's idea because of the husband's greater knowledge about livelihoods. This suggests that in some cases, what local residents called joint decision-making was not a process of active discussion, but a consultation on a pre-determined course of action or passing on of information from men to women and other household members for implementation. This feature of decision-making was consistent with the perceived role of men as household heads. We also encountered several men who said that decision-making was done jointly in their households, but who added that their wives always agreed with them. They did not experience having their wives hold a different view and challenge them. Several women confirmed this saying *"A husband dominates most of the work and a wife can't disagree with his ideas."* (DMPW1.6)

One of the important decision points for households was the type of crop to plant. Men and women, owing to their different roles, approached this decision point differently. In some cases, women's preference for a crop was influenced by the ease with which it could be prepared. On the other hand, men who were part of a community network called *didaro*[11] were commonly under necessity to consult with other men in the community to choose the most suitable crop for the season, considering factors such as the type of crop planted in the previous season and what was planted on adjacent fields. While women could and did inform their husbands about their preferred crops, in many cases, the decision was beyond the household unit because it was embedded in social relations outside the household. This process was described as *"The husband starts the conversation about crops to plant because he decides with people in didaro because the wild animals are a serious problem. So he discusses with his wife by saying 'The didaro is going to plant this crop type. If we plant a different crop, the wild animals will be a serious problem day and night. What ideas do you have?' So she knows the problems and agrees with what the husband decides with the didaro."* (DMRW1.9) One decision point that fell on women customarily but not always, was the fraction of crop harvest to allocate for household consumption. Women were widely perceived to have better knowledge of the household's food needs because of their responsibility in food preparation. On this point, a woman was more likely to challenge her husband if he wanted to sell food, while she considered the allocation for consumption inadequate. In households with very low harvest however, crop allocation was hardly a decision point because there was simply not enough harvest to even consider selling. Beyond this, women were also generally able to decide on practical matters including the purchase of small, daily necessities such as spices. However, more strategic decisions such as liquidating livestock, were typically not made by a woman without her husband's approval (with the exception of female household heads). In one household, a male interviewee asserted that if he was away and the family encountered a medical emergency, his wife still could not liquidate a livestock and must wait. The narratives suggest that while there had been a perceived increase in joint decision-making among households, the decisions women made were commonly practical decisions of limited long-term impact, with decisions having more significant magnitude and irreversibility being led mostly by men in various degrees of consultation with women.

[11] Collaborative guarding against crop-raiding mammals, where one edge of a stretch of fields was guarded by the household whose farm occupied that edge, and another edge by another household. In this way, groups of households maximized the benefit of increasing their labor input for guarding by pooling it with that of others.

Allocation of activities

Labor allocation similarly followed a gendered pattern. In practice, ploughing was considered an exclusively male activity. The reasons frequently provided by both male and female FGD participants were the strenuous physical demand of ploughing and women's perceived physical weakness, particularly on the grounds of their having to give birth. There was agreement among groups of women and groups of men that in the last ten years, women had been increasingly involved in farming activities other than ploughing. The exclusiveness of ploughing as a male activity, however, appeared to result in an overall greater importance ascribed to men's labor relative to women's (see Lavers 2017 for similar observations). In speaking about the impact of losing labor through her husband's death, one widow referred to her husband as her greatest asset. Other widows mentioned remarriage or having an adult son as alternative means to access male labor. Thus, even when women received land certificates through divorce or widowhood as earlier described, their farming livelihoods continued to have a significant level of dependence on male labor. In some cases, divorced female heads of households reported experiencing difficulties in finding willing sharecroppers because men in their communities feared straining their relationships with the former husband. Conversely, men landowners never reported encountering problems with accessing labor from sharecroppers. A female household head identified renting out farmland to her former husband at a rate lower than usual as an option: *"The law sees men and women as equal and divides the land. But the husband… rents the land by paying a small amount. The wife knows that it is difficult to get a sharecropper so she chooses this small benefit than having nothing."(DMRW2.24)* Female heads typically resorted to sharecropping or renting out their land to address lack of male labor. There are drawbacks associated with these options. Female-headed households received only half the harvest, resulting to less food available (see Ege 1997 for comparable findings). Sharecropping also meant that the proper timing for farm activities such as ploughing and sowing (depending on rains) were not always followed and depended on the availability of the male sharecroppers who were likely to be engaged in farm work elsewhere. These delays were reported to have a negative impact on farm yield (see Burke et al. 2018 for similar dynamics in Zambia).

Activities associated with the preparation of food, management of the house, and caring of the children were perceived by the majority of women and men as the responsibilities of women; while leadership of the home, production of food, and representation of respective households in formal and informal public gatherings were perceived as the responsibilities of men. Notwithstanding the gendered delineation of activities, there was a widely shared perception among women and men that women are increasingly engaging in activities that were previously closed off from them such as attending meetings and trainings – *"Ten years ago,*

women were not involved in meetings and had no right to decide… But now, women are involved in meetings and they get advice. So they are aware about their rights and are more involved in livelihood activities, wanting to plough as men do." (DMRW1.22). This participation in meetings and trainings was perceived by several women as an important opportunity to access information, and develop new networks with other members of the community.

Norms and practices around socioeconomic difference

Relationships between people who were better-off and those worse-off in terms of socioeconomic status were widely considered as an important feature of the smallholder farming livelihoods in southwestern Ethiopia. A male interviewee described this as *"The social relationship of people in the kebele are very high. This means rich people need labor from poor people constructing fences, ploughing, and other activities. The poor get benefits and support their families. There is also a relationship between poor people by doing work together for the rich people to get income."* (QQIM3.12) Sharing arrangements whether in the form of sharecropping, livestock-sharing, and coffee-sharing were common, often but not exclusively among men. A female interviewee remarked *"Poor men have a strong relationship with rich men in terms of work, but not women."* (QQIW1.13) These sharing arrangements were described as typically occurring between two household heads, with each individual contributing one or more capital assets to the arrangement. Types of contributions were associated with the socioeconomic status of the individual, and this had an influence on decision-making dynamics. In sharecropping arrangements involving land and labor sharing, worse-off men described male owners of land as having greater power in decision-making processes (e. g. crop choice). For instance, among better-off 'landowning' farmers, teff (*Eragrostis tef*, a local staple food) was a preferred crop because it fetches a high price at the market. Worse-off landless farmers on the other hand, preferred more calorie-dense foods such as maize, which lasted their families longer than an equivalent amount of teff. Worse-off men explained that better-off landowners had other fields from which they could get crops for family consumption, while worse-off farmers mainly depended on the sharecropping arrangement for their food, leading to different preferences. Thus in certain instances, perceptions about the relative importance of contributed inputs and unequal decision-making power embedded in sharing practices disadvantaged worse-off men in a way that affected the food security of households.

Moreover, responses from several of the worse-off men suggested that increasing risk from crop-raiding wild animals was unevenly distributed within sharecropping arrangements. Sharecroppers providing labor were primarily responsible for guarding farm fields from

raiders such as baboons (*Papio anubis*). The increasing incidence of crop raiding was reported to lead to more frequent and longer stays in the fields, including throughout the night. This not only had adverse health effects, but also prevented many sharecroppers from pursuing other livelihood activities. Sharecroppers also perceived a risk of losing the opportunity to stay in the sharecropping arrangement, if crop losses to wild animals were high. In practice, various configurations of sharecropping arrangements existed in the area, each associated with a specific harvest allocation. In some cases, those who provided labor also provided other additional farm inputs such as seeds and fertilizers. In cases where sharecroppers had no cash to contribute, inputs were bought by the landowner, who then subtracted the equivalent costs from the share of harvest. However, some sharecroppers said that they did not know the exact costs of the inputs and were unaware whether or not they were being overcharged.

Despite disadvantages reported particularly by worse-off male farmers, those who were landless perceived sharecropping as the only option for being able to farm and as the only opportunity for improving their lives. Work-relationships between the better-off and the worse-off, though not the most desirable way of undertaking a livelihood, were considered by the worse-off as very important in their livelihoods. *"Poor people who have no land nor oxen but have energy to work sharecrop with rich people and they benefit together. No one can make it alone without another person. By working like this together, poor people get food."* (DMIM1.8) Moreover, sharecroppers perceived an improvement in sharecropping arrangements, with most of them now receiving up to half of the harvest, compared to a lower share in the past. Help relationships between the better-off and the worse-off were also regarded as an important source of support and security. The erosion of some of these relationships because of a decrease in the capital assets of the better-off due to widespread livestock deaths was considered to have led to a loss in important sources of help in difficult times. However, it was also notable that as soon as those who were worse-off improved their socioeconomic status, they left these sharing arrangements and preferred to work on their own.

Women's experiences differed from those of men. Women's interactions with other women at the community level appeared more flat than hierarchical, for example through picking of coffee beans as a group, pooling money in order to purchase livestock, planting maize in groups, or organizing in groups to prepare *enset* – a labor intensive task that is critical for ensuring that there is food during the lean season. The disadvantages women experienced in relation to other women related mainly to differences in access to natural resources, and these were influenced by either socioeconomic status or age. For example, younger women were perceived as having better access to water compared to older women because they had more

energy to fetch water, while some better-off women were perceived to have better access because they had the means to construct an artesian well. Women also differed in their access to grazing land because those who had fewer livestock used grazing land less than those with more livestock.

Perceptions on women and men's agency to realize desired ends

Women and men from different socioeconomic backgrounds had different perceptions about their respective abilities to realize desired ends as represented by their perceived positions concerning where the majority of the women and men in their *kebeles* stood on the ladder of power (Figure 5.2). Both better-off and worse-off women considered the majority of the women in their *kebeles* to be at the bottom step of the ladder ten years prior. The reasons cited for this included their inability to get an education, marriage outside of their choice, and their inability to decide on various matters either due to a lack in necessary capital assets or being under the authority of others, particularly in relation to livelihoods. They also reported being hit by their husbands. One woman explained that she was at the bottom of the ladder because she could not decide on anything and was mainly "guided" by her husband. She recalled an earlier time when she could consider herself to be somewhere in the middle of the ladder of power, able to make a few minor decisions. *"Before the birth of my children, I could decide on some things in my life and I was at the third step of the ladder."* (QQIW9.3) Another woman described how exigencies such as children getting sick and needing to pay land tax disrupted the implementation of her plans by channeling money away (DMIW7.4). On the other hand, men's self-identified position in the Ladder of Power ten years prior was slightly above that reported by women. Men from a worse-off background viewed the majority of men in their *kebeles* as being somewhere between steps 1 and 2, while men with a better-off background viewed the majority of men to be at step 2 of the ladder. In general, they viewed a lack of capital assets as the main constraint to their abilities to choose and realize desired ends.

Both women and men from different socioeconomic backgrounds perceived a general upward movement of their group along the ladder of power in the last ten years. Broader changes in the *kebeles* were considered to have facilitated an improvement in people's agency. Such changes included the arrival in *kebeles* of roads, electricity, farming technology, schools, training, and transportation services. Worse-off women viewed the majority of women in their *kebeles* to have moved to step 3 or step 4 of the ladder at the time of the study due to increased access to education for their children, reduced occurrence of early marriages, and availability of birth control techniques. They also identified joint decision-making between husbands and wives, and increased awareness of gender equality as important factors of their

perceived expansion of agency. Better-off women viewed the majority of women in the *kebele* to be at the top step of the ladder. Similarly, this was considered to be due to improvements in access to education and involvement in decision-making. In addition, the women in this group also highlighted their awareness of equal rights between men and women. This perceived upward movement was linked with a change of perception in the wider community regarding women's abilities. One woman described the change as *"Now women trade and save a portion of the money they get. Women wear clean clothes and they clean their bodies, their children, their houses. But ten years ago, if women did that, people said it is a bad action. Ten years ago, women were sleeping. But now, women participate in activities such as in education and development."* (QQRW1.21).

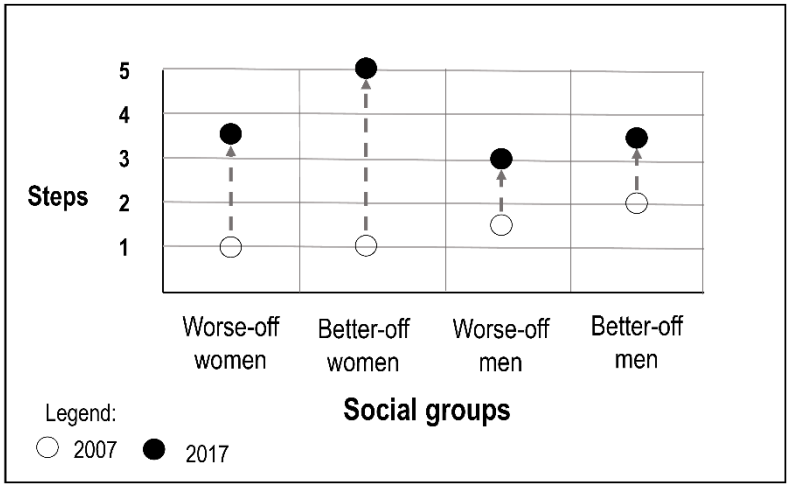

Figure 5. 2 Change in average ranking by different social groups for their perceptions where the majority of women and men in their *kebeles* stand on the Ladder of Power over a ten-year period. The ladder represents levels of agency; the higher the steps, the greater the perceived sense of agency.

On the other hand, men's assessment of their upward movement had been more conservative relative to women. Worse-off men viewed the majority of men in the *kebeles* to be at the third step of the ladder, while better-off men estimated between the third and fourth step. The factors that men identified for their upward movement on the ladder were qualitatively different from the factors identified by women. Men mainly linked upward movement with factors related to their livelihoods including access to information, access to technology such as fertilizers and improved crop varieties, and improvement in the market prices of agricultural crops particularly coffee. Better-off men, in particular, identified hard work and the use of natural capital assets as enabling factors facilitating upward movement on the ladder. Worse-off men distinctly identified sharing of experiences and sharing arrangements

(e.g. sharecropping) as important. These findings suggest that while certain social norms constrained people's engagement in livelihoods and their abilities to be food secure, broader and tangible changes in the communities nevertheless facilitated an improved sense of agency.

Discussion

Research around gender in the smallholder farming and fisheries sectors increasingly emphasizes the importance of facilitating changes in gendered social norms as a requisite for effectively leveraging livelihood improvements to reduce food insecurity and poverty among the marginalized (Kantor 2013; Cole et al. 2015; Lemke and Bellows 2016; Petesch et al. 2018a). Our findings exemplify how individuals' abilities to engage in and benefit from smallholder farming livelihoods are socially embedded (van Dijk 2011; Sakdapolrak 2014) in what Petesch et al. (2018a) termed the local normative climate that shapes "women's and men's sense of agency and capacities for taking important decisions, including in their agricultural livelihoods".

Women's empowerment and the strengthening of their abilities to provide for the food security, health, and nutrition of their families have been identified as an effective pathway to achieve food and nutrition security (Smith and Haddad 2015). However, enduring patriarchal norms in various contexts have been found to limit opportunities for women to engage in livelihoods in equal terms as men (e. g. Badstue et al. 2018; Burke et al. 2018). Our study showed, for example, that patrilineal inheritance practices continued to exclude young women from the most strategic capital assets in a smallholder farming context. Among the Oromo people of Ethiopia, this has typically led to gendered difference in relative control over conjugal assets with implications for intra-household status and abilities to engage in livelihoods (see Mamo Hebo 2006; Fafchamps and Quisumbing 2002; Kumar and Quisumbing 2015; Lavers 2017). This exclusion, still prevalent in various parts of Ethiopia, affirms and reproduces the view that women "are not farmers but shadows of their husbands" (Kabeer 2005; Petesch et al. 2018a). Razavi (2009) and Agrawal (1990) view access and control over land as not only influenced by tenure but also by rules around marriage, divorce, inheritance and intra-household relations – areas that are also likely to be strongly governed by strong social norms. Thus, in this and similar contexts, while formal institutional change around land tenure is important to promote women's access and control over land, informal institutions including social norms are an equally important sphere for critical reflection and locally led change (Douthwaite et al. 2015; Manlosa et al. 2018). In the area studied, the ability of some women to negotiate their disadvantaged asset position by drawing on a

culturally appropriate endowment such as the *nika* exemplifies how those who are disadvantaged can and do find spaces to exercise agency. However, it is also worth noting that this space to maneuver is narrow partly because the profitability of the *nika* depends on various factors such as whether the livestock women received manages to multiply. Even when women managed to successfully negotiate one form of disadvantage, they encountered other forms in the context of the non-egalitarian normative climate. A clear example was women's continued dependence on male labor even when they gained their own land certificate, and how this dependence constrained their abilities to choose how their livelihoods are undertaken.

Abilities to control key capital assets are also linked with abilities to decide (Kabeer 2005). Recent evidence associated women's use of capital assets to generate income with increased contribution to household expenditure and improved participation in household decision-making (Danielsen et al. 2018). However, Mabsout and van Staveren (2010) who investigated bargaining power in Ethiopia found that greater access to individual resources instead led to less bargaining power for women. They underscored the mediating role of unequal gender norms in producing this effect and called for supporting women's empowerment through an institutional approach. Our study did not systematically test the causal link between access to capital assets and decision-making, but it is likely that in this context, expanding women's economic power relative to men through a shift in the norms that underlie distribution of assets will be important in moving shared decision-making processes from nominal information-sharing described to a more substantive and strategic deliberation. The extent to which social norms influence women's abilities to equally engage in livelihoods and become capable of achieving food security for themselves and their households also involves allocation of activities. The exclusiveness of ploughing in Ethiopia as a male activity has resulted in sharecropping or renting out land as a typical strategy among female heads to be able to engage in smallholder farming (Lavers 2017). However, in these arrangements, women are often the less powerful party (Bevan and Pankhurst 2007). Their ability to access male labor outside of their household either through sharecropping or renting is embedded within a social matrix of community relationships. As described, the higher importance that men place on their relationships with other men (e.g. divorced husbands) caused women to face difficulties in finding male labor.

Such intertwined challenges suggest that expanding women's agency by changing deeply entrenched social norms and relations is required if women are to become more successful farmers. Our study demonstrates that gendered norms do not function as individual, isolated practices. Rather, they are manifested through a web of linked social practices interwoven by relatively consistent cultural tenets. In consequence, women not only face and have to

negotiate one form of disadvantage, but a systemic disadvantage that is encountered along multiple fronts (Burke et al. 2018; Lemke and Delormier 2018).

The effect of norms on agency also affected men but this was most pronounced along the axis of difference in socioeconomic status. In sharecropping arrangements involving men with incommensurate capital asset contributions, risk distribution as a response to increasing incidence of crop raids by wild animals was skewed such that landless sharecroppers bore more of the hidden costs including forgone opportunities to engage in other livelihood activities in the daytime, deterioration of health, and deterioration of relationships within and outside the households (Ango et al. 2017; Dorresteijn et al. 2017). Within these arrangements, the inability of some sharecroppers to determine the types of crop to plant and the uncertainty of access to land in the next planting cycle reduced their agency in livelihoods. Social innovation targeted at a more even distribution of risks regardless of capital asset contribution, a more negotiated process for decision-making, and some level of security in access to land will likely make these local social arrangements more beneficial to worse-off men. Interestingly, relationships between women with different socioeconomic status was more flat and characterized by help and collaboration. This may be because women, regardless of their socioeconomic status, were generally less strategically involved in farming livelihoods than men. They also faced similar limitations in terms of access and control over capital assets and thus were more likely to be involved in collaboration such as pooling of resources to buy livestock and of their labor for the demanding activity of preparing *enset* in advance of the lean season.

Notably, women indicated a greater difference in their subjectively perceived position in the ladder of power than men in the last ten years. Our findings are consistent with an insight from a multi-country study indicating that broader socioeconomic changes influenced improvement in women's agency (Badstue et al. 2018; Petesch et al. 2018a), even when these did not immediately change more constraining norms. For women in particular, their relationships with men, their abilities to be part of decision-making processes at the household level, to participate in public activities, and to avoid bodily harm, among others, were crucial to their sense of agency. Men's sense of agency on the other hand, was viewed in terms of the capital assets they could command, their abilities to implement the improvements they want for their livelihoods, and to earn more. In other words, while women perceived their agency as being linked with what they are able to do as dictated by social norms, men tended to perceive their agency as being constrained by the availability of capital assets (see also Petesch et al. 2018a). This underscores how women and men are differentially challenged and how women are more fundamentally constrained by norm-based restrictions than men.

This study provides evidence to the necessity of integrating an in-depth analysis and engagement with local norms in the design and implementation of development interventions to support smallholder farming livelihoods and improve food security (Johnson 1997; Rowlands 1998; Banks 2013). In this way, livelihoods can be re-cast as more than processes of production (Bebbington 1999; Appendini 2001) but also as critical spheres in which individuals from historically disadvantaged groups can build and strengthen agency through improved access and control over key capital assets, more substantive and strategic role in decision-making, and more inclusive allocation of activities. One innovative approach is the Gender Action Learning System (GALS) adapted by the Poroporo Multipurpose Group in West Nile, Uganda through the Oxfam Novib WEMAN programme (Reemer 2015). The farmers' organization combined agricultural livelihoods, market development, and gender transformative approach to foster behavior change. A key innovation in this project is in how it combines individual life planning with behavior change at household level, organizational development, and multi-stakeholder negotiation to engage the private sector and local authorities to foster the local creation of new norms (see Mayoux 2012 for how to design a GALS action and advocacy learning system). However, such an unconventional approach can be costly, requires longer period of engagement, and can involve non-linear processes of change that make attribution during impact assessment difficult. Approaches that engage with norms may not be very easily integrated with common approaches to livelihoods development that focus only on outputs rather than complex processes of change. Therefore, policy investments are needed to provide sufficient support to this type of innovation both in research and project implementation. Gender-related policies and their operationalization may be made broader in scope by not only targeting visible gaps but by requiring critical attention to the processes involved in terms of how formal institutional rules and social norms interact. Tools can be developed to capture lessons on how formal rules influence social norms and how changes in social norms may inform the setting and revision of formal rules to speed up change processes and amplify emerging positive outcomes.

Conclusion

Livelihoods are more than sites of material production and income generation; they are also spheres of social relations which are regulated by social norms. The embeddedness of livelihoods in social relations makes social norms an important consideration in understanding how men's and women's abilities to engage in and benefit from smallholder farming livelihoods are contextually constituted. In southwestern Ethiopia, prevailing gender norms create conditions that privilege men at the expense of women, for example through

unequal inheritance practices and unequal valuing of labor. In general, women do not have the same level of access and control over capital assets, power in decision-making, and access to activities relative to men – which are necessary to be effective agents of improving livelihoods. While these disparities between genders exist, worse-off men also faced systemic disadvantages typically experienced in their relationships with other men with different socioeconomic status. Normalized collective practices become institutions of disempowerment as they perpetuate conditions that limit the abilities of individuals to be agents who can choose and are able to improve their livelihoods. Reversing this arrangement is necessary to enable differentially disadvantaged women and men to achieve sustainable livelihoods and be food secure. The sustained efficacy of livelihoods in contributing to improvements in food security therefore needs to be viewed beyond increases in income and production, and rather involve critical assessments on whether livelihoods are expanding the agency of the most disadvantaged, or merely reproducing patterns of disempowerment.

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SUPPLEMENTARY MATERIALS

Supplementary Material 5.1

List of transcripts from focus group discussions

1. QQRM1 – Focus Group Discussion with better-off men in Quda Qufi on norms around decision-making, and various activities
2. QQRM2 – Focus Group Discussion with better-off men in Quda Qufi on norms around access and control of resources, and agency
3. QQPM1 – Focus Group Discussion with worse-off men in Quda Qufi on norms around decision-making, and various activities
4. QQPM2 – Focus Group Discussion with worse-off men in Quda Qufi on norms around access and control of resources, and agency
5. DMRM1 – Focus Group Discussion with better-off men in Difo Mani on norms around decision-making, and various activities
6. DMRM2 – Focus Group Discussion with better-off men in Difo Mani on norms around access and control of resources, and agency
7. DMPM1 – Focus Group Discussion with worse-off men in Difo Mani on norms around decision-making, and various activities
8. DMPM2 – Focus Group Discussion with worse-off men in Difo Mani on norms around access and control of resources, and agency
9. QHMM1 – Focus Group Discussion with a mix of better-off and worse-off men in Qela Harari on norms around decision-making, and various activities
10. QHMM2 – Focus Group Discussion with a mix of better-off and worse-off men in Qela Harari on norms around access and control of resources, and agency
11. QQRW1 – Focus Group Discussion with better-off women in Quda Qufi on norms around decision-making, and various activities
12. QQRW2 – Focus Group Discussion with better-off women in Quda Qufi on norms around access and control of resources, and agency
13. QQPW1 - Focus Group Discussion with worse-off women in Quda Qufi on norms around decision-making, and various activities
14. QQPW2 – Focus Group Discussion with worse-off women in Quda Qufi on norms around access and control of resources, and agency
15. DMRW1 – Focus Group Discussion with better-off women in Difo Mani on norms around decision-making, and various activities
16. DMRW2 – Focus Group Discussion with better-off women in Difo Mani on norms around access and control of resources, and agency
17. DMPW1 – Focus Group Discussion with worse-off women in Difo Mani on norms around decision-making, and various activities
18. DMPW2 – Focus Group Discussion with worse-off women in Difo Mani on norms around access and control of resources, and agency
19. QHMW1 – Focus Group Discussion with a mix of better-off and worse-off women in Qela Harari on norms around decision-making, and various activities
20. QHMW2 – Focus Group Discussion with a mix of better-off and worse-off women in Qela Harari on norms around access and control of resources, and agency

Supplementary Material 5.2

List of transcripts from interviews and information on age, status, and educational background of interviewees

1. QQIW1 – Female interviewee from *Quda Qufi*, 45, Married, 2 years for Amharic
2. QQIW2 – Female interviewee from *Quda Qufi*, 50, Married, 4th grade
3. QQIW3 – Female interviewee from *Quda Qufi*, 65, Married, None
4. QQIW4 – Female interviewee from *Quda Qufi*, 50, Married, None
5. QQIW5 – Female interviewee from *Quda Qufi*, 50, Widow, None
6. QQIW6 – Female interviewee from *Quda Qufi*, 45, Widow, 3 years for Amharic
7. QQIW7 – Female interviewee from *Quda Qufi*, 35, Married, None
8. QQIW8 – Female interviewee from *Quda Qufi*, 50, Married, 5 days for Amharic
9. QQIW9 – Female interviewee from *Quda Qufi*, 40, Widow, None
10. QQIW10 – Female interviewee from *Quda Qufi*, 24, Married, None
11. QQIM1 – Male interviewee from *Quda Qufi*, 80, Married, 4th grade
12. QQIM2 – Male interviewee from *Quda Qufi*, 60, Married, None
13. QQIM3 – Male interviewee from *Quda Qufi*, 60, Married, 3rd grade
14. QQIM4 – Male interviewee from *Quda Qufi*, 75, Married, None
15. QQIM5 – Male interviewee from *Quda Qufi*, 37, Married, 6th grade
16. QQIM6 – Male interviewee from *Quda Qufi*, 32, Single, 5th grade
17. QQIM7 – Male interviewee from *Quda Qufi*, 50, Married, None
18. QQIM8 – Male interviewee from *Quda Qufi*, 22, Married, None
19. DMIW1 – Female interviewee from *Difo Mani*, 60, Widow, None
20. DMIW2 – Female interviewee from *Difo Mani*, 60, Widow, None
21. DMIW3 – Female interviewee from *Difo Mani*, 40, Separated from husband, None
22. DMIW4 – Female interviewee from *Difo Mani*, 50, Married, None
23. DMIW5 – Female interviewee from *Difo Mani*, 25, Married, 10th grade
24. DMIW6 – Female interviewee from *Difo Mani*, 23, Married, 7th grade
25. DMIW7 – Female interviewee from *Difo Mani*, 25, Married, 4th grade
26. DMIW8 – Female interviewee from *Difo Mani*, 50+, Widow, None
27. DMIM1 – Male interviewee from *Difo Mani*, 71, Married, None
28. DMIM2 – Male interviewee from *Difo Mani*, 92, Married, None
29. DMIM3 – Male interviewee from *Difo Mani*, 45, Married, 7th grade
30. DMIM4 – Male interviewee from *Difo Mani*, 28, Married, 10th grade
31. DMIM5 – Male interviewee from *Difo Mani*, 41, Married, 4th grade
32. DMIM6 – Male interviewee from *Difo Mani*, Not staed, Married, Not stated
33. QHIW1 – Female interviewee from *Qela Herari*, 40+, Married, None
34. QHIW2 – Female interviewee from *Qela Herari*, 38, Married, 2nd grade
35. QHIW3 – Female interviewee from *Qela Herari*, 40, Married, None
36. QHIW4 – Female interviewee from *Qela Herari*, 50, Married, 2nd grade
37. QHIW5 – Female interviewee from *Qela Herari*, 20, Married, 6th grade
38. QHIW6 – Female interviewee from *Qela Herari*, 25, Married, None
39. QHIW7 – Female interviewee from *Qela Herari*, 25, Married, None
40. QHIM1 – Male interviewee from *Qela Herari*, 100, Married, None
41. QHIM2 – Male interviewee from *Qela Herari*, 67, Married, None
42. QHIM3 – Male interviewee from *Qela Herari*, 80, Married, None
43. QHIM4 – Male interviewee from *Qela Herari*, 37, Married, None
44. QHIM5 – Male interviewee from *Qela Herari*, 21, Married, None
45. QHIM6 – Male interviewee from *Qela Herari*, 80, Married, None
46. QHIM7 – Male interviewee from *Qela Herari*, 45, Married, Ethiopian adult education

S T A T E M E N T S

Prior to field work, all data collection and data storage protocols were formally cleared by the ethics committee of Leuphana University Lueneburg. All participants involved in the study provided consent to participate.

All co-authors had been named, and declare no conflict of interest in this work.

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D E C L A R A T I O N

I hereby declare that I have never taken any doctoral examination or applied for admission to such examination.

I further affirm that the dissertation with the title ‘Leveraging livelihoods for a food secure future: Smallholder farming and social institutions in southwest Ethiopia’ has not been submitted to any representative of any faculty and that I am submitting the dissertation only in this and in no other doctoral procedure and that no other definitely fail has been achieved in any previous doctoral procedure.

I furthermore declare, that I composed the submitted dissertation ‘Leveraging livelihoods for a food secure future: Smallholder farming and social institutions in southwest Ethiopia’ independently and without having recourse to prohibited means. I have not used any aids or texts other than those I indicated. All passages taken in verbatim or substance from other works have been identified.

Lueneburg, Germany
14 February 2019

Aisa O. Manlosa

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Reviewer: Prof. Dr. Julia Leventon
Reviewer: Prof. Dr. Katrina Brown
Date of disputation: 24 April 2019

To never simplify what is complicated or complicate what is simple. To respect strength, never power. Above all, to watch. To try and understand. To never look away. And never, never to forget.

Arundhati Roy