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RESILIENT LIVELIHOODS: ADAPTATION, FOOD SECURITY AND WILD FOODS IN RURAL BURKINA FASO

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2012

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Abstract

The dominant livelihood form in rural Burkina Faso consists of a combination of crop production, livestock keeping and agro-forestry. This research set out to understand how rural populations choose their livelihood activities in order to maintain the flexible and resilient livelihood system which has hitherto allowed them to survive in the arid and highly variable climate of the Sahel. To ensure their food security, in addition to their own agricultural production, all families also bought food, gathered wild foods and received food from friends and relatives.

A quantitative analysis was undertaken of the seasonal distribution of different food sources, discussing key obstructing and enabling factors determining access to these food sources. It revealed that, in addition to climatic conditions, the seasonality of these different food sources depended on multiple labour, time and monetary constraints. Cultural norms, as well as ongoing negotiation over rights and resource access played an important role in the choice of strategies.

In order to examine the livelihood as a coherent system, and identify the combination of strategies which enhanced the resilience of the whole system, a new methodology was designed and tested. This Resilient Livelihood Analysis (RLA) revealed the components which allowed livelihoods to both persist and adapt in a risk-prone environment. 'Resilience' was found to be a more appropriate conceptual framework than 'sustainability', which overemphasises the capacity of a system to 'persist', underemphasising its capacity to adapt and change. A better understanding of the trajectories of livelihood resilience allows enabling factors to be included in agricultural and development policy, thus helping to maintain livelihood resilience even in the face of increasingly interdependent and interconnected global drivers.

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I did not know what would await me as I prepared to leave for 18 months of fieldwork in Burkina Faso in August 2009. I set out looking for the single ingredient which kept people going in the face of incredible odds, only to find that (fortunately!) there was not one ingredient but many different recipes, which people employed repeatedly at different moments in time. Thank you to the families I worked with for having the patience to explain it to me. In the words of a Chinese proverb: "Tell me and I'll forget; show me and I may remember; involve me and I will understand". *Wend nan kô y sabab songo!*

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In memory of Lisetta OUEDRAOGO († 12 April 2010) of the village of Koukabanko, Madi Y. BILGO († 26 January 2010) and his wife Fati REMTUNDA († 11 September 2010) of the village of Kougrissincé, Salif TIEMTORE († 12 July 2011) of the village of Donsin, and fellow colleague SAVADOGO Adama († 5 December 2011).

Que la terre leurs soit légère

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Acronyms

CDR	Complex, Diverse and Risk-prone
EIU	Economist Intelligence Unit (an in-house research unit for <i>The Economist</i>)
FCFA	The currency (francs) of Burkina Faso, used by the eight countries in the West African monetary union (<i>Communauté Financière Africaine</i> ; CFA)
FEWS	Famine Early Warning System
HEA	Household Economy Approach
INSD	Burkinabé National Statistics Institute
MAHRH	Burkinabé Ministry of Agriculture
MEDD	Burkinabé Ministry of Environment (ex-MECV)
NTFP	Non-Timber Forest Products
PIP	Policies, Institutions and Processes
RLA	Resilient Livelihood Analysis
SES	Socio-Ecological System
SLF	Sustainable Livelihoods Framework
SSI	Semi-Structured Interview

Chapter 1: Introduction

1.1. Livelihood construction in a risky context

Avoiding and managing risk is a prerequisite for rural households to move out of poverty, and is thus central to their livelihood strategies. At the household level, decisions regarding how to allocate and use cash, land and labour are a function not only of available opportunities, but also of the need to minimise the exposure to shocks that can throw the household into poverty or prevent it from moving out of it (IFAD 2011, Scoones 1998). As such, risks affect people's ability to maintain their food security level, their welfare level and their wellbeing. Households face a variety of risks on a daily basis.

Due to inadequate or inaccessible health care, the risk of falling ill carries a significant cost because it affects people's ability to earn their living, particularly in rural areas where livelihood activities are very physically demanding. HIV/AIDS has had such a devastating effect precisely because it affects people's ability to earn their living, often forcing the infected, or those left behind, to resort to alternative means just to meet their basic subsistence needs.

The very fabric from which rural communities construct their livelihoods is also characterised by considerable variability. In rural areas, livelihood activities such as farming, fishing, livestock husbandry and agroforestry are closely linked to their environment and thus exposed to the risks which underlie them. 80% of agriculture, contributing to 58% of the global food basket, is rain-fed and thus highly sensitive to variable rainfall regimes (Wani *et al.* 2009). Particularly in the Sahel region where this thesis is situated, rainfall is erratic, resulting in drought pockets as well as floods during critical stages in the crop growth cycle. Population pressure and land scarcity increasingly push rural communities into marginal areas which are environmentally fragile (FAO 2010). Here, overuse of the fragile resource base accelerates deforestation, soil erosion and reduces recharge of aquifers. Climate change can be considered a risk multiplier which exacerbates the fragility of the natural resource base (IFAD 2011). Rural communities are already experiencing the effects of climate change, with competition over scarce resources such as land and water intensifying. Agricultural yields are also being affected, not just by the high variability of rainfall but by rising temperatures (Roudier *et al.* 2011). In addition, insecure land tenure and access to water resources can result in individuals losing the access to crucial assets necessary to pursue their livelihood activities from one day to the next. Particularly women often only have usufruct land rights, which can be revoked the day their husband

passes away. Furthermore, the insecure nature of resource access discourages individuals from investing in the sustainable use of environmental resources, as they may not reap the benefits of the seeds they sow.

In addition to the environmental risks outlined above, market-related risks and socio-political risks diminish the extent of food or income that can be kept as savings or reinvested in order to improve livelihoods in the long-term. This increases the proportion of food or income that is dedicated simply to maintaining the livelihood. Market-related risks include seasonal and interannual price volatility, which affect the food prices facing producers as well as consumers. Price volatility is in part the result of structural factors such as high transport costs, but is also a function of the interplay between global and domestic factors, making future price trends increasingly unpredictable (IFAD 2011). The costs of social ceremonies – including expected ceremonies such as baptisms as well as unexpected funerals – are another factor which can significantly affect a household's savings. While holding an appropriately lavish funeral, wedding or baptism is paramount to cementing the social relations which are so important in risk spreading, the high expense can significantly affect the household's own savings, and thus its own capacity to buffer risk. These risks can be compounded by wider-ranging political shocks which can worsen land tenure insecurity, price volatility and the legal and security environment within which individuals construct their livelihoods.

1.2. Towards a better understanding of risk management

The risky context within which rural livelihoods are constructed is well-known. As such, many policy initiatives focus on risk mitigation in order to reduce the risks which communities are exposed to. Initiatives range from immunisation and better health care to reduce health risks, to better environmental management to reduce the risk of flooding and soil erosion. Building on successes during the green revolution in Asia, agricultural production risk can for example be reduced by breeding drought tolerant and pest resistant crop varieties (ICRISAT 2009). Burkina Faso is currently thought to only achieve 35% of potential rain-fed cereal yields due to production risks (Rockström *et al.* 2007). Market-related risks such as price volatility can be addressed through the establishment of food reserves and improved agricultural productivity, particularly of small holders who produce more than half of the world's food supply (Altieri 2009). Good governance is also pursued as an overarching goal to address political instability and to improve the legal environment.

However, as risks are becoming increasingly interlinked and complex, it is becoming increasingly difficult to design policies which address every possible outcome. The recent

'triple crisis' amply demonstrated how interdependent seemingly unrelated sectors were (Addison *et al.* 2010). Firstly, the financial crisis, originating in the under-regulated financial systems of developed countries in 2007-08, affected financial systems countries worldwide. Secondly, climate change has affected harvests in several parts of the world. Droughts affected wheat harvests in China and Argentina in 2009. Wild fires, combined with drought, damaged the 2010 wheat harvest in Russia, leading to inflated prices, exacerbated by an export ban. Thirdly, food security was affected both by the financial crisis and climate change, with the former reducing the flow of remittances and the latter drastically increasing the price of key staple foods. Unpredictable ripple effects across sectors and continents have made the food sector increasingly volatile. The impact of ongoing global economic crisis on international aid remains to be seen. Price speculation on agricultural commodities as well as agricultural land has acted as a risk amplifier (Piesse and Thirtle 2009:121). These dynamics are exacerbated by longer-term trends of population pressure and land scarcity (Maxwell 2001).

The Arab Spring in 2011 demonstrated how closely political stability is interlinked with food prices and the rising cost of living. Burkina Faso – where this thesis is situated – has equally not been isolated from the ripple effect of global dynamics. The food price hikes during the 'triple crisis' of 2007-08 led to riots in major Burkinabé cities. The same occurred again in the spring of 2011, exacerbated by political unrest surrounding plans to amend the Burkinabé constitution to give President Compaoré an extra term in office. In contrast, the informal gold sector has flourished thanks to a recent hike in the global price of gold triggered by the financial crisis.

In recognition of these increasingly interconnected and interdependent dynamics, there is an increasing policy shift from risk mitigation to risk management, in order to address risks which have not yet been mitigated, or which are simply unavoidable or unpredictable (Jones 2011). It is argued that policies should no longer aim "simply to maximise productivity, but to optimise across a far more complex landscape of production, environmental, and social justice outcomes" (Godfray *et al.* 2010:817). Climate change, and the wide-ranging risks it entails, has amply demonstrated the need for a risk management approach, and has reinvigorated the debate on 'resilience' and 'adaptive capacity' within the academic literature (see Chapter 2).

Within the rural development context, risk management policies have predominantly focussed on promoting communal risk-spreading structures, which provide a pool of savings for individuals to access in times of need. Such initiatives include the establishment of informal community-level organisation such as rotational savings and credit groups (ROSCAS), village cereal banks and cooperative labour arrangements. Formal and informal financial institutions

can provide cash loans. Weather-indexed insurance schemes can reduce the risk small-scale farmers face due to extreme weather and high price volatility. Finally, governments can support vulnerable groups through social protection programmes which provide conditional cash transfers, social pension schemes or subsidised agricultural inputs (IFAD 2011).

While the shift from risk mitigation to risk management is paramount in light of the changing risk context, it is interesting to note that rural communities living in variable environments have already been employing a risk management approach for generations (Raynaut and Gregoire, 1997). For them, health and social shocks are not particularly ‘shocking’. They do represent significant expenses, but are not unexpected, allowing people to plan for them. These risks are considered part of everyday life, as well as part of the inherent seasonality of the agricultural cycle. Such risks are approached in a holistic manner. Different livelihood sectors form a coherent whole, as income gained from one livelihood sector is reinvested into another, and as the benefits gained from communal activities contribute to improving individual welfare. As pointed out by Carney over a decade ago, “rural households do not live their lives in sectors” (Carney 1998:21).

More can be learned from how the communities themselves conceptualise and manage risk, in order to improve the success of policies addressing food security and poverty alleviation in an increasingly interdependent world. For example, ‘adaptive management’ is a valuable policy tool, “given the high levels of uncertainty regarding the trajectories of coupled socioecological systems” (MEA 2005:24). Only when taking into account the multiple livelihood objectives which households juggle, can policy be designed in a way to address these intersecting risks. For example, households not responding to the price incentive of increasing cash crop prices, by increasing their cash crop production, have often been labelled as ‘irrational’ – however such behaviour is ‘logical’ when agricultural production is seen in the context of the whole livelihood. Households face a trade-off between increasing their labour allocation to cash crop production, as such a choice results in less labour being available for maintaining the necessary food production for its own food security (WB 2007). The dynamics between different sectors can be reconciled by taking a systems-oriented approach to the whole livelihood system.

Hitherto, tools for examining livelihood activities, such as the Sustainable Livelihoods Framework (SLF), have offered a rather simplistic take on risk management, stressing the need to accumulate assets to establish savings, and the diversification of livelihood activities to spread risk (Ellis 1998). When either of these approaches is insufficient, households are said to liquidate their assets progressively, thus undermining their ability to earn their living (Maxwell 1996). When a household’s risk management strategies are insufficient, for example following

a severe drought or political conflict, the unusual strategies resorted to often make headlines. However, fewer studies have documented how and why risk management strategies succeed the remainder of the time. The process through which risk management is achieved is insufficiently understood. Attaining the outcome of food security is usually conceptualised through food entitlements. However, Entitlement Theory insufficiently captures the fluidity of these entitlements, calling for further research on the negotiation of entitlements and role of power struggles within society, as well as within the household (Devereux 2001c). How do the strategies of different individuals interrelate? What is the role of collective assets? How do groups of individuals combine efforts to spread risk across a wider group? The risk-spreading benefits of communal structures such as informal safety nets are mentioned above, yet it is insufficiently understood how these structures are influenced by power dynamics. Spreading risk across groups of people also facilitates social learning, thus affecting rural people's decision because these are influenced by the experiences of other farmers in their social networks (WB 2007). Which are the underlying processes which enable such learning and sharing of experiences? For example, indigenous knowledge can be used to benefit from natural-resource based safety nets providing food or income (Takasaki *et al.* 2004). Combining wild food consumption with agricultural food production can spread the risks facing agricultural food production over several sectors (Bergeret and Ribot 1990, Pattanayak and Sills 2001). Yet natural-resource based safety nets are often based on collective assets. How is access to such assets guaranteed?

The detailed process of how households manage risk is insufficiently understood. How do households address relatively predictable idiosyncratic shocks? What are the trade-offs between addressing different risks? Which mechanisms improve a household's resilience to such risk? Is there a relationship between a household's capacity to address expected shocks, and its capacity to address unexpected shocks resulting from wider processes such as climate change and increasing globalisation? There is a counter-narrative emerging to the 'gloom and doom' scenario outlined in Section 1.1, arguing that farmers in Burkina Faso are coping with the population pressure on increasingly scarce land resources, and adapting by shifting to farming systems that are restoring exhausted soils and are increasing food crop yields, household food security, and incomes (Garrity *et al.* 2010). Which processes prompt and encourage such adaptive behaviour? This thesis sheds light on these questions using a detailed case study of two provinces in Burkina Faso.

1.3. Approach of the thesis

This original piece of research proposes and tests a novel systems-oriented approach to livelihoods analysis. It provides a case study at a micro-economics level of the processes through which households address risk with the aim of maintaining their food security. The contribution of 'collective' wild foods is used as a lens to explore the fluidity of resource access, as well as power dynamics existing between traditionally male and female spheres of livelihood construction. Burkina Faso was purposefully chosen as an example of a fragile and highly variable natural environment, but with a comparatively stable political environment at the time that research was initiated. This juxtaposition made for an interesting case study.

As the natural environment of Burkina Faso is characterised by considerable seasonal variation, livelihood strategies were examined over a whole agricultural cycle, from harvest to harvest. Strategies were also examined at different relational scales, covering the individual, the household, and the extended family compound. Different scales were chosen to examine if and how risk was pooled across different social units. In order to examine the livelihood as a coherent whole, systems-oriented theories from other disciplines were used to propose and test a novel systems-oriented approach to livelihoods analysis. The interdisciplinary nature of the methodology chosen allowed livelihoods to be examined through different narratives in the literature. However, such an approach made a necessary compromise between breadth and depth of analysis. The structure of the thesis is presented below.

1.3.1. Thesis outline

This research set out to understand how rural populations choose and adapt their livelihood activities within seasons in order to maintain the flexible and resilient livelihood system which has hitherto allowed them to survive in the arid and highly variable climate of the Sahel. The relevance of the problematic is introduced in **Chapter 1**, and discussed within the context of the academic literature in **Chapter 2**. The environmental, economic, and socio-political situation of Burkina Faso is presented in **Chapter 3**, with the methodological approach explained in **Chapter 4**. The fieldwork for the study was conducted over an entire agricultural cycle, from harvest to harvest, examining seasonal changes during six survey rounds within eight family compounds (containing 23 households) in two contrasting regions of Burkina Faso. **Chapter 5** describes the livelihood strategies observed, demonstrating that, in addition to their own agricultural production, all families also bought food, gathered wild foods and received food from friends and relatives. A quantitative analysis is undertaken of the seasonal distribution of different food sources, discussing key obstructing and enabling factors

determining access to different food sources. **Chapter 6** carries out a qualitative analysis on the same data set, revealing the important role of cultural norms and power relations. **Chapter 7** carries out a systems-oriented livelihoods analysis, determining how different food strategies were combined over the year, in order to test which combinations conferred higher resilience. It reveals the nuances of adaptation over time (between seasons) and over relational scales (household and compound size). **Chapter 8** draws out the novel contributions to the academic literature, as well as the policy implications from this thesis. Recommendations are made for improving policy design to foster livelihood resilience even in the face of increasingly interconnected and interdependent global drivers.

Chapter 2: The literature review

This thesis explores the strategies households used to ensure their food security year-round. To put this into context, this chapter reviews how livelihood strategies have been approached in the literature. First, the existing literature on food security and livelihood theory is discussed. The contributions which the fields of economics, nutrition and climate change adaptation have made to investigating livelihood strategies are examined next. In addition, the potential contributions, which the fields of ecology, risk management and portfolio theory could make to livelihoods analysis at a systems level, are assessed. The novelty of this thesis lies in combining the approaches taken by different disciplines in order to design and test a systems-oriented approach to livelihoods analysis.

2.1. Livelihoods and food provision

The way in which people acquire food, income and other tangible and intangible assets necessary to ensure their material and spiritual wellbeing is generally referred to under the broad term of 'livelihood construction'. Ensuring food security was long thought to be the main objective of such livelihood construction. However, since the 1950s, the food security literature has evolved significantly. The level of analysis has shifted from production to consumption; the scope has widened from the narrow 'food first' stance to broader non-food 'livelihood' objectives; and subjective perceptions have been increasingly recognised alongside objective measures of food security (Maxwell 2001). These paradigm shifts have mirrored trends in agricultural policy (Delgado 1995). This evolution in food security thinking is outlined below.

2.1.1. Moving beyond agricultural production

Assuring food provision was long thought to be a household's first priority. The psychologist Abraham Maslow suggested that basic needs such as food and security must be met before an individual focuses his motivation on 'higher' needs (Maslow 1946). This gave rise to the Basic Human Needs (BHN) paradigm of the 1970s, arguing for a more direct approach to meeting nutrition, health, and education requirements, as opposed to the 'trickle-down' approach of earlier agricultural policies (Delgado 1995). The BHN paradigm gave smallholder farmers

priority, as reflected through the emphasis of African national policies on food production for increased self-sufficiency (Eicher and Baker 1992).

However since the 1970s there has been an increasing shift from production- to consumption-focussed policy, with an according change in the level of analysis from the global- to national-, household- and finally to the individual level (Maxwell 2001). It was based on the realisation that food provision needn't necessarily be assured by home-grown food production, but can also be met by acquiring food in exchange for labour, through purchase, or through social networks. Rural surveys conclusively demonstrated that few households relied fully on subsistence farming, with many in fact being net buyers of food (Barrett *et al.* 2001). Amartya Sen's seminal work on the underlying causes of the 1943 Bengali famine identified three ways people obtain food, involving the 'mapping' or converting of the household's assets into food through own production; through exchange of goods for food via the market; or through food transfers from relatives or via food aid (Sen 1981). An entitlement failure can therefore result through four mechanisms (Osmani 1999): endowment loss (loss of assets); food production failure; trade-based exchange failure (the ratio of food prices to commodity prices or to labour wages is too high to obtain sufficient food) or employment-based exchange failure (too little wage received in exchange for labour); or through transfer failure (food no longer received from relatives or as food aid). By including production as well as demand, the entitlement approach examines the food available to a household at the equilibrium of supply and demand (Osmani 1999). Conceptualising food access via entitlements sparked a large volume of research on the importance of farm- and non-farm income (exchange failure) and remittances (transfer failure).

Entitlement theory has had important consequences for agricultural policy, highlighting that national food production levels matching the basic calorific needs¹ of the population are not sufficient to ensure food security if there is unequal food distribution within a country. This situation occurred during the Ethiopian Wollo famine, where food production actually increased at a national scale in the year of the famine (Sen 1999a). Importantly, Sen moved away from comparing supply and demand at a national level, to undertaking a disaggregated analysis, by examining the entitlement sets of different socioeconomic classes (Osmani 1999). By doing this, he drew attention to who did and did not have access to food, even if all faced the same availability of food at a national level. The policy shift to food access is often

¹ Basic calorific needs are generally defined as 2100kCal for adults, and based on weight-for-age guidelines for children (1996 World Food Summit). Note that the emphasis is on enough food for an active life, rather than simple survival, although the definition of "active and healthy life" may be subjective (Maxwell and Smith 1992:48).

accredited to Amartya Sen, although the idea was also found in nutrition planning at the time (Berg 1973, Joy 1973, Levinson 1974).

Even though conceptually useful, entitlement theory has however been criticised for having a too narrow specification of entitlements², omitting for example stolen food or wild foods gathered on collectively-owned lands. Stealing was excluded by Sen who defined an individual's entitlement set as all possible combinations of goods and services that a person could legitimately³ obtain using the tangible and intangible assets in their endowment set (Osmani 1999). Similarly, usufruct rights to wild foods were omitted by Sen as these do not fall within an individual's entitlement set, but are instead validated by community-level institutions on the basis of social membership rather than private ownership (Leach *et al.* 1999). However, the coping strategy literature amply demonstrated how important wild foods are as a grain substitute, thus arguably forming a part of an individual's entitlement set (Waal 1990). To include these, the concept of 'environmental entitlements' was proposed (Leach *et al.* 1999) which extends the entitlements framework to the whole range of socially sanctioned as well as formal-legal institutional mechanisms for gaining resource access and control (Gore 1993). These criticisms on the fluidity of entitlements, which have also been demonstrated by the violation of entitlements in conflict zones, call for further research on the negotiation of entitlements and role of power struggles within society, as well as within the household (Devereux 2001c).

2.1.2. The livelihoods approach

In the 1980s and 1990s, food security analysis underwent a further shift from the narrower 'food first' stance to a broader 'livelihoods' focus. Entitlement theory originally had not recognised the fact that people often choose to go hungry to avoid asset liquidation (Devereux 2001c), a finding first demonstrated during the Darfur famine of 1984-85 (de Waal 1989). These results were later widely confirmed by the sequence in which coping strategies were adopted, demonstrating priorities other than food provision, such as the maintenance of livelihoods (Davies 1993, Frankenberger and Goldstein 1990). The shift to a broader 'livelihoods' focus mirrored an earlier change from objective to subjective indicators in the poverty literature: the feeling of deprivation was found to be just as important as objective

² This critique and others were acknowledged by Sen himself: starvation by choice, disease-driven rather than starvation-driven mortality, ambiguities in entitlement specification and extra-legal entitlement transfers (Sen 1981:48-50).

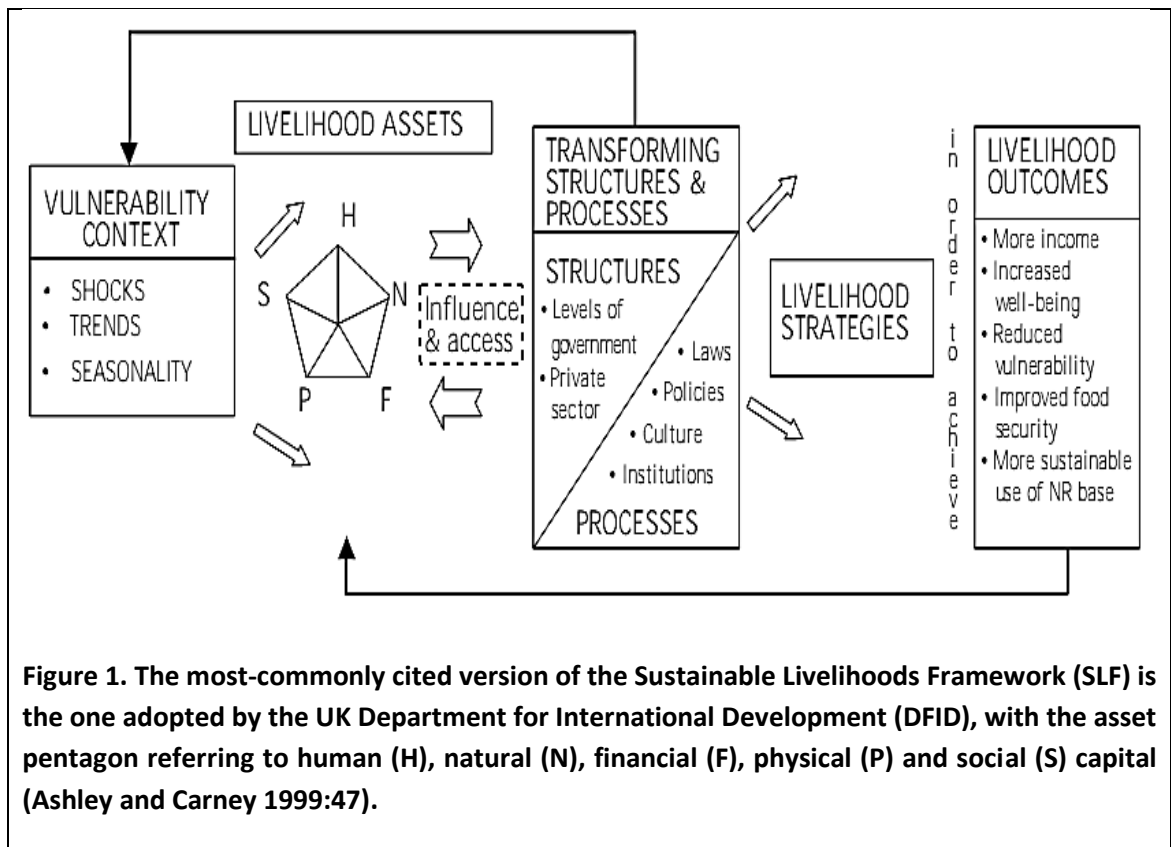
³ 'Legitimate' assets include those owned under law, as well as those entrusted via local norms and practices (Osmani 1999). The term 'entitlement' is perhaps misleading, as it suggests a moral right to food, yet Sen stressed the legal right to food (Devereux 2001b).

asset- or income holdings (Townsend 1974). In parallel with more participatory methods in poverty research, subjective indicators of food insecurity such as human dignity and autonomy were increasingly included in surveys (Maxwell 2001). Sen highlighted the fact that the aim of individuals was not acquiring commodities (such as food) obtained via entitlements but acquiring 'functionings' (good health, happiness, welfare and longevity)⁴, which could be obtained because one was well-fed (Dreze and Sen 1991). By focusing on overall welfare, Sen highlighted that food should not only be nutritious, but also culturally appropriate (Oomen 1988) and locally available in order to ensure autonomy and self-determination (Barracough and Utting 1985). Even if it were economically preferable, it may be culturally unacceptable to consume certain foods which are considered 'inferior hunger foods', thus offending human dignity and reducing welfare (Oshaug 1985).

In the 1990s, 'sustainable livelihoods' emerged as an integrating concept out of the conceptual shifts above, first being widely acknowledged following a report of an advisory panel of the World Commission on Environment and Development (WCED 1987). A sustainable livelihood is commonly defined as comprising "the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets" (Chambers and Conway 1992:10). Conceptually, the sustainable livelihoods framework (SLF) is based on the assumption that the poor behave as 'strategic managers' in negotiating their livelihoods outcomes, by selecting a portfolio of livelihood activities according to their entitlements and access to resources, as mediated by the parameters of institutional contexts (Moser 1996). Assets are the central feature, examining how are these affected by the 'vulnerability context' within which they are placed, and by 'transforming structures and processes' (also known as 'policies, institutions and processes'), to constitute 'livelihoods strategies' which lead to various 'livelihoods outcomes' (see Figure 1). It has been proposed as that rural people construct their livelihoods in three ways: through agricultural intensification, livelihood diversification⁵, and migration (Hussein and Nelson 1998). The fact that food security of only one of the livelihood outcomes listed reflects the shift from 'food first' to 'livelihoods' discussed above.

⁴ In the English literature, the distinction between functionings and commodities is reflected in the use of the terms undernourishment (an unsatisfactory state of being) and undernutrition (shortage of food intake).

⁵ Though livelihood diversification is often associated with non-farm income, it does not necessarily involve 'de-agrarianisation'; i.e. a move away from agriculturally-based modes of livelihoods.



The SLF approach can be interpreted in three different ways: as an analytical framework to explain short-term livelihood trajectories, as a set of principles guiding development activities, or as an overall developmental objective (Farrington 2001). In the academic literature the SLF was arguably intended as the former; as “a diagram to organise ideas into manageable categories, [to] identify entry points and critical processes, and assist with prioritising catalysts for change that can improve people’s livelihoods” (Ellis 2000:29). Although most commonly applied at a household level, it was designed to also be applicable at the scale of a whole community or agro-ecological zone (Scoones 1998). As noted elsewhere, a conceptual framework is neither a model nor a theory; “models describe how things work, whereas theories explain phenomena – conceptual frameworks do neither; rather they help to think about phenomena, to order material, revealing patterns – and pattern recognition typically leads to models and theories” (Rapoport 1985:256).

In contrast, development agencies have used the SLF in the two latter ways listed by Farrington, aiming to make development activities participatory, holistic, dynamic, people-centred, and sustainable (Ashley and Carney 1999, Carney 1998, DFID and FAO 2000, Drinkwater and Rusinow 1999, Hammond *et al.* 2005a, Scoones 1998). Through the process of translating the SLF into development policy, many development agencies have designed their own ‘model’, for example adapting the SLF to suit their activities in urban settings (CARE and

DFID) or in situations of conflict and chronic instability (DFID, FAO, ODI, USAID and WFP). A review of SLF application by 15 development agencies found considerable differences in concept definition and degree of translation into policy (Hussein 2002). The challenge of operationalising the SLF is noted, as “development institutions and national governments are usually organised along sectoral lines, hindering the adoption of [the] multisectoral approach” implied by the asset pentagon (Hussein 2002:55).

2.1.3. Shortcomings of the SLF

The SLF has been criticised for being too vague both for academic and policy purposes, though arguably it was never intended as a universal theory, instead encouraging the practitioner to carefully define each component in the local context, thus reflecting the participatory ethos of the SLF. To address its shortcomings, it has been suggested to add political capital to the asset pentagon (Baumann and Sinha 2001), in order to highlight the ‘dark side’ of social capital, such as the hijacking of participatory processes by elites (Fox 1997). Political factors and power dynamics are not just important as the ‘context’, to livelihood construction, but shape the way individuals make decisions (Scoones 2009) – an aspect addressed in more detail in Section 2.3.1 below. A distinction between horizontal (‘bonding’) and vertical (‘bridging’) social capital has also been deemed necessary (Woolcock and Narayan 2000). Others have highlighted that assets not only include those which are directly transformed, but also those which are stored as reserves (Swift 1989); a distinction that was incorporated into Save the Children’s definition of household assets (Hussein 2002). Another necessary distinction is that between private and collective assets mentioned above, which relates back to the fluidity of entitlements. The lifecycle stage or ‘locus’ of the household (Niehof 2004) is another important factor missing from the SLF, as it affects the level of human capital, rates of asset accumulation and degree of risk-aversion (Cavendish 2000, Sen 2003). Even though present in the risk literature (see Section 2.2.1), the vital role of attitudes, and the individual’s calculus or heuristic whereby alternative strategies are assessed and chosen, is missing from the SLF (Poole 2000).

The SLF has also been criticised for insufficiently stressing the potential interactions between components. Even though, conceptually, the fact that all assets are part of the same pentagon implies trade-offs between them, these trade-offs must be better defined to implement the concept of ‘sustainability’ enshrined in the SLF. Research has for example demonstrated important feedback between social and natural capital, and the role of local knowledge (Pretty 2003). A more explicit mention of the interactions between assets and ‘policies, institutions and processes’ (PIP) has also been suggested (Dorward *et al.* 2003). Further clarification is needed on the role of these PIP in transforming assets into ‘livelihoods strategies’. On a

definitional basis, informal institutions are inadequately captured by PIP, leading several development agencies to more explicitly include gender, power, and rights issues in their 'models' (Hussein 2002). Furthermore, the dual nature of enabling as well as hindering PIP has frequently been ignored. This echoes criticisms in the food security literature, which stress that the Entitlement Framework does not acknowledge that famines can be a deliberate act, either as a tactic of war (Keen 1994), a tactic of the colonial administration (Devereux 2007), or a tactic used to pressure a government receiving aid to change a controversial policy (Howe 2007). This realisation has shifted the emphasis from what caused a famine (market failure), to who caused a famine (political failure), and why it wasn't prevented, demonstrating an accountability failure⁶ at a national or international level. This evolution is reflected in the conceptual shifts from 'food first' ('old' famines) to 'livelihoods' ('new' famines), and later to 'accountability' ('post-modern' famines) in food security literature (Devereux 2007).

When applying the SLF as an analytical tool in the context of a thesis, other theories are clearly needed to explain the causative relationships within the conceptual framework. Ellis acknowledges that it is difficult for the SLF diagram to capture the "innumerable feedbacks and complex interactions between components" (Ellis 2000:29), even though these were nonetheless implied. He addressed the trade-offs between sustainability of asset use, gender and power dynamics, and macro-micro linkages in later chapters of his book. The main socio-economic and nutritional theories used to complement the SLF are outlined in the Section 2.2. In this thesis, particularly the interactions with the 'vulnerability context' of the SLF are explored in detail. The role of change and adaptation of strategies is acknowledged in the original definition: "a livelihood is sustainable which can cope with and recover from stress and shocks" (Chambers and Conway 1992:10). However the SLF is less clear on which strategies are more or less sensitive to such shocks, and how innovations emerge from this interaction (Robinson *et al.* 2007). Being able to distinguish between 'vulnerable' and 'resilient' households requires capturing the interactions between individual livelihood strategies. The approach of different disciplines to systems-level analysis is discussed in the Section 2.3.

2.2. Discourse analysis of livelihood strategies

This section discusses several theories which help to elucidate the 'vulnerability context' of the SLF, i.e. the role of uncertainty in livelihood planning. A variety of disciplines have attempted to predict and explain livelihood change in response to uncertainty. Economists have used

⁶ Sen famously stated that "there has never been a famine in a functioning multiparty democracy" (Sen 1999b:178).

consumption smoothing to explain risk-averse behaviour. Nutritionists have used subsistence needs to explain the sequence in which coping strategies are undertaken. More recently, research in the field of climate change adaptation has embarked on predicting the trajectory of livelihood change under increasing levels of uncertainty, particularly examining socio-cultural and institutional barriers to livelihood adaptation. These three approaches are discussed in turn below. This thesis examines livelihoods as a ‘people-centred’ and ‘participatory’ decision-making process (Ashley and Carney 1999). However, theories from related disciplines are required to understand how different objectives, attitudes and values influence the choice of livelihood strategies in the SLF.

2.2.1. Risk-coping and risk-management

Robert Chambers emphasised that the poor mostly live in environments which are ‘complex, diverse and risk prone’, the so-called CDR environments, characterised by volatile prices, incomplete market information, variable rainfall and unexpected socio-economic shocks (Chambers 1997). The impact of such a CDR environment is captured by the ‘vulnerability context’ of the SLF in the form of short-term shocks, longer-term trends and seasonality (see Figure 1). In 1964, Theodore Schultz proposed via his ‘poor but efficient’ hypothesis that farmers responded rationally to their environment, which led them to be efficient in their profit-maximising decisions and actions within the constraints of their poverty (Schultz 1964). This insight fundamentally changed attitudes⁷ to semi-subsistence farmers, with economists “beginning to realise that the farmer is no fool. A non-fool, in a static environment, learns to live ‘efficiently’: to optimise, given his values and constraints, and to teach his children to do the same” (Lipton 1968:327). Since then, it has become apparent that even in a ‘non-static’ and risky environment, farmers practise ‘constrained optimisation with bounded rationality’: they respond rationally to changes, given their objectives, constraints, opportunities, and knowledge (of both current and future situations). As a result, agricultural policy has focussed on alleviating these constraints, in particular institutional constraints, market imperfections and incomplete knowledge. The field of New Institutional Economics specifically deals with the high transaction costs which result from such incomplete institutional arrangements (Poulton *et al.* 1998).

⁷ Previously, the ‘modernisation paradigm’ dominated which supported transfer of technology and of the socio-political culture of developed societies to more ‘traditional’ societies. It was based on the idea of evolution, implying that development was directional and cumulative, predetermined, irreversible, progressive, and immanent with reference to the nation state (Servaes 1995). Developed ‘Western’ societies were thought to be the end goal which less developed societies strived to reach.

The economic literature suggests that the most common behaviour in CDR environments is captured by the 'risk-averse' household model. Although still acting 'rationally', these households aim to minimise risk, rather than maximise profits, contrary to the theory initially put forth by Schultz. The risk-minimisation concept is founded in the 'peasant'⁸ literature from the early 1900s (Chayanov 1925, Marx 1848), which was later integrated into the 'moral economy' literature (Hyden 1983, Richards 1985a, Richards 1985b, Scott 1976) and more recently into rural development planning (Chambers 1983, Chambers 1993, Chambers 1997, Chambers *et al.* 1989). Schultz's profit-maximising model was rejected because, particularly for a certain type of rural households known as 'peasant households'⁹, several of the assumptions of neo-classical economics were found not to hold (Ellis 1988:7-13):

- 'Peasant' households are both producers and consumers of food, whereas neo-classical economics assumes production and consumption behaviour to be independent.
- 'Peasant' households frequently experience partial market integration, only acquiring and disposing of some of their produce in markets. Instead, most of their goods are exchanged via informal networks.
- Any market exchange nonetheless occurring is imperfect (high transaction costs) and incomplete (lack of buyers or sellers). Strict economic efficiency demands a competitive market so that all producers face the same prices and that all agents are price takers.

The ubiquity of the 'risk-averse' model is based on the presumption that most rural semi-subsistence households live in a risky and uncertain environment, which leads them to diversify their activities in order to spread risk. However, their risk aversion discourages them from investing in productivity-increasing activities, potentially locking them into a 'vulnerable' subsistence existence. The following section critically examines these claims.

Households live in a 'risky and uncertain environment'

The effect of shocks and trends on a household's livelihood depends on a combination of three parameters: the severity of the shock, on the likelihood that that it will affect that household, and on the resilience of the household (its capacity to recover after the event). With regard to

⁸ Even though the term 'peasant' has strong Marxist connotations in English, in this thesis it is intended in its original meaning closer to the French term '*paysan*', i.e. a rural inhabitant.

⁹ Peasant households can be defined as "farm households, with access to their means of livelihood in land, utilising mainly family labour in farm production, always located in a larger economic system, but fundamentally characterised by partial engagement in markets which tend to function with a high degree of imperfection" (Ellis 1988:12).

the former two, shocks can be differentiated by their predictability and by the scale of their impact (see **Table 1**). Among these, the unpredictable and aggregate shocks are most damaging, as large parts of the population and multiple livelihood strategies are affected simultaneously, thus considerably diminishing the capacity to recover.

Table 1. Classification of shocks by severity (small or large scale) and by likelihood		
	Predictable	Unpredictable
Small-scale impact (idiosyncratic shocks)	Yearly school fees Predictable cash needs	Illness, funeral costs, wedding costs Crop failure Unpredictable cash needs
Large-scale impact (co-variate or aggregate shocks)	Seasonal drought Population trends	HIV Hurricanes, floods, locusts Market collapse of a major cash crop International trade shock War

It is argued that when the future is uncertain, meaning that both the likelihood of the outcome as well as the outcome itself is unknown, households have few incentives to invest in their livelihoods. However in the Sahel, the future is not necessarily uncertain, but risky: the likelihood of the outcome is unknown, but the outcome itself is known. It is known that every year it will rain, every year there are some drought pockets and every year there are some localised floods (see Chapter 5). The only question remaining is ‘when’. While many studies have examined the effect of unpredictable shocks in the Sahel, this thesis specifically examines the effect of ‘seasonality’. Whilst reasonably predictable, seasonal variations are not necessarily consistent; each season and year is different. It is hypothesised that the strategies used to address seasonality are different than the ones observed during the catastrophic droughts of the 1970s, demonstrating the existence of more forward-planning than previously thought.

Households ‘diversify activities to spread risk’ thus ‘not investing in productivity-enhancing activities’

The economic literature identifies two responses in a CDR environment: precautionary risk management (ex-ante), or reactive risk coping (ex-post) (see **Table 2**). The former is a strategy to strengthen a household’s ability to cope with shocks before they occur, or to reduce the risk itself. The prime objective is to reduce intra- and inter-annual income variation by increasing current-year savings to help buffer future income shocks (known as ‘income-smoothing’). The latter is a strategy to maintain a subsistence-level of consumption after a shock has occurred

(known as ‘consumption-smoothing’)¹⁰. The two types of responses are inextricably linked, as post-shock responses (such as seeking employment) may require preparations earlier in the year (such as fostering good relations with employers).

Table 2. Examples of precautionary risk management and reactive risk coping from the economics literature (Alderman and Paxson 1992, Dercon 2005, Kochar 1999, Rosenzweig 1988, Townsend 1995).	
Precautionary risk management	Reactive risk coping
Investment in liquid private assets to establish buffer stocks (e.g. livestock, granary stores, tree plantations)	Adjustment of food intake
Ensuring access to public assets via membership of community-level institutions	Selling (‘liquidating’) private assets
Spreading risk over a variety of field locations, crop types, and planting times	Resource extraction of public assets (forest products, fishing, hunting etc.)
Diversifying the portfolio of income-generating activities	Seeking formal credit (often unavailable)
Construction of social networks	Seeking informal credit via unilateral remittances from off-site family members, or via reciprocal insurance between families in the same area
	Re-allocation of dependants (sending children to relatives)
	Adjusting labour supply by seeking off-farm employment
	Temporary or permanent migration

While effective for preventing a loss in welfare, the economics literature suggests the responses above are not necessarily effective at *improving* welfare¹¹. The uncertain conditions under which households operate are thought to discourage the investments necessary to increase food consumption and improve living standards. Strategies are chosen on the basis of their minimal return, instead of their average return¹² (Robinson *et al.* 2007). In other words, lack of savings and credit facilities ‘force’ households to discard strategies which create a loss

¹⁰ The theory of optimal saving predicts that households which face substantial risk, but cannot smooth consumption through insurance or credit, use liquid assets for self-insurance (Merton 1971).

¹¹ The neo-classical literature additionally makes the judgement that a state of improved welfare should be preferred, whereas the Marxist peasant literature maintains that a ‘subsistence’ objective is equally valid.

¹² Given the option of two income-generating strategies with the same average return (Option A = \$100 every month, Option B = \$50 or \$150 alternating every month), a risk-averse household will choose Option A because the cost of having \$50 less outweighs the benefit of having \$50 more the next month, in accordance to the principle of diminishing marginal return of income.

in the short-term, even if these are profitable in the long-term¹³. In addition, degrees of innovation are low as households are reluctant to invest resources in novel technologies. Overall, low-risk activities with low returns are preferred, which do not generate sufficient profit for re-investment (Owens *et al.* 2003). According to Davies' work in the Niger Delta region of Mali, this can result in a "negative cycle of subsistence and adaptation" (Davies 1996:190). Heyer argues that in the Machakos Region of Kenya, agricultural and non-agricultural activities coexist in a complex mix that produces positive accumulation only in specific contexts (Heyer 1996:292-294). Findings from India go one step further, stipulating that diversification into non-agricultural employment "reflects the growing desperation of the rural poor for income-generating opportunities. Non-agricultural employment arises from the survival strategies of rural households unable to obtain employment or self-employment in agriculture. It is a last resort rather than an attractive alternative livelihood" (Bernstein *et al.* 1992:153).

From an environmental perspective, the short time-horizons explained above are thought to promote an unsustainable use of natural resources (Cleaver and Schreiber 1994). Particularly for common-property resources where the immediate returns are less clear, few investments would be made to protect the resource stock in the long-term, thus degrading the household's asset base (Ostrom 1990). Such a 'crisis narrative' gained prominence during the Sahelian famines of the 1970s, where increased population pressure¹⁴ and agricultural expansion was thought to degrade soils, lowering yields, and causing food shortages (Mortimore 2001).

In contrast to the views expressed above, there is a diametrically opposed strand in the literature which claims that livelihood diversification is both beneficial and essential in a CDR environment, but cautions that livelihood diversification is not necessarily accessible to all socio-economic groups (see **Table 3**). Both of these narratives are critically examined in turn, below.

¹³ In consequence, it is stipulated that risk aversion declines as wealth and savings levels increase, and the importance of survival as a livelihood objective diminishes.

¹⁴ While population pressure was originally proposed by Thomas Malthus as a driver of food shortages in the 19th century, it has re-emerged since in the form of a neo-malthusian narrative, cautioning against the increasing dependency ratios resulting from an aging population, falling fertility rates, decreasing per capita land availability and decreasing livelihood opportunities (Devereux 2001a).

Table 3. Comparison of ‘livelihood diversification’ narratives in the literature	
‘Last resort’	‘Necessary risk-management strategy’
<p>Livelihood diversification is detrimental</p> <p>... leading to an unsustainable vicious poverty cycle</p> <p>... but ‘poor’ and ‘socially excluded’ groups are forced to use such strategies due to lack of savings and lack of access to more lucrative strategies</p> <p>... thus increasing inequality.</p>	<p>Livelihood diversification is beneficial</p> <p>... allowing households to mitigate risk and accumulate assets in the long-term</p> <p>... but such strategies are inaccessible for ‘poor’ and ‘socially excluded’ groups</p> <p>... thus increasing inequality.</p>

While a detailed review of the natural resource literature is beyond the scope of this thesis, several case studies have demonstrated that the western view that rural people mismanage their environment is ill-founded (Ellis and Swift 1988, Homewood 2005b, Sullivan 1999). A counter-narrative has emerged, asserting that that rural people are not victims, but active managers, of their environment using their indigenous knowledge¹⁵, even under increasing population pressure (Behnke *et al.* 1993, Boserup 1965, Leach and Mearns 1996, Stott 1998, Tiffen and Mortimore 1994). Soil fertility, for example, is actively managed through indigenous soil conservation techniques (Reij *et al.* 2005). Ecological data has demonstrated that changing vegetation patterns are not a sign of uni-directional degradation, but an inherent feature of ‘unstable but resilient’ ecosystems (Holling 1973), discarding some of the common misconceptions¹⁶ about the Sahel (Mortimore 2001). Comparing social anthropological evidence with forestry statistics in six countries revealed that the West African forests had in fact never been at equilibrium (Fairhead and Leach 1998). It is argued that ‘resilience’ is more accurate than degradation for conceptualising environmental change in the Sahel (Mortimore 2009).

Just as populations were found to invest in their surrounding environment, long-term studies showed that they also invested in their productive assets – a finding that has been overlooked due to an insufficient sampling time frame. A 13-year study of Northern Nigeria revealed that villagers made small incremental investments in livestock assets and landscape transformation (Mortimore 1989). Livelihood diversification and other risk-coping and management strategies

¹⁵ Only in the rarest cases is the environment in which people construct their livelihoods ‘open access’, leading to a ‘tragedy of the commons’ syndrome. Most resources are instead owned by distinct groups who are responsible for their management (Barrow 1996).

¹⁶ Five common misconceptions listed are: Sahelian ecosystems were at equilibrium until this was disrupted; the Sahel remains poor due to a failure of export-led growth (land-locked); unsustainable farming practices have depleted soil nutrients; the carrying capacity of Sahelian farming has already been exceeded; thus locking it into a perpetual dependence on foreign food aid (Mortimore 2001).

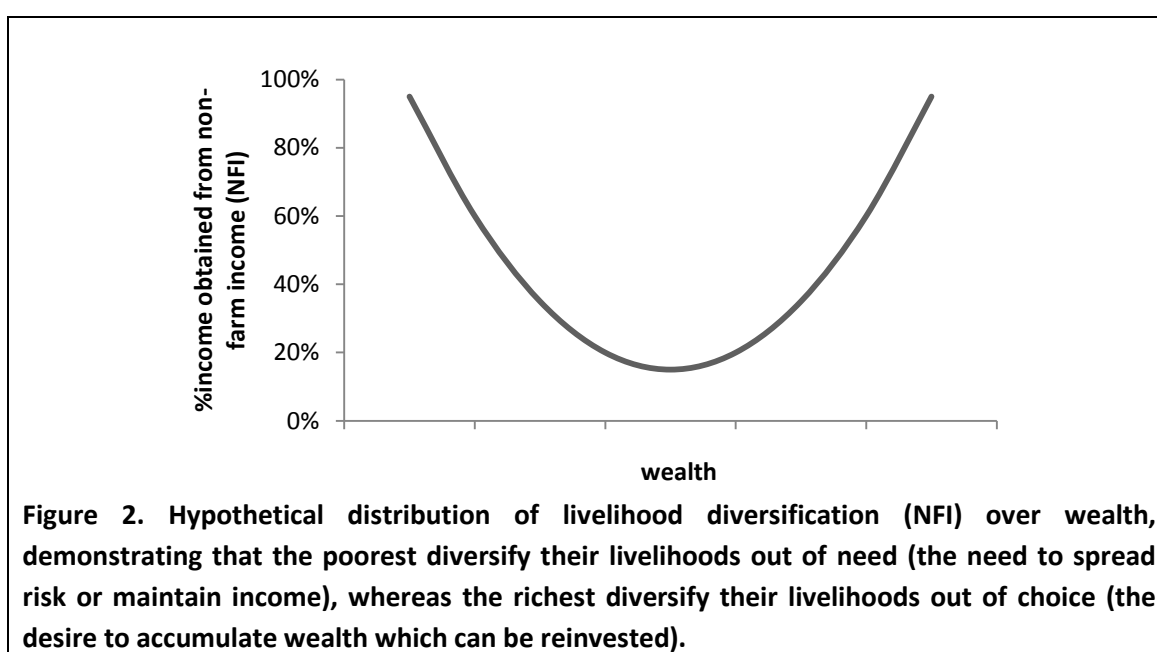
are not as incompatible with asset accumulation as suggested by economic theory. A survey of livelihood strategies shows that in reality the distinction between these categories is much more blurred¹⁷: households diversify their livelihoods out of need ('survival') as well as out of choice (Davies 1996, Hart 1994), also classed as push- or pull-factors (Barrett *et al.* 2001). A review of examples of livelihood diversification in contrasting agro-ecological settings qualifies this statement further, concluding that "livelihood diversification is pursued for a mixture of motivations [...]: from a desire to accumulate to invest, to a need to spread risk or maintain incomes, to a requirement to adapt to survive in eroding circumstances, or some combination of these" (Hussein and Nelson 1998:22). As such, the economics literature has recognised both the costs and benefits of diversification (see **Table 4**). These nuances demonstrate that the distinction between 'intensive' (asset accumulation) and 'extensive' strategies (livelihood diversification) is rather arbitrary. Such a stove-piped view has been perpetuated by examining 'investments' within the narrow domain of food production, or food entitlements, instead of considering the wider livelihood. Only when considering wider livelihood objectives, does it become equally valid to invest 'surplus' labour into activities *other than* food production, thus deliberate not maximising agricultural output at the benefit of livelihood diversification. As such, the claim is rejected that risk-averse behaviour always leads to a poverty trap due to a lack of investment activities.

Table 4. Costs and benefits of diversification (Dercon 2005, Ellis 2000, Robinson <i>et al.</i> 2007).	
Advantages of diversification	Disadvantages of diversification
<ul style="list-style-type: none"> - <u>Reduced seasonality</u>: Labour smoothing, consumption smoothing. - <u>Risk reduction</u>: Spreading risk among different activities, spreading reliance among different assets. - <u>Higher income</u>: By making better use of available resources and skills, increased re-investment into assets. 	<ul style="list-style-type: none"> - <u>Farm output</u> may decline, especially in cases where distant labour markets pull away male labour. - <u>Adverse gender effects</u>: When diversification is only available to men, women may be further relegated to the domestic sphere. - <u>Income distribution</u>: Opportunities for diversification available to the poor are often much less lucrative than those available to the rich. - Depending on the types of activities chosen, <u>risk may increase and incomes may decline</u> following diversification.

Based on these reflections, one could expect a positive relationship between the degree of diversification and wealth if 'opportunity' were the dominant driver, or a negative relationship

¹⁷ Ellis defined livelihood diversification both as "the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living" (Ellis 1998:4).

if ‘need’ were the dominant driver. This hypothesis has been tested repeatedly by using non-farm income shares as an indicator for livelihood diversification. A review of data across three continents discerned a “rough pattern [consisting of] a positive relationship [between non-farm income shares and wealth] found in much of Africa, a negative relationship in Latin America, and a very mixed set of results in Asia” (Reardon *et al.* 2000:272). It has been suggested that these patterns follow a unifying theory, which predicts a U-shaped relationship with increasing wealth: the poorest diversifying out of need, the richest out of choice (see **Figure 2**). Some data have indeed revealed such a pattern, cautioning, however, that while the poorest exhibit a higher percentage of non-farm income, the middle groups still earn considerably more absolute non-farm income than the poorest (Start 2001).

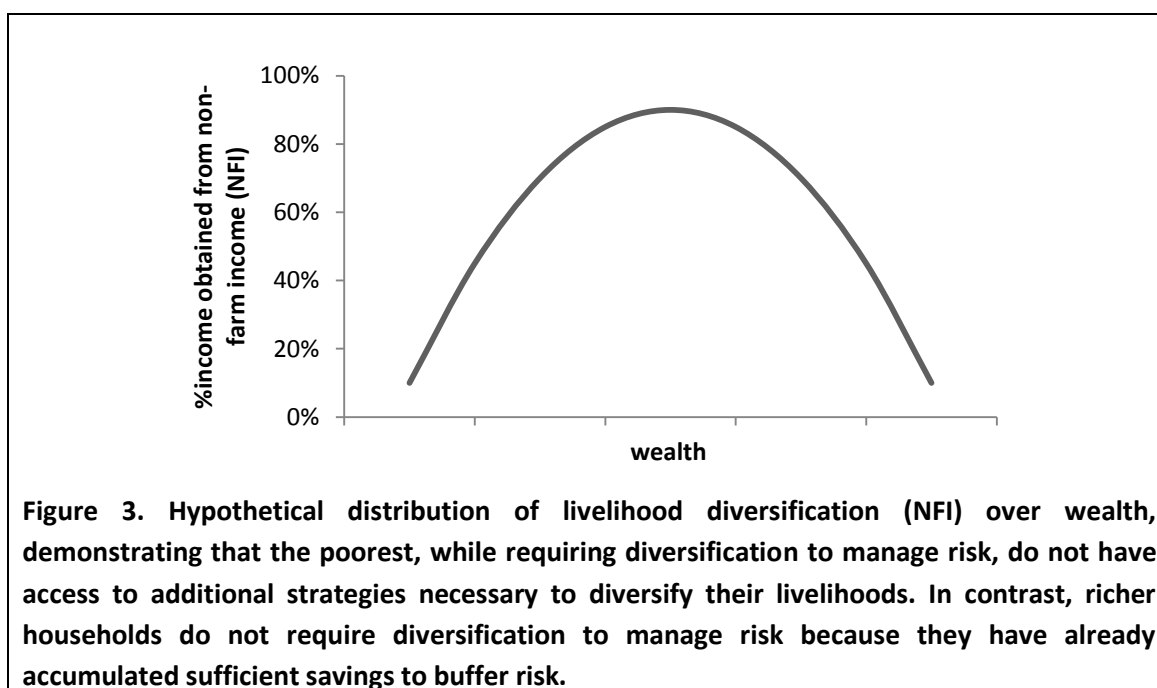


Moving beyond a normative view of livelihood construction

Whether beneficial or not, the question remains whether risk-coping and -management strategies, are accessible to the poorer strata of the population – a question posed by both of the narrative strands outlined in Table 3. While many studies have highlighted the economic barriers hindering access to such strategies – such as the lack of labour and of financial capital to make necessary initial investments (entry barriers) – less emphasis is placed on social barriers in the mainstream economics literature. One review mentioned that there may be a gender bias in livelihood strategies, certain ones being less accessible for women (Hussein and Nelson 1998), though there was no explicit mention of other power dynamics. In contrast, the Marxist literature has repeatedly highlighted the class constraints under which ‘peasant’ households operate (Bernstein 2002, Bernstein and Woodhouse 2001, McMichael 2008,

Whitehead and Tsikata 2003). The fact that the household's actions are constrained by the social fabric which they find themselves in violates the neo-classical assumption that these households act independently. This is particularly true for so-called 'complex' households common in the Sahel, which are comprised of smaller household units (see Section 2.3.1).

The presumption that the poorer strata of society, due to their lack of political capital, cannot access beneficial risk-management strategies, implies the opposite relationship to the one proposed above: the poorest do not have access to diversification strategies; the richest do not need them (see **Figure 3**). The anthropological literature has highlighted, in particular, the social tensions acting *within* households, and *within* larger family units (see Section 2.3.1).



This thesis explores which relationship holds for livelihood diversification in Burkina Faso (see Chapter 7, Section 7.2.1). It investigates if the concerns of food security and livelihood maintenance dominate, or whether the power struggle within and between households plays a significant role in livelihood strategy choice. A constructivist approach is needed which examines the meaning of livelihood strategies in their local context, moving beyond the narrow distinction between 'profit-maximising' or 'risk-minimising'. Research from Namibia demonstrates that the use of wild foods, widely seen by outsiders as a hungry season fallback, emerges as a value expression of cultural identity rather than food for the poor (Sullivan 2005)¹⁸. Similarly, the Fulbe of Northern Burkina Faso strive to have many children not due to a lack of planning but because it allows livelihoods diversification (Hampshire and Randall 2005).

¹⁸ The use of wild food in this thesis is explained in Chapter 4, Section 4.4.1.

This suggests that women in these societies do not have economic autonomy as their goal, thus preferring *not* to diversify their livelihood because they see it as more important to stay tied into family (Buhl 2005). Exploring the attitudes and motivations underlying livelihood choices is just as important as examining the assets underpinning them – a crucial component which is missing from the SLF. The objectives and motivations underlying livelihood construction in this case study are summarised in Chapter 5, Section 5.4.

2.2.2. The conceptualisation of ‘coping’

In parallel to the economic literature on risk management outlined above, nutritionists have specifically dealt with the household’s reaction to the risk of recurring food insecurity. Based on the premise that households do not respond arbitrarily to variability in food supply, people living under conditions of recurring food insecurity have been found to develop strategies to minimise the risk of immediate food insecurity and of longer-term livelihood insecurity (Frankenberger and Goldstein 1990:1). These strategies entail a re-interpretation of food entitlements, to include a wider range of sources of and calls on entitlements (Swift 1989). In the following section the conceptualisation of ‘coping’ is critically examined, concluding the analysis with one example: the use of wild foods as a form of natural resource-based insurance.

The existence of coping strategies has long been recognised by anthropologists even if they were not referred to as such (Colson 1979). Planning for ‘lean’ years goes back to biblical times, when the Pharaoh was warned in a dream to store a fifth of his grain harvest for the upcoming ‘seven years of famine’ (Genesis 41: 1-57). The adoption of the ‘coping’ term in the food security literature is probably traceable back to Watt’s seminal research on Nigeria (Watts 1983) and Campbell’s lesser-known work in Niger and Kenya (Campbell 1977, Campbell 1984). The term was widely taken up following Corbett’s review of these and other examples of ‘coping’ in Africa and Asia (Corbett 1988). The research cited in Corbett’s review includes Jodha’s seminal research on India, though he refers to seasonal migration or sale of assets following a drought as “adjustment mechanism[s] evolved by farmers” (Jodha 1975:1609), not as ‘coping’ mechanisms. Davies defines coping strategies as “the bundle of poor people's responses to declining food availability and entitlements in abnormal seasons or years” (Davies 1993:60). The term ‘coping’ comes from the psychology literature where it describes how people deal with (emotional or external) stress (Zeidner and Endler 1996). When applied to food security, however, it is arguably unnecessarily pejorative for the complexity and diversity of strategies it covers (Devereux 1999). Similarly, ‘coping’ is usually associated with the ‘hunger season’ preceding the next harvest. In French, the term *‘période de soudure’* is less pejorative,

simply meaning ‘transitional phase’ between two agricultural cycles. In this thesis, the term ‘lean season’ is preferred.

Based on survey results from Africa and Asia, it was argued that coping strategies were widespread and that similar strategies were used regardless of ethnic group (Corbett 1988, Longhurst 1986). A list of 10 ‘common’ strategies was first compiled by Watts, including food rationing (Watts 1983), which was originally omitted from Sen’s analysis of famine response (Devereux 1993a). The ‘coping’ strategies listed were not thought of as equivalent, but as ‘increasingly severe’, following a predictable sequence: strategies occurring later in time following a shock reflected the increasing vulnerability or ‘desperation’ of the household because these strategies carried an increasing cost, thus making them increasingly irreversible. Sequence follows the risk-minimisation principle proposed by the economic literature, with more reversible i.e. less risky strategies are carried out first. Strategies can be grouped into three stages¹⁹, thought to reflect progressively higher levels of vulnerability (see **Table 5**). Several of the strategies listed involve income- or livelihood diversification, concurring with the economic literature discussed previously.

Table 5. Progressive stages of household ‘coping’ (Corbett 1988).		
Stage 1 Insurance mechanisms	Stage 2 Disposal of productive assets	Stage 3 Destitution
<ul style="list-style-type: none"> • Reduction of current consumption • Collection of wild foods • Use of stored food • Use of inter-household transfers and loans • Sale of possessions (e.g. jewellery) and small produced commodities (crafts) • Sale of liquid assets (small livestock) 	<ul style="list-style-type: none"> • Sale of large livestock • Credit from merchants and moneylenders • Sale of agricultural tools or mortgaging of land • Temporary migration in search of employment 	<ul style="list-style-type: none"> • Permanent out-migration

By surveying the frequency of different coping strategies, the vulnerability of the household can be inferred based on the ‘stage’ it finds itself in. Based on this, the severity of food insecurity can be measured, allowing for an accurate policy response to a food ‘crisis’. CARE, FAO, WFP and other agencies have adopted a Coping Strategy Index (CSI) which has been designed for this purpose, based on demand-based coping strategies identified in Uganda and Ghana (Maxwell 1995, Maxwell and Caldwell 2008). The index is based on the answers to the question: “What do you do when you don’t have adequate food, and don’t have the money to

¹⁹ The original description of ‘coping’ as discrete responses (Corbett 1988) has been criticised as too simplistic, with strategies either following a discrete, a repeated discrete, or a continuous sequence (Devereux 1993a).

buy food?” (Maxwell and Caldwell 2008). It examines short-term strategies only²⁰, excluding longer-term alterations of income-earning or food-production patterns, citing research which has shown that “the management of short-term consumption strategies is an accurate indicator of acute food security” (Maxwell and Caldwell 2008:3). The accuracy of the CSI for identifying food insecure households in Ghana was tested by comparing it against three standard measures of food insecurity: a consumption benchmark (calories per person per day), a poverty benchmark, and a nutritional benchmark (presence of stunting). The study concluded that while the CSI gave few ‘false negatives’, it gave many ‘false positives’, thus increasing the likelihood of mislabelling relatively food-secure households as food-insecure (Maxwell *et al.* 1999). Using coping strategies to understand how households manage their food security thus paints an excessively pessimistic picture. Maxwell acknowledges that adaptive strategies should also be incorporated into the CSI, so that ‘coping’ can be examined in the context of longer-term livelihood strategies (Maxwell 1996). More research is needed to understand the cognitive basis for the choice of coping strategies.

Other researchers confirmed that using coping strategies as a food security indicator was not as straight-forward as thought. From a practical point of view, the presence of coping strategies is only an accurate indicator of food security levels if strategies are stopped once the level of food security of the household changes (Davies 1993). However, several longer-term studies have demonstrated that coping strategies can become permanent strategies for two reasons: Firstly, because people fall “out of the bottom of the livelihood system” (Davies 1993:61), meaning they are left with no other way of securing their food entitlements. This has been observed particularly in conflict areas where people’s livelihoods have been destroyed through war and repeated migration (Hammond *et al.* 2005b). Secondly, coping strategies can become permanent because they morph into a new form of livelihood, contradicting Davies’ definition that coping strategies are only used in ‘abnormal seasons or years’. Data from Nigeria shows that the distinction between ‘coping’ and ‘adapting’ is rather arbitrary: the same strategy can be a coping mechanism for one household but a sustainable livelihood form for somebody else (Mortimore and Adams 2001). In either case, if coping strategies become permanent they are no longer a useful indicator of food security levels.

This confusion above is the result of a misguided conceptualisation of coping strategies. The primary motivation behind their adoption has been assumed to be the maintenance of a

²⁰ The CSI is calculated from the frequency of six strategies: Eating less-preferred foods, limiting portion size, borrowing food or money to buy food, maternal buffering, skipping meals, and not eating for whole days.

minimal level of food consumption²¹, whereas different households can use the same strategy for many different reasons. This greatly diminishes their utility as a universal indicator of food security status. As already discussed previously, a misinterpretation of coping strategies has led researchers to label them as unsustainable and environmentally degrading: De Waal distinguishes between 'non-erosive' and 'erosive' coping (De Waal 1989). Maxwell asserts that coping strategies are "almost by definition nutritionally unsustainable, and are likely to be economically and environmentally unsustainable as well" (Maxwell 1996:294). Overall it is concluded that "the dilemma facing small-farm households involves [...] a trade-off between immediate subsistence and long-term sustainability" (Frankenberger and Goldstein 1990:22). Such statements ignore the fact that coping strategies must be examined in the context of wider livelihood strategies, and followed over several years to determine if they truly lead to asset degradation.

These misguided interpretations are the result of basing analysis too narrowly on food entitlements, instead of incorporating the wider objectives recognised by the SLF. The term 'coping' is in fact a misnomer, as it essentially means "acting to survive within the prevailing rule systems" (Gore 1993:16), yet households also react to food insecurity by adapting and managing the 'rule system' or livelihood system itself (Davies 1993). The nutrition literature seems to suggest that households only 'cope with' risk but, as is clear from the economic literature discussed previously, they also 'manage' risk. In Nigeria a whole suite of 'proactive' strategies were identified which responded to rain variability, managed crop diversity and livestock holdings, managed soil fertility and diversifying livelihoods (Mortimore and Adams 2001).

This thesis took the use of wild foods, often conceptualised as a coping strategy, as a starting point to critically examine 'coping' in the context of the wider livelihood (for a definition of wild foods, see Chapter 4, Section 4.4.1). Wild foods are one of several types of 'natural resource (NR) based insurance mechanisms' thought to be particularly useful for poor households with few savings with which to buffer income shocks (Baland and Francois 2005). Several case studies have shown that they can make an effective safety net, particularly when other coping strategies are unavailable or inaccessible (see **Table 6**). The findings suggest that, according to the coping hierarchy discussed above, NR-based insurance would be more beneficial than other 'consumption smoothing' strategies such as the sale of private assets (livestock sales etc.) or reliance on social networks, because it is less 'indebting', making it

²¹ "The risk of entitlement failure determines the level of vulnerability and hence the level of food insecurity, with risk being greater, the higher the share of resources [...] devoted to food acquisition" (Maxwell and Smith 1992:48).

particularly attractive to the poorest households. Some authors hypothesise that non-timber forest products (NTFP) are predominantly used as a ex-ante diversification strategy in Latin America, but are only used as an ex-post coping strategy in Africa when agricultural output is low (Delacote 2007). Nonetheless, earlier ethnographic work cautions that the storage of grains and of wild foods does not necessarily indicate vulnerability, but simply a seasonality in food supply (Tesart 1988).

Table 6. Examples of wild foods and of other types of non-timber forest products (NTFP) as a NR-based insurance mechanism.

Constraining factor	Examples
Risk exposure	Data from Brazil suggests that the production of NTFP do not have a strong positive correlation among themselves or with agricultural production, making them efficient risk-management instruments (Pattanayak and Sills 2001).
Access to other resources	<p>It is argued that poor households who lack private assets for self-insurance can easily extract NTFP from open- or semi open-access areas (Neumann and Hirsch 2000). Non-exclusive property rights can be seen as an integral part of risk sharing (Bromley and Chavas 1989). Data from India suggests that common-property resources (CPR) provide the rural poor with partial protection in time of unusual economic stress (Agarwal 1991, Reddy and Chakravarty 1999).</p> <p>Data from Burkina Faso suggest that the insurance value of NTFP, measured by the amount of income one would need in compensation for their loss, was significantly higher for poor households because they lacked access to other income sources (Tincani 2008). Similarly, several studies have shown that edible NTFP are particularly consumed in the lean season when other foods are less available (Bergeret and Ribot 1990, Falconer 1990, Fleuret 1979, Fleuret 1986, Odebode 2005, Schreckenberg 1996).</p>
Shortage of able labour	<p>In Brazil, Cameroon and South Africa, dependence on natural resources intensified when households lost human and social capital through adult morbidity and mortality , for example as a consequence of AIDS (de Sherbinin <i>et al.</i> 2008, Kaschula 2008, Kengni <i>et al.</i> 2004, Shackleton <i>et al.</i> 2008).</p> <p>In India, a higher dependence on CPR products is noted in low labour productivity regions (DasGupta 1987).</p> <p>Households with an unskilled labour force are more dependent on strategies requiring a low level of education and skills (Angelsen and Wunder 2002).</p>

Remote areas far from markets	<p>In Mexico, NTFP use high for households with less market access and fewer income generation opportunities (Lopez-Feldman and Wilen 2008). Households closer to the market used forests to cope with crop losses only; whereas households in more isolated villages used forests in response to deaths in the households and to crop losses (Godoy <i>et al.</i> 1998).</p> <p>In Sri Lanka, rural households' dependence on forest resource extraction decreased once they gained access to more diversified income sources (Illukpitiya and Yanagida 2008).</p> <p>With data from India and Malawi, it is argued that CPR income plays a significant role in reducing rural income inequalities (Fisher 2004, Jodha 1986, Shaanker <i>et al.</i> 2005).</p>
Insufficient help through social networks	<p>In Malawi, female-headed households relied more on NTFP, as did those households with few children to provide remittances (Fisher <i>et al.</i> 2005).</p> <p>In India, the gradual erosion of the traditional, community-based mechanisms have made other insurance mechanisms more important (Kabeer 2002).</p> <p>In Burkina Faso, Honduras and Peru, informal insurance agreements broke down in the face of aggregate shocks, making households more dependent on asset-based strategies (Fafchamps <i>et al.</i> 1998, McSweeney 2005, Takasaki <i>et al.</i> 2004).</p>
Lack of time	<p>South African women preferred NTFP-based activities because they were not full-time and could be carried out from home, thus allowing women to continue their household responsibilities (Shackleton & Shackleton, 2004b).</p> <p>In Mexico, NTFP use is mainly conducted by households with low opportunity costs of time (Lopez-Feldman and Wilen 2008).</p>
Gender roles	<p>In India and South Africa, women collected more NTFP than men (Dovie 2001, Khare <i>et al.</i> 2000) because it is traditionally a gender-linked practice and because they may have fewer alternative income strategies available.</p>
Legality of activities	<p>In South African and Peru, NTFP collection was preferred because it was less risky than illegal hunting for bush meat or illegal firewood selling (McSweeney 2005, Takasaki 2004).</p>

Instead of adopting a narrow food-entitlement approach, food security is examined in the context of the wider livelihood. The Household Economy Approach (HEA), a tool derived from the SLF and employed by, amongst others, the NGO 'Save the Children', incorporates the idea that the same coping strategy takes on a different meaning based on the type of livelihood within which it is employed (Boudreau 2008). The early warning system FEWS NET has modified the use of coping strategies as indicators of food insecurity by first mapping the livelihood types present within a particular country, and then differentiating within which livelihood zone a strategy occurred. Other researchers confirmed that people in 'marginal environments' coped 'better' because they were in a livelihood zone which experienced more

frequent shocks (Reardon and Matlon 1989). It is argued that in such a 'high sensitivity' system, 'coping' strategies are used in a proactive manner in anticipation of the lean season, whereas in a 'low sensitivity' system, 'coping' strategies are only used in a reactive manner (Davies 1993). As a result, it is imperative not only to examine food-entitlements in the context of the wider livelihood, but to also examine the resilience and sensitivity of the livelihood system itself (see Section 2.3).

2.2.3. 'Adaptation' concepts in the climate change literature

In addition to the disciplinary spheres traversed above, the emerging field of climate change science has also begun to concern itself with how households ensure their food security, specifically with farming in some parts of the world becoming increasingly precarious due to rising temperatures, diminishing rainfall and extreme weather patterns. The IPCC Fourth Assessment report warns that Africa will be particularly affected by the adverse impacts of climate change, reflecting both heightened exposure and increased social vulnerability²² (Pachauri and Reisinger 2007). Detailed climate change predictions for Burkina Faso are discussed in Chapter 3.

The research on livelihood impacts of climate change does not fall into a single disciplinary grouping. It emerged out of the field of physical and human geography which explores how societies deal with natural disasters. This literature covers much more than the man-made climatic changes occurring since the 20th century, going back to the climate-related demise of the Anasazi, the Mayans, the inhabitants of Easter Island and of Norse Greenland, amongst others (Brooks 2006, DeMenocal 2001, Diamond 2005, Huntington 1915). The term 'anthropogenic climate change' became prolific in the academic literature as well as the popular press following the four IPCC assessment reports (Houghton 1996, Houghton and Callander 1990, Houghton *et al.* 2001, Pachauri and Reisinger 2007) commissioned within the United Nations Framework Convention on Climate Change (UNFCCC).

Since its emergence, the anthropogenic climate change literature has undergone a similar evolution to the development literature discussed previously, a decade or two later: approaches have been criticised for focussing too much on economic and technological indicators of adaptive capacity, calling for more research on the political, social, and behavioural obstacles to change (Adger *et al.* 2004, Adger *et al.* 2009b). This mirrors the evolution of the food security literature from a narrow 'food first' to a broader 'livelihood' approach. As a consequence, the benefits of livelihood diversification for spreading climate-

²² The ambiguous definitions of these terms are discussed below.

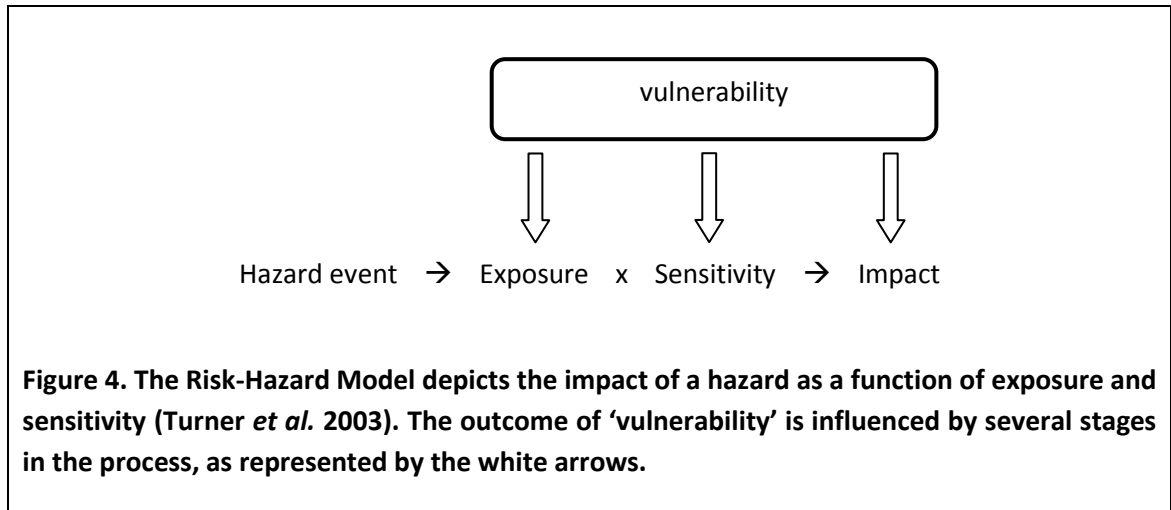
related risks have been widely heralded²³, without sufficient mention of the costs of diversification recognised by the risk-managed literature examined above (Goulden 2006). This sparked a debate on the sustainability of climate-related adaptation analogous to the debate surrounding the sustainability of coping.

An explosion of research on the role of (rigid) institutions in hindering adaptation (Adger 1999, Adger *et al.* 2009c, Leach *et al.* 2011) mirrors the livelihood literature on PIP. Similarly, researchers have warned that the climate change agenda could be hijacked by the elites, particularly with regard to the questionable pro-poor benefits of Community-Based Adaptation (CBA) and of Reduced Emissions from Deforestation and forest Degradation (REDD) (Disch 2010, Schwarte *et al.* 2011). These warnings are analogous to the recognition of ‘accountability failure’ in the food security literature. Other researchers have stressed the importance of participation in defining the meaning of adaptive strategies in a local context, taking into account local objectives and values (Adger 2006, O'Brien 2009). This mirrors the participatory approach mainstreamed into development practice since the 1980s (Chambers 1983). Unsurprisingly, local knowledge and the experience and perceptions of earlier climatic variability influence current and future adaptation (Mortimore and Adams 2001, Thomas *et al.* 2007). The role of cultural inertia in affecting the speed of behavioural change is well-documented in the anthropology literature (O'Brien 2009). Lastly, the potential role of innovation as a necessary element of adaptation is being debated, arguing that social and natural systems learn through experimentation (Berkes and Folke 1998), comparable to a similar innovation discourse in the development literature. As a result of this disciplinary muddle, the terms ‘adaptation’, ‘vulnerability’ and ‘resilience’ have been employed by researchers in many different ways. An attempt is made at untangling their etymology below.

In accordance with the hazard literature from which it stemmed, conceptualisation in the climate change literature typically follows a risk exposure approach: Vulnerability is seen as the combination of two factors; the likelihood or probability of a hazard (exposure), and the severity or impact of that hazard. The Risk-Hazard Model (see **Figure 4**) adds sensitivity to this equation, noting that climate vulnerability is not caused by exposure to hazards alone, but also resides in the sensitivity and resilience of the system to prepare to, cope with and recover from such hazards (Turner *et al.* 2003). Thus vulnerability can be “reduced by attempts to control or modify extreme weather events [with adaptation referring to] actions that may be taken to reduce the harmful impacts or take advantage of the beneficial opportunities of climate change” (Burton *et al.* 1978:260). The IPCC uses a very similar concept, characterising

²³ The climate change literature often conforms to the ‘risk-management’ narrative outlined in Table 3.

adaptation as “adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities” (Houghton *et al.* 2001). ‘Adaptation’ refers to the process which avoids the outcome of ‘vulnerability’.



In the hazard literature, however, ‘vulnerability’ was introduced as a concept in the 1970s relating much more to the ‘process’ of vulnerability, recognising the role of socio-economic conditions in the loss of life following natural disasters (O’Keefe *et al.* 1976)²⁴. Such a structuralist view, typical of the social sciences, defines vulnerability as being “essentially about the human ecology of endangerment [...] and is embedded in the social geography of settlements and land uses, and the space of distribution of influence in communities and political organization” (Hewitt 1997:143). It is argued that more research is needed on the social aspects of vulnerability (Cutter *et al.* 2003). However, it is precisely these social aspects of vulnerability which have been the focus of the economic literature for decades: it considers ‘vulnerability’ as the process which leads to the outcome of income- or health-poverty (Chaudhuri 2003, Davies 1996), usually defining it at the level of an individual household. Nevertheless, researchers do warn that focussing too much on poverty or vulnerability as a ‘social construct’ perpetuates the view of people as passive victims, neglecting the active choices made by ‘coping’ (Hewitt 1997).

When applying these concepts to climate change, it is argued that the social science view above does not sufficiently take into account the initial exposure to a hazard, focussing mainly on the socio-economic and political factors which determine people’s ability to cope with stress or change (Adger 2006). A similar compromise was already advocated in the

²⁴ There is a similar bone to pick in the nutrition literature, which sometimes defines food security as a ‘process’ and sometimes as an ‘outcome’ (Maxwell and Smith 1992).

development literature a decade previously, highlighting the exogenous aspects of vulnerability (the exposure) as well as the endogenous aspects; the coping capacity of people (Chambers *et al.* 1989). This compromise was also acknowledged in the hazard literature, enshrined in the Pressure and Release (PAR) Model which considers the outcome of a disaster as the additive effect of the physical hazard and the cumulative progression of vulnerability (Blaikie 1994) (**Figure 5**). However, similarly to the SLF critiqued above, the Pressure and Release Model is more useful as a conceptual framework than as an empirical theory. The model does not sufficiently address the feedbacks within the coupled human environment system, providing little detail on the structure of the hazard's causal sequence (Turner *et al.* 2003).

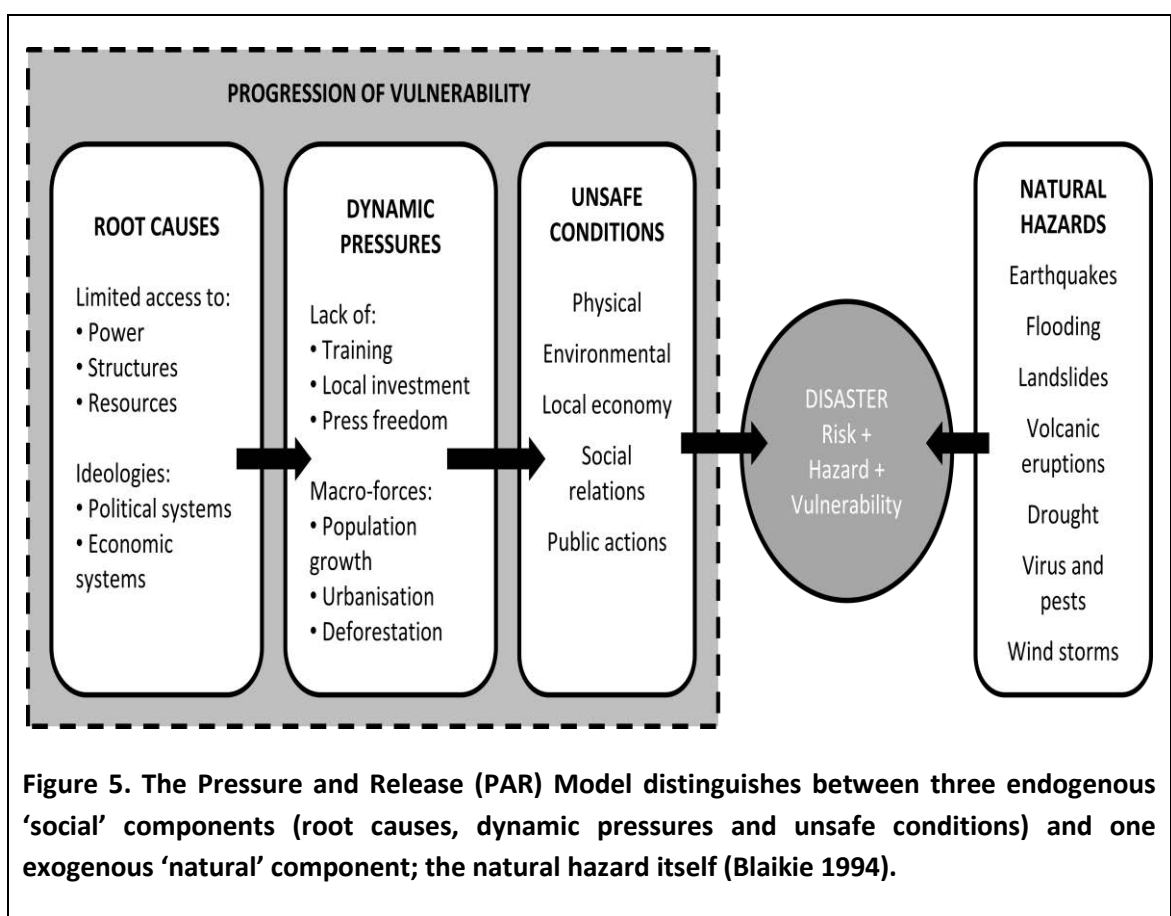


Figure 5. The Pressure and Release (PAR) Model distinguishes between three endogenous 'social' components (root causes, dynamic pressures and unsafe conditions) and one exogenous 'natural' component; the natural hazard itself (Blaikie 1994).

In addition to these definitional nuances, different disciplines examine the concepts of 'vulnerability' and 'adaptation' over different time scales (Smit and Wandel 2006). As demonstrated by the IPCC's definition, the climate change literature only considers *responses* to a hazard as 'adaptation', considering everything else as 'mitigation'. In contrast, the economic and anthropological literature considers strategies both before and after a 'shock' (see **Table 7**) – a realisation also later made by the food security literature. Other researchers

have confirmed that adaptation strategies can be passive, reactive or anticipatory (Smit *et al.* 2000), in order to retreat, accommodate or protect one's assets (Bijlsma 1997).

Table 7. Classifications of behavioural change by different disciplines, before and after an event.					
Disciplinary source	Law	Climate change literature	Hazard literature	Economics literature	Anthropological literature
Terminology	Ex-ante vs. Ex-post	Mitigation vs. Adaptation	Pro-active vs. Reactive	Risk management vs. Risk coping	Coping ability vs. Coping strategies

The fact that different disciplines use the same words in different ways has led to considerable misunderstanding. Already 30 years ago, it was pointed out that “vulnerability is a term of such broad use as to be almost useless for careful description at the present, except as a rhetorical indicator of areas of greatest concern” (Timmerman 1981). Some climate change researchers characterise adaptation as an outcome or state at a certain point in time and space (Turner *et al.* 2003), whereas others characterise it as a process or strategy; an intention to act (Holzmann 2001, Magnan 2010). However ‘adaptation’ rarely entails a permanent shift to the ‘outcome’ of a new form of livelihood, involving instead an ongoing cycle of repeated adaptation – a realisation made by the coping literature a decade earlier (Davies 1993). The warning of carefully specifying the adaptation ‘to what’, ‘of whom’ (a household or the system) and ‘through which process’ is still very relevant today (Smit *et al.* 2000).

Some researchers have attempted to bring some structure to the debate by distinguishing between adaptation itself (the process) and the goal of adaptation (the outcome), highlighting that the latter is often poorly defined (Adger *et al.* 2009a). The goal of adaptation can be maintaining a minimum level of food security via short-term measures, or improving overall wellbeing through a wider development process (Adger *et al.* 2009a) – mirroring a similar debate between ‘capability’ and ‘poverty’ (Dreze and Sen 1991). By referring to the lessons already learned in the development literature, it becomes evident that it is unnecessary to re-invent the wheel (see **Table 8**). The barriers to climate change adaptation can be better understood through factors which are known to influence the broader process of poverty generation. In the quest for a typology of climate change adaptation strategies (Goulden *et al.* 2009, Thornton *et al.* 2007), researchers have pointed out that essentially they all involve strategies that pool and share risks through mobility, storage, diversification, communal pooling and exchange (Agrawal and Perrin 2009) – strategy traits well-recognised in the economics literature.

Table 8. Distinctions made between ‘process’ and ‘outcome’ in different academic spheres.			
	Development literature	Hazard literature	Description
Exposure	n/a	Exposure	Are you likely to be affected by a hazard?
Process	Vulnerability	Adaptive capacity	If you are affected, can you ‘cope’? This depends on current as well as historical factors which determine people’s ability to cope.
Outcome	Poverty	Vulnerability	Not being able to cope ‘enough’ to maintain one’s standard of living.

Highlighting the distinction between ‘process’ and ‘outcome’ is important because it determines how, and over what scale, vulnerability is measured (Füssel 2006). It also affects which cost, equity and efficiency criteria are used to measure effective adaptation (Klein and Tol 1997). This ambiguity has spilled over into the conceptualisation of ‘resilience’, which is often employed as a loose antonym of vulnerability (Adger 2000). However, resilience and vulnerability have separate intellectual histories and do not refer to the same processes (Janssen and Ostrom 2006). Before exploring the concept of ‘resilience’ in more detail, a few outcome- and process-based indicators are compared (see **Table 9**). These are discussed in more detail in later sections.

Table 9. Comparison of outcome- and process-based indicators of vulnerability or lack of resilience.	
Outcome-based indicators	Process-based indicators
<ul style="list-style-type: none"> • The standard deviation (or coefficient of variation) of income or consumption is the most common indicator of observed vulnerability (WB 2000/01). • Lack of income mobility is used to identify long-term trends of vulnerability of certain groups within society (Fields and Ok 1996, Shorrocks 1978) • In accordance with expected utility theory, wellbeing is predicted to fall if the variability of consumption rises, <i>ceteris paribus</i>. Perceived vulnerability can be captured with quality-of-life surveys which rank happiness on an ordinal scale from 1 to 7 (Cummins (1996), but has proved difficult to measure (Kasperson 2001). • Vulnerability can be inferred based on the hierarchy of coping strategies observed (see Section 2.2.1) 	<ul style="list-style-type: none"> • Vulnerability can be inferred from the inefficiency of informal insurance networks, i.e. the degree that income shocks are translated into consumption shocks (Amin <i>et al.</i> 2000). This indicator requires panel data and does not take into account other ways of coping. • Vulnerability can be inferred from the (lack of) diversity of asset holdings. It does not require panel data but asset values are often difficult to quantify. As explained in Section 2.3.2, diversity alone does not reduce vulnerability if asset values co-vary. • Vulnerability can be inferred from the covariance of asset holdings. Section 2.3.2 explains the difficulty of measuring long-term changes in asset values from which to calculate covariance. • Vulnerability can be inferred using indicators of socio-ecological resilience, which are explained in Section 2.3.3.

In accordance with the ecology literature from which it stemmed, the concept of 'resilience' is usually not applied to a single entity (such as a household) but is considered the property of the whole system. It is characterised by an 'adaptive capacity'; a capacity to buffer and to self-organise. Resilience can be defined as the capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks, and therefore identity (Walker *et al.* 2006). As such it is closer to a 'process' than to an 'outcome', though such a distinction is less relevant at a scale larger than the household.

System-orientated analysis has largely been missing from the climate change literature. A bibliometric analysis of 38 years of literature concluded that the field of 'resilience' has been rather isolated from literature on 'vulnerability' (Janssen *et al.* 2006). A lack of system-orientated analysis is surprising because the 'system-wide' effects of climate change are rather apparent (see Section 2.3). Firstly, it is becoming clear how the coping capacities of different societies cannot be examined in isolation (over space or time) but that their coping capacities are interconnected, especially via trade linkages²⁵. Historically, it is evident that the presence of hostile versus friendly neighbours, and the presence or absence of trade with said neighbours, was important in determining the collapse of societies (Diamond 2005). Secondly, it is becoming clear that ecological, economic and social systems are tightly linked. Climate-related perturbations in the former have wide-reaching consequences in the latter two. Particularly for the 'natural-resource dependent' societies wide-spread in rural areas of the Sahel, any perturbation of natural assets has wide-reaching consequences for the whole livelihood.

Despite Blaikie's PAR Model, the climate change literature often conceives vulnerability as an outcome, perhaps because it is most apparent when calamity occurs (Adger 1999). However some researchers attempted to integrate the lessons learned from the poverty and food security literature, and examine climate change vulnerability as a socially-constructed phenomenon, terming it 'social' or 'inherent' vulnerability (Adger and Kelly 1999). Perhaps because a systems-oriented approach is still relatively novel in the climate change literature, the terms associated with it are sometimes poorly understood. Expressions such as sensitivity, vulnerability, susceptibility, robustness, resilience or coping ability are often used interchangeably to represent (in whole or in part) the adaptability of the system (Smit *et al.* 2000:238). The distinction between 'resilient' and 'sensitive' societies is briefly explained below.

²⁵ This interconnectivity also became painfully apparent during the global financial crisis of 2010.

The ecology literature employs these two terms so that they roughly correspond to ‘exposure’ and ‘process’, respectively: ‘Sensitivity’ describes to what degree the system is initially affected by a stress, while ‘resilience’²⁶ describes the magnitude of stress that can be absorbed before the system changes its structure (Holling 1973).

In the case of the adaptability of livelihoods to climate change, ‘sensitivity’ can be understood as the exposure of that system to climate-related shocks. Rural households whose livelihoods depend on agriculture, fishing or livestock rearing will be more ‘sensitive’ than urban dwellers (except for flooding). The former are often referred to as ‘natural-resource dependent’ households, though this term is usually employed in a pejorative sense in the economics literature, referring to the proportion of income gained from natural resources. Here it is employed simply to highlight how interconnected the Sahelian farmer is with his natural environment, making no distinction between himself and ‘nature’²⁷. The Sahelian farmer is often portrayed as vulnerable because of being so linked to a highly variable environment. However, studies have shown that particularly the Mossi of Burkina Faso have always been very mobile, arguably making them less dependent on a given parcel of land (Breusers 2000, Raynaut and Gregoire 1997). In the case studies examined in this thesis, the role of historical exposure to risk is discussed in Chapter 7, Section 7.3.

The term ‘resilience’ is often associated with a flexible response; the opposite of rigid control (see **Table 10**). In human societies it is associated with prior exposure to risk and learning from such prior exposure to risk – concepts which are explained in more detail in Section 2.3.3, below.

Table 10. Four possible kinds of strategy can be distinguished based on the time span of the hazard (short- or long-term), and the type of response (control or respond) (Leach 2008:3).		
	Control	Respond
Short-term shocks	Stability	Resilience
Long-term stresses	Durability	Robustness

²⁶ This definition of ‘ecological’ resilience is distinct from the way the term is employed in engineering, defined as the time required for a system to return to equilibrium following a perturbation (Gunderson and Holling 2002). The latter assumes stability in the system.

²⁷ This conceptualisation mirrors the participatory ‘community-based’ narrative pervasive in the ecology literature since in the 1980s, in contrast to the ‘fortress conservation’ approach of the colonial period, which advocated ‘parks without people’.

Apart from the necessity of having a methodology that is based on a solid understanding of the concept at hand, the distinction between ‘process’ and ‘outcome’ is also important for policy purposes: outcome-focussed initiatives have remained largely sectoral (studying the social impact separately from the ecological impact, etc), whereas systems-based initiatives have focussed on a more holistic trans-disciplinary approach. A systems-oriented analysis is necessary to learn from failure and promote the ongoing structures and functions of overall systems. In contrast, a vulnerability approach arguably focuses too much on ‘putting out the fire’ and protecting the most vulnerable individuals and communities, at the expense of the overall resilience of the system (Dow *et al.* 2006, Plummer and Armitage 2007). Therefore – apart from the conceptual muddle it has created – perhaps the most notable contribution of climate change research has been its role in reinvigorating the debate on ‘resilience’, and stressing the importance of systems-based thinking. The policy implications of applying such an approach in Burkina Faso are discussed in Chapter 8, Section 8.2. What is still missing is an analytical tool to help policy makers put this into practice. Section 2.3 discusses how existing systems-based models can be adapted to suit livelihoods analysis.

2.3. Systems-level analysis

Different disciplines have studied phenomena with a systems-oriented approach – this has been coined ‘complexity’; or “the emerging science at the edge of order and chaos” (Waldrop 1994)²⁸. A complex system is composed of interconnected parts that as a whole exhibit one or more so-called ‘emergent’ properties not obvious from the properties of the individual parts (Ziemelis 2001). The term comes from mathematical modelling, because such systems are, as the name suggests, difficult to model: they are made up of multiple feedback loops, which makes the system adaptable and self-regulating, with buffers absorbing shocks (Rind 1999). The system is often nested, with subsystems interacting through different feedback loops at different scales (Strogatz 2001). Any given theory can only explain one subsystem²⁹, and cannot predict the behaviour of the whole system. Once buffers are exhausted, the system can ‘tip’ rapidly: non-linearity, change and evolution are typical features of complex systems (Sethna *et al.* 2001). Despite such apparent ‘chaos’, complex systems are said to have ‘memory’, because change over time is not random, with prior states influencing present states (Goldenfeld and Kadanoff 1999).

²⁸ ‘Complexity’ is the antithesis to the ‘reductionist’ approach which formed the basis for modern science (Anderson 1972).

²⁹ “The complexity of any system is directly proportional to the number of non-equivalent descriptions that we can make of that system” (Casti 1994).

The earliest precursor to modern complexity theory can be found in economics, stating that order in market systems is spontaneous and emergent, and not the execution of any human design (Hayek 1978). Nobel Prize economist and philosopher Friedrich Hayek dedicated much of his work to the study of complex phenomena in the 20th century. Gregory Bateson played a key role in establishing the connection between anthropology and systems theory in the 1940s, recognising that the interactive parts of cultures function much like ecosystems. In the 1970s the field of economics integrated the same principles into agent based modelling and ‘fuzzy’ models. In ecology, systems-based thinking gained momentum following a seminal paper on the predator-prey cycles in lake ecosystems (Holling 1973)³⁰. Ecological systems theory is discussed in detail in Section 2.3.3. As all complex systems have many interconnected components, network theory plays an important role in the study of complex systems, culminating in the ‘new science of networks’ in the 1990s. The idea of complexity has sparked similar theories in different disciplines, “often brandishing an ominous-sounding C-name: in the 1960s it was cybernetics, in the 1970s it was catastrophe theory. Then came chaos theory in the 1980s and complexity theory in the 1990s” (Strogatz 2001).

Arguably, a lack of understanding of the complexity of socio-ecological systems has stymied progress on achieving sustainable development because policy makers lacked the tools to help them understand and plan for the complexity of the social, economic and ecological systems in which people live and construct their livelihoods. As pointed out by Robinson (2007:7): “To acknowledge complexity is not merely to accept that things are complicated and difficult to comprehend; it is to recognise that the natural environment, communities, economies, and agriculture are all complex systems, and that livelihoods are created within these complex and intersecting systems. To acknowledge this complexity is to accept, among other things, that no single theory or perspective can encompass or explain the systems in question”. As all the feedbacks working at different scales can never be fully understood, more efforts should be directed towards fostering resilience towards an unpredictable outcome, rather than trying to prevent a specific outcome of ‘poverty’ in the face of unknown future shocks (Jones 2011). While various disciplines have identified a plethora of indicators to measure vulnerability (see Table 9), this is impractical for guiding policy (Fraser *et al.* 2005). A ‘resilience’ approach can shift the focus away from purely growth and efficiency, to needed recovery and flexibility. The use of ‘adaptive co-management’ has been particularly useful for the management of fisheries (Hinke *et al.* 2004) and wild fires (Suyanto *et al.* 2004) – with important implications for understanding natural resource based livelihoods, present as well as past (Janssen and

³⁰ Current research on social-ecological systems is spearheaded by the Resilience Alliance, through their journal ‘Ecology and Society’.

Scheffer 2004). The emerging field of 'ecosystem health' has adopted a similar systems-based interdisciplinary approach to understanding and promoting health and wellbeing in the context of social and ecological interactions (Waltner-Toews and Kay 2005). Applying the principles of complex systems to livelihood analysis offers a more incisive diagnostic of livelihood resilience than development economics has delivered to date.

Nonetheless, a clearer methodology is still needed to incorporate 'resilience' into livelihood analysis (Gallopín 2006). Some researchers warn that applying 'adaptive co-management' to social systems comes with serious equity concerns, if less-vocal groups are not adequately included in the dialogue (Plummer and Armitage 2007). As mentioned earlier, the SLF already encompasses some of the principles of systems-thinking but lacks an analytical tool for measuring the adaptability of the whole livelihood system. Livelihoods analysis (dominated by the social sciences) has remained remarkably separate from research on ecosystem health (dominated by the natural sciences) despite livelihoods depending on natural assets, and on the risks which underlie them (Adger 2006).

The following sections examine the systems-oriented approach of three different disciplines, in order to draw out relevant lessons for livelihood analysis. The three approaches below concern themselves with different aspects of the livelihood system and operate at different scales. Only ecological theory deals with a truly 'self-organising' system. Nonetheless useful parallels can be drawn from all three. Quantitative methods are discussed, in order to propose a quantitative systems-oriented approach which can be applied to livelihoods analysis.

2.3.1. 'Complex' extended households

Economists traditionally examine livelihood strategies at household level. While the idea of the unitary household has a long history in economics (Chayanov 1925), it was brought into the mainstream by Becker in 1965 (Haddad *et al.* 1994). Becker argued that the household combined time and purchased goods, in accordance with one set of preferences, to produce commodities that generated utility for the household (Becker 1965). As this theory assumed that all household members had the same set of preferences, only surveying the preferences and behaviour of the household head was assumed to approximate the behaviour of the whole household. However, evidence from the nutrition literature demonstrated inequalities in consumption early on, for example regarding the nutritional allocation to girls and boys of the same households (Bentley and Pelto 1991, Sen 1984). Supporters of the unitary household model argued that preferential investment in boys was chosen to improve the welfare of the whole household because sons could obtain higher wages than daughters (Rosenzweig and

Schultz 1982). In contrast, Folbre (1984) suggested an alternative feminist viewpoint, that a preferential investment in sons reflected the benefits the father gained from male labour, whereas the mother would have benefited from additional help from her daughters, but had less control over resource allocation. Further evidence of divergent preferences stems from expenditure data, with several studies demonstrating that men preferentially spent their income on alcohol, cigarettes and other consumables while women preferentially spent their income on food (Doss 1996a, Hoddinott and Haddad 1995, Kennedy 1989, Thomas 1990). Thus time and labour were not allocated in accordance to one set of preferences; sometimes these preferences were even diametrically opposed (Guyer 1988). Falsely assuming a unitary set of preferences did not give a voice to subordinate members, with the feminist literature increasingly arguing that such an approach rendered women invisible (Edholm *et al.* 1978). Designating complex collectivities such as households as homogeneous units has arguably skewed the study of vulnerability in agriculture, particularly where substantial flows of resources occur within and across households (Carr 2008, Guyer 1981).

As a result, economists began opening the 'black box' of the household, particularly with the aim of improving the targeting of transfers: it became clear that it *did* matter at whom policy initiatives were directed inside the household³¹, and that it could no longer be assumed that such policy initiatives would have an equal effect on all household members (Haddad *et al.* 1994, Haddad and Kanbur 1991). Several quantitative models were developed to take into account 'non-pooling' households, following the rejection of the neoclassical 'common preference' (or unitary) household model (Doss 1996b, Scrimshaw 1983, Thomas 1990). However, collecting the necessary data to apply these models remains time-consuming, as every household member must be interviewed separately. In part because of these methodological and consequentially ethical concerns, carrying out surveys at the household instead of the individual level still persists and predominates. A seminal review concluded that the household is the logical social unit through which to view the question of access to food, in spite of intra-household inequities in the distribution of food (Maxwell and Smith 1992). In contrast, other researchers have cautioned that nutritional analysis at household level is imprecise if several household members are responsible for production and/or purchase of food, if there are multiple income sources (which are not divulged to all), and if household composition is variable (Maxwell 1996). Anthropologists have demonstrated that these three conditions are met by many households, further discrediting unitary household analysis (Fapohunda 1988). These pressures and restrictions have an effect on agricultural output, with

³¹Evidence from the nutrition literature confirmed that the education level of the mother, not of the household head, had a strong influence on the nutritional status of the child (Thomas *et al.* 1991).

studies finding significant inefficiencies in the allocation of inputs in Burkina Faso (Udry 1996) and other West African households as a result (Carney and Watts 1990, Jones 1986).

To better conceptualise the household as an agglomeration of multiple production and consumption groups with different income and expenditure streams, the field of New Institutional Economics has resituated the household as an institution based on “a long-term implicit exchange contract between individuals of different generations related by birth or marriage” (Todaro and Fapohunda 1987:3). While somewhat instrumentalist, the valuable insight of this perspective is that the behaviour of household members is thus determined both by contractual rights and obligations as well as economic incentives. Intrahousehold contracts are not static. The institution of the household can be seen as a structure to manage risk (Kabeer 1994:127), with individuals regularly renegotiating the contract to ensure they are better off as part of the household than outside of it. Such renegotiation results from different levels of risk faced by different household members, which is in turn the result of the relative bargaining power of participants (Todaro and Fapohunda 1987:3). These dynamics influence decisions regarding communal living versus progressive household fragmentation, and are particularly pertinent to complex Sahelian social structures.

The distribution of bargaining power within a household varies depending on household type. Anthropological research has identified two typologies of households based on observed patterns of household rules, norms and practices (Boserup 1970, Cain 1984, Caldwell *et al.* 1982, Dyson and Moore 1983, Goody 1976). The first type, referred to as ‘corporate’ households (Kabeer 1994:115) or ‘male farming systems’ (Boserup 1970), is centred around the conjugal bond with a pattern of female dependency and sole male responsibility for protection and provision of the household. This form is commonly found in a belt stretching from North Africa across the Middle East to Bangladesh (Caldwell *et al.* 1982). The second type, referred to as ‘female farming systems’ by Boserup, is commonly found in the Caribbean, Latin America and Sub-Saharan Africa (Cain 1984, Goody 1976, Guyer 1981, Guyer and Peters 1987, Youssef 1974). Here, men and women share the responsibility of household provisioning but are often allocated separate resources (separate fields, crop types and labour resources) to fulfil this task³². Anthropologists have long argued that the domestic economy in Sub-Saharan Africa is deeply divided ideologically between men's and women's spheres³³. The same has been shown for the Mossi of Burkina Faso (Badini 1994, Helmfrid 2004, Kevane and

³² The intrahousehold distribution of fields in this case study is presented in Chapter 6, Section 6.1.1.

³³ It has, however, been difficult to demonstrate quantitatively that household budgets have always been relatively separate in African households, as household budget surveys during the colonial period often only interviewed men (Guyer 1988).

Gray 1999, Lallemand 1977, Roost-Vischer 1997, Waibel 1993). As pointed out in Polly Hill's study of Ghana,

"the fact that West African marriage bears so little resemblance to European marriage, in terms both of the domestic economy of the household, and of day to day social activities, receives insufficient emphasis in the literature. Spouses usually enjoy little everyday companionship except, perhaps, when they grow old: they rarely sit and converse; they eat separately; they tend to have separate ceremonial and recreational activities. Considering that they are rarely seen walking down a path together, it is no wonder that they seldom work jointly to produce crops which either party may sell, or toil alongside each other on the fields" (Hill 1975: 124).

The two household types exhibit different constellations of bargaining power of their members. In the case of 'corporate' households, women have little access to extra-household activities which are restricted by cultural norms. As a result, their best risk management strategy is to stay (however reluctantly) within the household and adopt an attitude of submission and self-sacrifice to ensure their long-term protection by the household head (Kandiyoti 1988). In contrast, in the dominant household form found in Sub-Saharan Africa where this thesis is located, women have more extra-household options to pursue, allowing them to accumulate a separate savings pool with which to mitigate risk (Kabeer 1994). As household members have different preferences and therefore spend any income gained differently (Hoddinott and Haddad 1995), this gives them an incentive not to pool their resources. For example, women often seek independent income streams through rotating savings and credit associations (Anderson and Baland 2002). It is vital to note that household members are not just "at the mercy" of intra-household power relations, but may actively choose not to share their assets. Individuals have been found to engage in income-generating activities which increase their own bargaining power, even when it conflicts with the household's risk management strategy (Agarwal 1997, Dolan 2001, Thomas 1993).

Sen's model of the household as a site of 'cooperative conflict' identifies important factors which determine the bargaining power of household members (Sen 1990). He highlights the dichotomy between cooperation in production of food and wealth ("adding to total availabilities") and conflict over the distribution of the 'fruits' of this labour ("dividing total availabilities"). While at least a certain degree of cooperation in production is expected based on technological interdependence (Kabeer 1994:126-7), conflict over wealth distribution reflects the claim each household member has over household resources. This claim increases with an improved bargaining position, which depends on (i) what options the individual faces

when the household breaks down (fall-back position); (ii) the perceived importance of his or her contribution to household prosperity; (iii) the (un)willingness to compromise or subordinate, and (iv) the ability to exercise coercion, threats or violence against other household members (Sen 1990). Usually men fulfil all four of these criteria, explaining their dominant position of power. In contrast, household breakdown, for example following the death of her husband, has more severe consequences for women's well-being as compared to men's, resulting in women in particular having an interest in maintaining assets and risk-sharing networks outside of the household (Doss 1996a).

The literature cited above predominantly deals with the dynamics existing between husband and wife of the same household. However, less research exists on the dynamics among men and among women of the same household, as are present within so-called 'complex' households³⁴ common in the Sahel. These households contain several smaller nested units, consisting of sub-units of married sons still living with their father. Although the dynamics are similar to the ones described above, intra-household power relations play an even more important role because there are more individuals and interrelationships involved. Each 'son' sub-unit can be seen as an actor within the wider web of family responsibilities, instead of an individual household unit acting independently. These extended households have been studied especially with regard to the processes which lead to their fragmentation (Safir 2009, West 2010). However, there has been less research on the power dynamics within intact extended households, an exception being a detailed two-year study of Bambara households in Mali (Toulmin 1992). This thesis explores the role of bargaining taking place in such extended households with regard to food security; both within households, as well as across households within the same family compound (see Chapter 6). Burkina Faso makes an interesting case study, being at the border to Sub-Saharan cultures, which exhibit a 'non-corporate' household model, and Arab influences encouraging a 'corporate' household model.

2.3.2. Modern portfolio theory

The finance literature has long concerned itself with explaining how resources are allocated among multiple possible investments, offering valuable insights into livelihood diversification and strategy as a portfolio of activities. Instead of looking at the each investment separately,

³⁴ The origin of this term is unclear; any similarity with complexity theory is thought to be unintentional. 'Complex' household formation is frequently documented in Latin America and the USA in order to distinguish from the nuclear family (Schwede *et al.* 2005). Other authors use the terms 'extended' (Laslett 1972) or 'cluster' household (Wilk 1984). The francophone literature usually uses the term extended household (*famille élargie*). For simplicity, these households are referred to as 'extended' in this thesis.

modern portfolio theory (MPT), developed in the 1950s, takes a systems-based approach examining the whole 'portfolio' of investments (Elton and Gruber 1997, Markowitz 1952). Risk is defined as the standard deviation of expected returns. The level of cumulative risk is modelled as the weighted combination of assets, with the return of a portfolio being defined as the weighted combination of the assets' returns. Portfolio volatility is a function of the correlations of all portfolio components. MPT predicts which combinations should be chosen to reduce the total variance of the portfolio return. Diversification of investments should take place if (i) there is more than one investment option, (ii) all investments are subject to risk, and (iii) the value of the investments do not co-vary; meaning that the same economic conditions will not affect all investments equally (Fraser *et al.* 2005). Diversification is predicted to reduce the idiosyncratic risk associated with individual investments; the remaining co-variant risk is common to all investments and is therefore equated with the risk (the standard deviation) of the portfolio. MPT assumes that markets are efficient without any information asymmetry, and that investors are rational, risk-averse and utility-maximising.

Apart from critiquing the general assumptions underlying neo-classical economics, MPT has been widely criticised within the field of behavioural economics, highlighting that investors rarely have accurate information regarding the possible returns of their investments (Daniel *et al.* 2001). It is also noted that using the standard deviation of return as a proxy for risk is only valid if asset returns are normally distributed, which is rarely the case in real markets³⁵. Lastly, MPT assumes that correlations between assets are fixed and constant, yet especially during a shock such as a financial crisis, these correlations have been found to change. In other words, MPT breaks down precisely when investors are most in need of protection from risk.

Despite these drawbacks, the general concepts underlying Modern Portfolio Theory have found their way into other disciplines (Chandra and Shadel 2007, Marinoni *et al.* 2011). Its concepts are also applicable to the livelihoods analysis because resources (labour, time, money) are invested into multiple activities. As a result, portfolio theory, with its underlying principle of risk minimisation, can provide an analytical framework for examining a livelihood system as a whole (Fraser *et al.* 2005). When applying the same principles to livelihood analysis, it becomes clear that livelihood diversification is not a viable option in the face of co-variant shocks such as large-scale drought or war. This contradicts the view pervasive in the disciplines discussed above, that diversification always reduces the risk of livelihood failure. Portfolio theory qualifies this statement, stressing that diversification into a new livelihood strategy only reduces the risk of livelihood failure, if that new strategy is less susceptible to the

³⁵ Post-modern portfolio theory extends MPT by adopting non-normally distributed, asymmetric measures of risk (Rom and Ferguson 1994).

shock in question. For example trees are less susceptible to drought than crops due to their deeper root system. As a result, increasing access to forest-based foods would increase the resilience of food provision, as crop-based and forest-based foods are not subject to drought risk to the same extent. Conversely, a tree – a long-term asset – is liable to lightning, fire and cutting for wood and timber in the way that arable land is not. Similarly, it is suggested that spatial diversification can contribute to risk reduction if the spatial range of activities is larger than that of the climate shock, while temporal diversity is used to swap from activities that co-vary with the climate shock to other activities with a lower co-variance (Goulden 2006). By drawing on entitlement theory, it remains clear that livelihood diversification can only reduce the risk of livelihood failure if the underlying assets remain accessible and if there are enough opportunities to convert these assets into food (Maxwell and Smith 1992).

Though conceptually useful, it is difficult to quantitatively apply MPT to livelihood analysis, due to a lack of reliable panel data from which to calculate co-variances. There are few examples where portfolio theory has been explicitly applied to livelihoods or food security. One study demonstrated quantitatively that planting a variety of crop types in Spain reduced revenue loss as a result of climate change (Werners *et al.* 2007). Another examined the relations between ecological risks and returns in the provision of ecosystem services for British farmland using MPT (Abson and Termansen 2011). While designing a quantitative livelihoods model is beyond the scope of this thesis, the application of some of the principles underlying MPT are discussed in Section 2.3.3.

2.3.3. Socio-ecological resilience

Similarly to financial theory, ecology has concerned itself with examining the combination of ‘units’ (in this case species) which make whole systems most resilient to shocks, helping the ecosystem recover quickly after hurricanes and other natural disasters. Resilience is one of the emergent properties often ascribed to complex systems. The term ‘resilience’ can be employed as a conceptual framework, or as a measurable property of dynamic systems (Carpenter *et al.* 2001:765). With regard to the latter, however, there is no single testable theory or hypothesis for resilience, as the term refers to a loosely organised cluster of concepts, each one related to some aspect of the interplay of transformation and persistence (Carpenter and Brock 2008). When testing resilience as a measurable property, each study must carefully define which aspect of resilience is being addressed. Most models of resilience focus on the capacity to transform and adapt to change (Carpenter and Brock 2008). The same approach is adopted here.

While originally intended only for ecological systems, resilience theory is increasingly applied to socio-ecological systems (SES), referring to social structures with a strong link to environmental factors. The rural natural resource based livelihoods studied in this thesis are an example of SES. Incorporating social and ecological systems in a single complex systems model for sustainability is justified and supported by numerous evidence of the co-evolutionary nature of social and ecological systems (Norgaard 1994). For example pastoral livelihoods constructed under highly variable rainfall regimes are organised around the management of variability and unpredictability in fodder availability (Niamir-Fuller 1998). Resilience thinking emphasises the importance of encouraging adaptive capacity in feedback mechanisms between social and ecological systems (Tompkins and Adger 2004).

Resilience as a measurable property of socio-ecological systems

For the purposes of quantifying the resilience of ecosystems, resilience has been defined as the capacity of the ecosystem to tolerate disturbance³⁶ and still maintain its essential functions (Gunderson and Holling 2002, Holling 1973). As such, the exact (species) composition of the system changes following a disturbance, but the system still maintains certain key properties. This is analogous to the combination of livelihood strategies changing, while the living standard to which they contribute remains unchanged.

The long-term study of ecosystems has revealed that change following a disturbance follows a predictable cyclical pattern. This adaptive cycle first entails the slow build-up of wealth in the absence of disturbance (foreloop), and then the reorganisation of elements following a disturbance (backloop), followed by a renewed accumulation of wealth (see **Figure 6**). Because disturbances occur again and again, the ecosystem is never at equilibrium, but undergoes recurring cycles of adaptation.

When designing operational indicators of resilience, one is cautioned that researchers carefully define at what scale resilience is measured, i.e. the resilience ‘of what’ as well as the resilience ‘to what’. “Just as resilience can be achieved in one time period at the expense of resilience in a succeeding period, resilience at one spatial extent can be subsidised from a broader scale” (Carpenter *et al.* 2001:767). Three quantifiable properties have been identified which shape the nature of the adaptive cycle over the spatial scale of one ecosystem (Holling 2001).

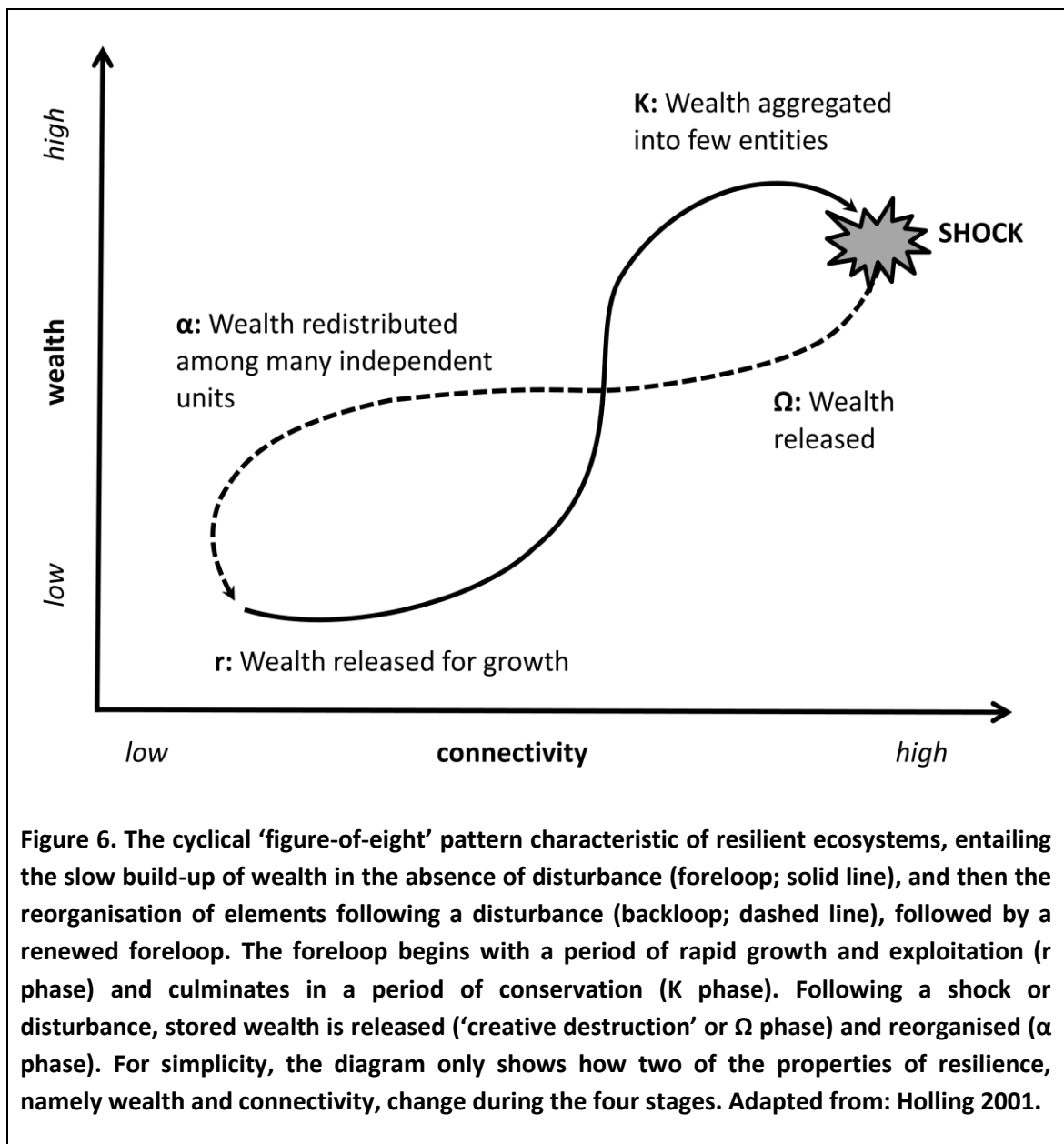
- (i) **Wealth:** If a system has more resources (biomass), then more can be destroyed by a shock.
- (ii) **Connectivity:** If a system’s components are tightly connected to and thus dependent on each other, it makes the system more efficient, but less flexible and able to adapt. Similarly

³⁶ The term ‘disturbance’ in the ecology literature equates to ‘shocks’ in the economics literature.

to a row of dominos spaced too closely together, shocks affecting one component of the system can reverberate through the whole system.

- (iii) **Adaptive or buffer capacity** determines how vulnerable the system is, based on its capacity to reorganise its elements into a new form, which is less exposed to a given shock.

All three properties change during the adaptive cycle (see Figure 6). Stored wealth accumulates during the foreloop. Simultaneously, connectivity increases as the system becomes increasingly specialised and 'top-heavy', while buffer capacity declines. Following a disturbance, stored wealth is released and declines during the backloop, with buffer capacity increasing and connectivity declining, as released wealth is reorganised into different units.



When applying these principles above to socio-ecological systems (SES), social resilience has been termed as “the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change” (Adger 2000). In this context, a ‘resilient’ livelihood would be one that is able to maintain its standard of living in the face of change. Few studies have attempted to translate the three characteristics listed above for non-ecological systems in a quantitative manner. The three quantitative indicators suggested by Evan Fraser *et al.* (2005) for assessing the vulnerability of food systems are discussed below, and tested in this thesis (see Chapter 7).

The first indicator captures the wealth of the system. In the case of ecosystems, this stored wealth refers to the biomass stored within an ecosystem. As an ecosystem accumulates biomass during the foreloop of the figure-of-eight, this biomass not only increases, but is aggregated among fewer units, meaning that species diversity declines (Holling 2001). This progression, however, makes the system more susceptible to shock. If a system contains more biomass, for example in the form of a dense forest, then more can be destroyed by a shock such as a forest fire. At first glance, this analogy can be easily applied to livelihood systems. If a household stores a high proportion of its wealth as physical assets such as houses, livestock and cereal granaries, more of this wealth can be destroyed following a fire or flood. Development theory, however, highlights that wealth is not only stored in form of tangible capital, but also as intangible capital (knowledge, social networks etc.). Similarly, entitlement theory distinguishes between the food a person is entitled to, and the actual ‘commodity bundle’ of food a person consumes (Dreze and Sen 1991). As such, wealth with regard to achieving food security can be defined as the sum of a person’s food entitlements. Fraser *et al.* (2005) suggest using the sum of potential entitlements through which an individual or household can obtain food, as an indicator of ‘wealth’. Similar to the wealth stored in an ecosystem, food entitlements can be disrupted following a shock, for example with drought affecting production entitlements and market shocks affecting trade-based entitlements. However, crucially, as long as a household can switch *between* entitlements, the impact of a shock can be lessened. This aspect is not covered by the indicator proposed by Fraser *et al.* (2005). In contrast, instead of using the sum of *potential* entitlements as an indicator, using the diversity of *realised* entitlements would better reflect the process described for ecosystems. If entitlements are not diverse – for example if a household only had access to home-grown food – this would make the household more vulnerable to a production shock than if it had access to home-grown food *as well as* purchased food on the market. The suitability of this diversity indicator is tested and discussed in this thesis (see Chapter 7, Section 7.2.4).

The second indicator captures the connectivity of the system, describing the interdependence of different elements within an ecosystem. For socio-ecological systems, it has also been termed as the degree to which the system is capable of self-organisation, rather than being shaped by external factors or being disorganised (Carpenter *et al.* 2001). Connectivity refers to the internal factors of a system which affect how flexible the system is. Slightly confusingly, Fraser *et al.* (2005) term this 'diversity'. They suggest using modern portfolio theory, discussed in Section 2.3.2, to capture the interdependence of different elements (Fraser *et al.* 2005). As long as covariance between elements is avoided, the different elements can be combined to buffer shocks. This captures the importance of being able to switch between different entitlement channels, as discussed previously. However if a livelihood is too dependent on one livelihood activity, and that activity is affected by a shock, the whole livelihood system is affected. This concept has been used to explain the demise of Norse Greenlanders, concluding that the farming system imposed by the Norwegian settlers was too rigid and specialised for the highly variable and risk environment of Greenland (Dugmore *et al.* 2009).

The third indicator captures the adaptive capacity of the system, describing how vulnerable the system is, based on its capacity to reorganise its elements into a new form which is less exposed to a given shock (Holling 2001). In ecosystems, adaptive capacity is characterised by the opportunities for innovation which arise after a disturbance. For socio-ecological systems, it has been described as the capacity for learning and adaptation occurring within the system (Carpenter *et al.* 2001). In the case of livelihood systems, this can be understood as the opportunities to undertake new or different livelihood strategies. Fraser suggests the presence of transport networks as an indicator because it represents the links between rural and urban systems (Fraser *et al.* 2005). In my opinion, this indicator is inappropriate as it captures the relationship *between several* systems (in this case rural and urban) and does not capture the capacity for innovation present *within one* system. In order to accurately measure resilience, it is vital to choose three indicators which operate at the same scale (Carpenter *et al.* 2001). An alternative indicator for capturing the adaptive capacity present at the spatial scale of one livelihood system is proposed and tested in this thesis (see Chapter 4).

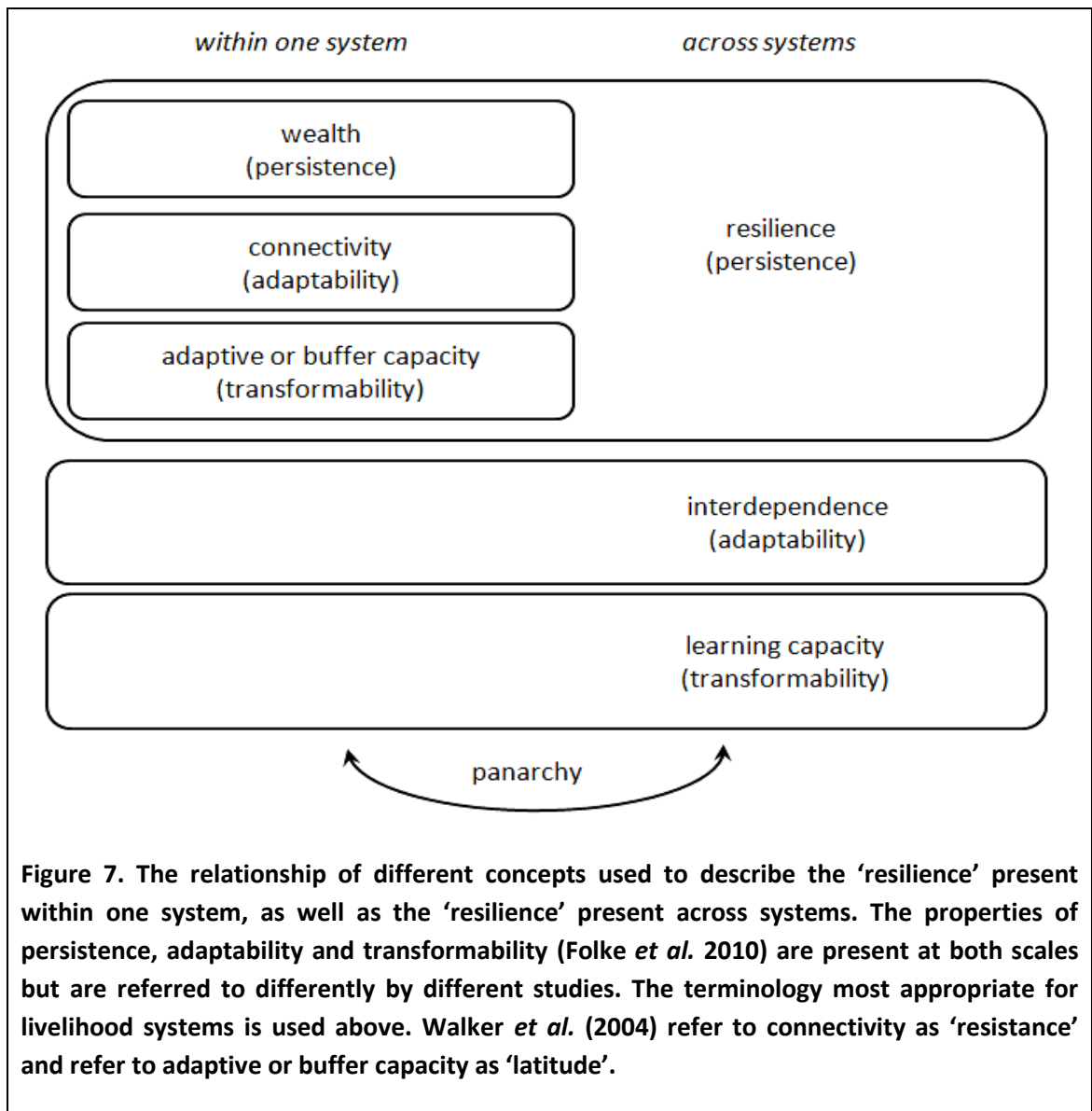
Untangling these three elements, and what they mean in the case of livelihood systems, remains a major challenge. Livelihood systems differ from ecosystems in the important element of foresight (Holling 2001). Human foresight can dramatically reduce the connectivity present in a system, simply by foreseeing the drastic effect that selling all one's livestock has on other interdependent livelihood sectors, for example. However, are all linkages foreseeable? What are the limits to an individual's capacity to forward-plan? These are some of the nuances explored in this thesis (see Chapter 7, Section 7.3).

Resilience as a conceptual framework

It is paramount to understand how the concepts above interrelate and how they behave across different scales. As mentioned, definitions of resilience vary depending on the spatial scale which they refer to. The quantitative indicators above relate to the spatial scale of the livelihood system of one family or household. However, resilience dynamics are also evident *across* livelihood systems, such as the livelihoods of several families, several villages, or even several regions. While it is more difficult to quantify resilience at higher spatial and temporal scales, the concepts described above still apply. Furthermore, processes at different scales are interrelated – a characteristic described as panarchy³⁷. It refers to the degree to which a certain hierarchical level of an ecosystem (a trophic level) is influenced by other levels, stressing the importance of interactions within a system as well as across systems (Walker *et al.* 2004).

Carl Folke *et al.* (2010) provide a useful overview of how the three different processes characterising resilience relate across scales. They describe resilience as “the tendency of a system subject to change to remain within a stability domain, continually changing and adapting yet remaining within critical thresholds. Adaptability is a part of resilience. Adaptability is the capacity of a [system] to adjust its responses to changing external drivers and internal processes and thereby allow for development within the current stability domain, along the current trajectory. Transformability is the capacity to create new stability domains for development, a new stability landscape, and cross thresholds into a new development trajectory” (Folke *et al.* 2010:6). Adaptive or buffer capacity at smaller scales enables resilience at larger scales. The capacity to adapt at smaller scales draws on resilience from multiple scales, making use of crises as windows of opportunity for novelty and innovation, and recombining sources of experience and knowledge to enable change (Folke *et al.* 2010:1). To facilitate understanding, I have organised these concepts graphically to explain how they relate across different scales (see **Figure 7**). It is vital to understand that two seemingly contradictory concepts – persistence on the one hand, and adaptation and transformation on the other hand – characterise resilience. How these antonyms relate in livelihood systems is explained below.

³⁷ The term ‘panarchy’, coined by Holling, describes a non-hierarchically organised system, governed (-archy) by unpredictable change, as personified through the Greek god Pan (Holling 2001).



Concepts of adaptation and transformation

Adaptation and transformation relate to different processes governing change, allowing a system to respond to changing external drivers as well as internal processes. As discussed previously, at the level of a single livelihood system, the processes governing change can be constrained by a high interdependence of elements (connectivity). However, the same process also acts across systems. Two highly interdependent livelihood systems can both benefit from spreading risk across more than one system, but can also both be negatively affected if one is affected by a shock. This aspect is partially captured by ‘social capital’ in the SLF. A wide social network can be both a capital liability as well as a capital asset. This principle has also been demonstrated in the financial realm, where high interdependence between the financial

systems of different countries can result in them being affected by a mortgage crisis in just one of these financial systems.

A high interdependence between systems can abruptly force a change. However there is a second process at work that enables change. This is characterised by the capacity to innovate and reorganise elements into a new constellation. The capacity to reorganise elements is evident in the relationship between every successive figure-of-eight. An ecosystem is said to possess 'memory' of previous constellations by discarding any unsuccessful adaptations, thus 'learning' from them (Holling 2004). As a result, the system does not follow the same figure-of-eight trajectory every time. This is analogous to livelihood systems referred to as 'resilient' precisely because they are regularly exposed to shock, have learned from them, and use the strategies which work best (Mortimore and Adams 1999).

Nonetheless, there are important differences between ecosystems and livelihood systems. It is generally agreed that an ecosystem, apart from some isolated suggestions to the contrary³⁸, is not a sentient entity. As such, the 'memory' evident in ecosystems is the result of unsuccessful adaptations being repeatedly discarded, only leaving the successful ones. It is not a conscious process, but one of the 'emergent' properties of complex systems. In contrast, the learning process crucial to determining trajectories of change in social systems is at least partly conscious. Similarly to ecosystems, unsuccessful trajectories simply perish, akin to the Norwegian settlers attempting to farm in Greenland. However, the lack of communication between elements of an ecosystem results in change occurring *faster* in social systems than in ecosystems (Holling 2001). Through the medium of communication, learning takes place both within the livelihood system of a single household, across systems existing at the same time, as well as across time in the form of stories and fables which communicate previous successful or unsuccessful strategies. More research is called for to elucidate the role of communication in governing change.

The concept of persistence

In contrast to sustainability, resilience is not a normative concept; it can be desirable or undesirable (Carpenter *et al.* 2001). Resilience not only relates to the capacity to enable change but also to persistence; the capacity to withstand change. However, withstanding change is not always desirable. To use an analogy from social systems, in the case of persistent dictatorships, change is preferable and persistence undesired. Two persistent undesired states

³⁸ Some of the more radical proponents of James Lovelock's Gaia Hypothesis consider the planet earth to be a sentient being.

are distinguished in ecology; rigidity traps and poverty traps (Holling *et al.* 2002). These are akin to getting 'stuck' at the 'K phase' or at the 'r phase' of the figure-of-eight, respectively.

A rigidity trap is characterised by low potential for change, high connectivity, and high persistence – for example an old-growth forest. An analogy in social systems is the Hindu caste system, where institutions become highly connected, self-reinforcing, and inflexible (Berkes and Folke 2002). As concluded from the study of ancient Anazazi, Byzantine and Mayan societies; “as a society increases in complexity, the investments in resource extraction, administration, organisation, and defence increase. In the beginning, an increase in complexity is favourable, but there is a decreasing rate of return. This will make the society prone to collapse, because diminishing returns make complexity less attractive and increasing costs of solutions [such as higher taxes] breed disaffection” (Janssen and Scheffer 2004:2).

In contrast, a poverty trap describes a situation in which connectivity and persistence are low, and the potential for change is not realised (Allison and Hobbs 2004). In psychology, it is analogous to manic behaviour of individuals characterised by a rapid generation of ideas, but little capacity to focus on a primary idea and move it forward (Westley *et al.* 2007). In social-ecological systems, a poverty trap can exist in situations of chronic, recurring disaster (Erikson 1995). It is evident that both too infrequent and too frequent disturbances are undesirable, with the former leading to a rigidity trap and the latter to a poverty trap (Carpenter and Brock 2008). More research is needed on the processes which can 'trap' a livelihood system in a persistent undesired state.

Combining persistence and change

In summary, the concept of 'resilience' encompasses both persistence and change. At first glance, the concept of 'resilience' is similar to 'sustainability'. As discussed above, a 'resilient' livelihood would be one that is able to 'persist' and maintain its standard of living in the face of change. A 'sustainable' livelihood is able to successfully “cope with and recover from stress and shocks and maintain or enhance its capabilities and assets” (Chambers and Conway 1992:10). However, these definitions reveal several nuances. Firstly, the latter makes the normative judgement that the living standard should be maintained or improved, while the former only implies the current state is maintained, whether it is preferred or not. Secondly, the term 'sustainability' implies a 'responsible' use of assets with which to construct a livelihood in the face of change, while 'resilience' does not. A 'resilient' livelihood accommodates 'irresponsible' asset depletion in the short-term as long as it contributes to livelihood construction in the long-term, taking into account the cyclical nature of asset

accumulation cycles. As such, the concept of resilience encompasses both transformation at smaller spatial and temporal scales, as well as persistence at higher spatial and temporal scales. In contrast, the concept of sustainability focuses only on persistence, while the concept of adaptation – for example in the climate change literature discussed previously – focuses only on transformational change.

It remains to be seen how useful the concept of resilience is for understanding livelihood construction and how it can contribute to designing a quantitative tool for livelihood analysis. The section above has raised many aspects which call for further research. As enquired by Folke *et al.* (2010:4) “what are the features of agency, actor groups, social learning, networks, organisations, institutions, governance structures, incentives, political and power relations or ethics that enhance or undermine social-ecological resilience? Are there deeper, slower variables in social systems, such as identity, core values, and worldviews that constrain adaptability?” Testing the applicability of the resilience concept to Sahelian livelihoods is the essence of this thesis (summarised in Chapter 8, Section 8.1).

2.4. Research framework

The preceding sections have raised a number of theoretical and practical issues. Three points emerge that are salient for livelihoods analysis in Burkina Faso. All of them refer in some form to the importance of spatial and temporal scale in analysis.

- (1) The negotiation of food entitlements must be examined within the wider livelihood system, in order to take into account not only the objective of food provision, but also wider livelihood objectives such as welfare and family solidarity. Such an approach allows strategies such as ‘coping’ with wild foods to be examined within objectives wider than simple food provision.
- (2) Analysis of strategies cannot be carried out at one moment in time, but must be seen in the context of past and future strategies. Resilience theory stresses the importance of focussing on the functioning of the whole livelihood system, instead of only on smaller inter-annual asset and income fluctuations. Learning is an important part of adaptive strategies. Ideally, analysis would be carried out over several years or over several generations. Due to logistical reasons, the time span of one year was chosen for fieldwork and data collection, examining how strategies are combined over this temporal scale. One year represents a functional unit; a full agricultural cycle.

- (3) The ‘strategy’ of one household cannot be examined in isolation, but must be seen within the on-going process of bargaining taking place within the larger family compound. Interrelated strategies are evident at different relational levels: from the individual, the wife sub-unit, to household, to the family compound.

Bearing these in mind, research design was undertaken in several stages. As a first step, insights from the economic, nutritional and climate change literature were used to characterise the negotiation of food entitlements. As a second step, principles of socio-ecological resilience were adapted to livelihood systems, to propose an analytical framework with which to assess the resilience of the livelihood system. As a third step, these threads were drawn together to form a coherent research framework (see Table 11). The research questions were used to identify data requirements and suitable research methods (Chapter 4). The research questions were approached by comparing and contrasting the narratives emerging through different methodological ‘lenses’.

Table 11. The research questions and their corresponding chapters.	
Research questions	Thesis chapter
How is livelihood diversification manifested in the local context?	<p>Chapter 5: characterisation of the livelihood system (assets, income, expenditure, food sources) and its seasonal flux</p> <p>Chapter 5: analysis of ‘coping’ within wider food entitlements</p> <p>Chapter 6: analysis of food entitlements within wider livelihood objectives</p> <p>Chapter 7: quantitative analysis of livelihood diversification</p>
How does a household’s role within the wider family compound influence its food security strategy?	Chapter 6: analysis of the negotiation of household food entitlements within the wider family compound
How is resilience constructed over the whole agricultural cycle?	Chapter 7: analysis of food strategies over temporal scales

In summary, this thesis investigates the ability of households to ensure their food security year-round. Analysis moved beyond the examination of individual strategies, focussing on the ability of the whole livelihood system to buffer seasonal food shocks. As such, it operationalises the SLF in a dynamic environment by identifying the processes through which different livelihood strategies are combined to ensure a given livelihood objective. First, the thesis investigates how livelihood diversification is manifested in the local context. This research question was chosen to shed light on conflicting narratives in the literature relating to

the beneficial and detrimental effects of livelihood diversification. Secondly, the negotiation occurring between households within the same family compound is examined, assessing the influence such power dynamics have on food security strategy. Thirdly, a quantitative analysis is proposed and tested to assess how resilience is constructed over the whole agricultural cycle. In this thesis, resilience is defined as the ability of individuals and groups of people to maintain their food security in the face of seasonal socio-economic and environmental shocks. Nutritional aspects of food security were not the main focus of the thesis, concentrating on the *process* through which food security was, or was not, achieved, instead of the final *outcome*; the nutritional status itself. As such, the thesis does not explore how the outcome of food security was affected once the buffer capacity of the livelihood system was exhausted, assessing any 'thresholds' of resilience. Instead, the thesis focuses on the individual's heuristic whereby alternative livelihood strategies are assessed and chosen. This cognitive process is poorly understood, particularly in risky and uncertain contexts such as the Sahel. According to the risk literature, the cognitive process is dominated by risk minimisation and 'cautious' behaviour. This thesis explores if the same narrative applies in the CDR context of Burkina Faso.

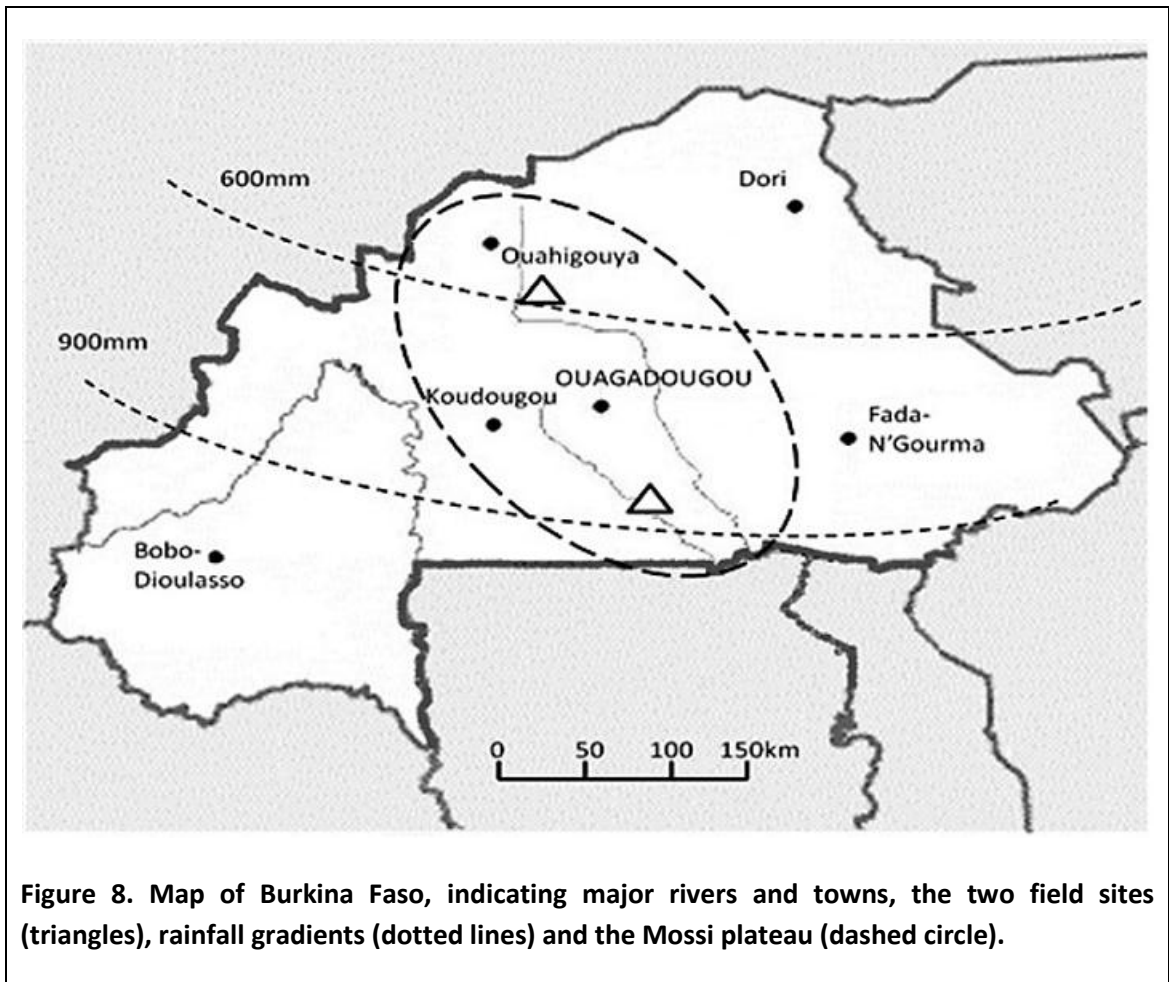
Chapter 3: The socio-economic, political and environmental characteristics of the Mossi Plateau

This chapter presents the rural CDR context within which the thesis is situated. Burkina Faso is a land-locked country in the centre of West Africa, located in the semi-arid transition zone south of the Sahara Desert. A French-speaking country roughly the size of the United Kingdom (274,000 km²), it has an estimated population³⁹ of 15.8 million, of which 81% was rural at the time of the 2006 census (EIU 2009, WB 2009a). This chapter focuses on the central region of Burkina Faso known as the Mossi Plateau, where the two study sites of this thesis are located (see **Figure 8**). The Mossi are but one of 60 ethnic groups that inhabit Burkina Faso (Englebert 1996). They are however the largest ethnic group, comprising roughly half of the total population (INSD 2009). The Mossi are characterised by a highly hierarchical society and closely-knit social structures, partly accounting for the unusually high population density on the Mossi Plateau. It is important to bear in mind that the conclusions drawn from the study sites cannot necessarily be generalised for the rest of the country, as different ethnic groups vary greatly both in the social structure and in the ecological characteristics of their area.

The CDR context of Burkina Faso is presented in several sections. First, the variable environmental conditions are outlined which influence rural livelihoods. These include long-term predictions of climatic change. Secondly, the agrarian system – the dominant component of rural livelihoods – is presented. Agriculture is the largest sector of the national economy, however due to distribution problems, several provinces suffer from a cereal shortage every year. Thirdly, the macroeconomic conditions which influence rural livelihoods are outlined. These macroeconomic conditions contribute to making Burkina Faso one of the poorest countries in the world, ranking 177th out of 182 countries in the UN's 2009 Human Development Index, with 44.5% of the population living below the national poverty line (UNDP 2009). Finally, the socio-political factors which influence the organisation of rural life are

³⁹ The national census, the "*Recensement Général de la Population et de l'Habitation*" (RGPH), is carried out approximately every 10 years, with the last one undertaken in 2006. Projections for 2009 vary by 2-9% between the IMF, WB, EIU and the INSD.

presented. This includes a brief overview of Burkinabé⁴⁰ political history, as well as the social structures which govern access to land and other key resources relevant to rural livelihood construction. All sections below are comprised both of personal observations and statistical data collated from various secondary sources. In the case of the latter, the data were carefully examined and critiqued, with any inconsistencies mentioned.



3.1. Environmental characteristics

3.1.1. Rainfall and water resources

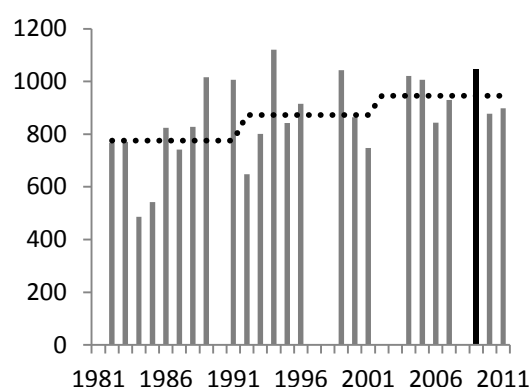
The Burkinabé climate is dominated by a short rainy season, lasting from May/June to September/October depending on the latitude, followed by a long dry season. At a national level, annual rainfall varies between 400-1100mm, with a decreasing rainfall gradient from south to north (Fontès and Guinko 1995). The study sites were chosen to exhibit contrasting rainfall regimes, with the northern site (Yatenga province) receiving an average of 613mm per

⁴⁰ In this thesis, the francophone adjective 'Burkinabé' is used to denote someone or something relating to the nation of Burkina Faso.

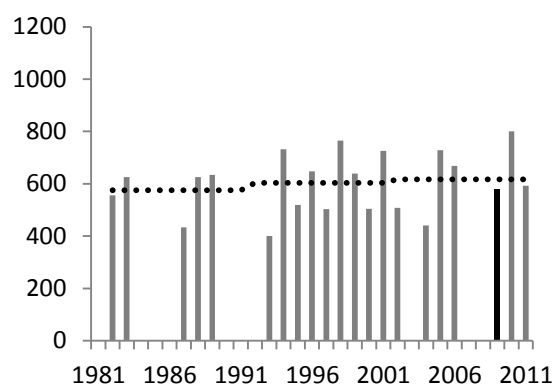
year, and the southern site (Zoundwéogo province) receiving an average of 921mm per year. Rainfall trends are discussed in more detail below.

During the long dry season, the population relies mainly on subterranean water reserves accessed through wells. Due to the high evapotranspiration rates, all but the largest rivers quickly dry out in the dry season⁴¹. Evapotranspiration rates are driven by high temperatures, which average 30-35°C during the day in the dry season. Temperatures frequently reach 45°C in April, the hottest month. In addition, the persistent Harmattan winds, blowing down from the Sahara Desert from January to February, dry out the soils. The Mossi distinguish between six distinct seasons: dry cold season (February); dry hot season (March – April); first rains (May); rainy season (June – July); lean season (August – September); and harvest season (October – January).

Table 12. Rainfall variation for the two study sites, indicating annual rainfall as well as decadal averages (dotted line). These were calculated using the daily rainfall data published by the National Metrological Service, which contained considerable missing data (blank years). The 2009 rainy season, which determined the cereal reserves examined in this thesis, is shaded black.



Annual rainfall (mm) for the town of Nobéré, in Zoundwéogo province.



Annual rainfall (mm) for the town of Séguénéga, in Yatenga province.

Examining long-term trends suggests that rainfall has been steadily increasing since the Sahelian droughts of the 1970s (see **Table 12**). However, such a trend masks considerable interannual variation, with rainfall varying on average $\pm 19\%$ and $\pm 17\%$ for each study site, respectively. The annual rainfall in 2009, which determined the cereal reserves examined in this thesis, was 10% above average in Nobéré and 6% below average in Séguénéga.

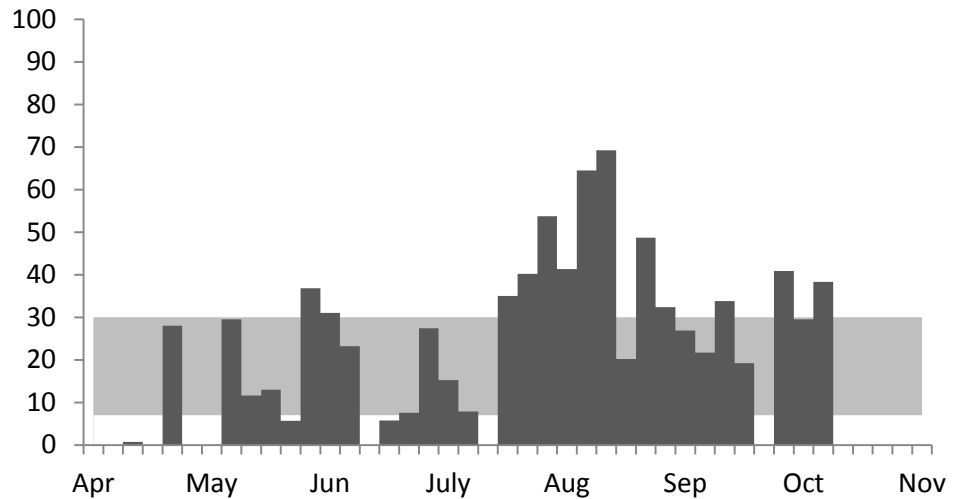
⁴¹ The Nakambé River (formally known as the White Volta River) which runs through both study sites dries out near the end of every dry season.

Annual averages mask considerable variation in both the intensity and the frequency of rainfall events. Drought pockets occurring during a critical crop growth period can have catastrophic effects on the harvest, as more than five consecutive days without rain can cause acute drought stress on sandy soils. Similarly, intensive rainfall at critical times in the crop growth cycle can be equally harmful. Intense rain while the crops are flowering reduces pollination. Intense rain during the harvest period results in damp grains which are difficult to store and can become infected by mildew.

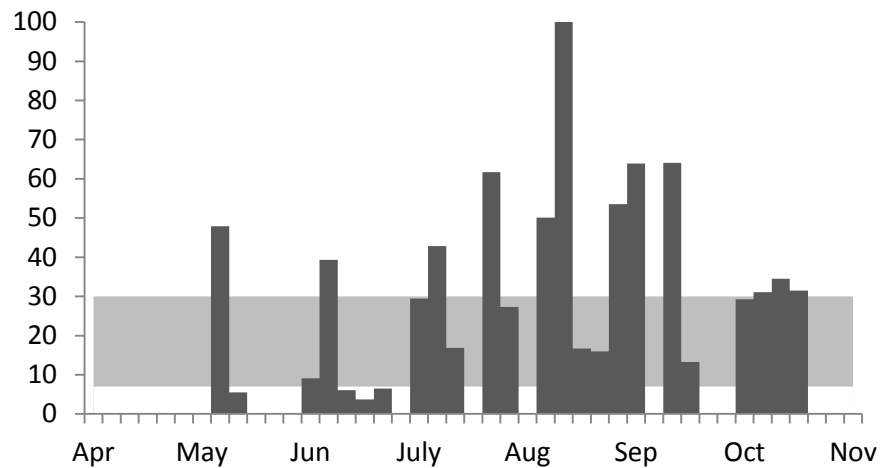
Reporting days of rain instead of annual averages would reveal drought pockets occurring in the middle of the rainy season, as well as the high variation in the date of the first rains. Over the last three decades, the rainfall reported in the graphs above has fallen over the course of 25-51 days (Séguénéga) and 38-75 days (Nobéré). Disaggregating the data by days of rain demonstrates how erratic rainfall is over the average six months (184 days) of the rainy season from May 1st to October 31st. The effect of rainfall on crop growth can be assessed via changes in the length of the growth period (LGP), defined as the number of days in any given rainfall season when there is sufficient water stored in the soil profile to support crop growth (Cooper *et al.* 2009). The extent of water stored in the soil profile is not only based on incoming rainfall, but also on daily soil evaporation rates, crop transpiration rates and the ability of soil to store water in the rooting zones (*ibid*). A five-day period with sufficient cumulative rainfall to support crop growth is termed a wet pentade. Disaggregating the 2010 data shows that crop yields were higher in Nobéré not because of a higher annual total of rainfall, but because more pentades fell within the ideal range than in Séguénéga (see Figure 9). Note that, despite a lower annual rainfall total, Séguénéga experienced more instances of high rainfall than Nobéré did, resulting in water-logged soils and crop damage. This analysis demonstrates the considerable variation in intensity and duration of rainfall, which influences the farmer's decisions on when and what to plant. National statistics are inadequate for examining the effect of variable rainfall on the farmer's decisions. Not only is rainfall reported over an inappropriate time period⁴², but rainfall data for each province is reported based on the rainfall of the main town of the province, masking the considerable spatial variation in rainfall. Villages separated by a few kilometres can have vastly different rainfall totals, as local factors such as prevailing wind patterns, surface temperature and relief largely determine the path of rain-bearing clouds and the release of precipitation.

⁴² The National Meteorological Service publishes cumulative 10-day rainfall. While this is an improvement over monthly or annual averages, it understates the surface moisture lost to evaporation. Daily rainfall data is only available with special permission.

Figure 9. Cumulative five-day rainfall for the two study sites over the course of 2010, with the shaded area indicating the ideal range based on standard water infiltration rates in sandy clay soils (Chevallier and Valentin 1985). Cumulative rainfall falling within the ideal range for crop growth is termed a wet pentade, less than the ideal range is termed a dry pentade, and rainfall above the ideal range results in surface run-off, and flooding in more extreme cases, because the soil is saturated.



Cumulative 5-day rainfall (mm) for the town of Nobéré in Zoundwéogo province, totalling 10 dry pentades, 15 wet pentades and 11 flooded pentades between May 1st and October 31st.



Cumulative 5-day rainfall (mm) for the town of Séguénéga in Yatenga province, totalling 16 dry pentades, 8 wet pentades and 12 flooded pentades between May 1st and October 31st.

3.1.2. Soil fertility

Over 80% of the country, including the Mossi Plateau, lies on a vast, flattish plain of an altitude of 250-300m. The landscape is characterized by low hills capped by ferruginous crusts, with gentle slopes falling to valley bottoms known as *bas-fonds*. According to 1970s research by IRD/ORSTOM synthesised by Fontès and Guinko (1995), this area is dominated by leached ferruginous soils and erosion soils derived from pre-Cambrian granite. Both have a sandy surface horizon (15-20 cm) and an underlying clay horizon, resulting in poor drainage and poor root penetration. Most soils are shallow and contain few nutrients due to the low percentage of clays and organic matter in the surface horizon. This low inherent fertility is because of the extreme age of the parent materials, and their chemical makeup (Ford 1982:144).

Due to the low fertility of the soil, farmed land is left fallow for a certain period to allow it to recover its nutrients. Vegetation cover is paramount to this restoration of soil fertility, with shrubs and trees quickly reclaiming fallow ground. There is little ‘untouched’ vegetation left in Burkina Faso. The majority of the country is covered by what is termed as ‘agroforestry parkland’⁴³. Such vegetation is the result of traditional extensive agricultural practices which involve the selective clearing of natural vegetation when establishing crop fields. The result is fields dotted with a few dozen trees per hectare, surrounded by fallow land covered more densely with shrubs and trees. This semi-natural system has been described as good examples of traditional land use systems and biodiversity management practices (Boffa 1999, Lovett and Haq 2000, Schreckenberg 1999). Nonetheless, rising population density has increased the area converted to farm land and reduced the length of the fallow cycle, with an average of 110,500 hectares of dry forest (7.67%) converted every year (MAHRH 2002).

3.1.3. Long-term climate trends

The climate of the Sudano-Sahelian transition zone, where the Mossi Plateau is located, has remained arid for the last 2,500 years, though historical studies of West African climate show multi-decadal swings in rainfall going back for centuries (Wickens 1997). Ecologists have discarded the notion that the Sahelian climate is at equilibrium, noting the variability of the climate (Fairhead and Leach 1996). Decadal rainfall was low in the 1920s, 1970s and 1980s, provoking several periods of crop failure and food shortage. Isohyets have shifted 100km south since the 1960s. Such climatic change triggered a widespread fear that the Sahara Desert was advancing south as the Sahel dried out. However climatic cycles are too erratic to

⁴³ Agroforestry parkland systems in West Africa were first described as ‘farmed parkland’ by Pullan (1974), and later as one of the many agroforestry systems observed all over the world (Nair 1985).

conclusively demonstrate a long-term downward trend. In the study sites, average rainfall has increased since the 1970s (see Table 12).

It remains unclear how climate change will affect temperature and rainfall regimes in Burkina Faso. Projections show a temperature increase ranging from +1.8°C to +4.7°C for West Africa by the year 2090 (scenario A1B), and a rainfall change ranging globally from -9% to +13%, with no agreement among models on the sign of the change (Pachauri and Reisinger 2007). For West Africa, especially the landlocked Sudano-Sahelian countries, these temperature increases are much larger relative to precipitation changes, with rainfall totals typically falling within the historical standard deviation (Schlenker and Lobell 2010). However, the analysis undertaken in Section 3.1.1 demonstrated that variations in total rainfall have less of a deleterious effect than increased variability in the timing and intensity of rainfall. The climate change predictions do not take this aspect into account. In September 2009, 243mm of rain (the equivalent of three months of average rainfall) fell on the capital, Ouagadougou, in the space of 12h, causing devastating floods. Similarly, three rural provinces received the equivalent of one month of rainfall in the space of a few days in July and August 2010, causing serious damage to houses and crops (MTPEN 2010). Conversely, other provinces experienced several dry spells in the middle of the 2010 rainy season (*ibid*). The higher variability of rainfall is predicted to significantly affect the length of the growth period (Cooper *et al.* 2009). An 18% loss of crop yields is predicted for the landlocked Sudano-Sahelian countries as a result of rainfall and temperature changes (Schlenker and Lobell 2010).

Regardless of how the climate will change over the coming decades, Sahelian people have developed a series of strategies which have allowed them to survive in this variable climate for centuries. The way they have adapted their agricultural system to navigate these climatic constraints is the topic of the next section.

3.2. Agricultural production

3.2.1. Main crop types

Of the 81% of the population who live in rural areas, the majority engage in a combination of farming and livestock keeping. Agriculture is mostly rain-fed, due to the shortage of permanent water courses for irrigation. Landholdings are highly fragmented, with the average extended household farming 9.6 plots of land, averaging 0.4ha each (EIU 2007). Both men and women participate in food production and farm separate fields (see Chapter 6, Section 6.1.1). Few inputs are used, with 30% owning a plough or traction animals and chemical fertilisers

only used on few cash crops (Thies and Janus 2008). The main staple crops are rain-fed sorghum and millet, with 1,875,000t and 1,255,000t harvested nationally in 2009. However the use of wells for irrigated vegetable gardening has expanded considerably, especially in the northern parts of the country. Maize is widely grown in wetter areas (1,014,000t harvested in 2009), and, thanks to public investment in irrigation projects, domestic rice production rose to 194,000 tonnes in 2009. The main export crop, cotton, has seen a major revival in recent years, with a record high of 740,000 tonnes harvested in 2007. As a result, Burkina Faso is the largest cotton producer in Sub-Saharan Africa.

3.2.2. Staple cereal production

At a national level, Burkina Faso is just about self-sufficient in staple cereal production, covering 105% of its food needs over the last decade (INSD 2009). However there are important regional differences, with the driest provinces only meeting 73% on average, the wetter provinces covering 129% and the region of Ouagadougou only meeting 13% of its food needs (*ibid*). Poor transport networks result in inadequate redistribution of this surplus, resulting in high regional price differences. Burkina Faso imports 320,000t of staples and receives 5,000t of food aid per year, compromising 6% of annual food consumption in 2009 (FAO 2009a).

Despite the majority of rural inhabitants growing their own food, only 19% can meet the entirety of their yearly food needs, either because their harvest was too low, or because they sold a large proportion of their harvest to cover cash needs (MAHRH 2009). The remainder of food needs are purchased. On average, 48-52% of rural income is spent on food (INSD 2009, MAHRH 2009) – a very large expense for a country where 44.5% of the population live below the national poverty line (UNDP 2009). According to Ministry of Agriculture, 85% of the rural population buy more food than they sell (INSD 2009), suggesting that net buyers are particularly affected by seasonal and regional price spikes (see **Figure 10**). These are driven by farmers selling their surplus after the harvest, lowering prices, and buying up cereals just before the next harvest (for example with the income of animals sold) to complement their dwindling stocks. However, national averages are not very helpful for understanding the strategies of farmers, which vary considerably between regions and within villages. Families differ in the amount and timing of cereals purchased, often taking advantage of the same seasonal price swings that are apparently to their detriment. These strategies are discussed in detail in Chapter 5.

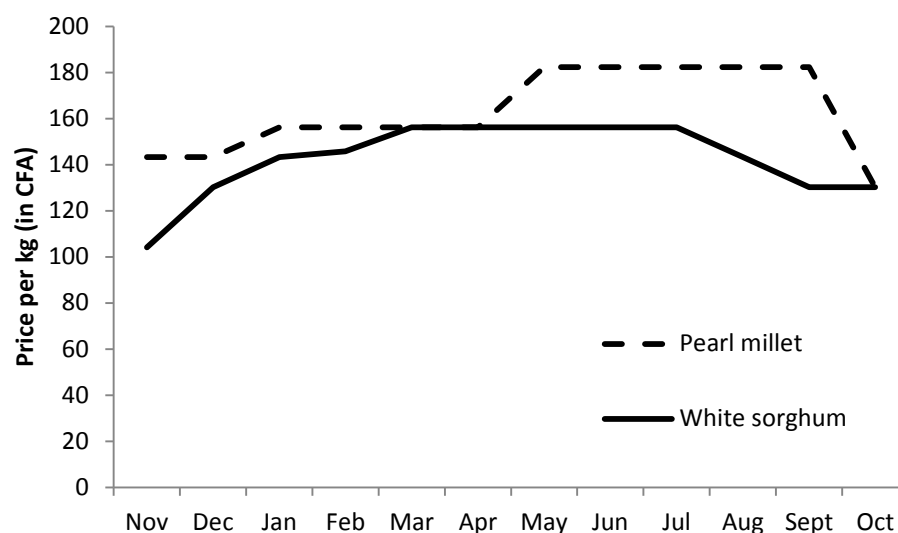
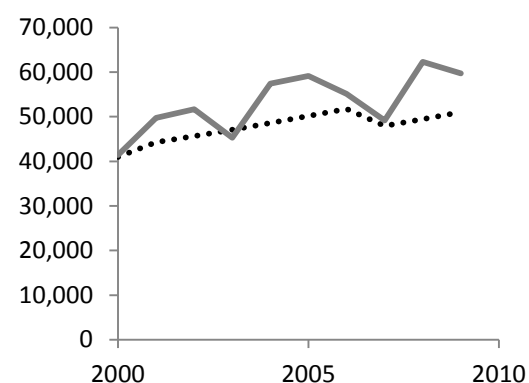


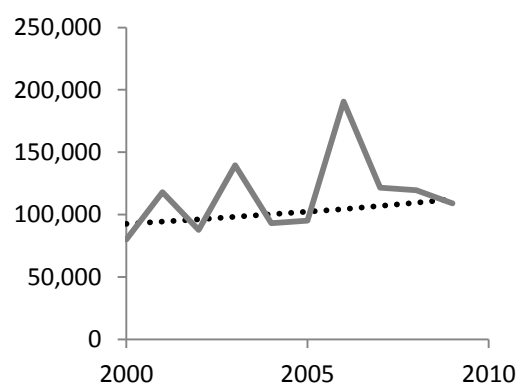
Figure 10. Cereal prices per kg, from November 2009 - October 2010, averaged across both study sites (primary data). There was no significant difference between prices in both sites.

The purchase of food is not a recent development driven by food scarcity. Production per capita has remained relatively constant over the past decades, as expected from demand-driven subsistence agriculture. Yields rarely fall below the subsistence minimum, with farmers growing as much as they need to feed their families, not as much as they *could* grow by maximising yields (see Figure 11). To keep up with the demands of a growing population, previous gains in agricultural production had been obtained by increasing the area farmed (Thies and Janus 2008). Expansion of farm land is however becoming increasingly difficult, as the rotational fallow cropping system, which is used to compensate for the low soil fertility, requires large amounts of available space. If a minimum of two years is maintained as a fallow period, not more than a third of arable land can be farmed at any one time. This threshold has already been reached, with 35% (4.8 million out of 13.8 million) of arable hectares under cultivation in 2009 (MAHRH 2010). The definition of 'arable' land is however debatable, as fields are regularly expanded into forested areas, or by reclaiming eroded areas with stone contours and tree planting; a practice common in the northern part of the country. Previous gains in agricultural production have not come from productivity gains, with yields per hectare remaining low and highly variable (see Figure 12).

Figure 11. Production of cereal staples per province (solid line), compared to the subsistence minimum (dashed line) from which the level of national self-sufficiency is calculated. The Ministry of Agriculture defines the subsistence minimum of cereal staples as 190kg per person per year (165kg of millet, sorghum, maize and fonio, plus 20kg of rice and 5kg of wheat bread). Note that the population figures after the 2006 census are estimates.

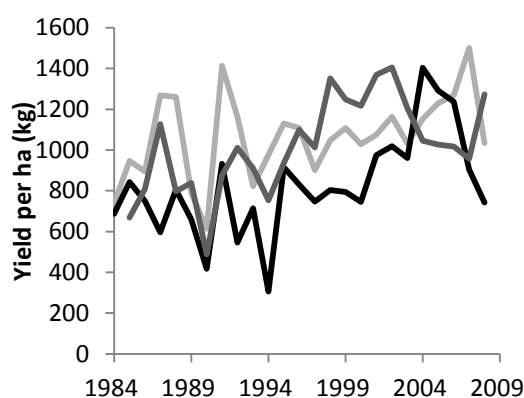


Cereal production (t) for Zoundwéogo province.

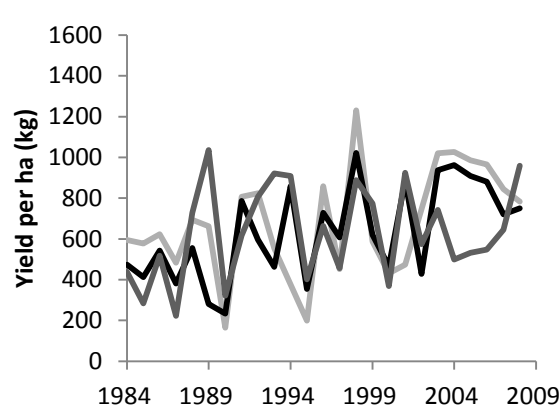


Cereal production (t) for Yatenga province.

Figure 12. Crop yield per hectare for three main staples; sorghum (light grey), maize (dark grey), finger millet (black), for both study sites.



Crop yields per hectare for Zoundwéogo province.



Crop yields per hectare for Yatenga province.

3.2.3. Agricultural strategies

Yields have remained low largely due to capital constraints limiting the opportunity for increasing yields through mechanisation, irrigation, or chemical fertiliser use. Despite these constraints, a variety of strategies are used to minimise the risk of a bad harvest due to poor rain, poor soils, or lack of labour or capital (Mortimore and Adams 2001):

- The **highly spatially and temporally variable rainfall** makes it difficult to decide when and where to plant. As a result, different crops and different varieties of the same crop⁴⁴ are planted on the same field, each with their own water requirements. Assuming that at least some of them will do well, in drier areas, the area sown is larger than the area that can be harvested with the available labour. Livestock-keeping is perhaps the quintessential adaptation to variable rainfall, with herd mobility allowing the farmer to follow the rains in search of green pasture.
- **Low soil fertility** is improved by using nutrients from trees and livestock as an integral part of the agricultural system. Sufficient trees are left standing on fields to reduce wind erosion and add nutrients through fallen leaves. If there is sufficient labour to keep livestock in a pen near the house, their manure is scattered on the surrounding fields. If there is insufficient labour to feed and care for them, they are left to graze freely, but a certain amount of manure can still be recovered from the pellets defecated in the yard when animals return at night. Crop rotation or intercropping with nitrogen-fixing crops such as ground nuts also improves soil fertility. The zaï technique⁴⁵ is a traditional farming technique from Northern Burkina Faso which has been widely promoted by NGOs. It is an ancient version of nutrient micro-dosing; a technique recently widely advocated by agricultural extension workers. The staples traditionally grown in Burkina Faso are adapted to the poor soils and require little extra nutrients. Chemical fertiliser use is low and is limited to cotton and maize, as too much fertiliser use actually increases drought stress, because rapid growth also increases crop water demand.

⁴⁴ The different varieties of sorghum available, for example, ripen in 2 or 3 or 4 months, respectively. The fast varieties do well in years when the rainy season is short but intense. The slow varieties are better able to withstand pockets of drought in the middle of the rainy season. A survey demonstrated that Burkinabé farmers planted 3-12 named types of pearl millet, 6-22 types of sorghum, and from 14-42 types of other cultivars (Mortimore and Adams 2001).

⁴⁵ The use of the zaï technique entails digging small holes, partially filling them with animal manure, leaving a small depression where rainfall collects. Into this depression seeds are sown. Seeds fare better as they have added nutrients and moisture.

- Despite the large polygamous families typical of the Mossi Plateau, there is a **lack of labour** during the peak-labour periods of planting, weeding and harvest. Labour shortage at planting and harvest time is diminished by timing the planting so that the harvest periods of different crops occur in sequence, instead of simultaneously. This requires substantial planning (see Chapter 5). During the weeding period, kinship-help is common in return for payment-in-kind. In general, the flexible management of family labour allows it to be redistributed at times of peak labour demand.

3.2.4. Population growth and agriculture

It has been suggested that the rotational fallow cropping system will become untenable at higher population densities. The national average is still comparatively low (40 people per km² in rural areas), though it is rising rapidly at a rate of about 3.5% per year nationally (EIU 2010; INSD 2009). At this rate the population would double in the next 20 years.

However, the Mossi Plateau has a higher population density than other rural areas (70-80 people per km²) and yet it is not an area of high malnutrition. Here, the intensive use of labour per hectare has compensated for the lack of land and has made it possible to maintain crop production despite a shortening of the fallow cycle (Boserup 1965). This provides a challenge to the neo-Malthusian paradigm of population growth driving environmental degradation and soil erosion. The classification of the Burkinabé farming system as 'extensive' is in fact a misnomer: The system of land occupation is indeed extensive, but there is an intensive use of labour per hectare. The distinction of extensive versus intensive depends on the parameter it refers to. Overall, it is vital to understand that the system is geared to minimising food shortages, not maximising production; a typical characteristic of subsistence agriculture. As demonstrated by Figure 11, the farmer's consumption is fairly constant; in good years the farmer may have some surplus to sell, and in bad years little or none, but levels rarely fall under the subsistence minimum. The aim is to minimise the variability in food consumption, as fluctuations below the minimum subsistence level would lead to famine. This embodies a relative preference for subsistence security over high incomes, stemming from the variable but lucrative sale of food surpluses (Scott 1976).

The low levels of innovation, characteristic of a risk-averse system, may be the result of active choice rather than the result of labour and capital constraints. The low levels of mechanisation, for example, are an adaptation to low rainfall, as a plough cannot work the hard crust that forms on the top soil during the dry season (Raynaut and Gregoire 1997). The farmer who uses a plough instead of a hoe must wait for the first rains to sufficiently moisten

the soil, thus losing 2-3 weeks of valuable growth time. Similarly, the low use of fertiliser, as pointed out previously, is a technique to reduce drought stress. The choice to *not* invest all of the household's resources in maximising agricultural productivity is part of a wider trend of livelihood diversification, which is, in essence, a strategy to spread risk. The farmer carefully chooses where to invest his time and money, as will be explained in more detail in Chapter 4 and 5. It is important to remember that strategies are not homogenous; some families suffer from land scarcity while their neighbours may have abundant lands. Similarly others have sufficient labour, while their neighbours may lack man power.

3.3. Macroeconomic performance and poverty

3.3.1. GDP and the economic sectors

In 2009 Burkina Faso had a GDP of US\$ 1,175 per capital (current prices); similar to or lower than its West African neighbours (OECD 2009, WB 2009b)⁴⁶. Despite yearly fluctuations, caused to a large extent by the uncertain output of rain-fed agriculture, GDP growth has generally matched or exceeded the country's population growth rate over the past decade, rising constantly at an average of 3% per year (see **Figure 13**). This is partly due to the gains in competitiveness following the devaluation of the FCFA Franc in January 1994 (IMF 2003). However the crisis in neighbouring Côte D'Ivoire from 2002-2005, and in 2011, has resulted in reduced remittances and increased back-migration to Burkina Faso. The primary sector (agriculture, livestock, fishing and forestry) contributed 34.1% to GDP in 2008, with 26.5% stemming from the secondary sector (mining, manufacturing, gas, water and electricity, etc.) and 39.3% stemming from the tertiary sector (trade, transport, telecommunications, banking etc.).

⁴⁶ Niger and Togo had a slightly lower GDP than Burkina Faso (roughly USD \$700/capita) in 2009, whereas Mali's GDP was similar to Burkina Faso's. Benin, Cote d'Ivoire, Ghana and Senegal lay roughly at USD \$1500-1900/capita.

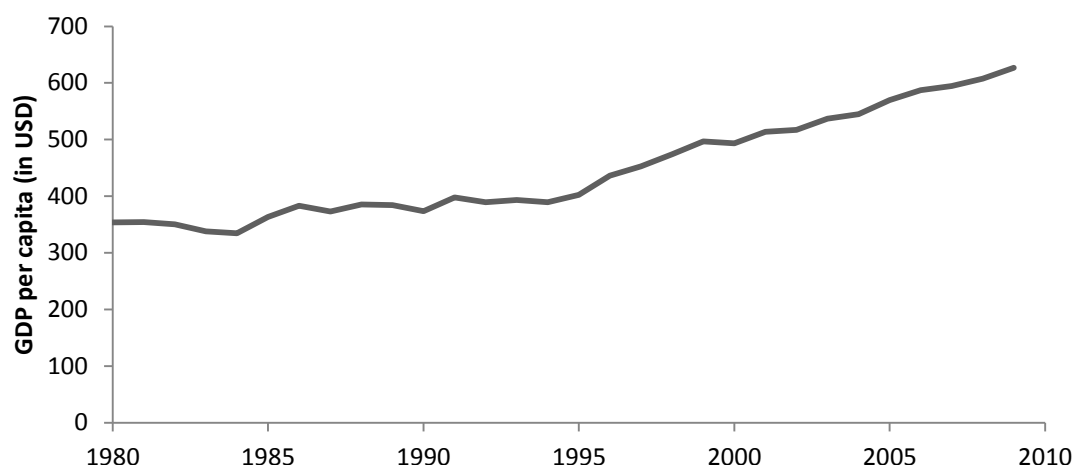


Figure 13. GDP per capita in USD (constant prices), using prices pegged for the year 2000, at which time the exchange rate was \$1USD to 343 FCFA.

3.3.2. The primary sector

The primary sector only constitutes a third of national GDP, but makes a much larger informal contribution, engaging 85% of the population. As mentioned above, the agricultural sector is vulnerable to climatic conditions because it is predominantly rain-fed, with little irrigation (only 5-10% of irrigable land is irrigated) and low levels of fertiliser use or mechanisation (Thies and Janus 2008). This vulnerability also affects the economy; the droughts of 1997/98 and 2000/01 slowed GDP growth (Grimm and Gunther 2007). Cotton and livestock have historically dominated the export sector. The landlocked position of Burkina Faso has dampened export-led growth, though it has helped to protect trade in local products such as shea butter.

3.3.3. The secondary sector

The contribution of the secondary sector has been growing. Burkina Faso has large but as yet underexploited deposits of minerals including gold, manganese, zinc, phosphates, copper and nickel. Around one fourth of the total land area comprises volcanic rocks known to be a potential source of minerals. Gold exports, once a major source of foreign earnings, slumped drastically after production stopped at the country's only commercial gold mine in Poura in 1999. However, following the start-up of several new gold mines, output has steadily risen, with gold earnings surpassing those of cotton for the first time in the country's history in 2009, with a total of 12t of gold exported (EIU 2009). The rapidly expanding gold sector has so far had little impact on reducing official unemployment or on boosting national GDP. Nonetheless,

the informal gold sector forms a very important contribution to local salaries in gold-rich parts of the country (see Chapter 5).

Manufacturing is focused on food processing, textiles and the substitution of imported consumer goods, and is concentrated around the towns of Ouagadougou, Bobo-Dioulasso, Koudougou and Banfora. The country has 14 cotton-ginning factories and one sugar factory. Currently only 1.5% of national annual production of cotton is turned into textiles in Burkina Faso (artisanal production), after the only local factory (Faso Fani) went bankrupt in 2001, though there are plans to rehabilitate it.

3.3.4. Transport infrastructure and electricity provision

Although Burkina Faso's transport system has benefited from significant new investment in recent years, it remains poorly developed. According to the World Bank, there are 15,272 km of roads, but only around 2,000 km are paved. This severely constrains the mobility of the rural workforce, as most dirt roads become impassable during the rainy season. The explosion of the mobile phone industry has considerably facilitated communication, with internet now also available in remote villages via the mobile phone network. Though reliable statistics are unavailable, mobile phone ownership has become common even in rural areas, with the three national mobile networks covering most of the country. Imports from China have made mobile phones for as little as 5000 FCFA, i.e. half the price of an adult male goat, readily available. The telecommunication network has also improved access to credit in rural areas, with mobile phone banking launched in partnership with Western Union in November 2011⁴⁷.

Electricity provision remains poor and underdeveloped, with only 13% of the population covered. About two thirds of electricity stems from petrol-fuelled thermal production, and one third from hydroelectric power plants installed on the dams of water reservoirs. In 2001, Bobo-Dioulasso, Burkina Faso's second-largest city, was connected to Côte D'Ivoire's power grid. In 2010, the high-tension power line linking it to Ouagadougou was completed, providing much-needed relief to the city's power grid, where power cuts were frequent. The Ivorian power link was suspended again following the political turmoil in Côte D'Ivoire in spring 2011.

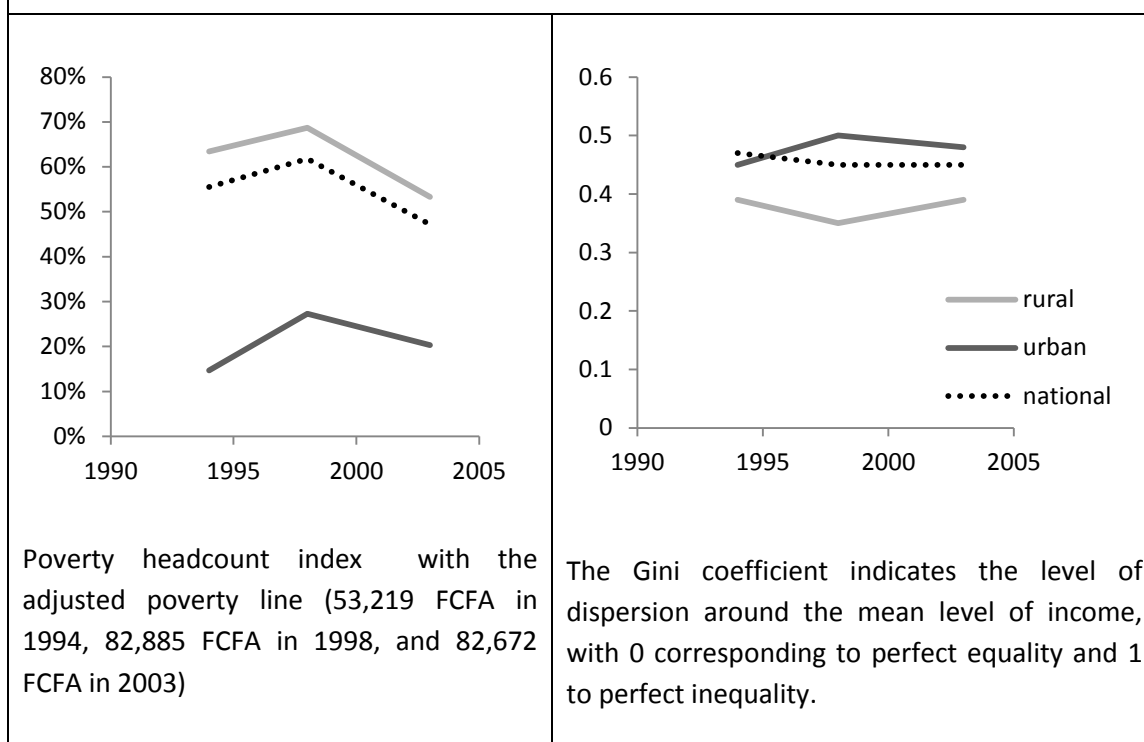
3.3.5. Poverty levels and national poverty surveys

The macro-economic situation outlined above has kept poverty high, although poverty levels did decrease over the period 1993-2003 (see **Figure 14**). There was a temporary increase in poverty in 1998 following the spike in food prices during the 1997-98 drought. As most rural

⁴⁷ For more information on the mobile phone banking partnership, see www.inovapay.com.

households are net buyers and not net sellers of cereals, the rising cereal prices had a negative effect on household expenditures (Grimm and Gunther 2004:72). Overall economic growth between 1994 and 2003 was moderately pro-poor, with income inequality decreasing at a national level, but not in urban areas (see Figure 14).

Figure 14. Adjusted growth and inequality decomposition of poverty levels for the period of 1994-2003 (Grimm 2004).



In Burkina Faso, the poverty figures stem from national surveys⁴⁸ undertaken approximately every 5 years (the last three were in 1994, 1998 and 2003). However there have been considerable methodological problems. The 1994 survey was undertaken in the post-harvest period (October-January), but subsequent surveys were done in the pre-harvest period (April-August) (Grimm and Gunther 2007). The choice of timing considerably biases results, as incomes are particularly low just before the harvest ('the hunger season'), and unusually high just after the harvest. In addition, the basket of goods on which the poverty line is based must be regularly updated to take into account changes in prices and consumption patterns. The Burkinabé Statistics Institute mistakenly claimed that the poverty headcount index stagnated at roughly 45% between 1994-2003, due to a calculation error which did not take into account the changes in food prices following the 1997/98 drought (Grimm and Gunther 2007). In order to address some of these methodological issues, the INSD launched a new survey entitled as

⁴⁸ The national surveys are entitled as « Enquête Nationale sur les Conditions de Vie des Ménages », coordinated by the INSD.

“Enquête Intégrale sur les Conditions de Vie des Ménages” (EICVM) in late 2009 which recorded the income and expenditure flows of about 5000 households, every 3 months, for an entire year. The results are not yet published.

3.3.6. Literacy, healthcare and malnutrition

The macroeconomic conditions outlined above are not the only factors affecting the standard of living reflected in the national poverty surveys. Adult literacy is very low (29%) with youth literacy slightly higher at 40% (50% for boys, 29% for girls). Literacy improved following the ‘education for all’ campaign launched in 1990, which included a move to make primary schools practically free. Primary school enrolment was 60% in 2009 (improvement over 25% enrolment in 1991), with a 0.84 ratio of girls to boys in primary education (ODI 2010). However, enrolment rates mask the high dropout rates, with children spending on average 4 years in school. Also, secondary school enrolment is only 18%. Arguably the curriculum inherited from the French colonialists is too theoretical, with a distinct lack of vocational training (Lachaud 1997). The Qur’anic and Franco-Arab schools (*medersa*) have provided an alternative schooling system, resulting in a portion of the population being literate in Arabic. Due to these low living standards, the UN’s Human Development Index, calculated from life expectancy, GDP and school enrolment, ranked Burkina Faso 177th out of 182 countries in 2009.

Healthcare in Burkina Faso is also very poor, with infant mortality at 97 per 1000 in 2004 (EIU 2007), and under-five mortality at 153 out of every 1000 in 2009 (ODI 2010). Life expectancy was estimated at 47.9 years in 2004, a marginal increase since 1970. In 2005 there were only 400 doctors for a population of 12 million, and in some remote areas there is only 2.1 doctors and 25.9 nurses per 100,000 people (OECD 2009). Few households have access to clean drinking water, though water-borne diseases have been largely eradicated from low-lying valleys. Malaria is the biggest killer with 36,000 cases per year (ibid). HIV/AIDS levels low for African standards, with a 1.6% infection rate among adults of 15-49 years, causing 9,200 reported deaths in 2007 (ibid). Condom use among the sexually active population, however, remains low at 17% in urban areas and 1.5% in the countryside. Tuberculosis cases have increased from 1,500 in 2000, to 3,556 in 2005. Meningitis epidemics regularly sweep through Burkina Faso during the Harmattan season (January-March), killing 1,000-1,500 people each year due to low levels of vaccination. According to the MDG progress report, only 10% of the national population are said to consume less than the minimum level of dietary energy consumption (ODI 2010). However the prevalence of malnutrition is much higher (37%) in

children under the age of five (*ibid*). As a result, malnutrition-related diseases are common among young children (MAHRH 2009).

3.4. Social organisation

3.4.1. Political history

To better understand the social organisation of Mossi society, a brief⁴⁹ historical overview will be given first. The original inhabitants of present-day Burkina Faso were part of one of the oldest kingdoms in West Africa, dating back to the 11th century. In the 1400s, the Mossi ethnic group came from present-day Ghana to settle in the area. They created 19 separate kingdoms each depending on the central kingdom of Wogodogo, today's Ouagadougou (Hammond 1966). By 1600, the Mossi created what was effectively a centralised state with a strong administrative system that resisted conquest by neighbouring African empires. It was finally colonised by France in 1896 and was used as a labour pool to service the French coastal colonies. It gained independence in 1960 as Upper Volta, after which a series of civilian and military governments succeeded one another, but generally without much bloodshed (Englebert 1996). After two military *coup d'états* in 1980 and 1982, a socialist government, led by Capt. Thomas Sankara, came to power in 1983. He formed the socialist *Conseil Nationale de la Revolution* (National Revolutionary Council) and promoted an ideology of national self-sufficiency and national pride, promoting local agricultural produce (e.g. beer brewed from local cereals and textiles made from cotton). He launched a campaign against corruption and laziness among civil servants (Speirs 1991)⁵⁰, renaming the country 'Burkina Faso' in 1984, meaning "the land of incorruptible men" in a combination of the Mooré and Dioula languages. The driving ideological force behind the revolution was Sankara's sense of 'Robin Hoodism'; of social justice, redistribution and sharing (Englebert 1996). As such he challenged the hierarchical structure of society⁵¹, aiming to reduce the political power of traditional chiefs and urban elite by giving a stronger voice to rural farmers. When the latter, especially trade unions, did not follow the national agenda, Sankara's regime adopted increasingly oppressive tactics, imprisoning and torturing political opponents, instating an obligatory military service and dress code (out of local cotton) and enforcing natural resource management at gun-point⁵²

⁴⁹ For a more detailed recount, refer to M. Izard (1985) and C. Savonnet-Guyot (1986).

⁵⁰ Sankara auctioned off the government's fleet of Mercedes vehicles and made the small *Renault 5* the official government car.

⁵¹ To a certain extent Sankara also challenged the dominant position of the Mossi ethnic group, being himself the son of a Peul father and Mossi mother (Englebert 1996:56).

⁵² Forestry officers, extension workers of the Environment Ministry, are a paramilitary force who patrol rural areas enforcing the laws against bush fires, against cutting of green wood, and against bush meat

(Englebert 1996). Despite these attempts to force popular mobilisation, Sankara's regime proved unable of "imposing upon the peasants the disruption of their traditional hierarchies by the elimination of customary authorities" (Otayek *et al.* 1996:21). The assassination of Sankara in 1987 by a group of officers led by Capt. Blaise Compaoré ended this period of radical change. Capt. Blaise Compaoré took over, adopting a softer line towards trade unions and traditional chiefs. Elections and multi-partyism were reintroduced in 1991, following the adoption of a new constitution. In the elections held in November of the same year, Blaise Compaoré was elected unopposed, with only 25% of the electorate going to the polls (Englebert 1996:68). In 1998, 2005 and 2010, he was again re-elected with an overwhelming majority (Conseil constitutionnel 2010)⁵³. Compaoré's current term is scheduled to end in 2015, when, according to Article 33 of the constitution, he should step down⁵⁴.

Despite winning by an overwhelming majority in elections, there has been increasing opposition to Compaoré's government, especially following the death of Norbert Zongo, journalist and editor of an independent newspaper, in December 1998. However civil society has not been strong, nor unified enough to offer a viable alternative (Englebert 1996). Historically, apart from the military, the two major social actors pushing for a political change have been trade unions and university students (see Diawara, 1996). The majority have acted in response to deteriorating living conditions, as opposed to out of ideological convictions. Recently, high food prices sparked riots in 2007-08 and in the spring of 2011, with the latter being accompanied by violent protests of the military, gendarmerie and police over salaries.

3.4.2. Structure of Mossi society

Irrespective of Sankara's attempts to change this, the Mossi are and remain a highly hierarchical society. It is comprised of the two⁵⁵ lineages with no inter-marriage between them (Englebert 1996):

hunting. Anyone caught carrying out these activities was arrested and fined. This repressive approach influenced the farmers' attitude to environmental protection.

⁵³ In 2005, Compaoré was re-elected with 80.35% of the 2 million valid votes (57.66% voter turn-out) and re-elected in 2010 with 80.15% of the 1.7 million valid votes (37.8% voter turn-out demonstrated the population's dissatisfaction). The most popular opposition candidate Arbo Diallo (a Fulani and not a Mossi, unusually) secured only 8.21% of the votes in 2010.

⁵⁴ Article 33 (amended in 2005) states that a president cannot be elected for more than two five-year terms. It does not apply retroactively. By the end of his 'official' two terms, Blaise Compaoré will have been in power for 28 years. Any efforts begun to amend Article 33, and give the president another term, were put on ice after the riots of spring 2011.

⁵⁵ There is a third category which falls outside of the hierarchy of Mossi society. These are relics of the assimilated ethnic groups, including 'blacksmiths' (the men are smiths and their wives are potters), 'griots' (bards; men and women are musicians and storytellers) and the Yarse (muslim merchants and marabout who settled in Burkina Faso in 17th century).

1. The 'people of power' ("*nakombsé*") possess "*naam*", meaning the power to control people. They are organised in a stratified hierarchy. Each kingdom has a king, who has half a dozen ministers each responsible for various economic and social functions. The king rules over several districts⁵⁶, each headed by its own chief. These rule over several villages, each of which has their own "*chef de village*" (village chief). The courtyard of the village chief is the site for discussions and resolutions of conflict. In most cases they live in relatively humble conditions, the struggle to become chief having more to do with status and influence than with wealth (Engberg-Pedersen 2001). Although the village chief would usually own more land than other members of the village, his harvest was redistributed in times of drought (Skinner 1989).
2. The lineage of 'farmers' ("*tengbiise*", literally 'children of the land') do not take part in the struggle for power, but control land rights. They are descendents of the ethnic groups which occupied the area before the Mossi arrived. As such they have a longer spiritual link to the ancestors, and their representative, the "*chef de terre*" ("*tengsoba*"; land chief), distributes plots and deals with land conflicts.

From the classification above it becomes clear that the spheres of political and agricultural life remain fairly autonomous. Just like the stratified organisation of the *nakombsé*, each family clan within a village is headed by an elder (the oldest living male ancestor). Last names are inherited from the father⁵⁷, as a result of which each village only contains a handful of last names. Each of these corresponds to a '*buudu*'; a family clan. Originally the elder of the clan lived in the same compound with his brothers. When their father died, the sons would eventually build their own home a small distance away, in accordance with the needs of their growing family (Roost-Vischer 1997). When they had sons, these would first continue to live with their wives in the same paternal compound, until their father, in turn, passed away, at which point they would build their own home a small distance away (ibid). In this manner every married man is the head of his family, but depends on the head of the compound (his father or sometimes uncle), who in turn takes advice from the head of the family clan (his father or uncle). The stratified hierarchy of the village is visible in the geometry of the compounds (Hammond 1966).

As a result of this social structure, families live in what is termed 'extended' households. These are families which contain several households, all of which share labour, food and money to

⁵⁶ These districts correspond to the 'cantons' demarcated by the French during their 60 years of colonial rule.

⁵⁷ Wives keep their maiden name, in accordance with the belief that she is only 'lent' to her husband, and can return to her paternal family if the marriage fails, or, at the latest, the day of her funeral, when all her belongings are returned to her parents.

greater or lesser degree. To avoid confusion, the term 'household' ('*zaka*' in Mooré) is used here to refer to one husband (the household head) and his wife(s) and their unmarried children. The term 'family' ('*yiri*' in Mooré) refers to all the households living within the same compound, headed by the compound head. It is important to remember that family compounds are not made up of homogeneous units. Here also a hierarchy is visible. The household of the compound head has more responsibilities, yet for example the household of the youngest married brother has fewer responsibilities.

Going one layer further, hierarchies are also found *within* the household, as most Muslim or animist marriages are polygamous⁵⁸. Nationally, 64% of married men are monogamous, 25% have two wives, 7% have three wives, and 3% have four or more, with older men having more wives on average (INSD 2009). Though co-wives may help each other with certain household tasks, each wife keeps her own stock of cooking utensils, firewood, staple cereals, dried vegetables and spices. Depending on how well they get along, some of these are shared. Each wife has her own little field (less than 1 hectare) on which she grows her cereals, spices and vegetables. Similarly, if she owns sheep, goats or chickens, these belong to her personally and can only be sold or slaughtered by her. The division of these 'wife sub-units' is visible in the geometry of the compound. Each wife has her own house and kitchenette⁵⁹. One of the first things a newly-married man does is build his new wife a house. A year later he builds her a kitchenette. In the meantime she sleeps and cooks with her mother-in-law (Hammond 1966). In a sense, each of these 'wife sub-units' are semi-independent entities, each striving to ensure the food security of her own children. The age⁶⁰ and number of children a woman has will determine how often she cooks, how much food she stores and how many crops she plants. Which wife has a higher status in the household is not only determined by the order in which they were married: it is the favourite wife (*pug-roumdé* in Mooré) who will have access to better lands and who will receive more financial help from her husband to carry out her household tasks.

⁵⁸ Christianity prohibits polygamy. Islam allows it but limits the maximum number of wives to four. Both in the francophone and Anglophone literature, as well as in the colloquial French of Burkina Faso, 'polygyny' is meant when using the term 'polygamy'. For simplicity, the term 'polygamy' is employed in the same way in this thesis.

⁵⁹ Women have two cooking areas: an external three-stone stove, and an internal one for cold or rainy days. The indoor three-stone stove is inside a small round house covered with a straw roof, so that smoke can filter out easily. The wife's main house is square with a wooden roof covered in clay, though some richer families have iron-sheet roofs.

⁶⁰ If the woman has young children, she will prepare porridge for them every morning. This meal is skipped as the children get older, with the leftovers of dinner are eaten for breakfast instead.

3.4.3. Principles of reciprocal helping

Even though Mossi society is hierarchical, patronage is a key feature which results in vertical wealth distribution from those of higher status to those of lower status. In recognition of the labour contribution of his household members, the household head assures their food security. Every household member has a right to enough food to assure their subsistence needs. The same occurs at a compound level: The granaries of the compound head are often the largest and serve to feed the whole compound in times of shortage. In those households of this thesis where the old compound head has ceded a large part of his land to his sons, his granary still remained a symbolic safety net and was used for collective festival meals. Similarly, at a village level, the granary of the village chief is used as a reserve stock in times of shortage (Skinner 1989). Subordination is compensated by help and protection in times of need. Such reciprocal helping, termed the 'moral economy' (Scott 1976), is a typical feature of peasant societies, and is still very much practised in Mossi society (Ouedraogo and Le Balle 1990). As Evans-Pritchard (1951:81) observed while studying the Nuer of Ethiopia, "*no-one in a [...] village starves unless all are starving*". This tradition is replicated by the French during the colonial period by collecting a part of the harvest as tax, stored in large metal silos still visible today, and redistributing it after a bad harvest. Sankara's socialist policy also followed this tradition by creating village granary stores, administered by village comités during his brief stay in power. The tradition was also supported by one of the five pillars of Islam: It entails giving a tenth of your harvest to a poor neighbour (the 'zacá' in Mooré); a tradition still very much upheld in the villages studied. An extension of food sharing is helping particularly needy members of society. These include the blind, cripples and mothers of twins⁶¹, all of which have the right to receive food from anyone they ask.

The similar food security level of all village families is the result of such vertical wealth distribution. It is enhanced by the principle of mutual respect, which results in wealth not being displayed openly or boasted about⁶². This does not mean that wealth is redistributed to such an extent that all are equal – far from it – it simply means that the poorest are helped at the very least to the extent that they will not fall below the subsistence threshold.

⁶¹ As women in Burkina Faso typically carry their young babies on their backs while working, twins severely hinder her activities if she does not have someone who can look after them for her. Twins are considered a curse and are expensive to feed.

⁶² The ostentatious behaviour of the urban *nouveaux riches* is against the grain of traditional Mossi culture. However other ethnic groups do not necessarily share the same traditions. Nomadic herdsman, for example, have no tradition of hiding their wealth as they carry it around with them every time they move. Even today, Peulh women wear more elaborately clothes and jewellery for daily household tasks than Mossi women do.

3.4.4. Principles of respect and honour

Every person has specific rights and responsibilities according to their status in society (see Chapter 6). Status is determined by gender and age in Mossi society. Gender hierarchy is very important in Mossi society and supersedes age – a younger man is respected more than an older woman, with an important exception being the mother (Helmfrid 2004). Young females are the bottom of the social ladder and can only become ‘women’ by marrying. It is through the association with her husband, and his lineage, that she has a right to more privileges and protection. The Mooré term for ‘woman’ and ‘wife’ is the same (*‘paga’*) whereas a distinction is made between a man (*‘rao’*) and a husband (*‘siida’*). Male and female spheres are largely separate, occupying different physical spaces, eating separately, and following different daily schedules, therefore rarely spending time together during the day (Lallemant 1977:112). Roles are separated thus because gender identity is a construct of society; “one is not born a man, one becomes a man” (Roost-Vischer 1997, Waibel 1993). Mossi boys and girls are taught the societal roles of men and women from an early age, using affection (age 0-3), fear or surprise, personified by the scarecrow (age 3-7) and shame (age 7-15) as the three main pedagogic tools (Badini 1994). Children are considered to be born hermaphrodites. They only become men or woman culturally by learning the tasks appropriate for their role from an early age, and through the ritual of circumcision⁶³. Circumcision is prevalent across most tribes and pre-dates the arrival of Islam. The frigidity resulting from female circumcision is also used as a way of discouraging adultery. The extremely unhygienic circumstances in which circumcision rituals take place frequently result in infections, some ending in death and others in lifelong pain and complications during childbirth. Female circumcision has been illegal in Burkina Faso since 1997 but is still widely practised. Reliable statistics are hard to come by, but according to the national health survey of 2003, 76.6% of women aged 15-49 years are circumcised (MIS 2003).

3.4.5. Land organisation and distribution

Land ownership is determined by ethnicity, and within an ethnic group by family clan. Religious orientation plays no part in determining land rights, nor does it affect social status in any other way in Mossi society. Muslims, Christians and animists have co-existed peacefully in Burkina Faso for centuries, partly because many still maintain certain animist beliefs and superstitions of their forefathers, even though they are ‘officially’ of a monotheistic faith. It is often humorously stated that the population of Burkina Faso is 50% Muslim, 20% Christian and 100%

⁶³ Removing the labia-resembling foreskin from the penis transforms a child into a ‘male’; removing the penis-resembling clitoris transforms a child into a ‘female’ (Helmfrid 2004).

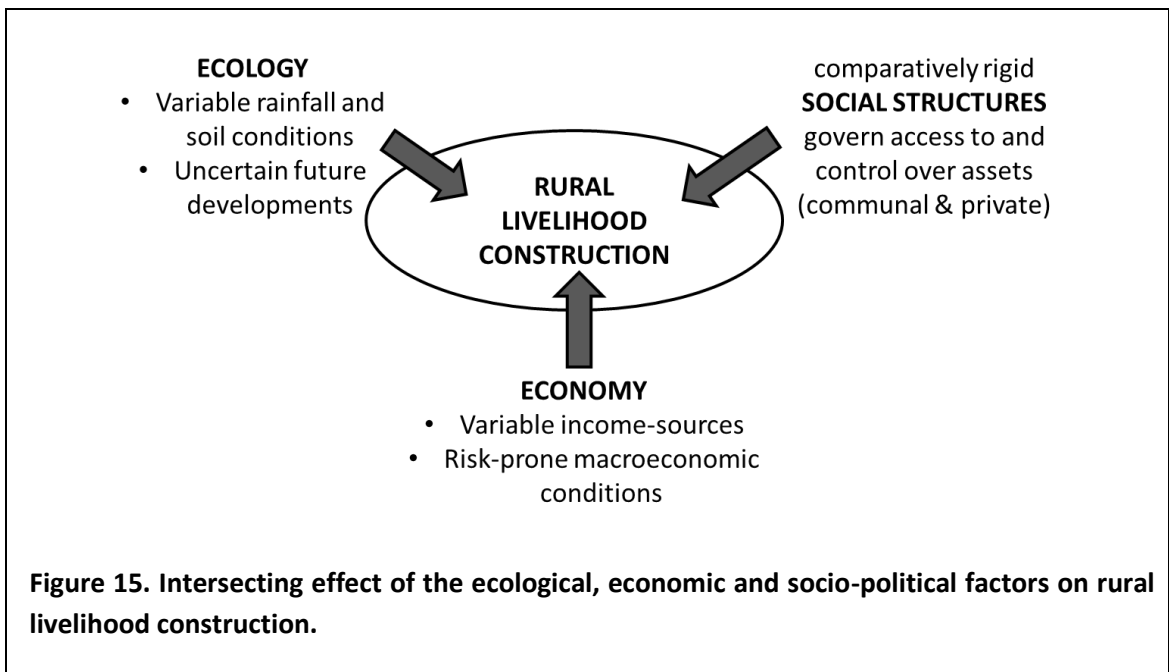
animist. The two study sites of this thesis are located in the predominantly Muslim part of the country.

Within the village, land is allocated by the land chief to the heads of each family clan. Each family clan allocates the parcel of land among themselves. Migrants can ask any land owner for a parcel of land, or negotiate via the land chief in case of conflict. Within the family, all land belongs to the head of the compound. He can allocate usufruct rights to his wives and sons. The sons in turn allocate usufruct rights to their wives. The tensions arising from how much area and which soil quality is allocated to different household members are addressed in Chapter 6. The precarious nature of land rights of sons and wives determine their farming practices. As wives and sons do not own land, their usufruct rights can be withdrawn at any time, for example after a wife's husband passes away. To retain her usufruct rights, she can remarry another male within the same family. On the other hand, usufruct right to farm land can also be claimed simply by farming a plot of land, if the owner is not using it. For women, there are also other avenues of negotiation for accessing land (Kevane and Gray 1999). How negotiable usufruct land rights are is further explored in this thesis (see Chapter 6, Section 6.1.4). Inheritance of land follows patrilineal lines. It is inherited in its entirety from father to eldest son, following which other family members usually retain their same usufruct rights. Focus group discussions revealed that while Muslim inheritance laws support the division of assets among offspring, land inheritance still follows the traditional Mossi practice outlined above. Other assets such as livestock are however increasingly divided among offspring. It remains to be seen how land inheritance practices will change in the future.

The importance of land issues was recognised in 1984 with the creation of the RAF law on agrarian and land tenure reorganisation (*Réorganisation Agraire et Foncière*). It was intended to enable all Burkinabé citizens to gain access to agricultural land regardless of their ethnic origin by allocating the power to administer land to an elected village committee, thus taking away this power from traditional chiefs (Ouédraogo 2002). Despite its worthy objectives, application of the law has come up against many difficulties in rural areas. The State effectively declared itself owner of all land in the country, but gave rural communities the responsibility for managing the resources of a defined area (the *terroir*). This "*Gestion des terroirs*" approach was part of a progressive decentralisation process which gave increasing power to elected village committees in order to manage land issues, amongst other things. These elected village committees only became fully operational during the regional elections of 2006, where they participated in vote counting.

3.5. Concluding remarks

The sections above demonstrate that Burkina Faso is characterised by a risk-prone ecological and economic environment, making it an interesting case study of risk-management behaviour. However, these variable conditions are juxtaposed by comparatively rigid social structures, cultural norms and gender hierarchies which influence access to and control over assets. Are comparatively rigid social structures beneficial or detrimental for addressing external variability? To what extent are social norms governing access to assets negotiable? Particularly, what role do collective assets play, access to which is less rigid? To what extent can ecological and economic risks be minimised? How do these factors interact and influence rural livelihood construction (see **Figure 15**)?



The data presented in this chapter suggest that, due to the way statistics are reported, national statistics do not necessarily paint an accurate picture of the highly variable ecological and economic factors influencing rural livelihoods. Yearly averages, and averages over geographic regions mask the high heterogeneity of these factors. Reporting national or regional averages for every sector masks the way these sectors intersect at the micro-level. Katherine Homewood argues that such a presentation of the data reinforces “splits between natural as against social sciences approaches, western versus local perceptions, and national government against village level interests. Where these debates are pursued over specific cases in the absence of data, assumptions and perceptions become the basis for policy, rather than a starting point for question and investigation” (Homewood 2005a:198). Absence of data

on livelihood construction in a risk-prone environment has led some policy makers to assume that such risk is detrimental and a determining factor in Burkina Faso's low standard of living (Thies and Janus 2008). However, other studies have shown that opportunistic behaviour in a changing environment has long been key to survival in West Africa, an area characterised by high mobility and temporal as well as spatial variability in population densities (Clay and Johnson 1992, Reardon 1988). Homewood (2005a) calls for a reappraisal of the way research issues are formulated and research data collected. "Western positivist approaches are very powerful at answering certain types of question, but are not necessarily effective at identifying the right questions to ask, nor at recognising that some types of question lie beyond their sphere" (2005a:204). In order to address the intersecting effect of the drivers highlighted in Figure 15, a mixed-methods approach was adopted. This methodology is presented in the next chapter.

Chapter 4: Methodology

Eight family compounds, containing a total of 23 households, were followed for an entire agricultural cycle, from harvest to harvest, to investigate the seasonal changes in food-acquisition strategies. This chapter explains how these households were chosen and studied using a combination of quantitative and qualitative methods. Fieldwork was carried out with financial and logistical support of the British NGO TREE AID, which has been coordinating development projects in the study villages since 1994. Their mandate⁶⁴ is to improve local livelihoods through the sustainable harvesting and sale of wild non-timber forest products (fruits, seeds and leaves), accompanied with reforestation activities.

4.1. The research design

Both qualitative and quantitative methods were combined⁶⁵ to address the three research questions outlined in Chapter 2 (see **Table 13**). Such a mixed-methods approach was chosen to allow triangulation of results, complementarity (to counteract inherent method biases⁶⁶) but also allow the initiation of new perspectives through critical assessment of seemingly conflicting data (Gray 2009). In the words of Albert Einstein, “not everything that can be counted counts, and not everything that counts can be counted”. To avoid the oversights arising from the choice of a mono-disciplinary approach, the same data set was aggregated and disaggregated in different ways, and critically compared to the qualitative data.

⁶⁴ For further information, refer to www.treeaid.org.uk.

⁶⁵ Such a combination of methods is known as the ‘Q-squared’ approach (Kanbur 2003).

⁶⁶ Qualitative analysis reveals process and causation, whereas quantitative analysis can only reveal correlation.

Table 13. The research questions and their methodological components (SSI: semi-structured interviews; PO: participant observation).		
Research questions	Quantitative	Qualitative
How is livelihood diversification manifested in the local context?	<ul style="list-style-type: none"> - Typology of households classed by food security level - Survey of seasonal food sources - Survey of income and expenditure flows - Secondary data on rainfall and commodity prices 	<ul style="list-style-type: none"> - SSI and PO on the social barriers and opportunities to livelihood diversification - SSI on the perception of food security status, 'coping' and wild food use.
How does a household's role within the wider family compound influence its food security strategy?	<ul style="list-style-type: none"> - Disaggregation of data within the household - Aggregation of data across the compound 	<ul style="list-style-type: none"> - SSI and PO on intra- and inter-household dynamics
How is resilience constructed over the whole agricultural cycle?	<ul style="list-style-type: none"> - Aggregation of data for all food sources - Aggregation of data over the whole year 	<ul style="list-style-type: none"> - SSI on the perception of resilience - SSI on short- versus long-term trade-offs

Before explaining these methodological components in detail, key concepts which emerged out of the literature review are reiterated first, as these determined the design of the study and the choice of methodology. Because this thesis concerned itself with the management of food security, the households studied were deliberately chosen to include only those households which did not assure their entire food supply from home-grown crops. As a result, all of them purchased, gathered and received food to a certain extent. The food obtained via these various food sources was conceptualised using a modified version of Amartya Sen's Entitlement Theory, expanding it to include rationing as well as non-private 'environmental entitlements' in the form of wild foods (for a definition of wild foods, see Section 4.4.1). As such, the nutritional aspects of food security were not the main focus of this thesis, focussing instead on the political aspects of food and resource access. If this thesis were to be placed within a single discipline, it would be that of political ecology or human geography. Understanding the negotiation of food entitlements was simply used as a basis for understanding livelihood construction, not for examining the household's nutritional status.

The role of food security objectives within wider livelihood objectives was conceptualised using the SLF. The role of 'policies, processes and institutions' was recognised by including market distance in the sampling framework, and by examining the household's social position within the family compound. A constructivist approach was adopted in examining the livelihood strategies themselves, in order to better understand their meaning in the local

context. The strategies were not ranked according to a normative 'risk-coping' hierarchy. However, narratives of 'vulnerability' were explored to identify if certain households or certain household members had better access to certain livelihood strategies. Lastly, the process of 'resilience' was examined by adapting principles stemming from socio-ecological resilience theory.

Finally, it is vital to see the study in its temporal and spatial context. Chapter 3 demonstrated that the 2009-2010 period was not a famine year; both rainfall and harvest quantities were within the ten-year average. This means that the agricultural strategies adopted were not meant to replace, but to complement home cereal production. This explains why this thesis examined both 'primary' agricultural strategies and 'secondary' non-agricultural strategies in detail, although the distinction between them is arbitrary; both together form an indivisible whole. 'Secondary' strategies were not less-preferred temporary 'drought responses', but an integral part of the livelihood. This is also the result of the spatial context of the study: as explained in Chapter 3, the Sahel is an area of variable rainfall and crops yields. The fact that Burkinabé farmers considered such regular idiosyncratic shocks 'normal' distinguishes this thesis from others studies examining the strategies following an 'unexpected' drought shock.

4.2. Choice of the sample size and study sites

The comparative case study approach was used to study food security in Burkina Faso. This method resembles a scientific experimental design, where the influence of one variable is studied by the effect caused by its presence or absence (Yin 2003). The factorial design chosen in this study is explained in detail in later sections (see Table 16). By comparing different case studies, 'demi-laws' can be deduced. Unlike the laws of physics, these are not universal, but apply only to similar societies or similar ecosystems (Lawson 1997). The case studies were not necessarily chosen to be as 'representative' or 'average' as possible because extreme cases can reveal trends which are also present elsewhere, but are hidden within other patterns. For example, only once a wife fell ill did it become evident to what extent cooking tasks were shared within a household, even though sharing also took place when all co-wives were healthy. Bearing this in mind, the sampling method explained below was designed to sample households which were similar enough to allow quantitative comparisons – yet unusual cases, such as one female-headed household, were not excluded, as they supplied extra information about the processes of causation. The case study approach is thus suited for refining existing theories by illuminating specific patterns of causation through detailed observation and analysis.

4.2.1. Definition of the sampling unit

Several studies stress the importance of carefully defining the sampling unit within which food security is examined, due to concerns that food may not be equally shared within the group (Bentley and Pelto 1991, Folbre 1984, Sen 1984). In order to shed light on such dynamics, the ‘extended’ household, i.e. the family compound was chosen as the sampling unit, instead of the nuclear household. Households within each chosen compound were sampled in their entirety, with every household being interviewed. For the quantitative data analysis, the household was chosen as the unit of analysis. The qualitative data explored both inter- and intra-household dynamics. A household is usually defined as the group of people who eat the same meal (Beaman and Dillon 2010). This ‘consumption group’ can be equal to or smaller than the ‘production group’, i.e. the group of people who farm the same field. Applying this definition was not straight forward in this study for the following reasons:

1. **‘Consumption groups’ varied during the agricultural cycle.** As the cereal granaries ran low, certain families in the study sample decided to merge households and eat together from the collective granary of the head of the compound. If previously the compound contained three households, each with two wives cooking alternately, now all six women operate a single cooking rota for all three households, effectively creating one large consumption group.
2. **The ingredients consumed varied slightly within the ‘consumption group’.** Even though one woman may be cooking for the whole household, the men and elder sons in the study sample ate separately from the women and younger children, as is traditional for Mossi households (Sawadogo 2002). As a result, the contents of men’s and women’s plates differed slightly, even though the basic cereal ingredient remained the same. For example, the man may not like the sauce that was cooked for the household, and may request the cooking of a separate sauce to accompany his cereals. Similarly, expensive foods such as meat may be added to the men’s plate but not the women’s plate. These small variations arguably had an effect on the individual’s protein and vitamin intake. For those households part of a larger family compound, the men of each household ate together in the same place, each bringing their own plate which their own wife had cooked.

In light of these two facts, the household was defined as the group of people eating the same cereal staples. As this thesis was concerned not with nutrition but with food security, small variations in secondary ingredients were not studied. To simplify quantitative data analysis, it was assumed that during those periods when consumption groups were merged, each

household still consumed an equal share of the collective meal. Qualitative methods were used to explore in more detail any tensions arising out of such meal sharing.

4.2.2. Choice of the study sites

In order to assess the effect of varying food shortages on livelihood strategies, family compounds were sampled from two contrasting provinces of Burkina Faso; Yatenga and Zoundwéogo. Yatenga province is located about 150km north-east of Ouagadougou, has an average population density of 79.2 people/km² and receives an average rainfall of 613mm per year (INSD 2009). Zoundwéogo province is located about 100km south of Ouagadougou, has an average population density of 68.3 people/km² and receives an average rainfall of 921mm per year (*ibid*). The northern field site had lower average yields, while the southern one had higher average yields. It was hypothesised that a lower level of agricultural production in the North would influence the diversity of food-acquisition strategies. Regarding the use of wild foods, it was hypothesised that more wild food would be used in the southern than in the northern site, as there was greater availability of trees. Despite these differences, both provinces were still within the same livelihood zone dominated by agricultural as opposed to pastoral activities, thus making comparable analysis possible (USAID 2009b).

In order to determine the effect of market access on livelihood strategies, family compounds were selected from villages an easily walkable distance to a larger market town (less than 5km away), as well as from villages further away (20-25km). Economic theory would predict that different choices are made as the number of alternatives increases with the increasing proximity to larger market centres. Most villages held their own small village market every three days, but these only featured a limited variety of goods.

4.2.3. Description of the four study villages

In total, four villages were chosen. Two were chosen from each province, with one nearer and one further away from a market town. The choice of exact village was a practical decision reflecting the sites where the partner NGO, TREE AID, operated. The key characteristics of the villages are briefly presented (see **Table 14**).

Table 14. Presentation of the four study villages		
	Near a market town (<5km)	Far from a market town (20-25km)
Zound-wéogo province (market town: Nobéré)	Donsin village - 1 primary school. - The closest health centre is in town (2km). - No village market, closest one is in town (2km). - 3km from the National Park, some land was confiscated to make the park. - 2 cement wells ⁶⁷	Kougrissincé village - No school, only an 'alphabetisation centre'. - No health centre, the closest is 10km away. - 1 cement well, but it is broken. - A small market is held every 3 days. - 1km from the National Park, much land was confiscated causing many families to move away. - Poor access: 10km from the nearest tarmac road, accessible by a dirt track.
Yatenga province (market town: Séguénéga)	Sima village - 1 primary school. - Closest health centre is in town (4km). - No village market, closest is in town. - 10 cement wells.	Koukabanko village - 1 primary school. - No health centre, closest is 15km away. - 1 cement well. - A small market is held every 3 days. - Difficult access: 15km from the nearest tarmac road. The adjacent river is impassable for 3 months of the year. Crossing it by 'ferry' costs 1000F CFA.

4.2.4. Selection of the sample

Each study village was of a similar size, containing 150-250 family compounds (roughly 2000-3000 people), unevenly spread among several boroughs. Within each village, two family compounds were selected purposively (non-random), following a participatory wealth ranking exercise. This participatory technique was used to group households into three food security categories, based on local criteria (Grandin 1988). As a first step, the characteristics of a food-secure, slightly food-insecure and strongly food insecure household were defined with the help of a village focus group (see **Table 15**). Secondly, a list of compounds containing a minimum of two households and a maximum of 25 adults⁶⁸ was made. The original intention was to choose family compounds of varying levels of food security from this list in order to investigate if different strategies were used at different levels of food security. However it became clear that family compounds did not have a homogeneous level of food security, but that there was considerable variation within the same compound. To investigate this phenomenon further, compounds containing households of *varying* levels of food security were preferentially

⁶⁷ Each village had many hand-dug wells, which were not very deep and often dried out during the dry season. These were not counted. Wells with cement walls were up to 60m deep and did not collapse or dry out as easily.

⁶⁸ The maximum size of the compounds was restricted for practical reasons, even though some contained over 50 adults.

chosen, based on the definitions given in Table 15. It is important to note that all households studied were deliberately chosen to include only households which did not assure their entire food supply from home-grown crops. This does not mean that all were food-insecure: some were 'easily' able to cover the shortfall through buying or other sources, while others struggled more to make ends meet.

A definition of food security was needed to carry out the participatory wealth ranking exercise used to choose family compounds and households. Table 18 displays the criteria identified. The euphemisms chosen by the villagers to describe each category give an indication of the reluctance of ranking different households in Mossi culture. Interestingly, income, education level, number of dependent children and extent of land holdings were not mentioned as criteria. The baseline data collected (see Section 4.3.1) showed that the number of dependent children and extent of land holdings varied across households (see Annex 2), though education level did not. The final security category classification of the chosen households is presented in **Table 16**, with none of the households chosen being in the highest food security category.

Eight family compounds were chosen⁶⁹ following the method outlined above. All households within each family compound were sampled. The small number of households was deliberately chosen to allow detailed ethnographic work to accompany the quantitative surveys. The frequent visit of a small number of households turned out to be essential to building the trust necessary to collect accurate data. As a result of the small sample size, econometric analysis was not possible. Instead, the comparison of case studies within a factorial design was chosen as an approach. It was difficult to obtain the same number of households in each village as some compounds contained two households, while others contained seven. Historically, compounds in Yatenga province are larger than in Zoundwéogo (West 2009), resulting in a larger sample in the northern field site. As a result, the 23 households are unequally distributed within the factorial study design (see **Table 16**), also rendering econometric analysis difficult.

The number of households did not change throughout the study period, though their original composition of 38 men and 56 women changed slightly. One wife of a polygamous marriage died of measles. One son emigrated to Cote d'Ivoire. One man took a second wife. Another husband divorced his wife and took a new one. Eleven babies were born during the study period.

⁶⁹ The final sample depended on the consent and cooperation of the family in question, resulting in the swapping of one family.

Table 15. Characteristics of food-secure, slightly food-insecure and strongly food insecure households, defined during a participatory ranking exercise.

	<i>‘doing well’</i> - Extra food to sell - Extra money	<i>‘doing ok’</i> - Enough food - Some money	<i>‘doing kind-of ok’</i> - Enough food - No extra money	<i>‘doing not so well’</i> - Not enough food - No extra money
House construction	House walls made of earth mixed with mud (<i>‘banco améliorée’</i>), floor made of cement.	House walls made of mud (<i>‘banco’</i>)	House walls made of mud (<i>‘banco’</i>)	House walls made of mud (<i>‘banco’</i>)
Roof of the house	Iron-sheet roof	Wooden roof (requires cart to transport wood)	Wooden roof (requires cart to transport wood)	Straw roof (can be collected in the bush)
Mode of transportation	Motorcycle, donkey cart.	Motorcycle, donkey cart.	Several bicycles, 1 donkey cart	1 bicycle
Animals owned	>3 heads of cattle. Purchased donkey(s). >30 Sheep and goats.	<3 heads of cattle. Purchased donkey(s). >20 Sheep and goats.	<3 heads of cattle. Purchased donkey. >10 Sheep and goats.	No cattle Donkey received as gift ⁷⁰ . <10 sheep and goats.
Mode of communication	Television (powered with a solar panel). Mobile phone with music player.	Mobile phone with music player	Mobile phone with music player	Cheap mobile phone. Radio.
Lighting	Solar panel	Flash light.	Flash light.	Flash light, petrol lamp.
Agricultural equipment	Plough is owned. Fertiliser used. Water pump for irrigation. Compost pit.	Plough is owned. Fertiliser used.	Plough is owned. Fertiliser used.	Shared or borrowed plough. Animal dung used.
Toilet type	Cement pit latrine. Shower with cement walls.	Wooden pit latrine. Shower with mud walls.	Wooden pit latrine. Shower with mud walls.	No toilet, the bush is used.

⁷⁰ A common strategy for poor households to slowly accumulate livestock is to take care of the donkeys, goats, and sheep of a richer neighbour for free, but receive one of the foals as payment later.

Table 16. The distribution of sampled households (n), with the number of the household (#1-23) indicated in brackets below each category.			
	Near a market town (<5 km) (n = 9)	Far from a market town (20-25 km) (n = 14)	TOTAL
High rainfall (Zoundwéogo province; 100km South of Ouagadougou) (n = 8)	<i>village of Donsin</i> (n = 3) Food secure households (#17) Less food secure households (#16) Food insecure households (#18)	<i>village of Kougrissincé</i> (n = 5) Food secure households (#20, 21, 22) Less food secure households (#19) Food insecure households (#23)	23 house- holds (94 adults)
Low rainfall (Yatenga province; 150km North of Ouagadougou) (n = 15)	<i>village of Sima</i> (n = 6) Food secure households (#3) Less food secure households (#1, 2, 5, 6) Food insecure households (#4)	<i>village of Koukabanko</i> (n = 9) Food secure households (#7, 8, 12) Less food secure households (#11, 13) Food insecure households (#9, 10, 14, 15)	

4.3. Survey design and data collection

A total of 18 months were spent in Burkina Faso, from August 2009 to January 2011. This included one month of planning, one month of piloting, 15 months of quantitative and qualitative data collection, and one month of data verification. In addition, a preliminary visit was made to Burkina Faso seven months before starting field work. This visit was very useful for establishing initial contact in both survey locations and visiting potential village sites. The preliminary visit was also used to get invaluable feedback on study design from local colleagues⁷¹. Upon arrival in Burkina Faso, lessons were taken to learn Mooré. Assistants were chosen two months before starting fieldwork and paid a local salary throughout the study period. These assistants were resident in the study regions and knew the each study village well, having previously worked there as ‘animateurs’ for TREE AID. This familiarity with the study villages, and in some case the studied families, greatly facilitated contact and the establishment of a trust relationship. The surveys themselves were piloted and adjusted repeatedly in September and October 2009. When the complexity of the thematic became evident, a ‘narrow and deep’ approach was deliberately chosen. The number of survey rounds was increased from four to six. Cooking surveys were increased to cover six instead of three days. The number of households studied was reduced to a number allowing in-depth

⁷¹ I already had a network of colleagues from when I did my M.Sc. dissertation in Burkina Faso (April-August 2008).

ethnographic work. For the rest of the fieldwork, I lived with a local family in the closest market town (Nobéré or Séguénéga)⁷² and drove to the study villages during the day. In between surveys I stayed half-way, in the capital, resulting in over 4000km of driving⁷³.

4.3.1. Baseline data

Before starting the quantitative surveys, basic socio-economic variables were recorded together with household members in October 2009. These included listing household members, and their relationship to household and compound members. Their education level was determined. Asset holdings were quantified separately for each person, using the following proxy indicators:

- **Physical capital:** number of animals owned
- **Financial capital:** income and expenditure streams over the last two months
- **Natural capital:** hectares of land farmed
- **Human capital:** education level
- **Social capital:** ease of accessing social capital was determined by enquiring if the individual originally came from this village, or had moved here (for marriage or otherwise).

In addition to these asset categories, food reserves were quantified. These included reserves of stored wild foods which stemmed partly from 'public' assets (see Section 4.4.1 for definition).

4.3.2. Quantitative surveys

In order to capture the seasonal variation of food-acquisition strategies, surveys were repeated every two months, resulting in six surveys rounds (S1 – S6) (see **Table 17**). The questionnaires were piloted in October 2009, and administered over 14 months. The length of the survey period reflected the agricultural cycle, starting and ending with the harvest period. This allowed all phases of the agricultural cycle to be captured. To allow for adequate monitoring, surveys were slightly out of phase in the two field sites. The 4th and 5th survey rounds took longer than usual due to road access problems and unavailability of villagers. Interviews were scheduled as much as possible around agricultural activities, taking advantage of breaks in the sowing activity (if it stopped raining), or breaks before weeding and before

⁷² Séguénéga is connected to the electrical grid. Nobéré is not, making data entry on a laptop difficult.

⁷³ I drove myself, experiencing six tyre punctures, two flat tyres in remote locations and two car accidents.

harvesting activities. The temporary mysterious absence of the river ferry owner meant that the village of Koukabanko was inaccessible for two weeks in July. The same village was inaccessible for three weeks in April due to a measles outbreak. Ramadan disrupted the 5th survey round (S5), particularly the cooking surveys.

Table 17. Timing of the six survey rounds in both study locations.														
	2009		2010											
	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Nobéré (Zoundwéogo)		S1			S2		S3		S4		S5		S6	
Séguénéga (Yatenga)	S1			S2		S3			S4		S5			S6

During each survey period, two types of questionnaires were administered (see below). The questionnaires are displayed in Annex 1, translated into English.

- **Cooking questionnaire:** Each adult woman quantified in detail what she had cooked over the last three days. This cooking questionnaire was filled out twice during each survey round, supplying data over six days. Each time it took 10-20 minutes to complete. It provided the main primary data around which data analysis was structured. Other quantitative data on assets and qualitative data on livelihoods were contextual, and were intended to complement the information gained from the cooking questionnaire.
- **Asset questionnaire:** Each adult man and woman quantified their remaining food reserves, remaining livestock, and income and expenditure flows over the last two months. These questionnaires took 30-45 minutes to complete.

This methodology allowed for multiple sources of food production and food purchase to be quantified within the same household (Maxwell 1996). It also takes into account that wealth should be quantified both in the form of asset stores, as well as the flows stemming from these assets in form of income (Swift 1989). The storage of wild foods was quantified alongside other private assets, taking into account the importance of environmental entitlements (Leach *et al.* 1999).

Every adult member of the compound was interviewed separately, as each person has their own personal store of food, livestock and income. An ‘adult’ was not defined by a particular age, but by whether the person considered themselves as an active member of the household.

As a result, all married people and unmarried men⁷⁴ were included, as well as the elderly (including two men and one woman who were partially blind but still contributed to providing food and income). Only four elderly people were excluded, who were fully blind and no longer active in any way⁷⁵. A detailed survey of labour productivity from the 1980s confirms that 'inactive' members put in at least 70% as many hours of labour as 'active' members (18-40 years old) of the household (Ancey 1983)

One female field assistant affiliated with TREE AID was employed in each site to administer these two questionnaires in the local language (Mooré). It is a happy coincidence that women were chosen, as the man originally chosen for the job turned out to be unavailable. Like most women, the female assistants were particularly familiar with cooking arrangements and food acquisition strategies, which improved data quality. Maintaining the same assistants throughout the study period contributed significantly to building a relationship of trust with the families. Only the last survey round in Yatenga province was administered with the help of another TREEAID staff member, as the field assistant in question was offered a job elsewhere.

4.3.3. Qualitative data

In addition to these quantitative surveys carried out by research assistants, qualitative methods were used to validate and provide additional information about the patterns emerging from the data. Semi-structured interviews and focus groups were conducted on a variety of topics during the year (see list below, with detailed interview guides available in Annex 1). A semi-structured interview is a conversation between the interviewer and the respondent, where the interviewer has an outline of the topics to be covered but has considerable freedom to conduct the conversation in his or her own style (Corbetta 2003). They were usually structured around a given scenario⁷⁶, with follow-up questions to understand the reasoning behind their decisions. These interviews were administered by me in French, and translated by my assistants from French into Mooré. My basic Mooré language skills helped reduce the nuances lost in translation.

⁷⁴ As women are married young, unmarried women were generally younger than 15 years old. Even though they may contribute to income generation and help in farming, both these roles only increase significantly after marriage.

⁷⁵ The negligible income earned by children was not recorded in the survey, but their household roles are described in Chapter 7.

⁷⁶ For example: What would you do if you harvest was poor this year? What would you do if you succeeded in earning more money from gold this year? Or if you earned much less? What would you do if you fell ill? What would you do if the rainfall remained highly variable (climate change)?

- **November - December 2009:** socio-demographic household characteristics, types of crops planted, size and location of fields. Interviews were carried out only with the household head.
- **March - April 2010:** detailed discussion of the assets available and income generating activities (verification of data) and the sequence of coping strategies. Interviews were carried out on an individual basis.
- **August 2010:** discussion of the coping strategies during the lean season. Interviews were carried out as focus groups.
- **October 2010:** accessibility of forest products. Interviews carried out as focus groups.
- **December 2010:** discussion of the strategies used and difficulties or opportunities encountered during the study period. Interviews were carried out on an individual basis.

These focus groups and individual semi-structured interviews provided invaluable contextual information. In tandem with prolonged field engagement and participant observation, they allowed the establishment of causation beyond correlation, ensuring the internal validity of the data. Unstructured interviews were also carried out with key informants who were TREE AID staff, development personnel, research colleagues and government staff, in order to clarify certain concepts or questions. Discussing with them the trends present in other parts of Burkina Faso gave me a better understanding of the representativeness of my sample. A limitation of the qualitative data was that it did not necessarily give an equal voice to all stakeholders. Although efforts were made to include everyone in the discussion, invariably some interviewees were more talkative and more interested than others. As a result, more qualitative data were available for some interviewees than for others. This caveat reiterates the importance of combining qualitative and quantitative methods – whereas the latter did not necessarily provide depth of understanding, it supplied the same amount of information for each interviewee, painting an unbiased picture of their strategies.

A field journal was kept in recognition of the fact that qualitative data, particularly if collected via participant observation, can be very subjective. Here impressions, frustrations and thoughts on research progress were recorded. At the time it provided an important outlet for a range of conflicting emotions arising during fieldwork (Kleinman and Copp 1993), especially following the death of five members or relatives of the families I worked with (two of them were interviewees). During data analysis, the field journal also provided an important insight on biases and assumptions made.

4.3.4. Contextual and secondary data used

In addition to the qualitative data, a variety of contextual data were collected to verify the representativeness of the results. The following data were compiled:

- The seasonal price variations of forest products and of their substitutes were recorded in both field sites (primary data). Prices were recorded for a fixed volume once per month in the main market town of the province (Nobéré and Séguénéga, respectively).
- Consumer prices of livestock (adult males), cereals, vegetable and spices recorded once per month in Nobéré and Séguénéga (primary data).
- Consumer prices of cereals recorded every 10 days in Po (near Nobéré) and Séguénéga for 2009-2010 (secondary data, Ministry of Agriculture).
- Consumer prices of livestock (adult males) recorded every 10 days in Po (near Nobéré) and Séguénéga over 2009-2010 (secondary data, Ministry of Animal Resources).
- Daily rainfall data for Nobéré and Séguénéga for 2009-2010 (secondary data, Ministry of Transport)
- Annual agricultural production statistics per province over the last 10 years (secondary data, Ministry of Agriculture).

The market price data were used to convert the asset holdings into monetary values. All of the secondary data provided useful information on the seasonality of several agricultural variables, as well as the extent of variation in long term trends of these variables, where available. All secondary data were carefully checked for missing data points and unrealistic outliers. Primary data on livestock and cereal prices was collected purposefully to double-check the secondary data. The rain and livestock data, especially, contained many missing data points.

4.4. Data analysis

All quantitative data were entered and coded in Microsoft Excel. The calculation of compound variables is explained below. As data were heteroskedastic and not normally distributed, non-parametric group comparisons and regressions were computed using version 11 of the statistical software STATA (StataCorp, College Station TX, USA). The significance level (p) of any statistical tests undertaken was reported, as well as the degrees of freedom (d.f.). Due to the non-normal distribution of the data, medians were chosen as indicators of central tendency.

Semi-structured interviews, focus groups and general observations during field work were written down by hand (in French). These were classed by date and by interviewee. All quotes cited were anonymised and identified with a three digit code which is explained in Annex 2. The qualitative data analysis (QDA) is explained in Section 4.4.5. First, the analysis of the quantitative data is outlined, below.

4.4.1. Determining the sources of cooked meals

Examining the sources of food was used as a basis for understanding livelihood construction. A livelihood strategy was defined as a strategy to obtain food (via direct or indirect means), thus ensuring the food security of the household. To simplify matters, only the sources of cooked⁷⁷ meals were quantified in the cooking questionnaires. This methodology reflects the aim of the thesis to investigate food and resource access, as opposed to compiling an accurate nutritional profile of the household. The origin of the dominant ingredient⁷⁸ of each cooked meal was coded. For simplicity, this dominant ingredient is referred to in the following sections as 'cereal', even though in some cases the dominant ingredient was a pulse (beans or ground peas) or various combinations⁷⁹ of boiled or leafy vegetables. In either case, the origin of the dominant ingredient was coded.

Once the quantity of meals cooked per household over two sets of three days was determined, the proportion of these meals stemming from various sources was quantified. It is this *relative* proportion that is the main data set used in this thesis. The sources of cooked meals were coded into four basic categories. These contained a variety of subcategories to allow a more detailed disaggregated analysis within and across households:

1. **Food grown by:** the household head; his wife(s); the step-mother(s); the head of another household within the same compound; the compound head.
2. **Food purchased by:** the household head; his wife(s); the step-mother(s); the head of another household within the same compound; the compound head.
3. **Wild foods gathered:** from the bush or fields; by the wife(s); the step-mother(s); the wife(s) of other households within the same compound.

⁷⁷ Previously-cooked foods which were re-heated were not coded, neither were snacks.

⁷⁸ For a diet diversity study simultaneously carried out for TREEAID, the origin of the main sauce ingredient was also coded in each survey (Tincani 2011). That data set was not presented in this thesis.

⁷⁹ These combinations of boiled and leafy vegetables sometimes contained cereals, all combined together into a dish locally referred to as 'leaf couscous'. In this case, the origin of the cereal was not coded separately. Only origin of the boiled or leafy vegetables, being the dominant ingredient, was coded. The definition of different dishes was made with the help of the families and did not entail the precise weighing of ingredients.

4. **Food received by:** the household head; his wife(s); the step-mother(s); the head of another household within the same compound; the compound head.

For clarification, one of the four food sources, namely wild foods, is explained in more detail below. The term 'wild foods' refers to edible leaves, flowers and seeds gathered from wild or semi-domesticated⁸⁰ tree species. Surveyed households used these products both as major components of a dish, or as minor ingredients to add flavour. The distinction between 'major' and 'minor' components was made based on the volume ratio of wild foods to cereals in any given meal. Wild foods formed a major component in traditional meals such as *gnon* or *babenda* (see Chapter 5, Table 18)⁸¹. In contrast, wild foods were only a minor component of cereal dishes containing some wild foods in their sauce (e.g. a meal of *tô* with baobab leaf sauce), or in the case of meals which used wild foods to add flavour or as a preservative⁸². The quantitative cooking surveys presented in this section only recorded wild foods when employed as a major ingredient. This choice was made to be able to specifically record the contribution of wild foods to food security (a quantitative cereal saving), as opposed to the use of wild foods to add flavour and improve diet diversity. In contrast, the qualitative interviews presented in Section 4.3.3 included discussions relating to wild foods used both as major or minor components of a meal. This choice was made to be able to capture socio-economic and cultural factors governing wild food use, regardless of the form in which these wild foods were used (see next paragraph). The quantitative asset questionnaires presented in Section 4.3.2 recorded all wild foods stored, regardless of whether these were later used as major or minor components of a meal, allowing data triangulation with both the quantitative cooking surveys and the qualitative interviews mentioned above.

As demonstrated by the four food sources presented in this section, the concept of food security was approached using a modified version of Amartya Sen's Entitlement Theory, expanding it to include rationing as well as non-private 'environmental entitlements' in the form of wild foods. The food gathered from fields was classed separately from home-grown food (home production) because each of these sources were governed by different access rules. Wild foods could be collected from *any* field, not just from fields owned by the

⁸⁰ For simplicity, these products are referred to as 'wild' hereon in, even though some stem from trees which are actively maintained. These trees are pruned, and selectively protected against bush fires and animal grazing.

⁸¹ Wild foods frequently used in this form included the leaves of Baobab (*Adansonia digitata*), 'bulvaka' (*Corchorus tridens*), 'lalongo' (*Leptadenia hastata*), 'kankalaga' (*Afzelia africana*); Kapok flowers (*Bombax costatum*), or the grains of the Acacia tree (*Acacia macrostachya*).

⁸² For example, the fermented seed of *Parkia biglobosa* were used to make 'soubala' spices. The leaves of two species (*Tamarindus indicus* and *Piliostigma reticulatum*) were added to meals as a souring agent, acting as a preservative. Finally, shea butter (made from fruits of *Vitellaria paradoxa*) was added to meals as a cooking oil substitute.

individual, as is the case for home-grown food. Nonetheless, wild foods were not ‘open-access’ as often described in the literature (Baland and Platteau 1996). In Burkina Faso, all trees have a private male owner (head of a household or head of a family lineage) (Guirou-Ouedraogo 2009). Harvesting is however not necessarily reserved for the members of the household or lineage of the tree owner. For certain species access rules are relatively relaxed, whereas for other species of high economic or cultural importance, access is highly regulated (Tincani 2011). This makes wild foods an interesting case study of the negotiation of access to entitlement channels.

For the quantitative analysis of Chapter 7, the sub-categories of the four food sources presented in this section were pooled to supply the proportion of produced, purchased, gathered or received food for each household. In Chapter 6, the same data set was disaggregated and examined on an individual basis, as well as aggregated for the whole compound. In addition, participatory methods were used during each survey round to obtain qualitative information on the perception of food security, for every household member.

4.4.2. Contribution of each food source over six average cooking days

The proportional contribution of each source was calculated not from a simple count (number of meals stemming from the source) but from a weighted sum. The latter method was chosen to avoid giving disproportionate weight to small meals (i.e. breakfast and lunch). Each meal was weighted by the quantity cooked, which was measured in volume⁸³. Unfortunately meal size was not always recorded. Any missing data were completed with the average size for that meal type during that season, for that household. Data were expressed over the period of six days. However, surveys of the last three meals cooked per woman could span as many as 12 days, depending on the number of co-wives taking turns cooking. Such data were normalised to cover six days, making the data comparable to other households.

The choice of collecting cooking data over six days, as opposed to the original three days, was made to improve data quality. Firstly, if more than three women operated a rotating cooking schedule, all of them could not be captured in three days. Secondly, it was found that ‘unusual’ circumstances often altered cooking habits, such as market days or visits by friends or relatives. For these reasons, surveying six days provided more representative data, including both ‘normal’ and ‘unusual’ days. Nonetheless, recording cooking over six days, every two

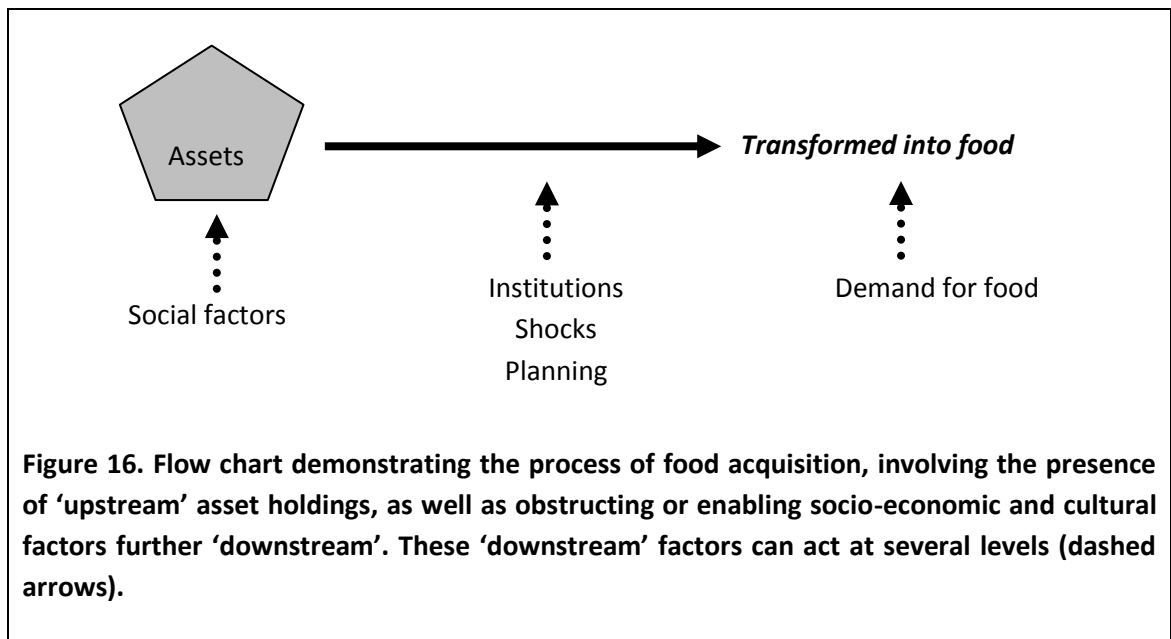
⁸³ The standard volume units with which the women were familiar were used. In Séguénéga, the standard unit was a tomato tin of 1.5 litres (*une boîte*). In Nobéré the standard unit was a calabash bowl (*un yoruba*), equivalent to 1 1/2 tomato tins. Any data stated in other volume units (a cart load, 100kg sack, 50kg sac, 3 litre tin, 12 litre water-carrying bowl or 0.5 litre sauce bowl) were converted into units of tomato tins.

months, is not a very frequent sample. It is likely that this method under-sampled rare meals. To check the representativeness of these data, it was compared to rough ratios obtained every survey round by asking the head of the household what proportion of collective meals over the past month stemmed from the husband's grain reserves; the wife's grain reserves; purchased food; or consisted of 'leaf couscous'.

Each data point was checked against the food reserves of all household members. For example, if a woman stated she had cooked her home-grown rice, but the stock data revealed that she had not produced any rice, a follow-up question was posed to verify where the rice had come from. This was very time-consuming but ensured the quality of the data. It revealed more food was purchased than was at first stated.

4.4.3. Examining livelihood strategies

Livelihood strategies were examined using the baseline analysis of the Household Economy Approach (HEA), entailing first the identification of livelihood zones, followed by a wealth ranking (see Section 4.2.4) and the analysis of livelihood strategies (Boudreau 2008). Both provinces studied were selected within the same livelihood zone dominated by agricultural as opposed to pastoral activities (USAID 2009b), and thus experiencing a comparable level of risk exposure. This choice was important because the degree of current and historical risk exposure significantly shapes livelihood construction (Reardon and Matlon 1989). Secondly, selected households were classed into wealth groups (see Section 4.2.4). Thirdly, livelihood strategies were examined with regard to how these transformed the assets available to the individual or household into food entitlements. In accordance with entitlement theory, four different ways were documented through which assets were transformed into food: home-grown food production, purchase of food, gathering of food, and food received from relatives. Each of these four food sources requires asset holdings, as well as the presence of enabling socio-economic and cultural factors which allow these assets to 'translate' into food entitlements. The relationship between these factors is graphically represented in a flow chart, within which 'upstream' factors refer to asset holdings, and 'downstream' factors to the obstructing or enabling process of this transformation (see **Figure 16**).



All livelihood strategies were considered equally in data collection. A greater emphasis was *not* placed on wild foods, simply using these as a starting point to critically examine adaptation or ‘coping’ in the context of the wider livelihood. The livelihood strategies observed were not classed, coded or ranked according to a normative ‘risk-coping’ hierarchy. Instead, a constructivist approach was adopted which explored their meaning in the local context; for example perceptions regarding the consumption of wild foods. Referring to these strategies as ‘coping’ strategies was considered inappropriate, as it wrongly suggests the activities were temporary. They were temporary in the sense of only spanning a few months of the year – thus better described as ‘seasonal’ strategies – but they were repeated to a greater or lesser degree every year. In this thesis these are simply referred to as livelihood strategies. By including downstream factors in the figure above, the negotiation process governing access to assets, and control over the food streams emanating from these assets, could be explored in particular detail. In addition, qualitative data was collected to identify if certain households or certain household members had better access to certain livelihood strategies. This data set is presented in Chapter 6 and Chapter 7, exploring the processes governing resource access. Access to strategies was compared across wealth categories, investigating if their adoption followed a U-shaped or an inverse U-shaped distribution.

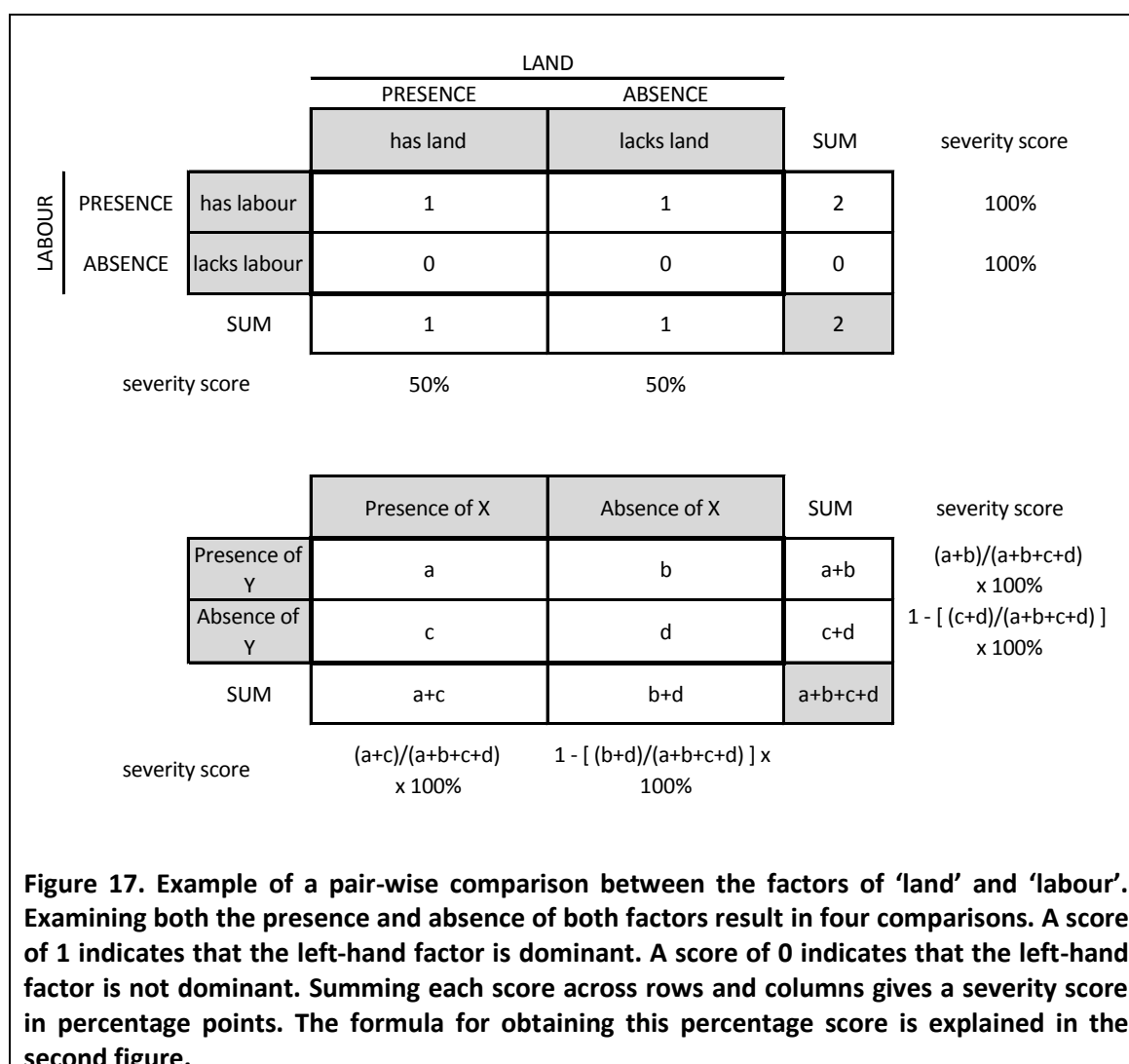
In order to identify the most important obstructing and enabling factors affecting food acquisition, a pair-wise ranking exercise was undertaken. Pair-wise ranking is a common participatory technique used to rank preferences or rank lists of problems such as lack of market access or lack of credit facilities (Russell 1997). The technique is used to establish which factors are most important, by comparing every pair in turn. To give an example, such a

comparison would entail the following question: “All other things being equal, if you are trying to ensure the food security of your family, which is a stronger obstacle, the fact that you don’t have enough labour to farm, or the fact that you cannot obtain sufficient land area?”. This process is repeated for each pair, noting every time which factor emerged as more important (the dominant factor). Based on this information, a ranked list is generated, ranking the dominant factors from most to least frequent (UC 1997). The factor which emerged as dominant in every pair-wise comparison is at the top of the list.

This methodology is usually employed in a participatory setting, allowing the interviewees themselves to generate the ranked list by asking them to compare each pair of factors (Russell 1997). In this thesis, this method was adapted so that it could be used *ex post*, after return from fieldwork. As a first step, a list of relevant factors was compiled. In a participatory setting, this list would be compiled together with the interviewees. In this thesis, the list of relevant factors was established based on the factors which appeared most frequently during qualitative data analysis (see Section 4.4.5). A list of relevant factors was compiled for each of the four food channels. As a second step, the dominant factor in each pair was established, based on preferences clearly stated in interviews, or evident from the quantitative data, or from general observations made during field work. In order to compensate for the fact that preference varied between individuals, the pair-wise comparison was designed in a way to distinguish between severity and incidence of a factor. Severity relates to the impact which the presence or absence of a factor has. Frequency describes *how often* such a beneficial or deleterious factor is experienced. To take the example above, comparing labour and land constraints provides both information on the frequency of these factors in the study setting, and the severity of these factors. Severity could be objectively established based on the data collected, as demonstrated by the following example:

- If you lack farm land (absence of a factor), can this be compensated by having available farm labour (presence of a factor), in order to maintain food production? *The answer is yes, because more labour can be invested per hectare to intensify food production.*
- If you lack farm labour (absence of a factor), can this be compensated by having available land (presence of a factor), in order to maintain food production? *The answer is no, because there is insufficient labour available to farm the available land.*
- ‘Lack of labour’ has a higher severity than ‘lack of land’, because the former can compensate for the latter, but not vice versa. Therefore, lack of labour is the dominant obstructing factor, and presence of labour is dominant enabling factor.

By comparing the presence and absence of every factor in four different ways, a list of dominant enabling factors and a list of dominant obstructing factors could be established for each food entitlement channel (see **Figure 17**). The full pair-wise analysis is presented in Annex 3. Each ranked list was verified with the research assistants and with key informants in June 2011, while returning to Burkina Faso for a TREE AID workshop. The dominant factors emerging from pair-wise analysis were graphically represented in flow charts following the layout of **Figure 16**, and discussed in Chapter 5.



4.4.4. Measuring livelihood resilience

Resilience is an emergent property of complex systems, which arises from the combination of several elements. The property itself remains unchanged, while the elements contributing to it can change. In the case of livelihood systems, the combination of livelihood strategies change constantly, while, ideally, the food security level to which they contribute remains unchanged. As discussed in Chapter 2, resilience can be measured at several scales (Carpenter *et al.* 2001).

In this thesis, resilience is quantified at the spatial scale of the livelihood system of each household. It is quantified at the temporal scale of a whole agricultural cycle, from harvest to harvest. When measuring resilience, it is important to quantify to which shock or stress it refers. In this thesis, resilience to seasonal food insecurity is explored.

Taking into account the narrow temporal and spatial scale delineated above, the three universal characteristics of resilience – namely persistence, adaptability and transformability (Folke *et al.* 2010) – were defined using ‘fast’ indicators. ‘Slow’ indicators describe the underlying processes of a system, while the ‘fast’ indicators reveal the dynamics of these underlying processes (Carpenter *et al.* 2001:778). It is vital to choose indicators which change sufficiently over the temporal and spatial scale chosen, so that they can be used as indicators of the underlying processes. For all three indicators, medians were chosen as indicators of central tendency due to the non-normal distribution of the data.

(1) **Persistence** is observed via the **diversity of realised entitlements**, as these capture the portfolio of food entitlements through which the household achieved its food security. Resilience theory predicts the diversity of these entitlements to decline, as wealth is accumulated, and the system persists. This idea is based on the premise that assets – in this case food – can be successfully accumulated through few entitlement channels, i.e. those which ‘work best’. The diversity of realised entitlements was measured *ex post*, via the weighted proportion of food obtained through each of the household’s four entitlement channels during the study period. For each survey round, diversity was calculated using Simpson’s diversity index D (see below). In order to capture persistence over the whole agricultural cycle, the diversity figure for each survey round was averaged, reflecting the median level of diversity, referred to as ‘yearly diversification’ from herein.

$$D = 1 - \sum_{i=1}^N p_i^2$$

, where N is the number of food entitlement channels (4), p is the proportion of each food stemming from each food entitlement channels designated by i .

(2) **Adaptability** is observed using the indicator of **covariance**, which captured the interdependence present between the four different entitlement channels, and thus the connectedness of whole system. Positive covariance signals high interdependence and low adaptability, whereas negative covariance signals low interdependence and high adaptability. Covariance between each pair of sources was calculated using standard COVAR function in Microsoft Excel (see below, for source X and source Y). In order to

capture adaptability over all four food sources, the covariance figure was averaged, reflecting the median level of covariance.

$$\text{COVAR (X, Y)} = \text{mean of [(X - mean of X) \cdot (Y - mean of Y)]}$$

(3) **Transformability** was observed via the capacity of separate food sources to respond to changing food demand over the study period. The capacity to respond was measured *ex post*, via the **standard deviation** of each food source, thus measuring a property of each source, and not a property of the whole system. This transformability was calculated using the standard STDEV function in Microsoft Excel (see below, for source X). In order to capture transformability over all food sources, the standard deviation figure was averaged, reflecting the median level of standard deviation.

$$\text{STDEV} = \sqrt{\text{mean of the sum of (X - mean of X)}^2}$$

These indicators are purposefully simplified in order to be able to capture a complex set of processes over a narrow temporal and spatial scale. To examine the effect which scale had on the indicators, Chapter 7 examines them both as aggregated indicators, defined above, and as indicators disaggregated over time or by food source. The indicators are based on definitions proposed by Fraser *et al.* (2005), adapted for the local context of livelihoods in Burkina Faso: The persistence indicator was modified to capture the diversity of *realised* and not *potential* entitlements, and the transformability indicator was defined at the scale of one livelihood system, not across several systems (see Chapter 2, Section 2.3.3). The methodological and conceptual problems encountered are discussed in Chapter 7. It was not possible to measure the three characteristics of resilience over a spatial scale beyond that of the household, nor over a temporal scale beyond that of the study period of the dissertation. However, resilience over these wider temporal and spatial scales is discussed in a qualitative manner in Chapter 7.

4.4.5. Qualitative data analysis

Quotes from semi-structured interviews and focus groups, as well as general observations were analysed using qualitative data analysis (QDA). The quantitative data provided the lens through which qualitative analysis could occur. The quantitative data on remaining food stocks, as well as the participatorily-defined food security categories, allowed households to be classed into different food security groups. QDA could then be applied to explore the differences between groups. Similarly, the quantitative data on food-source diversity allowed households to be classed into different groups according to livelihood diversification, the

differences among which could then be explored using QDA. QDA involved the iterative process of data reduction (abstraction and coding), data synthesis, and data verification (Miles and Huberman 1994). A mixed approach was adopted using first inductive reasoning to detect the theories emerging from the data, and then using deductive reasoning to further verify these patterns, also testing them against quantitative data.

The qualitative data was coded using Microsoft Excel. The same quote or observation could be coded several times under the following themes: perceptions of food security; comments on diversity; comments on temporal scale and historical trends; perceptions of resilience; factors of inter-and intra-household dynamics. This data set was used particularly in Chapter 5 and Chapter 6, in order to determine if certain factors were perceived as more dominant than others. In order to rank their importance, a pair-wise ranking technique was used (see Section 4.4.3).

4.5. Data quality

“This [study] can only be a secular guide, mostly limited to tangible, measurable realities and the kind of thing that people are prepared to say to a stranger. And what a stranger feels in the Sahel, more strongly than most other places on earth, is the power of the unspoken, the impalpable. Between the lines, therefore, you must read many long silences, a lot of human warmth and laughter, a reverence for all the spirits that have been part of the world since time immemorial – and imagine above it all – from one flat horizon to the other, the great unbroken canopy of sky” (Sharp 1990:3)

As described in Section 4.3, efforts were made to improve data quality by verifying the cooking data carefully against asset data and income and expenditure flows. Data were continuously entered into Excel throughout the year to check the consistency across surveys rounds and across households. This was a necessary but very time-consuming task⁸⁴. It revealed inconsistencies between responses within the same household, as well as problems of recall. Inconsistencies in the income and expenditure data were clarified repeatedly through semi-structured interviews. The data collected were complemented by participant observation throughout the long fieldwork period. As cautioned by the quote of another researcher of Burkina Faso, above, it is vital to observe the unspoken. As such, all four types of triangulation were used to increase the validity of the findings (Denzin 1988). Data and methodological triangulation was achieved by using both quantitative and qualitative methods of data

⁸⁴ The long hours of data entry on an unsuited laptop keyboard resulted in a repeated-strain injury (RSI) on both wrists, which resurfaced during the write-up period of the thesis.

collection and analysis. Observer triangulation was assured via discussions with my research assistants. Use of alternative theoretical concepts from different disciplines provided theory triangulation.

To ensure representative data in a variable environment, the study was designed so that the timing of the survey did not confound the information collected: data were collected throughout the seasons, thus avoiding the 'convenience sampling' of dry season research⁸⁵. Secondary data permitted the comparison of the study period with long-term trends. To ensure a balanced view of the topic, marginalised groups were given a voice in group discussions by specifically asking for their view point, and the opinion of a variety of governmental and non-governmental employees was sought. Several discussions originally planned at a household level were carried out at an individual level once it was noticed that certain individuals were not talking openly in front of others (see quote below).

Quote 1. People do not speak openly about their problems here. They have their pride. This is why everyone needs to be interviewed separately. When I interviewed them, I always brought some sweets, so that each woman takes them to their own children and leaves me alone with the woman I want to interview. Also that way the babies cry less, we won't be interrupted as often (Bonkougou A., Jan. 2011).

To avoid misinterpretations of the questions asked or the data recorded, abstract concepts such as wellbeing or risk were carefully tested and translated into the local context. Local input into the design was included in the pilot phase to avoid imposing a pre-conceived view. An inductive as opposed to deductive approach dominated the fieldwork period, with adjustments made where necessary. The combination of several methods allowed the triangulation to minimise misinterpretation of the data. As an example, testing the asset questionnaire revealed that certain terms were frequently misunderstood: When inquiring how much livestock (*rumse*) a person owned, chickens and guinea fowl were frequently omitted as these were considered secondary. Similarly, when inquiring how many crops (*koodo*) were stored, vegetables, spices and leafy vegetables were frequently omitted as these were not considered as crops. When asking how many children lived in the household, nephews and nieces living in the household were often forgotten, and only remembered when a follow-up question was posed at lunch time.

⁸⁵ Convenience sampling was poetically captured by Robert Chambers: "Nutritionists take care to plan to do their surveys when they can | be sure the weathers fine and dry, the harvest in, food intake high | then students seeking PhDs, believe that everyone agrees | that rains don't do for rural study – suits get wet and shoes get muddy | and bureaucrats, that urban type, wait prudently till crops are ripe | before they venture to the field, to put their question 'what's the yield?' " (Chambers 2008:37).

Overall, to avoid misrepresentation of the data, all data collected were validated first by the interviewees themselves during the final semi-structured interview (December 2010) and later through an academic conference (December 2010) and a TREE AID workshop (June 2011), both in Ouagadougou. This validation, in addition to frequent informal discussions with TREE AID staff, contributed significantly to improving data quality as well as the representativeness of the results found.

4.6. Ethical considerations

Significant ethical considerations had to be kept in mind during this thesis. When each family was approached at the beginning of fieldwork, the aim of the task ahead was clearly stated, clarifying that the work was not part of a development project. Participation was voluntary. In-kind compensation was provided for time spent answering questionnaires, in the form of small gifts (salt, cooking oil, sweets for the children, cola nuts for the elders) or favours (rides to town, help with baptism or funeral expenses). The content of individual interviews was never discussed with other family members to maintain confidentiality. Anonymity was respected where requested. Both villagers and assistants knew other TREE AID staff and thus had the possibility of making comments or complaints through TREE AID, if they did not wish to speak directly to me. I made every effort to maintain an open dialogue with my assistants regarding the progress of the study, accommodating their logistical and monetary suggestions as far as possible.

Although every effort was made to establish a relationship of trust with the families studied, some individuals were less eager to participate than others. Cross-checking of the data revealed that some individuals consistently lied (see observation below). Some young married men were particularly suspicious of the intention of the study, sometimes deliberately leaving the house the day they knew the interview would take place. It would be disrespectful to openly confront this issue; repeated inquiry can only go so far. Cross-checking the data enabled any conflicting responses to be identified and correctly re-entered, after careful comparison with other household answers and after consultation with my assistants. Respect of the local culture was felt to be more important than the errors these corrections may have caused.

Quote 2. I asked him "how much did you harvest?" He laughed. He looked at me. He looked away. He looked at my sheet of paper and my notes, and answered "six donkey carts" [full of cereal]. 30 minutes later I asked his eldest son the same question. He

answered that his father had harvested 15 not 6 donkey carts. Other household members reiterated the son's statement (personal observation, Tincani L., Dec. 2009).

In order to ensure the equitable dissemination of results of this thesis, the preliminary results were presented back to the villagers at the end of the survey period. Results were presented at academic conferences held in Burkina Faso at the end of fieldwork (December 2010) and six months later, providing invaluable feedback. To make them accessible to the wider public, results were published in the local Burkinabé newspaper in June 2011 in conjunction with a national workshop, attended by researchers as well as employees of governmental and non-governmental organisations.

Chapter 5: Livelihood structure and diversity in Yatenga and Zoundwéogo province

This chapter describes the livelihoods of the eight families⁸⁶ studied in Yatenga and Zoundwéogo province. It is envisaged as a descriptive chapter, presenting the complex interactions between ecological, economic and cultural factors which determine livelihood activities. It is intended as a complement to the agricultural and social sections of Chapter 3, critically comparing my own data with national statistics and development narratives. This chapter also critiques the portrait of Sahelian livelihoods in the literature, and how it relates to changing attitudes in the research community over the last decades. The results are further discussed in the following two chapters, with Chapter 6 exploring the power dynamics within and across households, while Chapter 7 examines the livelihood strategy as a whole. An overview of the 23 households studied is given in Annex 2, explaining the relationships between different households living within the same compound. Below, the inherent seasonality which affects livelihood strategies is outlined first, before describing the strategies themselves.

The quantitative data presented are supplemented with quotes and other qualitative data to give an idea of the variety of strategies used. Where possible, purchases mentioned in quotes are quantified in West African Francs (FCFA), to provide an idea of scale. As a general reference, in rural areas, a chicken cost roughly 3000 FCFA, an adult male goat 10-15,000 FCFA, an adult male sheep 20-25,000 FCFA and a male cow 100-150,000 FCFA. Livestock prices varied seasonally (see Figure 28). A loaf of baguette bread cost 125 FCFA. One litre of petrol cost 675 FCFA. Married men with children spent roughly 4-5000 FCFA per month on daily expenses. Married women spent roughly 2-3000 FCFA per month on daily expenses. However, additional non-daily expenses varied greatly between seasons. The head of a household spent roughly 5-10,000 FCFA for each religious festival, such as the end of Ramadan, not including the cost of

⁸⁶ The term 'household' ('*zaka*' in Mooré) is used here to refer to one husband and his wife(s) and their unmarried children. The term 'family' ('*yiri*' in Mooré) refers to all the households living within the same compound.

new clothes. One year of (highly subsidised) primary school fees cost 3000 FCFA in rural areas, plus 2000 FCFA worth of notebooks and pencils. A 25 litre sack of fertiliser cost roughly 15,000 FCFA. A 25 litre sack of millet cost 15-25,000 FCFA depending on the season (see Figure 29). As mentioned in Chapter 3, the national poverty line was set at 82,672 FCFA per person per year in 2003. During the 18 months of fieldwork, 100 FCFA were equivalent⁸⁷ to 0.73-0.80 GBP or 0.655 EUR (pegged value) or 0.45-0.51 USD.

5.1. The seasonality of livelihoods

Burkina Faso is marked by a distinct seasonal variation in climate, agricultural activities and social events. The structure of the Mossi calendar must first be understood before examining the livelihood activities themselves. The various phases of the Mossi year are dependent on the climatic conditions which affect crop growth. As a result, the beginning and duration of each phase varies from year to year (Hammond 1966). The year starts after the harvest has been stored and the king (*nakombsé* lineage) has been thanked for ensuring peace and stability, while the earth priest (*tenbiise* lineage) has been thanked for good rains and fertile soils. When these ceremonies have been carried out, the new Mossi year begins in the moon corresponding to December or January. The first third of the Mossi year is dominated by non-agricultural activities, followed by eight months of agricultural activities.

The non-agricultural phase (approximately January-April) is dedicated to re-affirming social ties and repairing houses and tools. Both of these activities necessitate money, hence during this phase the majority of income-generating strategies are carried out. The non-agricultural phase is a period when people have time and money. As a result, marriages and funeral rituals⁸⁸ are arranged. Visits are made to relatives and friends. Young mothers take their new baby to meet its maternal grand-parents. Wives can stay away for several weeks during the dry season, especially if the home of her family is far away. In the meantime one of her co-wives cooks for the family. The non-agricultural phase is also the time when men leave to seek migratory work. They often leave right after the harvest (around November) and don't return until the new agricultural season starts.

The agricultural phase (approximately May-December) is characterised by intense labour demand, as any free periods occurring between the phases of sowing, weeding and harvesting

⁸⁷ These values were obtained from <http://www.xe.com/currencycharts/?from=GBP&to=XOF&view=5Y>.

⁸⁸ The funeral ritual can occur several months after the actual interment, if the death has occurred during the growing season. Funeral rituals also include remembrance ceremonies held several years afterwards.

of the main cereal crop are filled with the cultivation of secondary crops (see Section 5.3.1). Due to lack of time, any other activities are delayed until the harvests are finished. A detailed survey of labour productivity from the 1980s revealed that the numbers of hours worked per day remained relatively constant throughout the year, but that during the agricultural phase they were dominated by agricultural activities (Ancey 1983).

The yearly cycle is structured both around the variation of agricultural labour demand and around the ecological cycle. The latter not only drives the agricultural cycle but also the timing of other activities. Bricks are made at the end of the rainy season before the stagnant ponds dry out. Straw mats are made before the grass becomes too dry and brittle. Wild foods are gathered when the desired fruit ripens. Firewood must be collected before the rainy season starts and wets the wood. Intense rain in July and August suspends trading activities because the roads to the market often become impassable, particularly with a donkey cart or motorcycle. Conversely, the intense heat of March and April restricts work to the cooler morning hours and the late afternoon until dusk. The environmental and mineral conditions also frame the non-farm activities available, with water availability dictating the capacity to grow vegetables in the dry season, for example. Similarly, gold-digging was only practised in one out of the two study sites of this dissertation, due to the mineral deposits present there.

In contrast, the Muslim calendar is out of sync with the agricultural and the ecological cycle. It is determined by the moon cycle, with dates falling 10-11 days earlier every year (because the Muslim year is only 354.36 not 365.25 days long). The two largest Muslim festivals in Burkina Faso; the end of Ramadan and Tabaski⁸⁹; incur major expenses for the household head, as an ample meal must be prepared and new clothes bought for the family. If these festivals fall during the agricultural season, meeting these expenses can be very difficult. Unlike marriages and other non-religious festivals, they cannot be moved until enough savings are accumulated. In addition, the fasting prescribed during Ramadan makes heavy physical activity difficult. If Ramadan falls in the hottest month of April, the interdiction to drink water during the day seriously affects the farmer's ability to work. If Ramadan falls in the agricultural season, as it did during the study period of this thesis, the lack of food affects fieldwork. Furthermore, regarding funerals, Muslim beliefs prescribe that the funeral and the remembrance ceremonies should be held exactly seven, thirty and one hundred days after the death

⁸⁹ Tabaski, known as Eid-UI-Adha in other parts of the Muslim world, celebrates the fact that Abraham was willing to sacrifice his only son to appease God. In remembrance, every household slaughters a sheep. It is a festival of sharing; a piece should always be given to the poor. The price of sheep can double in the week leading up to this festival.

occurred (personal comment, Bonkougou A.). Having fixed dates for such expensive ceremonies may not suit the household.

While the seasonality described in the previous paragraphs is certainly seen as a ‘fact of life’, storing seasonally-available products makes them available all year round (e.g. cereal granaries and the drying and storing of fruits and vegetables). The money earned during the dry season can also be ‘stored’ to cover cash expenses during the rainy season. Other activities are scheduled to suit the seasonal cycle, except unmovable expenses such as school fees and Muslim festivals. In short, the organisation of the Mossi year is predictable – either because of the inherent ecological cycle or because activities have been scheduled to suit it – meaning that precautionary planning is an inherent feature of the livelihood.

5.2. Food production, consumption and meal types

Before describing how households managed their food security throughout the year, this section explains the crops grown, and the meals cooked with those crops. The rural Burkinabé diet is not as monotonous as it appears to the casual observer. A variety of crops were grown by the surveyed households, in line with the findings of national surveys for the studied provinces (MAHRH 2010). The majority of these crops were grown on the field of the household head, though a proportion also stemmed from the wife’s small field, or from the fields of other household or compound members (see Chapter 6). Pearl millet, white sorghum and maize made up the bulk of cereal production. Some households also grew rain-fed rice. Red sorghum was only grown in the southern field site, but preferably not for home consumption but for sale or beer production. Red beans were the main pulse produced, though peanuts were also grown as a cash crop, and women produced red groundnuts (*Vigna subterranea*, or *bambara* in Mooré) in small quantities on their plots. In the areas studied, cassava and other tubers were rarely eaten. Few leafy vegetables were grown (sorrel leaves and bean leaves), the rest were collected wild or purchased on the market (cabbage). While some households grew aubergines or cabbage, these were grown as a cash crop and not consumed by the household. There was a trade-off between growing extra crops to diversify the diet or to gain extra income (see quote 3; see Chapter 6 for details). In the southern field site, women used the wild Néré seeds to make their *soumbala* spice. The scarcity of this species in the northern field site resulted in the use of cultivated sorrel seeds to make *soumbala*. Only two out of the 23 households grew cotton. Even though every household kept

animals, the meat was not eaten, except during festivals⁹⁰. There was negligible production of eggs and milk (see quote 4).

Quote 3. I don't find our diet very varied, though mixing leaves into the meal helps a lot. Before, we used to grow beans so that we could eat something different in the rainy season, when we were tired of eating tô. Now we sell them instead because they are expensive and fetch a good price. Instead my wife makes zoomkoom in the rainy season, to give us strength before heading to the field in the morning. When our granary runs low we eat fresh maize, red groundnuts and vegetables until the new cereal harvest is ready (Tiemtoré M., Donsin village, March 2010).

Quote 4. People don't eat eggs. The chickens here don't lay any. And any guinea fowl eggs are sold (woman 221, Nov. 2009).

These crops give rise to a variety of meals (**Table 18**). A superficial national survey found that eight of the meal types listed in Table 18 were consumed nationally (FAO 2009b). It concluded that tô was by far the most frequent dish, although surveys were only carried out during one month (July 2009). The data of this thesis however revealed that the frequency of tô and other meal types varied with the seasons (see **Figure 18**), as was confirmed by studies in other parts of the country (Mertz *et al.* 2001, Sawadogo 2002). The diet was diversified either through the purchase of food or through the gathering of wild foods (see Sections 5.3.2 and 5.3.3). Arguably the seasonal bias of national statistics has influenced the perception of diet diversity.

⁹⁰ In the 1960s, bush meat, as well as roots and tubers gathered in the bush, still formed a larger part of the diet (Lallemand 1977).

Table 18. Description of the ten main meal types cooked by surveyed households, with an indication of their required cooking time (focus group data, April 2010).

Over 2h of cooking	30-60min of cooking	Less than 30min of cooking
<p>Tô is the most frequently cooked meal; a semi-solid cereal dish common all over Africa⁹¹. It can be made from maize, millet or sorghum flour. The dish itself is flavourless, requiring a tasty sauce.</p> <p>Beans, or beans mixed with rice, is a protein-rich dish, commonly eaten during the agricultural season.</p>	<p>Rice with an oil (<i>riz gras</i>) or vegetable sauce (<i>riz sauce</i>) is a common festival dish.</p> <p>Couscous is made from crushed and steamed maize, millet or sorghum grains.</p> <p>'Gonré' is made from crushed and steamed beans.</p> <p>'Gnon' is either made purely from crushed and steamed leaves (like cooked spinach), or mixed with cereal couscous.</p> <p>'Babenda' consists of crushed and steamed cereals, beans and leaves, all rolled into a ball.</p>	<p>Porridge (<i>bouille</i>) can be a sweet or savoury dish made from maize, millet or sorghum flour, commonly eaten at breakfast.</p> <p>'Zoomkoom' is a sweet liquid porridge made from pearl millet and Tamarind juice, commonly drunk at festivals (especially Ramadan) and given to guests.</p> <p>'Boualbouala' is a thick savoury cereal porridge, mixed with shea butter; commonly drunk as a hearty breakfast before going to the field.</p>

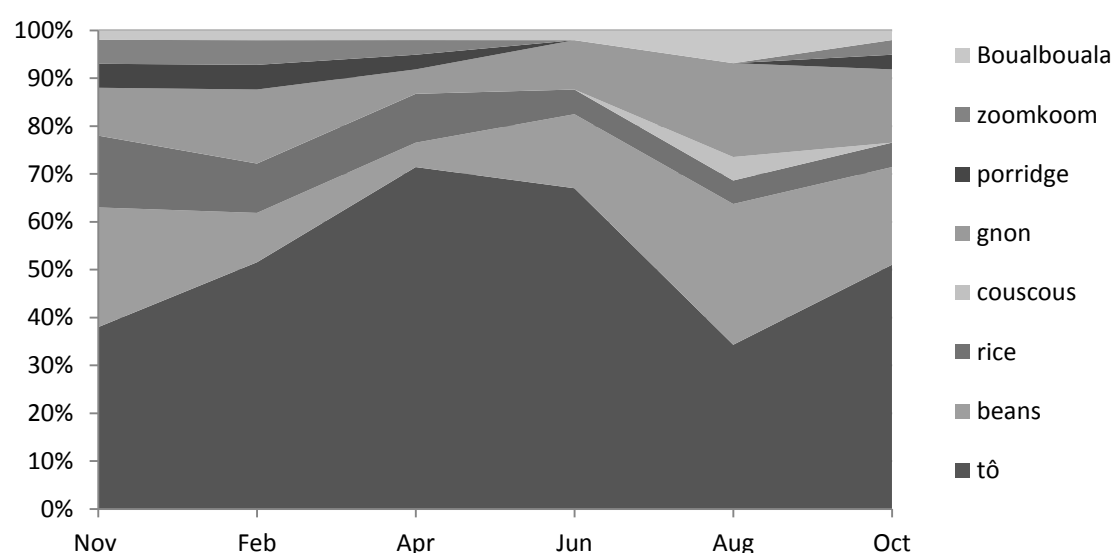


Figure 18. Seasonal variation of the meal types cooked, averaged across both field sites.

⁹¹ In Kiswahili 'tô' is called *ugali*, the dish also closely resembles Italian *polenta*.

The meal types listed above were all made from the same ingredients: rice, beans, maize, millet or sorghum flour or steamed vegetable leaves. Culturally, the husband was responsible for supplying the staple cereals for the meal, while the wife was responsible for supplying the 'sauce' (containing various combinations of vegetables, meat, fish and spices). These foods produced by both men and women were grown on separate fields; an arrangement discussed in more detail in Chapter 6, Section 6.1.1.

Cooking arrangements were complex and varied during the year (see quotes below). As a general rule, each household cooked its own food, with wives of the same household operating a rotating cooking schedule. The geographical layout shows that households lived close together but the wife/wives of each household had their own kitchen (see **Figure 19**). However different households also shared food if the wives of the compound head, for example, were too old to cook for themselves, or if one of the households ran out of food. Each production group contained several consumption groups; with men and women eating separately. Households were both producers and consumers of food – a typical feature of a 'peasant' household (Ellis 1988). Contrary to the 'unitary household' assumption of neo-classical models (Maxwell 1996), food was not shared equally among household members. In addition, several independent income streams were observed for every household, the details of which were rarely shared with other household members. These features justify the methodological approach of interviewing each household member separately.

Quote 5. Only once boys have been circumcised can they eat with the men. Before that, they eat with their mother (man #310, Sept. 2009).

Quote 6. I am newly married; my wife does not yet cook. I eat breakfast with my own mother (as does my wife), but I eat lunch and dinner with my brothers. Those meals are cooked by their wives (man #370, Nov. 2009).

Quote 7. My wife left to visit her relatives in Bobo for three months. There was nobody at home to cook; I ate in the little restaurants on the gold site every day (500F/day) (man #520, March 2009).

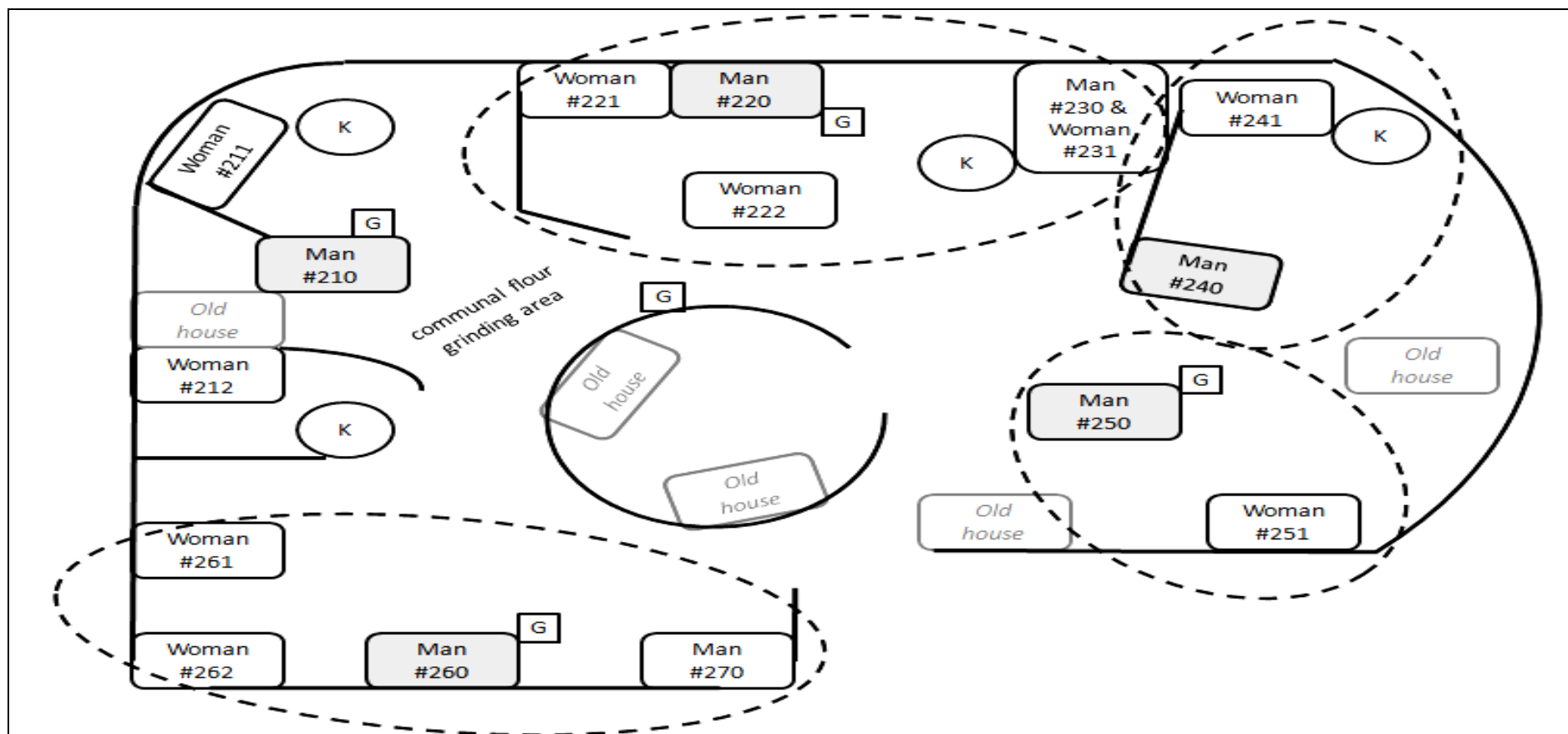


Figure 19. Geographical layout of the Tao family compound, indicating houses (square boxes), kitchens (circles marked with K) and granary stores (marked with G). Old abandoned houses are indicated. The compound contains four households (surrounded by dashed lines) each with their head of household (shaded boxes). Most households have their own granary and own kitchen. All adults have their own houses, except man #230 and his wife #231 who recently got married (he has not yet built her her own house). The elderly head of the compound (man #210) and his elderly wives (woman #211 and #212) do not form a separate household as they no longer cook for themselves but are taken care of by the other households.

Quote 8. Yesterday I didn't eat dinner. Neither did my son. But my husband did. My co-wife cooked for him. He prefers her (woman #412, Nov. 2009).

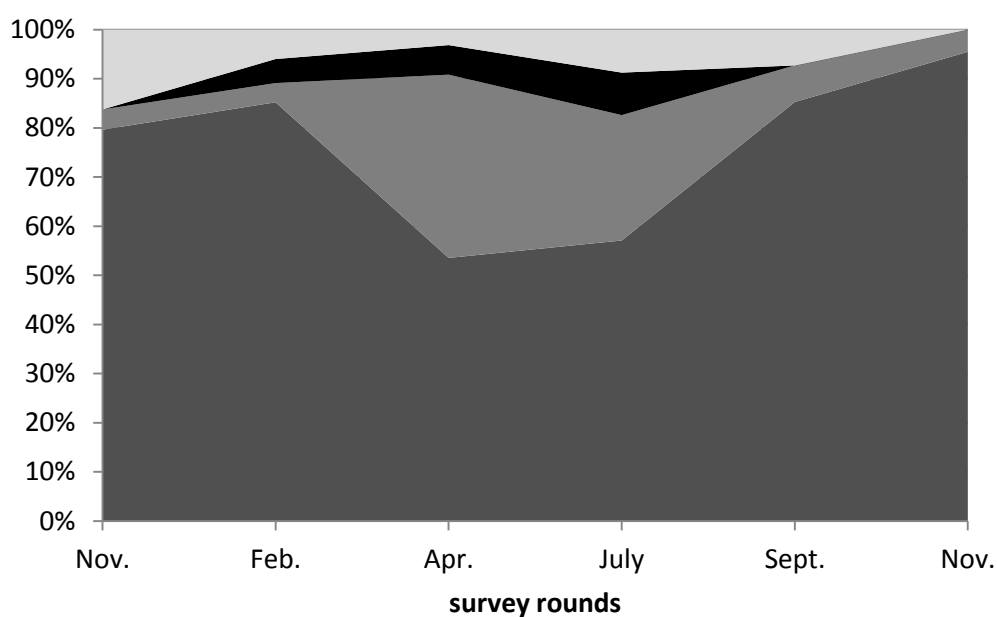
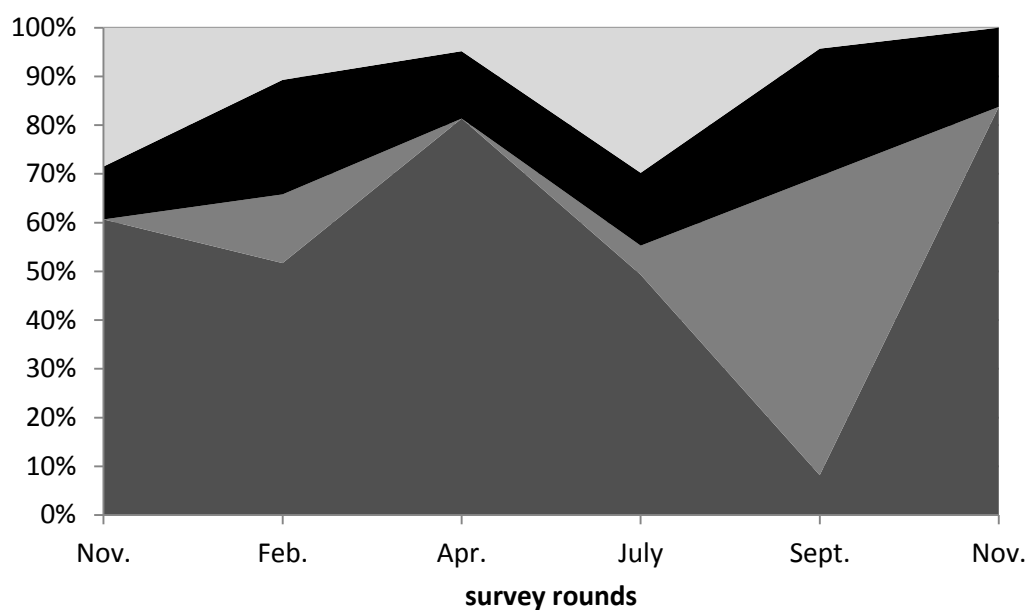
5.3. Factors determining the choice of food sources

The cereals used to prepare the meals above stemmed from a variety of food sources. It is important to remember that all households were deliberately chosen so that they could not meet all their food needs through home production. As such, all households also purchased foods, collected foods in the wild, and received foods from friends or relatives. Obtaining food through other sources in addition to subsistence agriculture is commonly observed for rural households (Barrett *et al.* 2001). Accessing food from each of these four sources required different resources. Home production required land and labour, purchase required cash, receiving food required generous friends and relatives, and wild food collection required time as wild foods are often distant and unequally scattered. The way that these four channels were combined to ensure the household's food security is the topic of this section. The household's food security level, ranging from very low to low to medium, was defined through a participatory wealth ranking exercise (see Chapter 4). This chapter focuses on how households managed food supply, with some techniques for managing food demand noted in Section 5.3.1. It is important to note that not one, but several, household members contributed to securing food supply. Any intra-household variations in food contributions are briefly presented in this chapter, but addressed in more detail in Chapter 6.

Most households employed all four food sources to maintain food consumption year-round. The following graph (**Figure 20**) gives a helpful overview of the seasonal distribution of food sources, averaged across all interviewed households. It shows that, as expected, home production is the predominant source of food, reducing in importance as granary stores run low. Conscious decisions were made to either reduce dependency on the granary early in the year, or complement the dwindling granary late in the year, or both. The following sections examine which factors were important in determining how much food could be accessed via each of the four channels. The relevant factors were categorised following an asset conversion flow chart. The importance of different factors was compared using a pair-wise ranking exercise (see Chapter 3 for detailed methodology). The results for each food source are presented and discussed below. To conclude, the most important factors affecting all food sources are summarised in Section 5.4. As such, an inductive approach was taken to structuring this chapter, organising it according to the factors which emerged as most

important following the qualitative data analysis, thus reflecting the views held by the interviewees themselves.

Figure 20. Seasonal distribution of food stemming from each of the four food sources, displaying median values for the households of the northern (top) and southern (bottom) field sites. The four sources (from bottom to top) are home-grown cereals (dark grey), purchase (medium grey), gathered (black) and received (light grey). The food sources are summed for the men and women of the household.



5.3.1. Eating home-grown food

The surveyed households grew their crops on an average of 2-3ha spread over several fields. Both men and women farmed, but on separate fields often cultivating different crops; an arrangement discussed in more detail in Chapter 6, Section 6.1.1. Each household harvested 0.7-1.5t⁹² of staples per household in the 2009 harvest; figures similar to the averages of the province recorded in the national survey of that year (MAHRH 2010). It should be noted that not all of this production was destined for home consumption. A portion was sold, potentially resulting in conflict if too much of the harvest was sold (see Chapter 6).

Even though fresh home-grown food was only available for 2-3 months of the year⁹³, thanks to careful drying and storing, the dried grains could be consumed year-round. None of the granaries suffered from pest attack or mildew during the study period. At first glance, the seasonal distribution of average levels of home-grown food consumption would suggest that use declined as the granary became progressively emptier (see **Figure 21**), with use only increasing after the harvest (December 2010 for the northern field site; October 2010 for the southern field site). However, a more nuanced analysis reveals that the granary store was not used up in a linear fashion. The wide range of data points in Figure 21 show that some households preferred to use other sources in March, with less than 30% of food stemming from the granary, while other households first used their granary, and other sources later in the year. This distinction was due to a deliberate decision of the household head to 'close' his granary store. Normally, he would hand out a fixed amount (the *mondé*) every 5-7 days, which the women would de-husk, grind and cook. Some varied the quantity handed out, while others did not (see quotes below). Tensions arising from an unreasonable variation of the *mondé* are addressed in Chapter 6.

Quote 9. I closed my granary; I won't re-open it until the field work starts. We are eating from the granaries of my wives. If their stock finishes before the rains I will buy more to make up the deficit (man #420, March 2010).

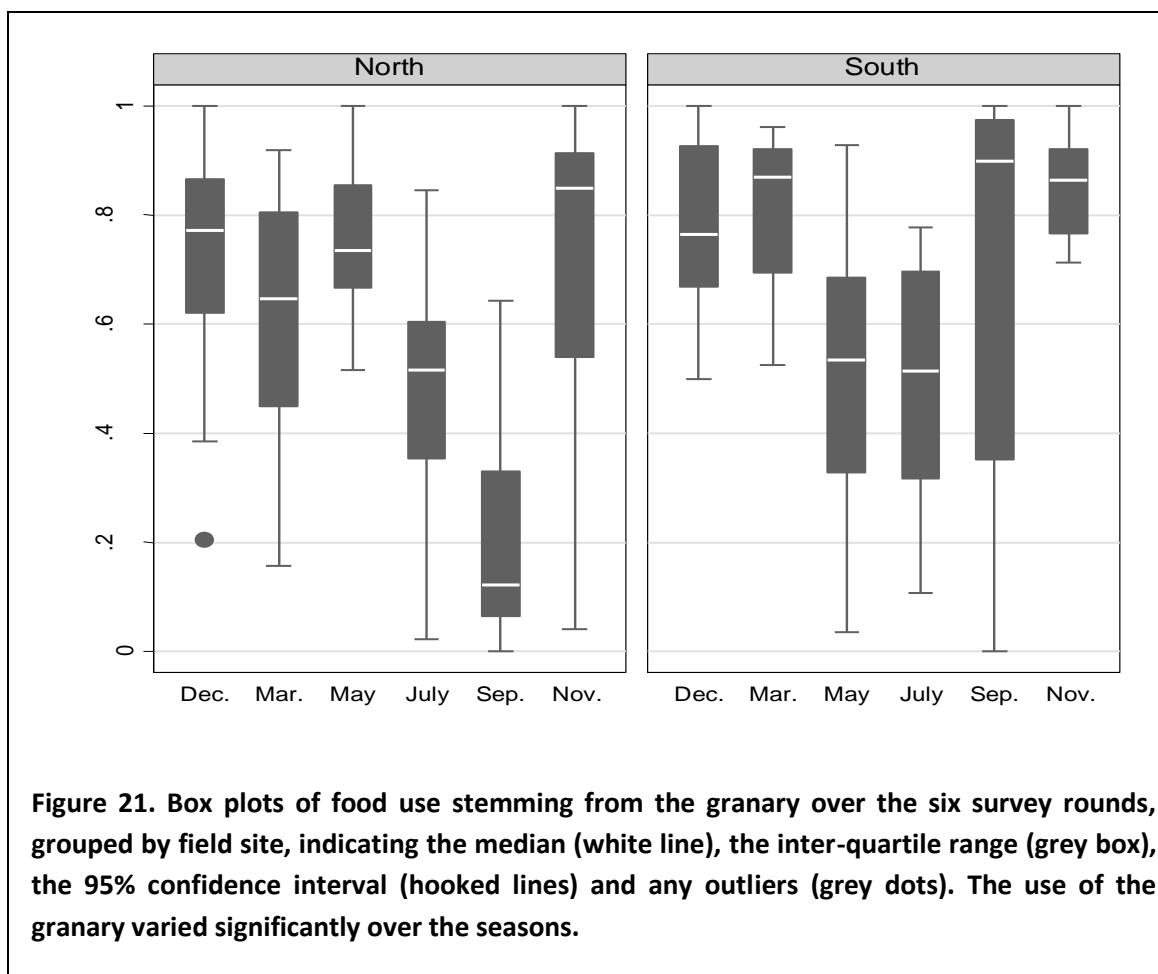
Quote 10. We do not reduce the quantity cooked, as one cannot reduce the mouths that need to be fed (man #350, March 2010).

⁹² These values were extrapolated based on the volume of cereals stated as harvested in December 2009.

⁹³ None of the families interviewed engaged in counter-seasonal vegetable gardening (on irrigated fields), although this activity is common in certain other regions of Burkina Faso. The families stated that lack of reliable water sources year round, and lack of training, were the main factors discouraging this activity in their region.

Quote 11. I do not reduce the *mondé* in the rainy season, we need our strength to farm or we will fall ill (man #810, April 2010).

Quote 12. The most important thing is having enough to eat during the rainy season. You need your strength to farm. We work in the dry season so that we have savings for the wet season. In a bad year, we reduce the meal size in the dry season [January-March], to save cereals for the rainy season (man focus group #110-150, March 2010).



It is evident from the quotes above that variations in the quantity eaten could be the result of a deliberate decision to reduce dependence on home-grown food, not just the result of a dwindling cereal stock. The most extreme manifestation of this phenomenon was for the household head to no longer hand out any *mondé*. This occurred in four of the 23 households interviewed, with the head of the household refusing to hand out a *mondé* for the first three months post-harvest. Instead, women provided the cereal staples for each meal, based on what they had harvested from their own small fields. All of these households belonged to the conservative Ouedraogo family compound, located in the northern field site. Note that, contrary to the man's granary, the women's granary was never able to meet 100% of the

household's food needs. Once the women's reserves were depleted, the man's contribution increased (see **Figure 22**). In the other households, where the granary was not closed, both the man's and the women's granary were used simultaneously (see **Figure 23**).

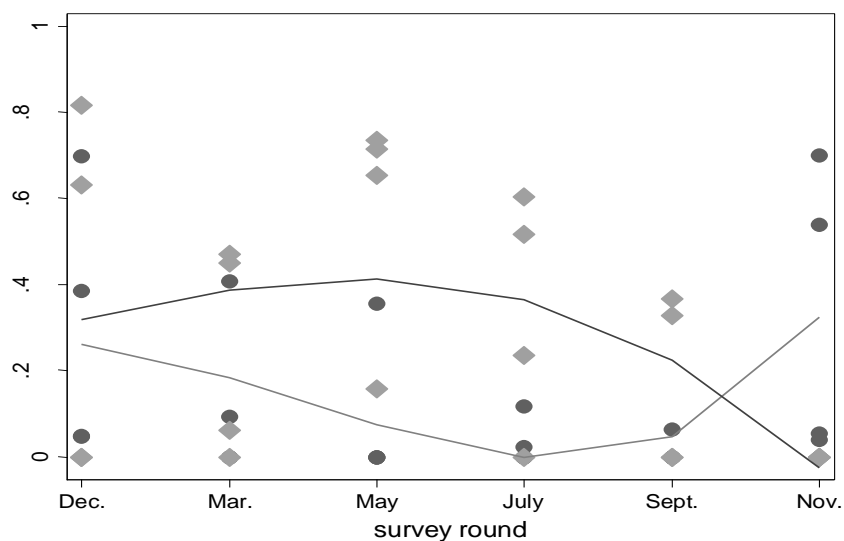


Figure 22. Proportion of food use stemming from the women's granary (dark grey dots) and the man's granary (light grey diamonds), for traditional households which closed their granary store (n=4). The medians for each gender are indicated with dark grey and light grey lines.

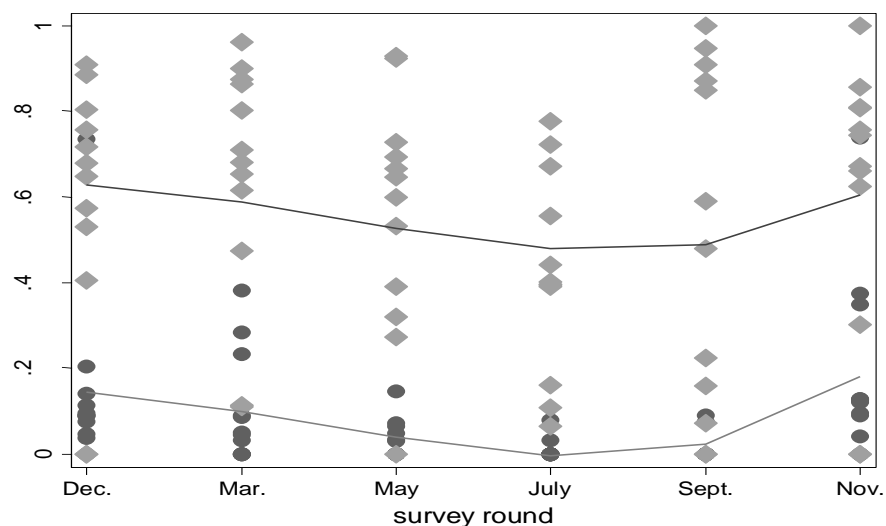
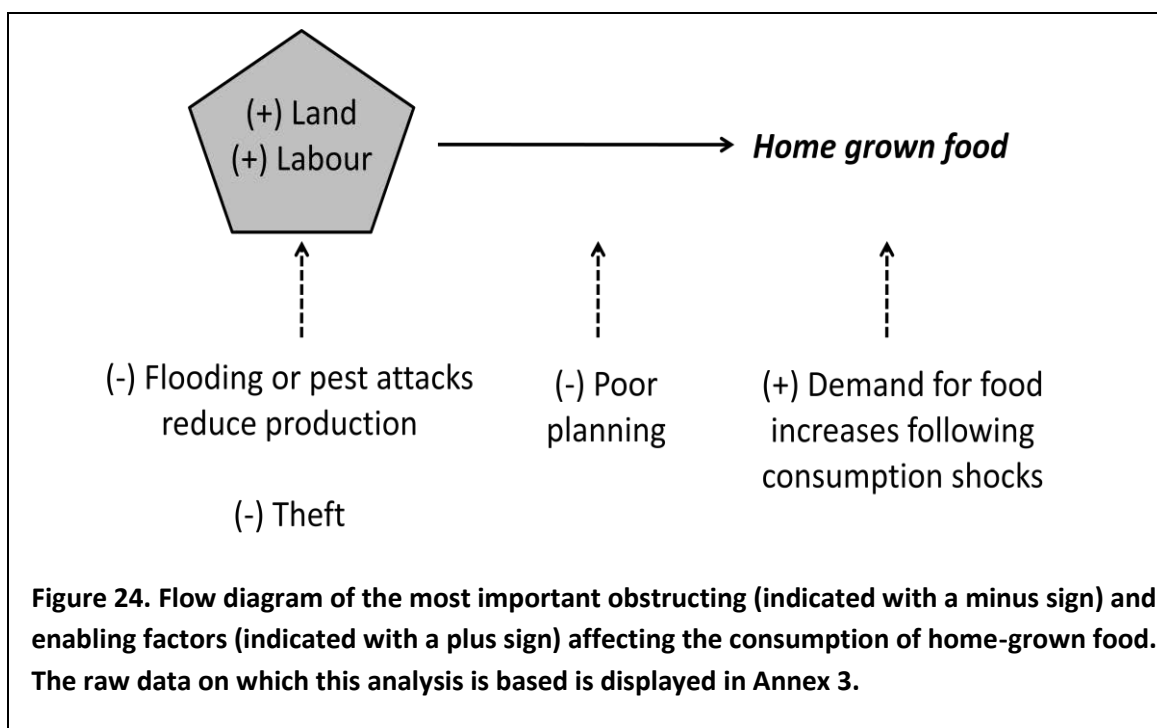


Figure 23. Proportion of the food use stemming from the women's granary (dark grey dots) and the man's granary (light grey diamonds), for households which did not close their granary store (n=19). The medians for each gender are indicated with dark grey and light grey lines.

Pair-wise analysis revealed that the important limiting factors determining the quantity of home-grown food consumed were shocks affecting agricultural production, poor planning of the granary reserve (see **Figure 24**). Both are dealt with in turn below. Shocks included both production shocks (too early or late rains, floods, droughts and grasshopper invasions) and consumption shocks (theft and social shocks requiring large food contributions).



During the course of this study, all families reported using a variety of techniques to spread production risk; such as sowing different cereals with varying degrees of drought or flooding tolerance, in a variety of locations, a few weeks apart (see quotes below, and Chapter 6 for further examples)⁹⁴. Nonetheless, women's harvests were more exposed to such shocks as they had less land area available over which to spread risk, and were often allocated second-rate land in areas prone to flooding. Two women reported losing their entire peanut and ground pea harvest to flooding in 2009.

Quote 13. It is important to be flexible. If the rains stay this 'strange' I will farm different locations. This year I tested a new site. It was fertile. I harvested well. I will plant more there next year (man #420, Jan 2011).

Quote 14. This year we did not plant in the same place that was flooded last year (woman, Aug. 2010).

⁹⁴ Other studies have described these techniques in detail for various regions of Burkina Faso (Reardon, 1988, Bolwig, 2001).

Quote 15. In the valleys we plant millet that takes four months to ripen. On hills we plant the faster variety; those soils drain quickly and dry out (man focus group #510-510, Sept. 2010).

Consumption shocks were more frequent than production shocks: theft was not reported, but baptisms, weddings and funerals necessitated considerable contributions of food⁹⁵. Six baptisms were held during the study period (affecting 6 households), and two funerals (affecting 10 households). The main technique reported for addressing consumption shocks was the partitioning of grain reserves among household members (see Chapter 6). This required substantial planning, as did the deliberate variation of the size of the *mondé* already mentioned above. The pair-wise ranking method confirmed that poor planning was an important obstacle to accessing food through the production channel. Not all families planned equally well, as was also evident in the variation of meal sizes throughout the year: some reduced meal sizes in anticipation of food shortages, others in reaction to food shortages. From the qualitative data, no universal reason emerged explaining planning capacity. Nonetheless, households with lower food security generally tended to be more cautious, and manage their stocks more carefully (see quote below).

Quote 16. People here [in the south] are surprised how people in north [of Burkina Faso where harvests are less abundant] get by on so little. I think they worry more. It makes them more careful (Bonkougou A, May 2010).

As one might expect, the most important reason encouraging the use of home-grown food was owning or having access to sufficient land and labour (see **Figure 24**). Note that *lack* of such asset ownership did not, however, significantly *discourage* home-grown food production (see below). Secondly, high food demand encouraged the use of home-grown food. Both are dealt with in turn below.

The interviewees did not perceive lack of land as a significant problem in the study areas. Qualitative data showed that households with little land simply invested more labour or more money per hectare (see quote 17). Research done in Niger confirmed that food needs were cited as the dominant factor in labour allocation: in areas with 600mm of annual rain, households farmed 1.4ha/person, while in areas with 400mm of annual rain, over 2.5ha/person were farmed (Raynaut 1980:20). The area farmed was based on the labour

⁹⁵ The traditional snack served at ceremonies is *zoomkoom*, prepared with pearl millet and tamarind juice. For this reason, if women grow any cereal on their own fields, it is likely to be pearl millet. Tamarind fruits are collected in the bush or purchased. The traditional meal served at ceremonies is rice-based. As few households grew their own rice, this amounts to a substantial expense.

capacity available to cultivate (see quotes 18 and 19 below), as was confirmed by other studies in northern Burkina Faso (Reenberg and Paarup-Laursen 1997). This finding also demonstrates the impact that demand for food has on strategy choice: the reason food demand ranked as so important in the pair-wise ranking exercise was because it could overcome certain 'entitlement' obstacles: If the need to meet food requirements was strong enough, the household head could always find someone from whom to ask for more farm land, even if he was not a land owner. It is part of the basic right that every village member has to subsistence (see quote 20 below). Similarly, if the food requirement was strong enough, a woman could overcome the gender-bias on land access by asking someone apart from her husband for more land (see Chapter 6 for details).

Quote 17. Livestock prices are good at the start of the rainy season, but it is also the time I need to be home to sow my fields. Often my wife does most of the work because it is better if I don't stop all my trading. I buy fertiliser to put on the fields [to compensate for the lack of labour input and the small area farmed] (man #440, March 2010).

Quote 18. I don't have time to sow a larger area. I work alone (woman #140, May 2010).

Quote 19. We sow the area that we need to feed the family. This year my brother moved back from Bobo Dioulasso so we were able to farm a larger area (man #120, Nov. 2009).

Quote 20. One will never refuse giving land to someone who has asked for it to feed his family (man #210, Nov. 2009).

Adjusting labour allocation on fields implies a high degree of planning as agricultural tasks had to be planned into the other tasks which household members engaged in at various points in the year (see Chapter 6). Discussing the seasonal crop calendar in focus groups revealed the complexity which went into planning which crops to plant, when and where. If it was timed right, secondary crops were ripe before the main millet harvest, filling a critical seasonal food gap (see quotes below). Planting times also had to be planned to take into account variable rainfall distribution. The rainfall data, presented in Chapter 5, demonstrates the high variability of rainfall for the two study sites.

Quote 21. I plant maize and peanuts as early as I can, so that we have something to eat while waiting for the main cereal harvest to be ready. Sorghum is harvested next, with pearl millet harvested last. I am old and only one of my sons lives with me, I do not have

time to plant everything at once. But this way we have a steady supply of food during the [second half of the] rainy season (man #610, March 2010).

Quote 22. My maize saved me this year. I planted it early so that we could eat the fresh harvest while waiting for the sorghum to ripen (man #810, Sept. 2010).

Quote 23. It is difficult for the farmer to decide when to plant. There are short-cycle beans (50 days) and long cycle beans (2.5-3months). If you plant too early, they will be ripe when it is still raining and will rot. If you plant too late, they will not get enough rain. Also millet, sorghum and maize seeds are available as long or short cycles (Kirakoya A., Sept. 2009).

Interestingly, statistical analysis found no effect of labour allocation on the proportion of home-grown food eaten. Only once the results were disaggregated by food security level, a factor that emerged as important from the pair-wise ranking exercise, did the impact of labour become apparent (see **Figure 25**). This emphasises the importance of combining quantitative and qualitative data, by using the factors which emerged from qualitative analysis to disaggregate quantitative data. The figure below shows that all households in the lowest food security category only contained one man per household, who was not able to grow enough food to feed his family year-round (less than 100% contribution). Households containing more than one man were able to grow more food, and exhibited a much higher consumption of produced food, and were therefore in a higher food category. This demonstrates the benefit of added labour mentioned previously. However, in the highest food category, increased labour resulted in a *lower* proportion of produced food. The additional labour was invested in other food-acquisition strategies, such as trading, thus meeting their food security by diversifying away from home-grown food. Such strategies are discussed next.

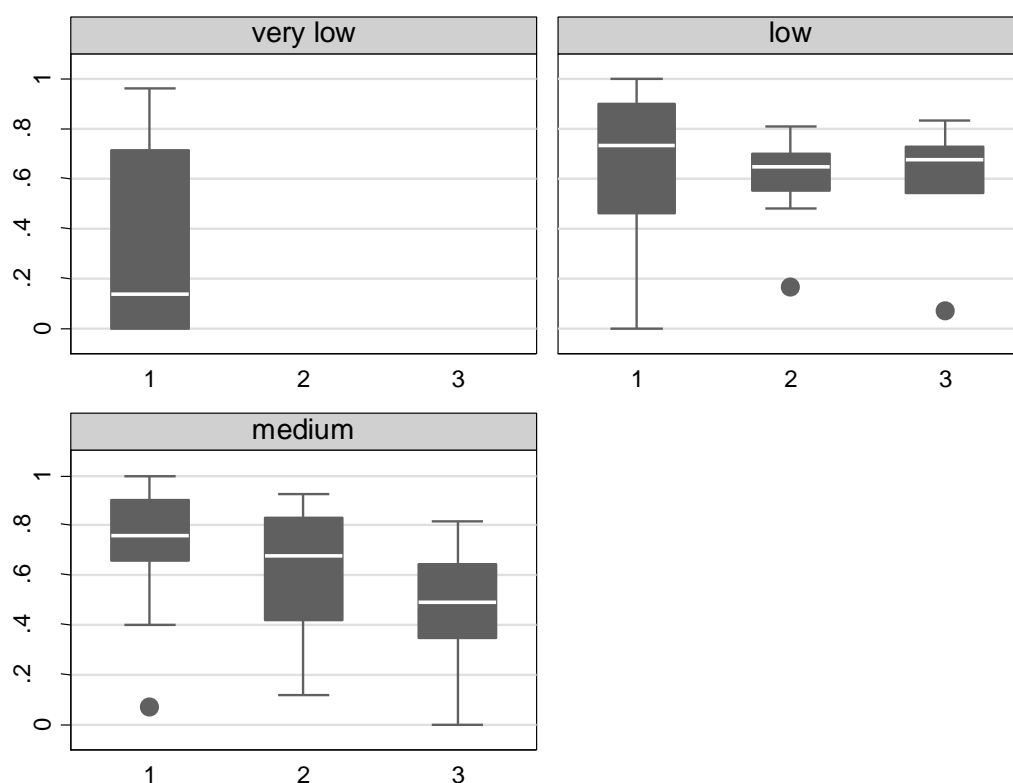


Figure 25. Box plots of %food use stemming from the man's granary, grouped by food security category, indicating the median (white line), the inter-quartile range (grey box), the 95% confidence interval (hooked lines) and any outliers (grey dots). The x-axis shows the number of men per household.

5.3.2. Eating purchased food

Traditionally it was the husband's responsibility to purchase more staples if the granary ran low. In accordance, men pursued a variety of income-generating activities year-round. In the interviewed families, this included gold digging, the sale of livestock and cash crops, the trade of cigarettes, cola nuts or other items on the market, the sale of timber or (rarely) firewood, the making and selling of mud bricks (mostly young unmarried men) or other hand-made items (e.g. woven straw mats). The precise income-generating activity pursued depended on available start-up capital and the exit and entry barriers of the activity (see Chapter 7). Younger⁹⁶ married or unmarried men left for seasonal migratory work; the most common form of which was to buy up livestock in the village, fatten them up, and then travel for several months round the larger urban markets of the country (Ouagadougou, Bobo-Dioulasso) to sell them. Interestingly, it was very rare to engage in hired labour; it was considered a sign of

⁹⁶ The eldest son of the compound head rarely left on these trips, as he was often responsible for his younger married brothers, as well as for his own household, and thus expected to stay nearby.

desperation (see quotes below). It also it did not pay well, as it was customary to pay by area farmed, not by time period worked.

Quote 24. Helping your neighbours harvest in exchange for payment is shameful. I prefer to sell tobacco even if I make little profit (man #470, March 2010).

Quote 25. I have seen neighbours who earned money working other people's field and had too little time to farm their own, they never recovered [because they harvested little themselves]. I prefer to tighten my belt and eat less (man #520, April 2010).

Note that hired labour was clearly distinguished from helping one of your neighbours for a day or two, without receipt of any substantial payment (see quotes below). This practice, known as *entraide villageoise* (reciprocal helping) is very common in Mossi society (Ouedraogo and Le Balle 1990). It was considered an act of solidarity, not a sign of desperation. It was considered an investment which could result in more help being received in the future (see Section 5.3.4).

Quote 26. I helped my mother harvest for a day (man #150, Dec. 2010).

Quote 27. I helped neighbours harvest over a few days – I don't do it out of money, just to help them out. They cooked me lunch. It is common to ask ten or so neighbours for help; together they can weed a whole field in one day (man #270, Dec. 2010).

Quote 28. My parents live here in the same village; I help them harvest and don't ask for anything in return. But if I have problems later in the year they always give me food. I use that to make breakfast for my children (woman #121, March 2010).

Heads of household pursued a variety of income-generating activities not only to cover food costs, but also because they were responsible for schooling and the welfare of their wife/wives and children (see quotes below). Nonetheless, data collected on income and expenditure flows demonstrated that wives and sons also contributed significantly to such costs. Tensions resulting from an unequal sharing of expenses are discussed in Chapter 6. Income levels per household were comparable in both field sites, though the sources of income differed with more livestock and gold sales in the northern site, and more crops being sold in the South.

Quote 29. I sold two sheep (45,000 FCFA) to build a new house. My wife will move into my old house. Her roof was leaking. It is important to fix that (man #430, Feb. 2010).

Quote 30. I am not yet married. When I dig for gold I use it for my own expenses and help my father as well. I would like to buy a new plough for him, and build a solid house

for my mother and father. I am building myself my own house; I want to get married soon. Next I will start building up my livestock herd. I would like to buy myself a motorcycle (man #150, March 2010).

Quote 31. For the end of Ramadan, my father slaughtered a sheep, I slaughtered three of my chickens and bought rice and spaghetti [i.e. special 'western' food] and condiments to go with it (man #630, Dec. 2009).

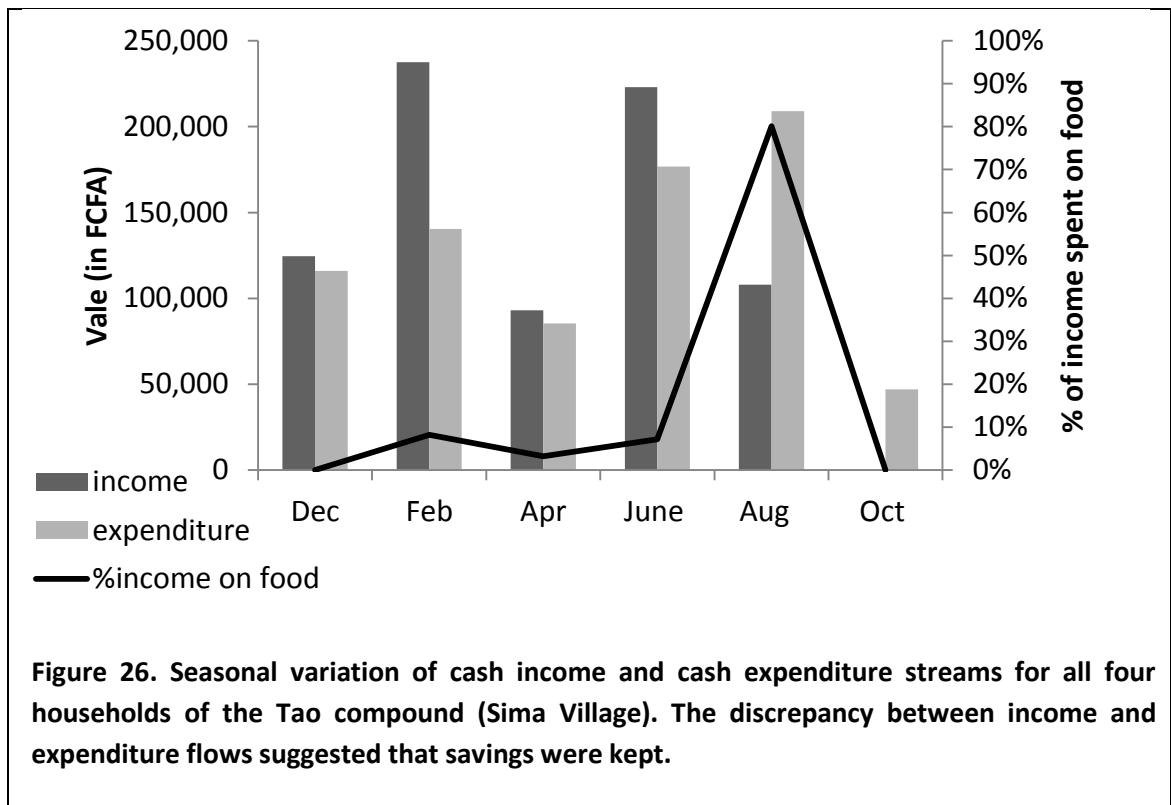
Quote 32. I used the money I earned to buy iron sheets for the roof of my parents. I also need to buy tobacco and kola nuts⁹⁷ in case we receive visitors. There is not always money left to buy cereals (man #720, April 2010).

Women also pursued a variety of income-generating activities, as they were responsible for providing the 'sauce'. Women grew the majority of ingredients on their own field, fetched their own water and firewood for cooking, and used her own income to buy meat, fish, salt, cooking oil and other ingredients. To cover these and other expenses⁹⁸, women in the interviewed families went gold digging, sold cash crops (e.g. peanuts grown on her own field) or firewood, cakes, cookies, wild fruits, wild vegetables or other hand-made items on the local market.

With the income gained by the men and women of the household, food was purchased year-round. The seasonal distribution of food purchasing varied strongly between households. Even though the majority earned their money from trading and selling livestock in the dry season (as expected from the annual agricultural cycle described in Section 5.1 of this chapter), food was also purchased later in the year, presumably with savings kept from the dry season. The discrepancy between income and expenditure flows suggested that savings were indeed kept (see **Figure 27**), although the majority denied this during the data verification process which followed each survey round. Keeping savings is a well-documented 'income-smoothing' strategy to reduce inter-annual income variation (see Chapter 7, Section 7.3.1).

⁹⁷ Kola nuts contain caffeine. Similarly to coca leaves in South America, kola nuts are chewed in a social setting or individually. The kola tree, part of the cocoa family, is a tropical coastal tree which does not grow in Burkina Faso. Its high social value in Mossi society is testimony of the fact that the Mossi tribe originally came from coastal Ghana and migrated north.

⁹⁸ Expenditure data showed that women often used their income to buy their children clothes, though the husband usually bought new clothes for his whole household the day of religious or family festivities (baptisms, marriages etc.).



Focus groups held to discuss the culture of saving revealed that not only is it culturally unacceptable to publicly display wealth, but doing so would encourage one's 'needy' relatives to come asking for help. As a result, they hid their savings, fooling researchers and their neighbours alike (see Chapter 6 for details). A misunderstanding of the culture of saving, as well as the fact that savings were not in a formal structure that could be easily monitored, has resulted in savings being systematically underreported in national poverty surveys. In contrast, this data set provides evidence that savings were kept for periods of at least 4-6 months. Further prodding revealed that at least three household heads had savings that had been carried over from the previous year, beyond the survey period.

The main reason cited for keeping savings from the dry season was to negotiate labour bottlenecks during the rainy season, when there was little time to seek work but high food expenses (see quotes below). Despite this precautionary strategy, sometimes unexpected expenses foiled their plan (see quote 35).

Quote 33. I got through the rainy season using the savings from my cake selling. When the festival of Ramadan came I dug some gold to buy new clothes and shoes for my children (1500 FCFA). For the festival of Tabaski I sold two chickens (2000 FCFA) for the same purpose (woman #462, Dec. 2010).

Quote 34. I dig a lot of gold, last year I was able to buy a motorcycle. But I stop in the rainy season. It is dangerous. The shafts can collapse in the rain. I used my savings from the dry season to buy two sacks of millet (35,000 FCFA) (man #450, March 2010).

Quote 35. I sold two goats to buy a sack of sorghum and fertiliser for the rainy season. The money I gained from weaving in the dry season was not enough, I spent it all on daily expenses and social expenses [Ramadan, Tabaski, marriage of his daughter] (man #120, June 2010).

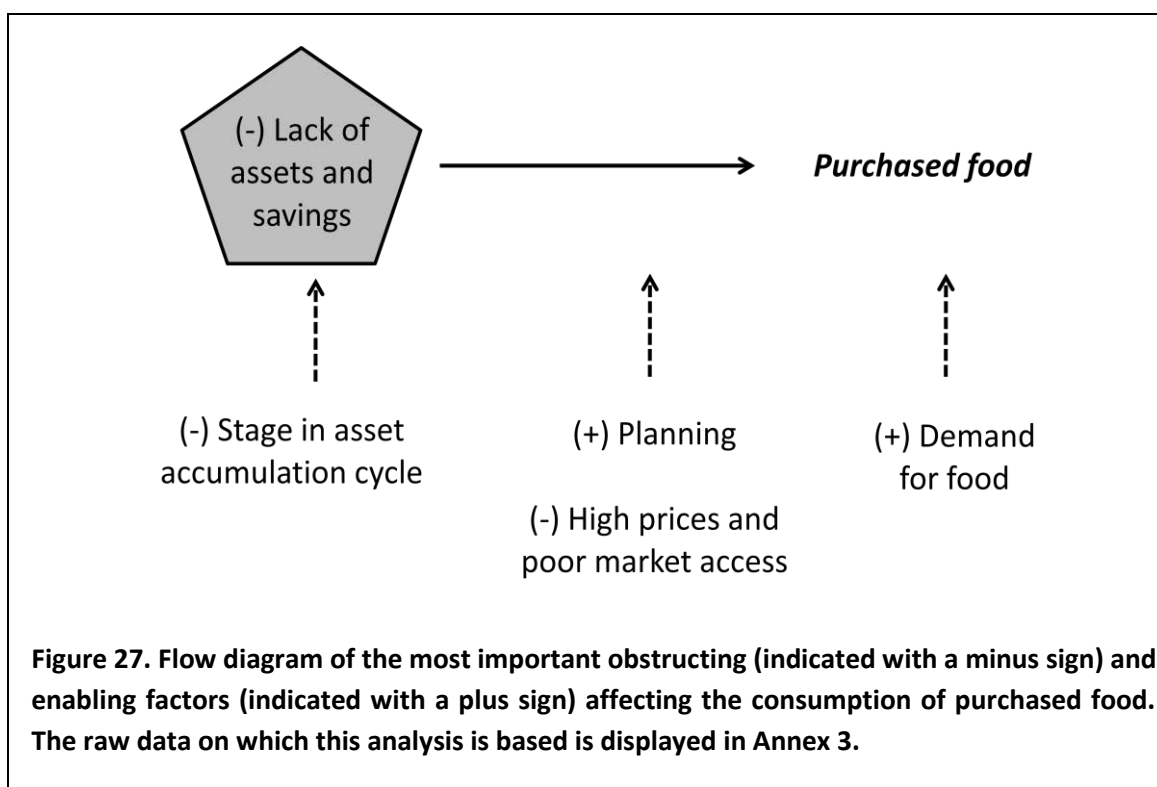
The quantitative data in Figure 26, above, suggests net income plays an important role in the seasonal distribution of purchased food. The pair-wise ranking method confirmed this finding, ranking the lack of asset holdings, such as livestock, income sources and savings, as the most important reasons discouraging the purchase of food (see **Figure 27**). The sale of livestock was not considered a 'coping' strategy, as it has been portrayed in the famine literature, but a routine part of seasonal income smoothing (Alderman and Paxson 1992). It was a preferred strategy for elderly men because it was less physically demanding than other activities (see quotes below). The seasonal price variations of different livestock shows that small stock (goats and sheep) were preferably used as liquidity in comparison with cattle (see **Figure 28**).

Quote 36. I don't sell my animals out of desperation. They are my income source. I am too old to do [tiring] work. I only sell the little ones once they are big enough (man #210, Sept. 2009).

Quote 37. I would never sell one of my ten heads of cattle except if things turn really bad. If I need money, I sell smaller animals like sheep (man #820, April 2010).

The average livestock holding per household was 0-2 cows, 8-20 goats and sheep, and 10-30 chickens or other poultry, comparable to national averages (MAHRH 2009). The extent of livestock holdings was a function of the asset accumulation cycle, with older household members owning more animals (see quote below). Donkeys were also owned but never sold to purchase food because they were more valuable as agricultural labour. However other studies have reported donkey sales to occur during periods of severe famine (Devereux 1993b).

Quote 38. I am young I don't have an animal herd yet. I sell the sponge cakes I make on the market to cover my daily cooking expenses and the cost of milling grain. For larger expenses like clothes and shoes for my children I dig for gold (woman #121, March 2010).



Unsurprisingly, factors such as cereal prices and market access influenced the quantity of food purchased during the year. The market data collected in both field sites demonstrated that the ratio between cereal and livestock prices more than doubled during the year (see **Figure 28**; **Figure 29**). Having income or assets to sell was deemed worthless if the market was inaccessible during the rainy season: households in both remote study villages reported not going to the market for several weeks because the road was impassable. Extreme price hikes were associated with a very bad year (see quote 39). A more extreme version of this phenomenon was characteristic of a famine (see quote 40).

Quote 39. In 2005 the harvest was very bad, millet was even more expensive than rice, nobody could afford it. I relied on my two sons in town who sent me a sack of millet (man #510, April 2010).

Quote 40. This is no famine year. During a famine there would not even be cereals to buy on the market. It was like that in the 1970s. Even if you had money, you could not buy any cereals on the market. So we ate wild foods; it was the only thing left (woman focus group #611-632, April 2010).

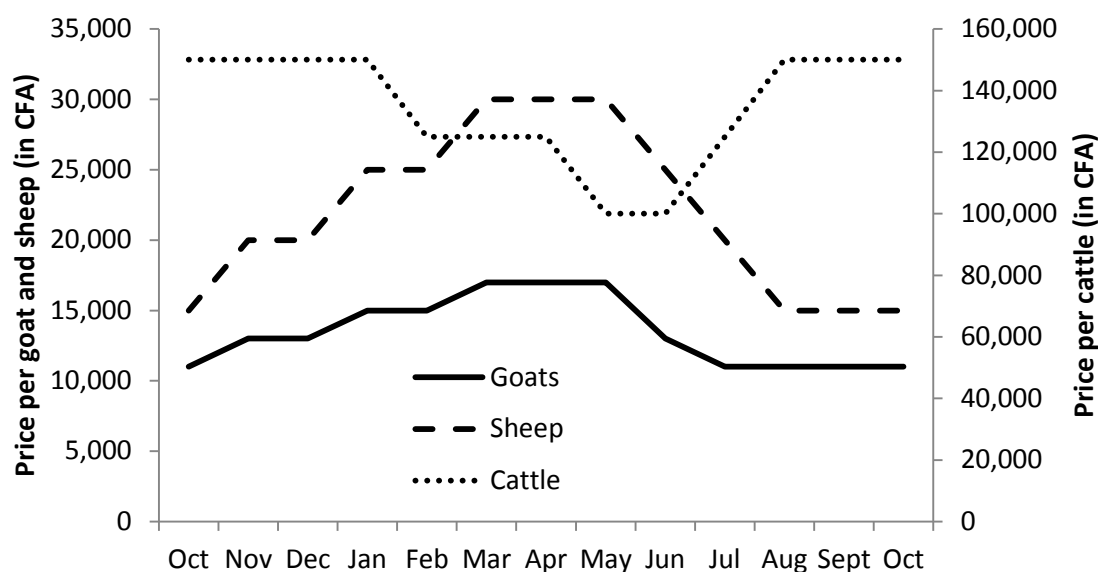


Figure 28. Prices of one adult male goat, sheep or cow, from October 2009 – October 2010, averaged for both field sites. Only small stock (goats and sheep) were sold to cover small expenses. As cattle are worth 5-10 times as much as goats or sheep, they were not used as liquidity, and exhibited a different seasonal price pattern. Note that on the days immediately preceding the Muslim festival of Tabaski (27 November 2009), the price of sheep rose to 30,000 FCFA.

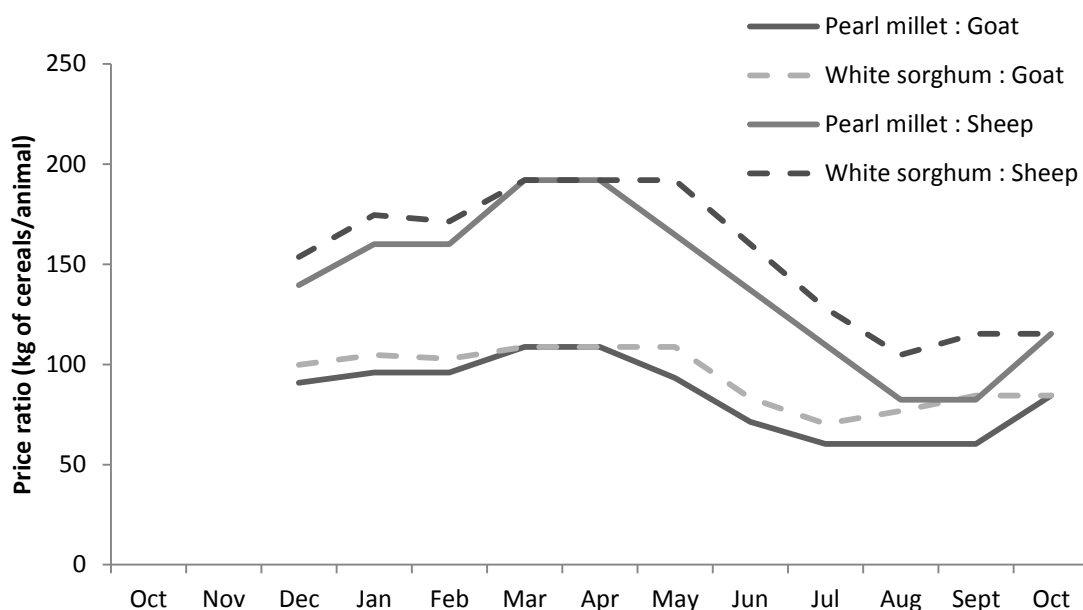


Figure 29. Seasonal variation of the cereal:livestock ratio, from October 2009 – October 2010, averaged for both field sites. The best time to sell animals in order to buy cereals is at the end of the dry season (March-May). The worst time is during the lean season (July-Sept).

The high heterogeneity in purchasing behaviour could not be explained by asset holdings or price and market factors alone. Households nearer to markets were not necessarily found to purchase more cereals (see **Figure 30**). While the quantity of assets owned was generally a reflection of the individual's status within the household, the amount of income earned was not. Young household members were found to earn just as much or more than older household members. This was explained by the fact that income was generally sought to match specific expenditures, not vice versa (see quotes below). It was demand-driven, matching the size of the household.

Quote 41. I don't keep animals to make a profit. I keep them in case I need them. I sold three sheep to pay for my children's school fees (17,500 FCFA) (woman #120, Nov. 2009).

Quote 42. I make potash so that I can send my children who are at boarding school some pocket money for food (woman #831, April 2010).

Quote 43. I only have one baby, there are few mouths to feed, what I have is enough. My husband works in the Ivory Coast, he sends me money back, and my parents-in-law help me with my daily cooking expense (woman #862, April 2010).

This finding was backed up by the pair-wise ranking method, which showed demand for food as an important reason encouraging food purchase. Demand ranked highly because it was a strong enough reason to partially overcome the limiting factors such as market access. Focus group discussions showed if the need to meet food requirement was strong enough, women would even walk the 15km to the market during the rainy season. Similarly, if food needs were pressing, livestock would be sold even if the conditions were unfavourable (see quote below).

Quote 44. The man who takes his pregnant female goat to the market to sell will cry [but he will do it anyway to feed his family] (man #820, March 2010).

The quantitative data confirmed that not market distance alone, but also the food security status of the household influenced buying behaviour (see **Figure 30**). Only during the lean season, when food security was low for all households, did market distance significantly affect buying behaviour: those household with easy market access purchased more. During the rest of the year, households far from the market bought a similar amount as households near the market. It is important to remember that purchasing cereals had the dual function of relieving the granary – a need that varied depending on the seasons – and the function of diversifying the diet – a need that was present year-round (see quote below).

Quote 45. I regularly buy a few *yoruba* [bowls] of rice, beans or yams to vary the meals; it also helps to save my cereal stock (man #720, April 2010).

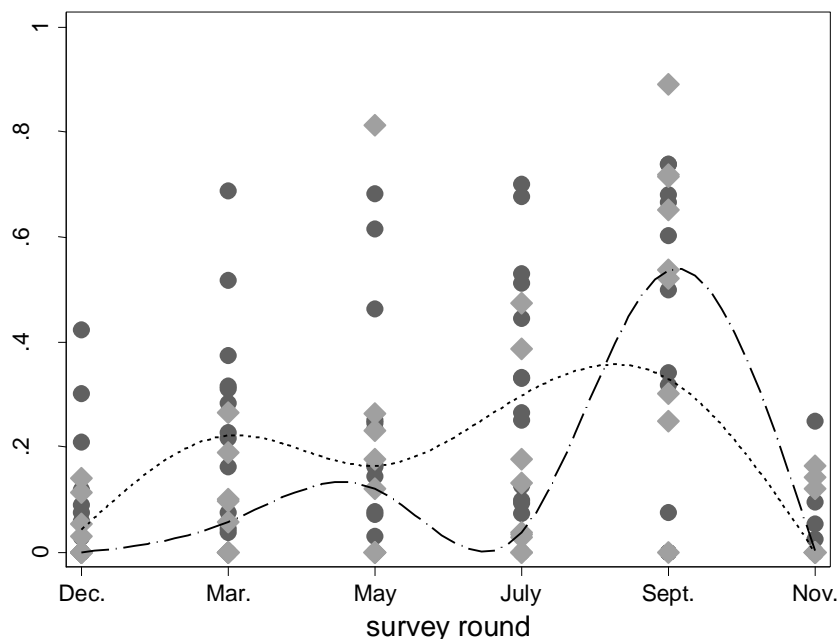


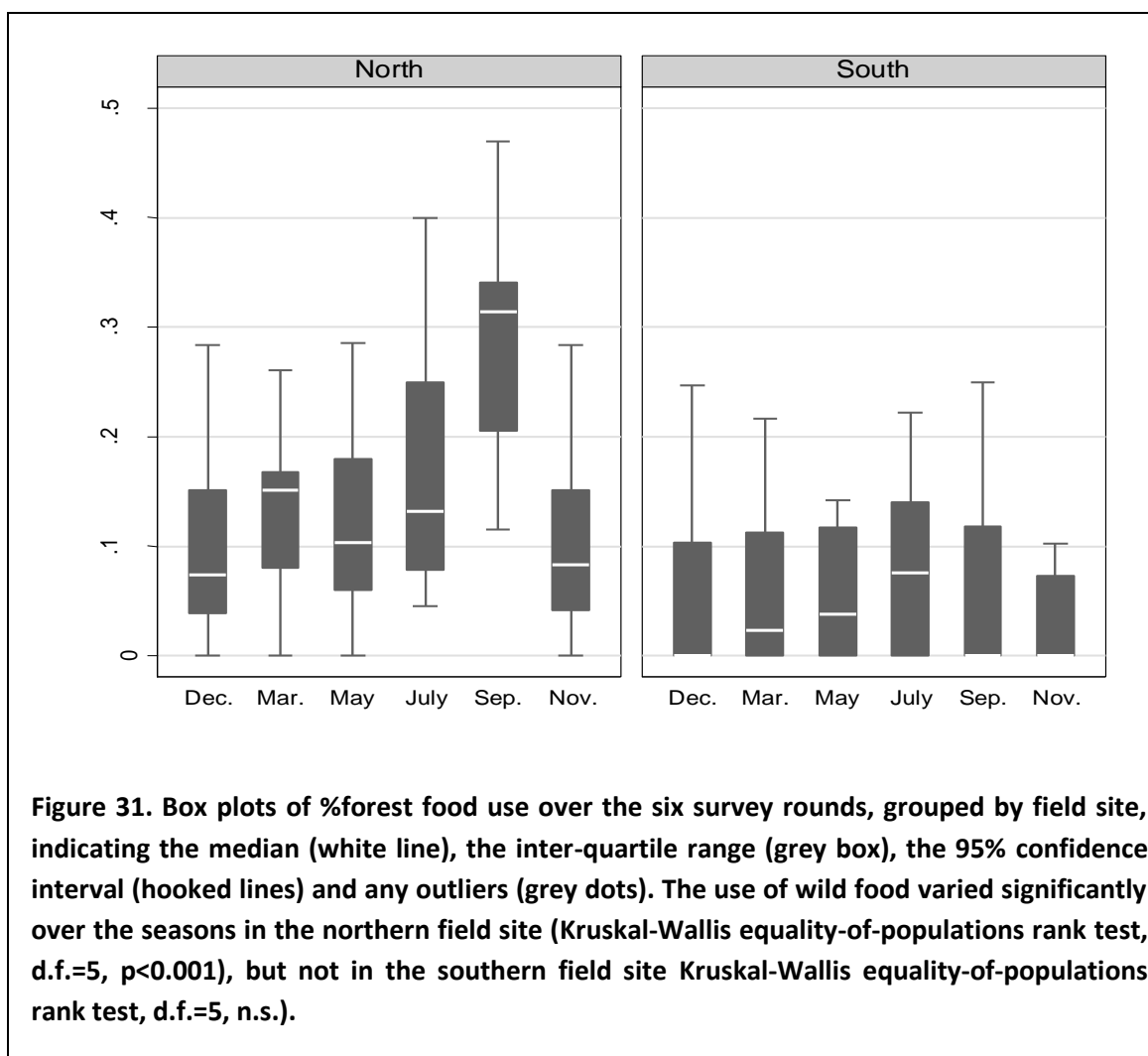
Figure 30. Scatter plots of %food purchased over the seasons, for households near a market (light grey diamonds) and far from a market (dark grey dots), with the dashed lines indicating the median values for both sub-groups. The percentage of food purchased was not significantly different between groups, except during the rainy season.

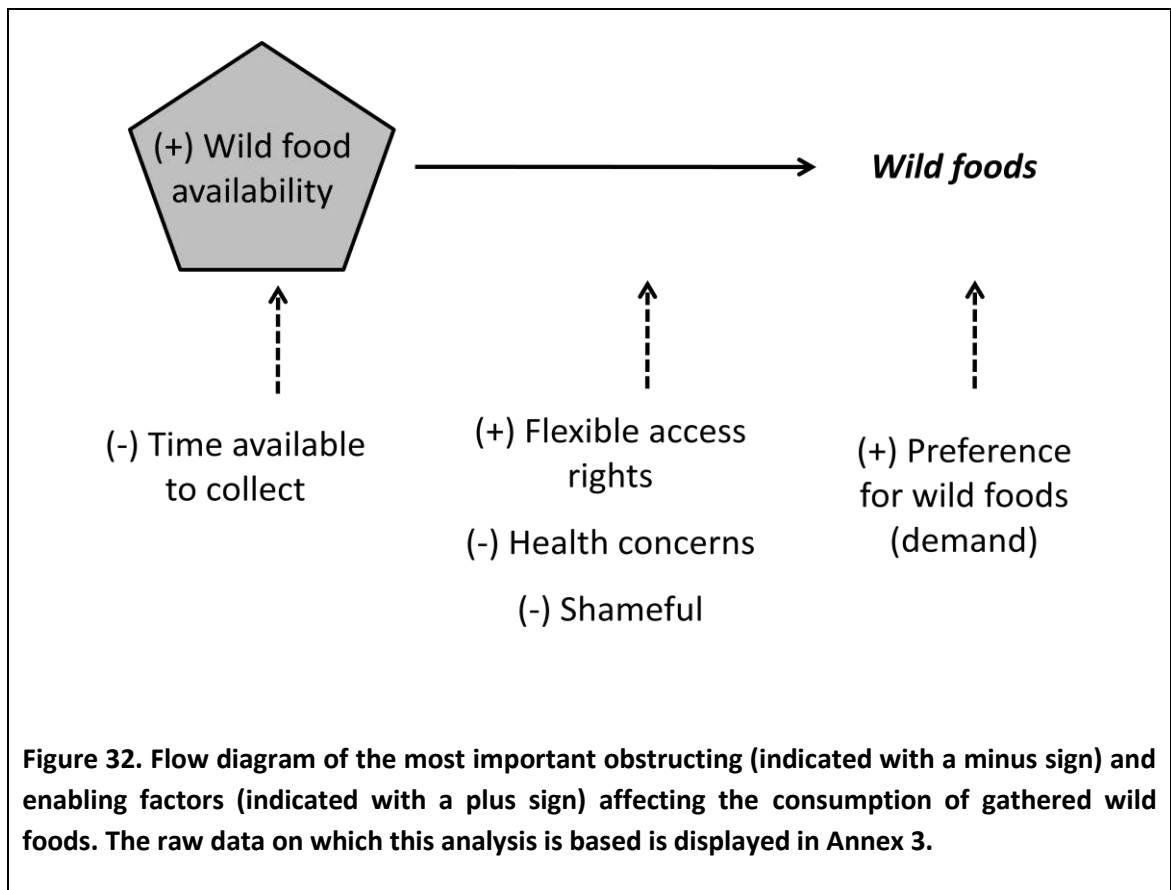
In addition to demand for food, the capacity to plan emerged as an important factor in the pair-wise ranking exercise (see **Figure 27**). Planning capacity ranked highly because it allowed households to overcome prices shocks and difficulties in market access by buying early, and storing the purchased cereal. The easiest way to plan to have a steady income flow over the year was to have several income sources. This added flexibility, in case one income source dried up (see Chapter 7).

5.3.3. Eating gathered food

All households used wild foods, though use varied during the year depending on which species were available. Contrary to the findings of Delacote (2007), wild foods were collected both in case of food shortage (ex-ante strategy), as well as in reaction to a dwindling granary (ex-post strategy). Women dried and stored a variety of wild foods in order to have a stock available year round, both to diversify the diet and to complement dwindling grain reserves (Waal 1990). Contrary to expectation, the wild foods were used more frequently in the northern field

site, even though there were fewer trees (see **Figure 31**). This finding was confirmed by the pair-wise ranking method, which found that the low availability of tree resources (asset holdings) did not significantly discourage the use of wild foods (see **Figure 32**). Instead, downstream factors were more important. It was not the presence of trees alone, but having the right to harvest wild foods, and being healthy enough to eat them, which played an important role. Both of these points are dealt with in turn below.



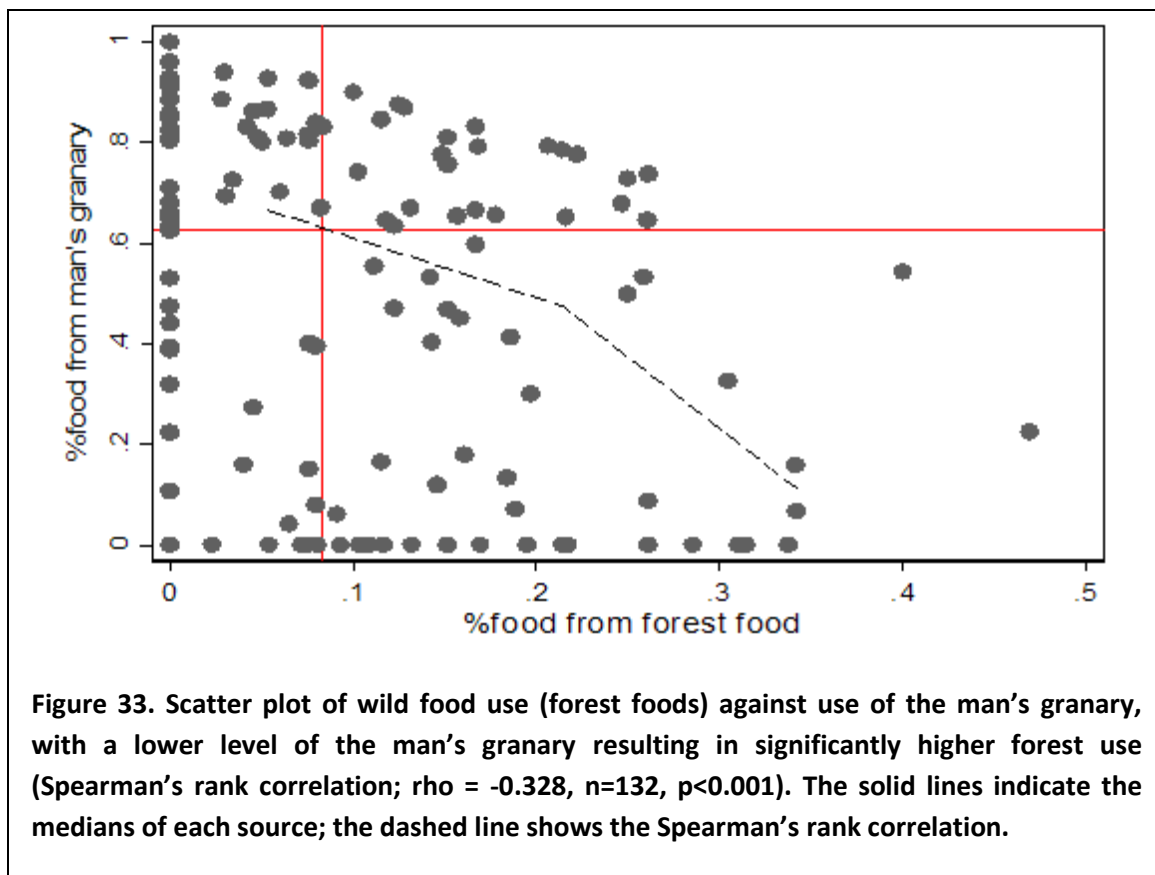


Even though trees are often referred to as ‘open-access’ resources in the literature, in Burkina Faso, their access is highly regulated. Every tree has a (male) owner; be it an individual, the head of a household, or the head of a lineage; as documented elsewhere in Burkina Faso (Guiro-Ouedraogo 2009). However focus group discussion revealed that the crux was not *whether* one had ownership, but how tightly such ownership was *enforced*. Access rights were found to be subject to considerable negotiation, as is examined in detail in Chapter 6. If negotiation failed, forest products were also frequently stolen from tree owners. Hence, even though lack of tree ownership was not an insurmountable barrier, households which were tree owners did have easier access to wild foods. The head of one of the 23 households studied was a land chief, giving him automatic ownership over many trees. As a result, this household used significantly more wild foods than other households in the same field site.

Secondly, health concerns were found to be a significant reason discouraging wild food use. Especially in the southern field site there was a perception that a high consumption of wild foods would lead to diarrhoea, and that ill people should therefore not consume them (see quote below). Two households had members of the family that were chronically ill, and both reported avoiding wild foods because they could cause diarrhoea:

Quote 46. The children don't like [wild leaf sauce] it gives them a stomach ache (woman #611, Jan 2010).

Even though access to wild foods could be difficult and collection time-consuming, the pairwise ranking method showed that these limiting factors could be overcome if wild foods were a preferred meal. Preference for wild foods ranked as the most important reason encouraging their consumption, outranking the need to meet food needs. Focus group discussions showed that this was due to the fact that wild foods were not only used to meet food requirements, but also to diversify the diet. Historical discussions showed that wild foods were not only eaten in famine years, but every year (woman focus group #211-262, March 2010). Quantitative analysis confirmed that households not only used wild foods when their granary store was low, but also when their granary was still full, resulting in a weak Spearman's Rank correlation (see **Figure 33**). If the women liked the taste, the time constraint of wild food collection was no longer a significant obstacle: they reported combining wild food collection with other household chores such as firewood gathering, well-water collection, or field visits, in order to save time. Particularly during the period of most intense agricultural labour, wild foods are gathered during the lunch break.



The qualitative data showed that the reason wild foods were 'preferred' had to do with more than just taste. Mixing in wild foods with a cereal meal could lead to a substantial cereal saving. As such it was an important contribution to food security, as well as representing a saved expense because it substituted the need to purchase cereals (see quotes below); a finding confirmed by research in other regions of Burkina Faso (Gausset *et al.* 2005).

Quote 47. Leaves are really important in this [drier] region. You can mix one bowl of millet with two bowls of leaf sauce and you have a full meal (women focus group #411-472, March 2010).

Quote 48. If all trees would die we would live in misery, it would really be [a life of] poverty (woman #511, April 2010).

Quote 49. If we have money, we vary our meals by buying other meals, if there is no money, we vary with leaf sauces (men focus group #710-720, April 2010).

For women in particular, wild foods represented a saved expense as women had the responsibility of providing the sauce for the meal (see quotes below).

Quote 50. In the rainy season I have less expenses, I only buy salt on the market and all other cooking ingredients I can get in the bush [because leaves are abundant] (woman #721, April 2010).

Quote 51. I already sold most of my stock of peanuts and okra [used to make sauce] because I needed money but now I have little with which to cook my sauce, I will gather wild leaves soon. I gather more leaves in the years when my stock runs low (woman #822, March 2010).

However, if *too many* wild foods were eaten, they were no longer considered preferable. The reason given was that it no longer 'tasted good'. However, this was intended in the figurative sense of "something turning sour", i.e. no longer being beneficial. Further discussion showed that, precisely because they represented an important cereal saving and a saved expense, wild food use could be perceived by others as indicating that the family was 'poor' or 'starving' (see quotes below). To maintain one's pride, excessive consumption of wild foods was therefore avoided. Interestingly, such views were particularly found in the southern field site, which had a higher level of food security overall, due to a more favourable rainfall regime. In the northern field site, wild food use was more common, due to poorer harvests, and did not stand out as 'unusual' behaviour. These findings echo suggestions of other studies, stressing the importance of including the role of attitudes in the conceptual framework of SLF (Poole 2000).

Quote 52. I like the taste of leaf sauce but when you eat it every day it no longer tastes good. When it becomes a regular habit it no longer gives you strength (woman #511, April 2010).

Quote 53. If all else fails, you can always gather leaves in the rainy season. It is the last option not because we like it least, but because they are always available. But if you eat them every day you will become bored of them. So first we try other things. After, we gather leaves (women focus group #111-141, March 2010).

Quote 54. In this part of the country we don't store dry [baobab] leaves [so that we can eat them year round], the neighbours would talk and say we're eating like the people in the Sahel [such behaviour is associated with famine] (man #720, April 2010)

The diversity of reasons for using wild foods shows the importance of individual preferences in the choice of food-acquisition strategies. Food security related-, as well as non-food reasons were both important in determining the use of wild foods. The cultural context played a vital role in determining the extent of wild food use because of the image it could convey to neighbours, quite independently of a desire or need to consume wild foods by the household itself.

5.3.4. Eating food received from friends or relatives

As solidarity and patronage are important values in Mossi society a large degree of sharing and reciprocal helping was observed in the study sample. The precise person asked for help depended on a complex web of rights and obligations among relatives, such as mutual reciprocity between two kinship groups. The idea of reciprocity was critical, as shown by the following Burkinabé proverb: "the safest place to store your food is in someone else's stomach" [because one day he will feed you in return] (Bonnet 1982). This tradition of reciprocity involved exchanges of money, assets, or favours (see quotes below). Sharing of household tasks also helped to negotiate labour bottlenecks, and save time. Tensions arising from unequal sharing or unequal allocation of household tasks are addressed in Chapter 6.

Quote 55. My stock was finished at planting time; I borrowed cereals from my brother to plant the new crop (man #620, June 2010).

Quote 56. Some of my sons live in Ouaga but they keep their goats and sheep with me and sometimes they allow me to sell one if I need money (man #610, Dec. 2009).

Quote 57. I did not have time to gather fresh leaves; I borrowed some from my co-wife for lunch today (woman #821, Nov. 2010).

Quote 58. I was ill when tamarind leaves were ripe [so I could not gather any]; therefore the wives of my bothers-in-law gave me some of theirs (woman #831, Dec. 2009).

Even if – or perhaps because – sharing of food was so common, it was difficult to quantify how much staple cereal was exchanged and received from friends or relatives. Firstly, gifts made by visitors were often small and usually not staple cereals, but cooking ingredients (e.g. *soumbala* spices), especially if the visitor was a woman. Secondly, especially within the family compound, food was usually shared on the basis of exchange rather than uni-directional gifts (see quote below). Again, such sharing predominantly concerned cooking ingredients. Any sharing of staple cereals within the compound occurred not in the form of a direct transfer, but simply by sharing meals, making it difficult to measure. Thirdly, any larger quantity of staple cereal received was underreported as, culturally, it was considered ‘shameful’ to ask for help (see section below).

Quote 59. I still live in my mother-in-law's house. She helps me with my expenses; she helped me harvest a part of my field. I gave her a part of my cereal harvest to thank her. I also gave her leaves I gathered; she cannot climb trees (woman #831, Dec. 2009).

Despite these methodological difficulties, two types of receipt of staple cereals were observed in this study: transfer from outside of the compound, and sharing within the compound (transfer from outside of the household). Transfers could either come from relatives, or in a form of ‘*zaca*’: Under Islam, each farmer should give a tenth of his produce to the poor or elderly. In the interviewed families, the elderly received such contributions after the 2009 harvest. Sharing of food between households was either done as a form of ‘payment’ for helping farm the field of the compound head (received after the harvest), or to help struggling households during the year. In the latter case, it was usually the father-in-law or mother-in-law who shared food with a daughter-in-law in a different household. Inter-household sharing is further discussed in Chapter 6. The total proportion of received food consumed did not vary by field site, or market distance, but did vary between the seasons (see **Figure 34**).

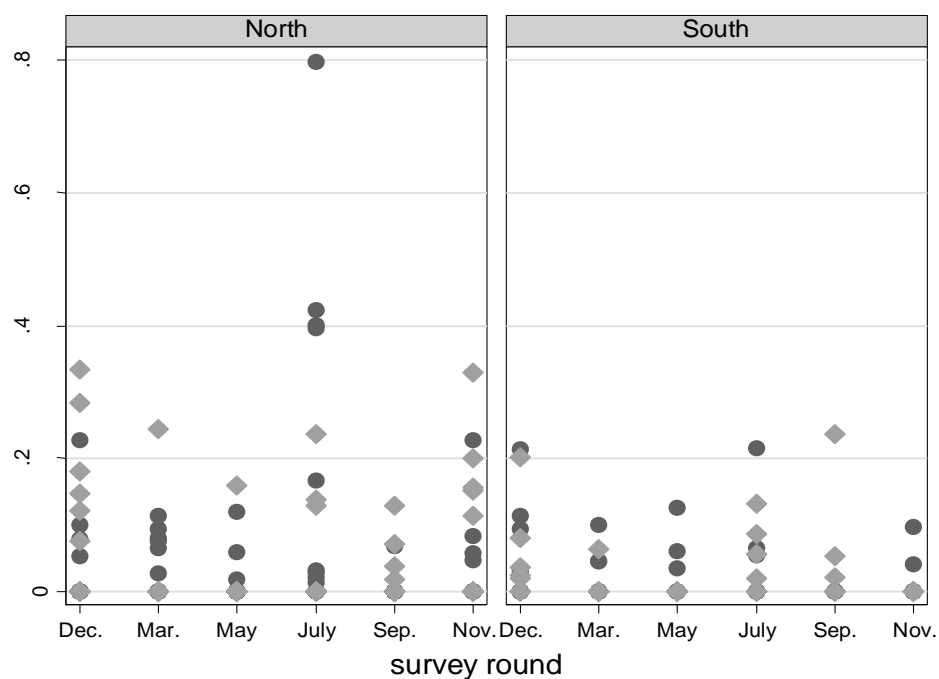


Figure 34. Proportion of food received from inside (dark grey dots) or outside (light grey diamonds) of the family compound, over the seasons, for households in the northern or southern field sites.

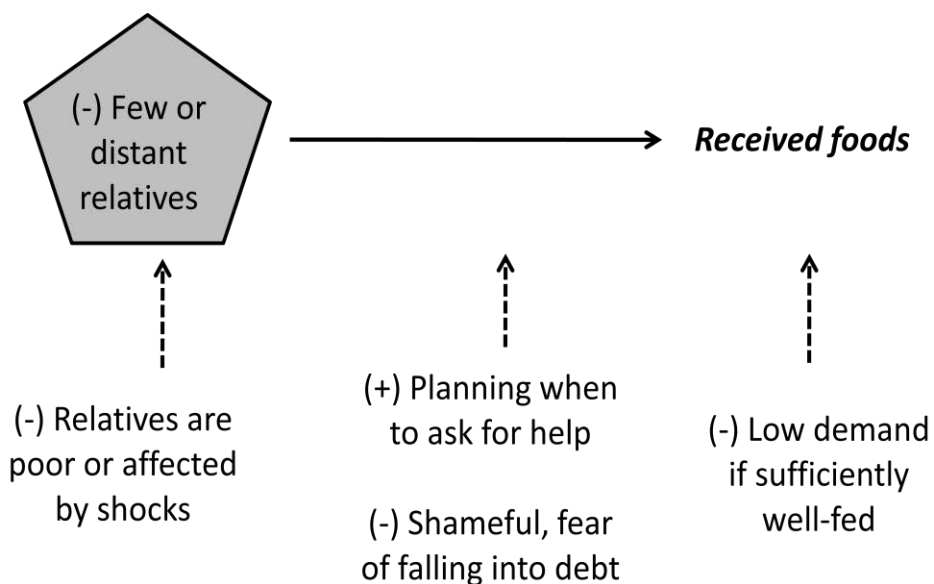


Figure 35. Flow diagram of the most important obstructing (indicated with a minus sign) and enabling factors (indicated with a plus sign) affecting the consumption of received food. The raw data on which this analysis is based is displayed in Annex 3.

Interestingly, the most important reason discouraging the use of food received from friends or relatives was the fact that the household itself had sufficient food, and thus demand was low (see **Figure 35**). This demonstrates that this channel was not used to diversify the diet, contrarily to the three previous strategies. The two second most important reasons discouraging the use of received food related to asset holdings: not having any relatives; or the occurrence of co-variant shock which affected the relatives, and reduced their ability to help (see quote below).

Quote 60. I cannot ask my parents for help; they are poor [as well] (woman #821, April 2010).

The fact that food was not requested when the household had sufficient food itself suggests another factor was at play, which was only trumped by a real need for help. It emerged from focus group discussion that asking for food contributions was considered shameful. The reason for this lies in the traditional societal roles of men in Mossi society, which consider the head of a household to be the breadwinner (see Chapter 6). A request for help would suggest he had failed in his role to provide for his family. If help was nonetheless necessary, it was requested as discreetly or as indirectly as possible (see quote below). The quantitative data confirmed that the female household members received more food transfers than male household members.

Quote 61. People use many cunning strategies. If the head of a household does not want to lose face, he enlists the help of his wife, specifically, his mother-in-law. The wife is instructed to visit her mother, who of course knows all about the problem already, because, you know, women talk. Therefore the wife only needs to drop a few indirect hints so that the mother, in turn, asks for a cereal contribution from her own husband for their daughter. She then delivers it back to her own husband who uses it to feed the family (Savadogo A., Dec. 2009).

Focus group discussions revealed that the shame associated with asking for help was also linked to a fear of falling in to debt (see quotes below). This dimension of falling into debt is further addressed in Chapter 7.

Quote 62. I cannot count the number of times I cried alone in my house but I will not go out and beg and ask someone for something I will have to repay later. I just find my own way to get by (woman #611, April 2010).

Quote 63. I prefer to content myself with what I have rather than let my worries be discovered, and then ask for help, only to find that the person will not help me (man #470, March 2010).

Planning capacity also emerged as important from the pair-wise analysis. Careful examination of seasonal food flows revealed that the received food, which was consumed during the lean season, was actually received a few months earlier. The reason for this discrepancy emerged from focus group discussions: it became clear that it was considered rude to ask for help over a mobile phone, for example. Such requests had to be made face-to-face. As most of the richer relatives lived far away, in the fertile SW region of Burkina Faso, undertaking such a trip could take several weeks⁹⁹. Such a long absence was only possible in the dry season when the demand for agricultural labour was low. In accordance with the cultural constraint explained above, it was usually the wife who was sent on such trips.

Quote 64. I went to visit my parents in Bobo Dioulasso this February. I came back with six *pagne* cloths, two pairs of shoes, a sack of maize, 24 cups of kapok flowers [to cook my sauce], 40 balls of soumbala spice, and 10,000 FCFA (woman #432, June 2010).

Nonetheless, at the height of the lean season, some households received sacks of maize that were sent to them by their married sons living in nearby cities. Such transfers did not require a trip to ask for help, but were based on an unspoken agreement, thus not affecting the father's pride (see quote below).

Quote 65. I would never have asked for such a sack, but I expect my sons to instinctively know that the lean season was a difficult time, and that they should send us food if they can (man #510, June 2010).

Overall, it was evident that, similarly to wild foods, the contribution of received food was not only determined by the food security level of the household, but was substantially influenced by social factors, such as the perceptions of neighbours.

5.4. Key lessons

This chapter examined the factors which were most important in determining access to different food entitlement channels. The analysis above demonstrated that the factors which

⁹⁹ Such trips take time not only because the relatives may live far, but because it would be rude to bring up the purpose of the visit upon arrival. 'Small talk' is expected first, then the problem can be hinted at indirectly for several days, until it is at last mentioned on the day of departure. As the Ethiopian proverb goes, "*he who is in a hurry shall not eat*" (Knappert 1989).

had been thought of as important when designing the sampling framework (availability of trees; distance from markets) were not as relevant as expected. There were more differences within than between study villages. Nonetheless, choosing different locations allowed a wider range of factors to be identified. Employing the pair-wise ranking method demonstrated that not all factors were perfect substitutes: in cases where the presence of X encouraged food purchase, for example, the absence of X did not necessarily discourage food purchase. Being able to make such a distinction between limiting and enabling factors is useful for policy planning. The inductive approach used in coding the qualitative data provided an unbiased view of the most important factors. It showed that demand was often not the most important factor determining the use of a certain food source. Instead, non-food objectives were often more important. This discredits a narrow 'food first' approach to livelihood conceptualisation. Only when taking into account wider livelihood objectives, do strategies such as the consumption of wild foods emerge not as desperate 'coping' strategies but as strategic decisions to diversify the diet, among other things. Non-food objectives are further explored in Chapter 6.

Combining quantitative and qualitative data demonstrated that asset holdings *per se* were less important than the downstream factors which governed their access. This insight refines the approach of the Sustainable Livelihoods Framework (SLF), which uses asset holdings as the starting point of livelihoods analysis. Instead, the findings of this chapter echo the approach adopted by Amartya Sen's entitlement theory, which focuses on the socio-political aspects which govern asset conversion. However, the SLF needs to be further refined not only to conceptualise how food is obtained, but also to take into account food flowing *out* of the household. The sections above demonstrate that food was frequently given to relatives inside and outside of the household. Such social obligations could potentially form a significant drain on the household's food reserves, highlighting the dark side of social capital (Fox 1997).

High heterogeneity was found within the interviewed households. While certain factors emerged as important, there were exceptions to every rule. Several household members experienced unusual or unexpected events which disrupted the strategies they would have normally have pursued during the year (see quotes below). This reiterated the need to disaggregate household data and look at individual strategies within the household (see Chapter 6).

Quote 66. As there is no gold this year, my cakes do not sell well this year [there is little money circulating] (woman #312, May 2010).

Quote 67. My sheep trade has suffered from the troubles in neighbouring Ivory Coast. There are fewer buyers (man #320, Jan 2011).

Quote 68. Normally I gather leaves at this time but I have been ill (woman #422, Feb. 2010).

As a result of this heterogeneity, there was no universal preference for which entitlement channel was used. Strategies were not ranked within a portfolio of strategies. The adoption of strategies did not follow a linear sequence: grain reserves were not used until exhaustion, followed by the continuous purchase of cereals. Focus groups revealed that, culturally, it is considered irresponsible to completely empty one's granary before the next harvest. There should always be a few bushels left, just in case. The traditional name that was given to one famine period of the early 20th century was *"the year when one had to sweep the bottom of one's granary [to get the last grains]"* (Millogo-Rasolodimby 2001). Instead, in this study the use of grain reserves was interspersed by periodic buying, receiving and gathering of foods. Because any shortfall of the granary was continuously complemented with other sources, the length of time that the grain reserves lasted – the indicator used in the national agricultural surveys – gives an inaccurate indication of the household's food security level.

Similarly, the type of strategy used was not found to be a reflection of the household's food security level and risk exposure, as is often assumed in the coping strategies literature (see Chapter 2, Section 2.2.2). The findings above did confirm that certain strategies signal a certain level of food security: eating wild foods or purchasing a large proportion of consumed cereals was perceived shameful precisely because it suggested that the household is having difficulties meeting its food requirements. As a result, such strategies were found to be underreported. However, it emerged that this 'code' could be deliberately used to make a false statement about the household's food security level (see quote below). As such, a household may use a more 'drastic' strategy not because it had a lower level of food security, but to avoid contributing more than was gained from the family's or village's solidarity system. Such power dynamics are further discussed in Chapter 6. In such cases, it is evident that using a 'coping strategy' typology such as CSI (Maxwell 1995, Maxwell and Caldwell 2008) to measure the household's food security can lead to considerable misclassification.

Quote 69. Neighbours often ask me for help because I am one of the wealthier men in the village. It is difficult to refuse politely, so if I want them to stop asking, I start buying cereals and everyone understands that this is a universal signal that my family

apparently did not have enough itself, even if this was untrue. Everyone watches what everyone else in the village is doing; this is a small place (Savadogo A., Aug. 2010).

Instead of identifying certain key strategies which proved essential for assuring a household's food security, the findings above show a plethora of different approaches. Regardless of which entitlement channel was used, it emerged that not ownership *per se*, but having the possibility of storing assets, was vital for securing food supply year-round. As such, planning food strategies, and foreseeing expenses and periods of food shortage, emerged as a key factor in maintaining food security. Coordinating the efforts of different household members played an important part, such as sending sons away to find work in the dry seasons, and sending women away to visit relatives and asking them for support. Conflicts which emerged between household members regarding such task sharing are further addressed in Chapter 6.

The use of qualitative data helped to paint a more nuanced picture of Sahelian households. The demonstrated capacity to plan ahead has important implications for the portrait of these households in the academic literature, as well as by development practitioners, disproving the commonly-held notion that poor farmers only made decisions based on the short-term. Instead, individuals were found to negotiate numerous periods of peak labour demand or periods of peak expenditures by accumulating savings or asset stores in advance. Contrary to common belief, the lean or 'hunger' season was not necessarily the hardest from a food security point of view – in fact, meal size often increased in the lean season to provide strength for agricultural tasks. Instead, men and women perceived those seasons, where most savings or assets had to be accumulated, as the hardest (see quotes below).

Quote 70. The rainy season is hard for men. We need to buy extra cereal to complement the granary but there is no time to work. I use the savings I have from the dry season (man #121, June 2010).

Quote 71. Dry season is hard for women. If you have not stocked leaves, you can only find a few in the bush. *Lelongo* and *Balanites* [tree species exploited in the dry season] are rare. In the rainy season life is easier: If you have no money to buy cereals you can just collect leaves and mix them in (woman #461, March 2010).

The tendency to conceal strategies emerged as another key factor which featured for all entitlement channels (see quotes below). This factor is related to the capacity to plan ahead, above. It was deemed necessary to conceal assets or income, so that these could be used at a later stage. Traditionally, for example, Mossi women are forbidden to look inside their husband's granaries to verify the remaining stock. The focus group discussion revealed that the

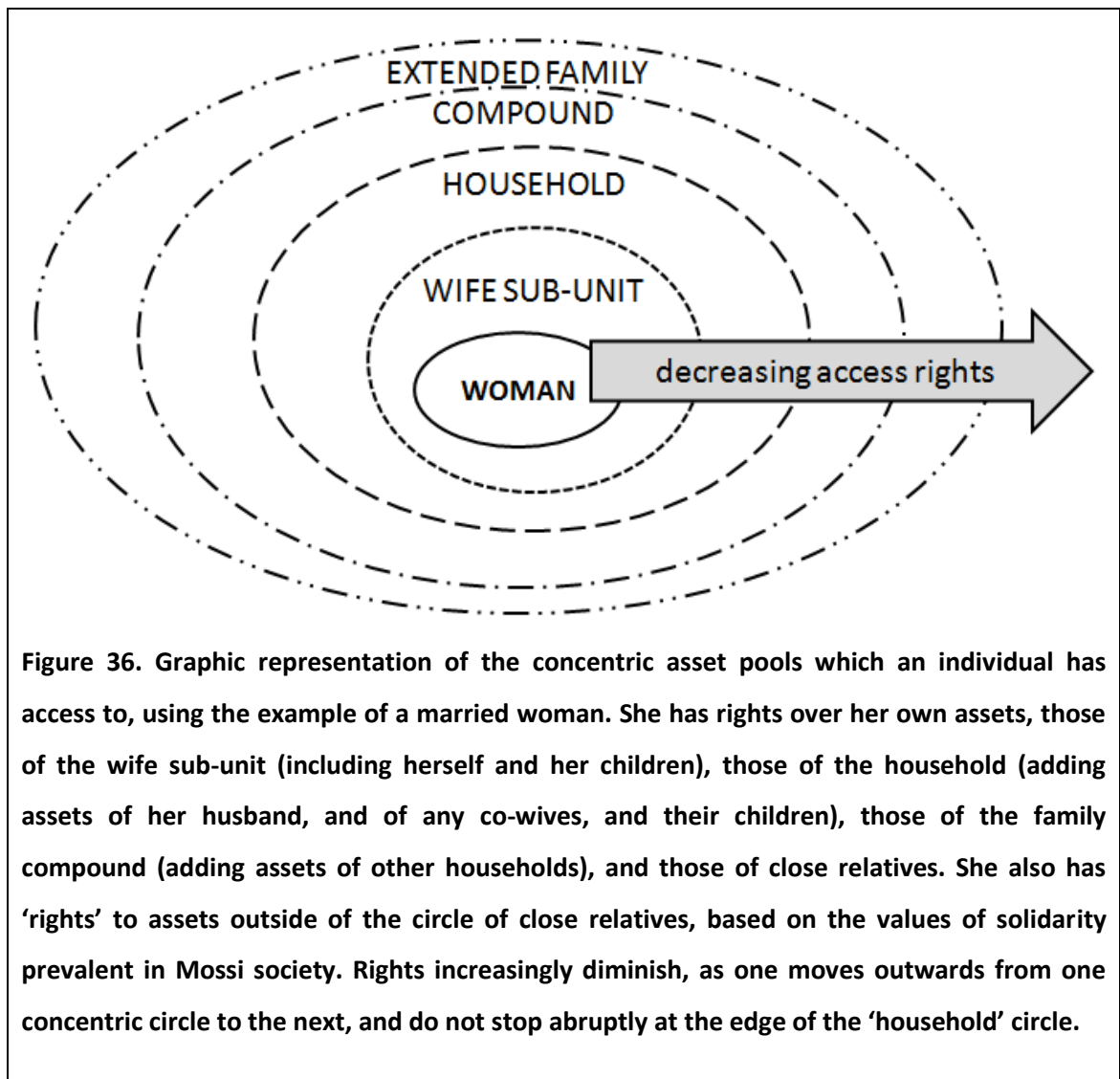
purpose of this custom was to allow the head of the household to be more cautious in managing the household's food reserves. If only the husband knew how much was left, he could announce that food reserves were running 'terribly low', thus enticing the other members of his family to help him find alternative sources, even if the situation is not as dire as it seemed.

Quote 72. I don't know how much cereal is left. My big brother is responsible for that. If he needs me to help him [buy a sack of cereals] he will tell me (man #270, March 2010).

Quote 73. I don't know when my husband's granary is running low. It is him who tells me when I should use less flour and mix more leaves in (woman # 331, March 2010).

Such concealment of asset or income holdings has important implications for the accuracy of national poverty statistics. For example, the notion that farmers are subsistence producers and thus net food sellers is probably overstated, as the purchase of cereals was found to be underreported for cultural reasons. Furthermore, quantitative poverty surveys do not take into account that people not only rely solely on private asset holdings but draw on a much wider web of tangible as well as intangible assets, as demonstrated by the high degree of sharing (see Section 5.3.4). It was for example common for the head of a household to have the possibility of selling on one his son's animals, which the son kept in the village, while working in town. Such nuances only emerged using qualitative methods. This finding critiques the conceptualisation of the household in the literature as a static and hermetic entity, which can be clearly separated from other household units. Instead, the data show that the asset holdings of households, particularly those in the same family compound, overlapped. The household can be more accurately described as a loose collection of individuals who have decreasing rights over concentric assets pools (see **Figure 36**). This finding corroborates the conceptualisation of the household as an institution based on exchange contracts governing the rights and responsibilities of household members (Kabeer 1994, Sen 1990, Todaro and Fapohunda 1987). This misconception has important policy implications because national poverty statistics based solely on quantitative surveys paint a misleading picture of poverty and food security levels.

Combining quantitative and qualitative data revealed that not only food objectives, but also other livelihood objectives influence the strategies undertaken. The intersecting effect of these objectives is explored in more depth in the following chapter.



Chapter 6: Power dynamics within and between complex households

Chapter 5 presented the factors affecting the choice of each of the four food sources. This chapter examines the social factors in more depth, focussing on the power dynamics within and between households of the same family compound. Triangulating the cooking data with the income and asset data collected for each household member revealed that in some cases, each food acquisition strategy was carried out by a different household member, while in other cases, several people contributed to the same food channel. While in the previous chapters, the data were aggregated by household or by family compound, here data are disaggregated by 'who' supplied food during the year, not only 'from where' the food stemmed. It is investigated whether a different narrative emerges by analysing the same data set in a different way. First, intra-household differences are examined in Section 6.1. Next, households within the same family compound are compared and contrasted in Section 6.2. This chapter addressed the second research question of how the household's role within the wider family compound influenced its food security strategy. The findings discussed in this chapter stem from participant observation during fieldwork, as well as from semi-structured interviews and focus groups. Quantitative data and findings from other studies are presented as a comparison, where suitable.

6.1. Diversity within the household

The anthropological and feminist literature has amply demonstrated the existence of intra-household variation (see Chapter 2, Section 2.3.1). The household is not a homogeneous unit with one set of preferences working toward the common goal of a sustainable livelihood – it exists at the intersection of communal responsibilities as well as individual goals and aspirations, some of which may be conflicting. This section explores how this context influences household food provision over the agricultural cycle. First, the traditional gender roles found in Mossi households are explained using the findings of this study, describing the ideal behaviour of husbands and wives, as described by the interviewees themselves. Deviations from this norm are then highlighted, noting the disparities between what is said and what is done. A differentiation is made between shifting rights and shifting responsibilities

with regard to food provision. Finally, the strategies of women are explored in the form of a more detailed case study, investigating how women navigate this landscape of varying household responsibilities and gender roles.

6.1.1. Traditional task division within the household

Task allocation within the household was generally found to follow gender lines, but also age divisions, making a differentiation between able-bodied and young or aging household members. The head of the household was responsible for food provision, but all household members contributed to this goal in some form. For example, the task of supplying the staple cereals for the meal was usually ensured by the husband, while the wife supplied the 'sauce' for the meal, containing various combinations of vegetables, meat, fish and spices (see quote below). Such an arrangement was documented for other regions of Burkina Faso (Thorsen and Reenberg 2000:50, Venema 1986) and in neighbouring Benin (Albert 1993:121). Meeting separate food responsibilities was the main reason men and women each had their own fields. This arrangement is typical of 'non-corporate' households found in Sub-Saharan Africa (Kabeer 1994:115). Each household farmed one large collective field – sometimes shared with other households if the compound was not too large – which was used to provide the main cereal supply. In addition, 'secondary' adult males (who were not head of the household) and women had their own independent fields, used to provide a secondary cereal stock; an arrangement also documented in Northern Ghana (Whitehead 1981) and the Gambia (Dey 1981). Typically, each field had its own labour pool, with only the collective field being farmed with the help of all household members. Such a division of labour was characteristic of 'non-corporate' households, with each person having their own granary or cereal store, as also documented in other regions of Burkina Faso (Janin 2004) and in Cameroon (Jones 1986). This 'non-pooling' arrangement indicates that traditional Mossi values determine asset allocation and role division; in contrast to Arab influences which would support a more 'corporate' model (see Chapter 2, Section 2.3.2).

Quote 74. It is a wife's responsibility to provide the sauce for the meal. If her stock runs out in the dry season, it is she who needs to buy more. If it runs out in the rainy season, it is not a problem; there are plenty of fresh leaves which she can gather (woman #431, March 2010).

Interestingly, women did not consider themselves as 'farmers', but spoke of their farming activities as an extension of their roles as mothers and feeders of the family, as confirmed by findings from other regions in Burkina Faso (Helmfrid 2004). The husband was fully aware that

he could not ensure the household's food provision without the help of his wife/wives. As such, the relationship between husband and wife/wives was one of complementarity (see quotes below). Women were principally considered in their function as an additional unit of labour. This was the main rationale behind polygamous marriages¹⁰⁰, not procreation, as often thought¹⁰¹. Providing that everyone got along well, having an extra wife benefited the whole household as well as each wife, because it freed up some of her time through shared cooking responsibilities, for example. In recognition of the contribution of different household members, not only the household head but also other household members each farmed their own fields in order to contribute to communal food production. However, the field of the household head was usually the largest, in accordance with his role as main breadwinner.

While all household members farmed, simplistically speaking, men mainly focussed on agriculture and food purchase, while women mainly collected wild foods and negotiated food transfers from friends and relatives. The gendered task division common in Mossi culture (Badini 1994, Helmfrid 2004, Kevane and Gray 1999, Lallemand 1977, Roost-Vischer 1997, Waibel 1993) was observed in this study both for the tasks of food provision as well as for other household domains.

Quote 75. Husband and wife need to work together, we complement each other's [contributions]. It is good that we each have our own field. The women insisted on having their own (man #470, Nov. 2009).

Quote 76. Being able to collect and cook leaves allows me to help my husband, especially if I have little money to buy extra food. It is normal that I compensate. When my husband's millet is not enough, I mix leaves in to make a full meal (woman #612, April 2010).

In recognition of the support given by the household head, all members contributed to ensuring the household's welfare¹⁰². The traditional household tasks of women, men, children and the elderly are presented in turn, below. It is important to note that these tasks were not allocated by the household head; everyone instinctively knew their role. As mentioned in Chapter 3 (Section 3.4.4), gender roles are internalised from an early age. The household head

¹⁰⁰ In both the francophone and Anglophone literature, as well as in the colloquial French of Burkina Faso, 'polygyny' is meant when using the term 'polygamy'. For simplicity, the term 'polygamy' is employed in the same way in this thesis.

¹⁰¹ Procreation for the purpose of creating additional units of labour (children), was however one of the benefits of polygamy.

¹⁰² Exceptions were made for newly-wed wives, who were exempt from collective cooking activities for the first months of marriage. Similarly, a mother had a right to 30 days of rest after child birth.

only intervened¹⁰³ or offered advice when unusual circumstances arose. Task allocation appeared highly efficient, with the able-bodied labour focussing on labour-intensive activities, while the children and elderly engaged in secondary activities. Overall, the completion of 'communal' tasks took precedence for each person, after which they were free to pursue their own interests. In general, the main hours of the day were reserved for collective activities, and the early morning or evenings were reserved for individual activities. Such a hierarchy was evident in the order in which fields were farmed: The communal field owned by the head of the compound – often the largest one of the compound, with lands comprising several hectares – was farmed collectively, usually for one day in the week on which everyone helped (see quotes below). Field preparation was usually done by the men, while planting and harvesting was carried out by all. Similar labour arrangements are documented in neighbouring Benin (Albert 1993:42). Apart from this collective farming activity, each household head farmed his own slightly smaller field, with the help of his wives. The wife/wives were thus left with little time to farm their own field, usually doing so early in the morning or late in the afternoon. Women who were too old to farm their own fields were helped by their sons.

Quote 77. I helped my husband harvest his field for five days. I helped on the collective field for 10 days, and helped my mother-in-law for two days. I harvested the cereals on my own field in three mornings, and the beans in three mornings and two evenings. The vegetable harvest took one evening (woman #461, Nov. 2009)

Quote 78. First I harvested my beans, it took me 20 days. They are still drying. Then I harvested my pearl millet over five days and my sorghum last, over four days. I helped on my father's collective field for two days (man #220, Nov. 2009).

Able-bodied men and women were the ones who primarily contributed to the food security and welfare of the household. Both farmed, purchased food and obtained additional food via other sources (see Chapter 5). While the household head was primarily responsible for ensuring the food security and welfare of the household, his wife/wives saw it as her/their duty to help him in this task. The respect a man received was contingent upon his ability to provide for his family; men saw themselves as the principal breadwinner (see quote below).

Quote 79. I have trouble sleeping; it is my responsibility to take care of the family. My family needs to eat. If we are hungry we cannot work. My wife is already ill; it is my

¹⁰³ Similarly, if there were three or more wives operating the same rotational cooking schedule, the eldest wife was responsible, but only intervened on rare occasions.

responsibility to see she is well-fed, and yet I don't make enough from the sale of firewood. I sell my goats, chickens and guinea fowl instead (man #830, May 2010).

Focus group discussions showed that the household head preferred to conceal any inability to meet his family's needs, as this would affect the respect that was received from household members (see quote below). This finding explains the reluctance of men to ask for help (see Chapter 5). In addition to the trade-off between help in the short-term versus help in the long-term (see Chapter 6), the high social cost mentioned here also influences the reluctance of men to ask for help.

Quote 80. If I need credit I prefer to travel to Ouahigouya [a town 50km away] and ask my sister for help. She is more discreet than someone in the village and I don't need to repay her (man #120, March 2010).

Women also showed a reluctance to admit any difficulties in feeding their children, which they considered part of their duty as mothers (see quotes below). As such, they also showed a reluctance to ask for help outside of the family, presumably because it would undermine the image of their husband as a successful breadwinner.

Quote 81. People have their pride. Sometimes we [women] would just boil water so that there is smoke and the neighbours don't realise we don't have anything to eat (woman focus group #611-632, April 2010).

Quote 82. It is shameful to ask your parents for help [to feed your children]; problems should be sorted within the walls of the home. I ask my husband if I need help (woman #861, April 2010).

Children contributed significantly to secondary tasks, thus freeing up valuable time for their parents, particularly during peak labour periods in the rainy season (see quotes below). Boys played an important role in livestock-herding¹⁰⁴, especially during the rainy season: the animals, left unguarded, could eat the neighbour's crops and cause conflict¹⁰⁵. Girls primarily helped their mothers by taking care of younger siblings and fetching water. Chapter 6 discusses the high time cost of child care as a result of falling pregnant. In their free time, children gathered wild fruits and other things and sold these by the road side, for pocket money.

¹⁰⁴ Mothers with few children took their goats with them as they went to farm, tying them to a nearby tree to let them graze.

¹⁰⁵ The Kabré household lost livestock, as neighbours had poisoned the grass around their fields to punish families who let their animals roam freely during the rainy season.

Quote 83. I am a widow, I farm alone. If I find a lot of gold I will not buy more livestock, I don't have time to guard them. My children are too young to help. I lost three sheep because of that in 2010. I prefer to keep the cash, in case. In the rainy season I farm. There is no time to trade. I live off my savings and sell some of my goats (woman #141, Jan. 2011)

Quote 84. Guarding animals is the work of children. But mine are not old enough so I need to do it myself. I sleep in a hut on my field in the rainy season to stop other animals trampling my own field (man # 220, Nov. 2009).

Quote 85. In the rainy season I need my children to chase other people's animals from my [bush] fields. But I have three fields and they are far apart from each other; I don't have enough children to guard each field (man # 240, March 2010).

Quote 86. I am highly pregnant, I cannot dig for gold. But my children help me. They fetch water and sell it to the gold diggers. Those always need water. They can sell 3-6 basins a day [75 FCFA each] (woman #421, Feb. 2010).

The elderly fulfilled a very important function in the family, often overlooked by researchers focussing on indicators of labour productivity, contributing both directly and indirectly to household food strategies. These groups of people, labelled as passive 'dependants' by economists, directly contributed to what can be termed 'social security': the granary and animal stocks of the elderly compound head and his elderly wife/wives served as a back-up food and income store, respectively (see Section 6.1.2)¹⁰⁶. Elderly men and women did what they could to earn some income, as they had the time to spend all day at the market selling small goods. The only activity the elderly were exempt from is farming, but in every other way they were still active members of the household. They made a particularly important indirect contribution by helping with time-consuming tasks which are not very physically demanding (taking care of young children, feeding the poultry etc.), thus freeing up valuable time for their sons and daughters-in-law to do other household tasks.

Quote 87. I use my savings to buy up beans and pearl millet, so that my daughters-in-law can cook with it when their stock is finished (woman #511, April 2010).

¹⁰⁶ Elderly women also shared their spice reserves. The time-consuming production of *soumbala*, a spice made with the fermented seeds of the Néré tree, was a typical activity of elderly women, and was shared with daughters-in-law who rarely had time to prepare it.

Quote 88. Now that most children go to school, it is the old people who take care of the livestock. They feed them. But [the elderly] don't have the strength to fetch water (Bonkougou A., Jan. 2011).

The role allocation of women, men, children and the elderly described above was based on the understanding that the efforts of household members were rewarded by the household head providing them with sustenance and security. As explained in Chapter 3, every household member in Mossi society has a right to enough food to assure their subsistence needs. These rights also extended to a lesser extent to the wider family compound and kinship group. To avoid tension between kinship groups, alliances are often formed which then necessitate the mutual helping of *both* kinship groups. Such alliances are formed through marriage¹⁰⁷. The traditional form is termed *pogsyure*, where a man gives his daughter in marriage to a man of another lineage in exchange for the first daughter to come out of that marriage, who then marries a maternal nephew and thus become part of the former household and lineage. By this reciprocal exchange of women, the alliance between the two lineages was firmly cemented. It is important to note that upholding such arranged marriages becomes a question of honour, with both lineages doing their best to help settle marital disputes in order to maintain good relations with the other lineage (Helmfrid 2004). This explains how obligations at the level of the lineage also encouraged the husband to ensure food security and wellbeing at the level of his household. As confirmed by other scholars, marital alliances are cemented by 'shame' (*yande*) and honour (Roost-Vischer 1997).

To ensure that nobody was left outside of the supporting structure of the lineage, widowed women were remarried to a brother of her deceased husband, so that they could maintain their status as 'the wife of a son of the lineage'. If the woman was beyond child-bearing age, she also had the choice of returning to her parent's household and lineage. The families studied in this thesis contained two such remarried widows who had joined the households of a brother of their deceased husband.

For any relationship at the level of the lineage, the compound or the household, the accord between the giver and the receiver was contingent on the fact that both sides honoured their agreement. At the level of the household, the relationship between husband and wife/wives was based on the fact that the husband ensured the food security and welfare of his household, while his wife/wives contributed her/their labour to this endeavour by farming,

¹⁰⁷ Mossi marriages are exogamous; a woman should not marry within her father's lineage. From birth it is known that a baby girl will eventually leave to join her husband's lineage, which is why she is already referred to as a 'foreigner' at birth. In contrast, baby boys are referred to as '*autochthones*' (locals), as they will stay within their father's lineage.

cooking, and taking care of the household members. When either party was unhappy with the behaviour of the other, such matters were rarely discussed openly. In Mossi society it is disrespectful to shout at an adult – only children are shouted at – and doing so would be treating him or her like a child. Instead – similar to negotiating tensions in a marriage (Helmfrid 2004) – such conflicts are resolved via the intermediation of relatives from the same kinship group. When dissatisfaction between parties could not be resolved, it usually ended in divorce (Helmfrid 2004). This confirms the point that the matrimonial union was principally a marriage of convenience, not love (ibid). One divorce and re-marriage was observed during the study period. Such events were common when reciprocal responsibilities were not fulfilled. If the husband was not able to provide for her children, the wife was free to leave him and return to her parents until she found a more suitable man, thus supporting the concept that the husband's main duty was to ensure the household's welfare. Similarly, if the wife failed to adequately cook for her husband and the household, she could be sent back to her parents. This example shows that there was ongoing negotiation regarding contributions made and the benefits received. Such negotiation is the topic of the following sections.

6.1.2. Devolving the responsibilities of food provision

In many households there was a noticeable seasonal shift in the responsibilities of the head of the household as principal breadwinner, with other household members also substantially contributing to food production. As mentioned in Chapter 5, such a diversification of food sources could be observed in response to current food insecurity, or in order to avoid future food insecurity. Having multiple fields and multiple granaries spread the risk of flood damage or pest attack, and made reserves easier to partition and manage. Some households used as many as four different granary stores, alternating between the granary of the household head¹⁰⁸, his wife, the compound head, and his wife (see Figure 37). The granary of the compound head (father-in-law) and his wife (mother-in-law) were vital back-up stores for the woman cooking (their daughter-in-law) (see quotes below). As the elderly compound head and his elderly wife/wives were fed by their daughters-in-law, his cereal reserves were no longer used for daily meals. Instead, they were kept for social obligations such as large village-wide meals prepared on the occasion of baptisms, weddings or funerals and as a back-up to address food shortage during the lean season. Similarly, the mother-in-law's stock of dried vegetables and spices formed a back-up for the daughters-in-law in case of shortage. Having separate granary stores to spread risk was also found in other studies, documenting that women's granaries were used first after the harvest, followed by men's granaries later in the year and

¹⁰⁸ Even within the granary of the household head there was a further subdivision: the poorly-developed husks of millet and sorghum were eaten first; the good ones were dried and eaten later.

the 'collective' granary of the elderly head reserved for the hungry season (Janin 2004, Jones 1986).

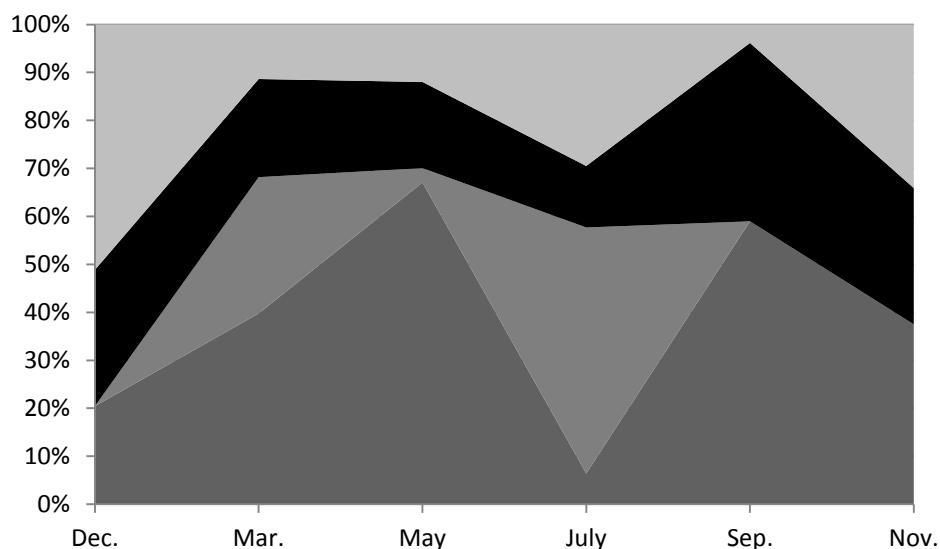
Quote 89. Now that my father is old, it is my granary that feeds the family. My father's granary is only used for baptisms, funerals, and other social obligations (man #120, Nov. 2009).

Quote 90. Usually we use my granary for festivals, for example to prepare a collective meal at the end of Ramadan. But Ramadan came late this year [in September] and my granary was already empty. It was used up during the rainy season (man #210, Nov. 2009).

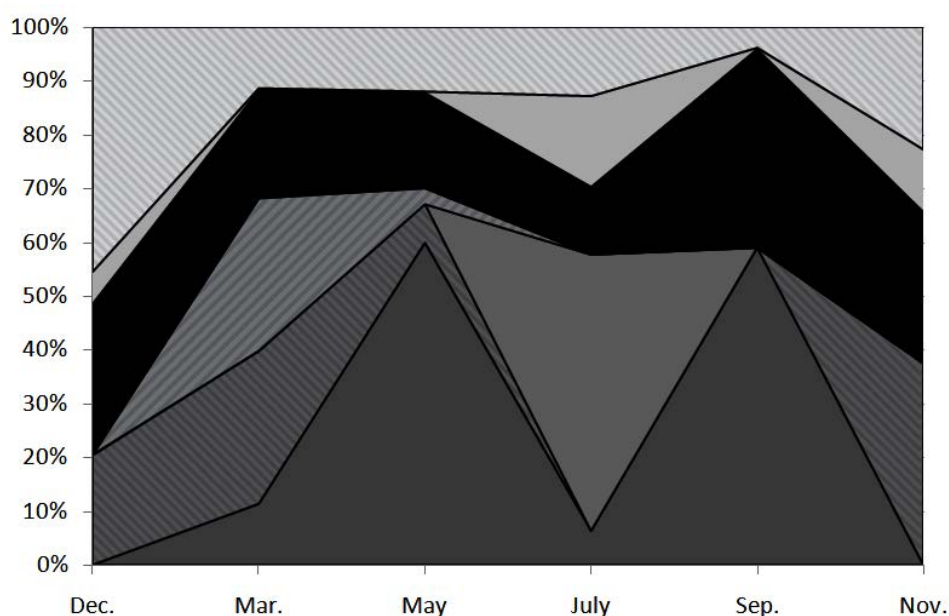
Quote 91. My granary was used to cook for the relatives when my daughter-in-law gave birth, and at my sister's funeral. Now it is already empty. I cannot buy more; I am too old to work, I already sold the three sheep I had last year. This year I rely on the contributions I get for being a retired marabou [Qu'ran teacher] (man #410, March 2010).

Quote 92. I don't sell my peanut harvest [to have income for myself]. It gives my grandchildren something to munch on when they are hungry (woman #212, March 2010).

Figure 37. The seasonal distribution of food sources for household #15 (Koukabanko village) is presented as data pooled by source (top graph), and as data disaggregated by the household or compound member from which it stemmed (bottom graph). Presenting 'by whom' food was acquired as opposed to 'from where' revealed further diversity.



The four sources from which food was acquired, indicating the percent of food stemming from each food source. The four sources are home-grown cereals (dark grey), purchase (medium), gathered (black) and received (light grey).



The four sources, disaggregated by the household or compound member from which it stemmed. This household alternated between four different granary stores: the granary of the household head (dark grey, solid), his wife (dark grey, striped), the compound head (light grey, solid), and his wife (light grey, striped).

Seemingly in contradiction with the ideal of the breadwinner portrayed in Section 3.1.1, some men refused to make the harvest from their field available to the household, at least for a part of the year. They would close their granary for a few months, refuse to provide breakfast, refuse to distribute the *mondé* when absent for a week¹⁰⁹, or refuse to meet food-based social obligations¹¹⁰ which they considered as non-essential. During these periods, other household members were forced to compensate (see quotes below). In such cases the refusal to provide food was a deliberate act, an example of an ‘accountability failure’ not acknowledged by the Entitlement Framework (Devereux 2007). It shows the importance of moving beyond production-based causes of food shortage and including behavioural factors in causal analysis.

Quote 93. My husband closed his granary. He will start providing lunch and dinner again when the field work starts – but only on those days when I help him farm his field. On all other days, when I farm my own field, I make my own lunch (woman #472, March 2010).

Quote 94. My husband has reduced the *mondé* for dinner and stopped providing lunch. At lunch everyone now finds their own way of filling their stomach (woman #831, May 2010).

Such behaviour was justified by men as a precautionary strategy to avoid over-use of the granary, which they saw as part of their duty as breadwinner (see quote below). As mentioned in Chapter 5, some men would deliberately ‘feign bankruptcy’, so as to encourage the other members of the family to help find alternative food sources, resulting in a high level of diversification. However, encouraging other household members to contribute to food provision could significantly undermine the respect the household head received. As such, he faced a delicate trade-off between conserving food reserves by delegating food provision, versus maintaining responsibility, and therefore respect and status, as principal food provider.

Quote 95. Women cannot be trusted with such things [as managing the household’s food reserves]. In Mossi culture, women are not even allowed to look inside the granary of their husband. If they see it is becoming empty, they will panic and make lots of noise, yet it is better to be discreet (man #360, March 2010).

¹⁰⁹ Nobody else was trusted to allocate the right amount of food in his absence. In those households, where the husband was frequently away, the first son was entrusted with the task of removing the right amount of grain (the *mondé*) from the granary every week. In Mossi culture, women are forbidden from looking inside or taking from their husband’s granary.

¹¹⁰ As it was traditionally the woman who was more aware of social obligations, she often used the pearl millet grown on her own fields to make *zoomkoom*.

Delegating food provision to a certain extent was considered normal; tensions only emerged when such delegation became 'excessive' (see quotes below).

Quote 96. A man only needs to provide the cereals for dinner; my father does this. It is not his role to diversify the meals; the women should do this. Sons like me can help too by buying some beans to vary the meals. But that is a luxury; the only thing we really need is a solid dinner (man #630, April 2010).

Quote 97. Of course I will not sit there and watch my own children starve. If my husband cannot feed everyone I will do what I can. As the proverb goes, "a good mother always finds a solution to help her children" (woman #611, April 2010).¹¹¹

Sharing the responsibility of feeding the family was particularly tolerated if the head of the household suffered a shock which made him less able to meet his household's food needs (see quotes below). One of the benefits of having separate fields and granary stores for different household members (see Chapter 5) was precisely to provide an insurance policy in case the head of the household's production failed. In such cases, the responsibility of taking care of the household shifted to a more senior male in the lineage; an older brother, or his father (if still alive), or an uncle. Also under 'normal' circumstances, the granaries of these individuals were available as a back-up food source (see above). Note that under circumstances where the head of the household was visibly unable to take care of his family, relatives were rarely openly asked for help. It was instead expected that they notice without being told openly.

Quote 98. My husband is ill. It is my co-wife and I who take care of the family and find ways to feed and clothe our children (woman #621, June 2010).

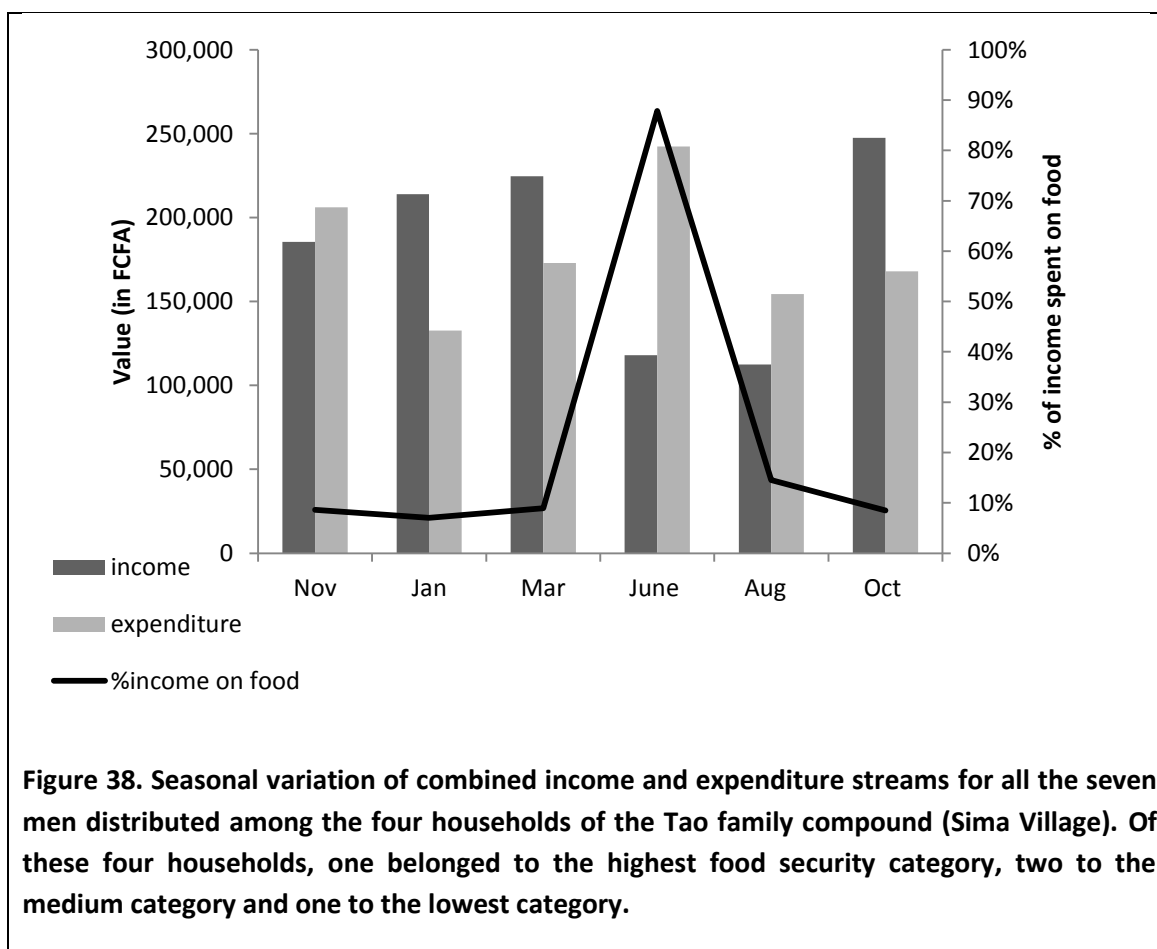
Quote 99. Normally I dig for gold to have a little income but I hurt my foot, I cannot walk far. I have been selling my sheep and goats little by little but there are only three left. It is not a good year; everyone needs to pitch in (man #420, March 2010).

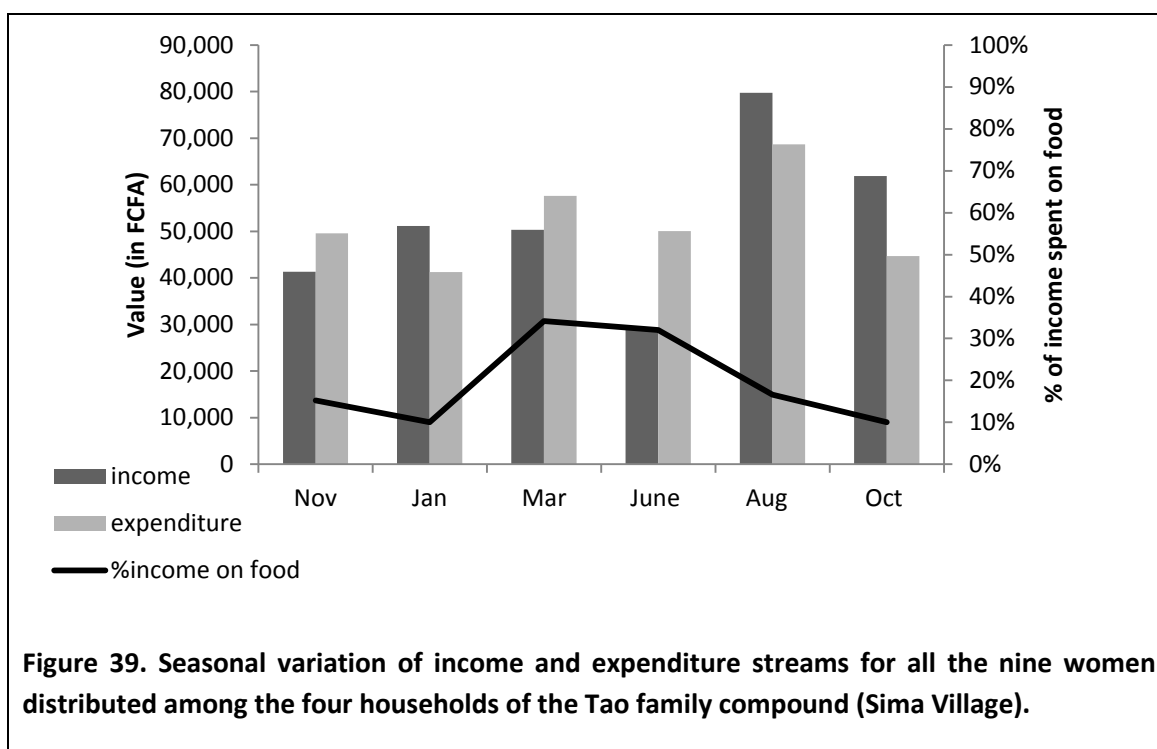
Quote 100. Two of my daughters died, my [five] grandchildren now live with me; there are very many mouths to feed yet I am old I don't have the strength to work anymore (woman #611, Dec 2009).

Disaggregating the household's income and expenditure streams shows that both men and women spent a substantial amount of their income on food. However, comparing their contributions shows that men purchased more in the rainy season (**Figure 38**), while women

¹¹¹ Maternal buffering, with the mother eating less to save more for her children, is a widely documented 'coping' strategy (Maxwell 1996, Roost-Vischer 1997:229).

purchased year-round (**Figure 39**). This confirms the conclusion of the qualitative data, illustrating that men primarily contributed by buying large quantities to supplement the granary, when needed. In contrast, women contributed by buying small quantities regularly, to diversify the diet and ensure the sauce for the meal. The graphs below also reveal a larger discrepancy between seasonal income and expenditure for men, than for women. This confirms the conclusion of the qualitative data, namely that men earned the majority of their income in the January-March, which they then saved for the June-August. In contrast, women earned smaller amounts of income year-round.





While it is undoubtedly cautious to have a system in place to delegate food responsibilities in case the main breadwinner could not cover all food needs, this system could also be exploited by a 'lazy' household head (see quotes below). Some researchers have argued that men take insufficient responsibility for a high number of offspring precisely because they experience the whole benefit of added labour, but only a part of the cost of feeding these children, because somebody else will always contribute to food provision¹¹² (Helmfrid 2004).

Quote 101. I don't think people have a real strategy. They simply regularly check how much is left [in the granary] and find alternatives accordingly. It is reactive. It is easy for a man to simply close his granary; it is the women who then need to find a solution (Sawadogo H., Jan. 2011).

Quote 102. Some harvest little and have it hard. Others harvest well but [just] manage their stock badly. [Man #710] and his wife [woman #711] drink too much *dolo* [an alcoholic beverage]. [Man #610] used to be a big trader; he is used to money. Now he spends too much money, as if he still were one. He even wanted to get a new wife! Then there are also some bad people. Those use the rainy season as an excuse to go begging for help with relatives, yet they will not be spending the money they get on food for the family. They use it for other things (Bonkougou A, Jan. 2011).

¹¹² In Mossi culture, children are considered as belonging to the wider family lineage, not to the parents themselves. As a result it is very common for children to live with their uncles and aunts for a few years (Helmfrid 2004).

As a result of such nuances, tensions arose when wife/wives or sons ended up contributing an 'excessive' amount of the harvest from their own fields to cook communal meals. Such a diversion of food responsibilities caused resentment because these secondary fields were smaller and had been allocated an unequal share of labour, fertiliser and agricultural equipment (see quotes below).

Quote 103. Even if the head of the household owns a plough, it will never be used on the women's fields. The women all use their hoe to farm (Kirakoya A., Oct. 2009).

Quote 104. My husband bought a sack of fertiliser but he used it all on his own field. When I have money I try to buy a few cups [3000-5000 FCFA] otherwise I scatter the manure of my goats if I have time (woman #112, Oct. 2009).

Quote 105. We [women] have very little time to farm our own field. We need to help our father-in-law on the communal field. Then we help our husband [on his field]. This leaves us with very little time [to farm her own field] – we usually go early in the morning or late in the afternoon. Life is not easy (woman #431, Oct. 2009).

Devolving, or even 'shedding' responsibilities of food provision also caused conflict because it essentially took away the wife's and son's right to decide over the use of their own harvest, reducing them to the status of share-croppers (Kevane and Gray 1999). Otherwise, the wives and sons could have sold a part of their own harvest to meet their own expenses (see Section 6.1.3).

It is important to note that, up to a certain point, women tolerated such devolution of food responsibilities without complaining (see quotes below). In contrast, if the household head requested an 'excessive' contribution from his sons, it was less common for them to acquiesce. The request of the household head was, however, rarely openly challenged. Either the son simply sold all of his harvest before the father could ask for a contribution (see Section 6.1.3), or he simply left the household to seek work in town (see Section 6.2.2). It is harder for a wife to refuse her husband's request – she struck a delicate balance between being a good wife and mother – especially in comparison to her co-wife.

Quote 106. Suffering is routine for us [*note the use of the plural 'us', suggesting a certain sense of solidarity among women; author's comment*]. We all try to get by in our own way. I de-husk and resell rice to make extra income (woman #821, April 2010).

Quote 107. This year was ok. We are used to the poverty (woman #612, Dec. 2010).

Quote 108. It is shameful to ask your co-wife for help when your stock runs out. If you were ill, it is ok. But otherwise not. It means you are lazy; it is every woman's responsibility to take care of her own children (woman #222, March 2010).

Conflicts over food provision only ended in divorce in extreme cases. The interviewed families supplied a case of a woman leaving her husband because he was too 'poor', and of two cases where a man asked his wife to leave because she was too 'lazy'. In the former case, woman #221 had left her husband a few years before the study period of this thesis. In the mean time, he had obtained a new wife (#222). At the time of the surveys, the first wife had come back. All parties involved refused to discuss the matter; though a little insight was gained with the help of field assistants (see quote below).

Quote 109. [Woman #221] must be very ashamed. I heard she left her husband because he was poor and found another. But it was even worse with that one, so she came crawling back. You can really feel the tension in this household. The two wives don't get along at all (Kirakoya A., Sept. 2009).

In the latter case, tensions between man #720 and his second wife (#722) became so strong that he divorced her in May 2010. A new wife was found to be living in the compound by December 2010. When asked for the reason for the divorce, the husband stated she had been 'lazy', not adequately contributing to meeting his and the household's food needs. The quantitative graph in Chapter 7 (**Figure 45**) suggests that the women of this household contributed unusually little to food provision. However, when disaggregating the data by wife, it is evident that the divorced wife had contributed more substantially to food provision than the first, evidently preferred, wife. Unfortunately, once the divorced wife left and returned to her parent's village, she could no longer be interviewed to gain a more balanced view of the event. My field assistant provided an alternative take on the reasons prompting the divorce (see quote below).

Quote 110. It has nothing to do with which one helped out more with household tasks. He just preferred the prettier one (Bonkougou A., May 2010).

The third case of (attempted) separation confirmed that other tensions apart from food provision could prompt one party to leave another (see quote below).

Quote 111. The Qu'ran only allows four wives, so my husband tried to divorce me so he could get a fifth one. He built me a house 50 meters away from the family compound so that she could come stay with him. What will an old man like him do with a new wife?!

Thankfully the [extended] family talked him out of it. I still live alone outside the compound though (woman #611, Dec. 2009).

In summary, on the one hand, the household head encouraged diversification of food sources in so far as it helped meet the household's food needs. On the other hand, the reluctance of the household head to give up his role as sole breadwinner discouraged a too high diversification of food sources. It could be argued that cultural norms were thus a barrier to diversification. However, qualitative data showed that women actually had a vested interest not to challenge the cultural ideal of the male breadwinner, because it would encourage the husband to continue to strive to feed his family. A similar attitude of Mossi women was found in other parts of Burkina Faso (Thorsen 2002). Several scholars have demonstrated with quantitative data that women contribute much more to the household economy than the cultural model states, using it as an argument that gender roles appear to be shifting (Paarup-Laursen 1996). I would argue that roles have not shifted, but that the discrepancy between the 'ideal' and 'reality' is a deliberate decision. Women have a vested interest in upholding an 'out-dated' household model so as not to challenge the authority of their husband, while simultaneously pursuing independent income-and food-strategies in hiding, in order to gain greater autonomy. The latter type of strategy is discussed next.

6.1.3. Autonomy and conflict over food provision

The previous section shows that the process of food source diversification could emerge out of the drive to help meet the whole household's subsistence needs, i.e. sharing the *responsibility* of feeding the family. However, the same process of diversification could also arise out of a more 'selfish' power struggle; defending one's own *right* to food. Due to time constraints, there was a clear trade-off between activities undertaken for the communal benefit – usually involving procuring food – and activities undertaken for a personal benefit – usually involving procuring income (see quotes below). This finding demonstrates that trade-offs within the SLF are about more than trade-offs between different asset types (Ellis 2000:29), reflecting instead the power struggle between different users of the same asset pool.

Quote 112. I have thought of buying up young cows and fattening them up [to sell them]. But I cannot do many. I do not have the time to cut much grass for them. I am the only son left. All my brothers left for town. I need to help my father [to feed the family] (man #520, Dec. 2010).

Quote 113. My married son and I share the same household. I am old and I rely on him to help me. I gave him his own field so that he could grow his own crops. He planted red

millet, but sold all of it by December, instead of stocking and drying it for the whole family to use later (man #510, Dec. 2009).

Quote 114. I prefer to put the fertiliser I bought on my aubergines rather than on my cereals, that way I harvest more [aubergines] and have more income [for myself] (man #840, Dec. 2009).

Quote 115. I don't spend much time collecting wild leaves. I prefer to go gathering sand and selling it [to the construction site] nearby so I have income for myself (woman #812, April 2010).

Conflict resulted out of the divergent priorities in the allocation of the family's food and income streams (see quote below). A woman acquired the right to pursue her own food- and income-generating activities if her husband could not or refused to meet the family's food and income needs. The most frequent conflicts were those between co-wives, and those between husband and wife. All were the product of a deteriorating level of trust, and a feeling that one member was getting more than their fair share. An unfair allocation of food could be the result of behaviour of the giver (the husband) or the receiver (the wife).

Quote 116. I am tired, I am old, but there is still work to do. My husband refused to continue paying for my son's school fees, I make shea butter [very physically demanding activity] and sell it so that I can send money to my son who is at boarding school in town [there are no secondary schools in the village] (woman #612, Dec. 2009).

The husband could cause tensions between wives by allocating the weekly *mondé* unequally, giving additional grain to his favourite wife, or helping her with her cooking expenses. It was the wife's responsibility to thresh the grain and make flour. A generous husband gave her money to grind grain at the petrol-powered village flour mill (75 FCFA per 2kg), thus saving her two hours of labour. The unequal allocation of food meant that that one co-wife got more than her fair share, at the expense of the other co-wife. The less-favourite wife was obliged to have independent food and income sources to cover cooking expenses.

The power struggle between the giver and the receiver, as well as among wives, was epitomised by the capacity to make breakfast. Breakfast was considered a 'non-essential' meal by the husband, thus not falling under the remit of the household head. He only considered it his responsibility to provide dinner, and sometimes lunch. However it was an important meal from a nutritional point of view, with children, especially, often being hungry in the morning. The quantitative cooking data showed that the majority of breakfast meals were cooked using

sources other than the husband's granary, such as the wife's granary, the mother-in-law's granary, or wild foods. However, the qualitative data also showed that some women stole a part of the grain, which they had been given from the husband's granary to cook the communal dinner, to cook breakfast for her own children (but not for those of the co-wife) the following morning (see quote below). Other wives refused to keep food for anyone who had missed the communal dinner (see quote below). Such behaviours involved some covert form of stealing or concealing food which meant that one co-wife got more than her fair share, at the expense of the other co-wife. To insure themselves against such behaviour, each wife stored her food separately in her house; many refused to speak openly about their remaining stock in the presence of other wives.

Quote 117. Even if the husband reduces the *mondé* for dinner we all keep a bit of the flour to make breakfast for our own children the next day (woman # 231, March 2010).

Quote 118. If my [sister-in-law's husband] is not present at dinner the day I cooked, that is not my problem. She has to cook for him using her own stock when he comes home (woman #271, June 2010)

The examples above explain how the need to have an independent food and income source encouraged wives to pursue parallel food-acquisition strategies. Similarly, many adult sons grew cash crops instead of millet on the small fields given to them by their father, in order to have an independent food source.

The cultural norms dictating task allocation within the household were found to change only slowly. For example, it was unheard of for men to help their wives in the collection of wild foods, even though this would have been a rational move for households with labour shortage. Similarly, all households stated that even if yields became substantially worse under climate change, they would never stop farming, as this was part of their cultural identity. It is likely that such an attitude was however also part of a wider risk strategy to retain several parallel food sources (see Chapter 7). This was particularly important because income-generating activities could not be pursued year-round (see quotes below).

Quote 119. I would never stop farming; trading activities cannot feed you all year. In the rainy season the roads are impassable; you cannot do trading (man #710, April 2010).

Quote 120. If I had extra money I'd use it to buy fertiliser; I would not stop farming and become a trader. Trading is risky; you never know what will happen. It is unlikely you

will make so much money that you can only live off purchased food all year. But if you have a good harvest you have no more worries (man #812, April 2010).

In short, the need to cement their own bargaining power encouraged household members to pursue independent food sources, in the same way as they pursued independent income sources. Qualitative data showed that several household members had concealed savings, keeping the livestock they succeeded in purchasing over the years with an uncle, as opposed to at home. Almost all women interviewed were members of a rotational savings and credit association (ROSCAS); a group of 10-20 women who paid in a fixed amount each month and lent each other money on a rotational basis. This gave them a pool of savings independent of their husband's control which they could tap when necessary (Anderson and Baland 2002).

Quote 121. We contribute 250 FCFA every 21 days so that when one of us gives birth we can buy soap for the baby and clothes. My pay-out at the end of the year will be 10-15 times as much, depending on how many women participate (woman #841, Dec. 2009).

Quote 122. I contribute 125 FCFA every 3 market days (every 9 days) to one ROSCAS to save for soap, and 100 FCFA every 3 market days (every 9 days) to another ROSCAS to save for a new *pagne* cloth for myself (woman #612, Dec. 2009).

Quote 123. I was able to buy half a sack of sorghum (16,000 FCFA) with the money I earn from knitting scarves. I bought two tomato tins of fertiliser (2000 FCFA) with the money from my ROSCAS (woman #112, March 2010).

The strategies illustrated different instances of ensuring one's right to food by pursuing independent food sources. In other words, the one strategy which is strikingly absent from the data above, is individuals simply requesting more contributions from the head of the household who is the individual seemingly responsible for their food security and welfare. There were no reported instances of free-riding where a household member would receive more (food) benefits than the labour that was put in. Such power struggles were nonetheless present *between* households, at the level of the whole compound (see Section 6.2.1).

It has been argued that having independent food and income sources was particularly important for vulnerable groups, as a form of insurance. As such, women would especially have an interest in keeping savings and maintaining a good social network, because they were likely to be worse off if they became a widow or a divorcee (Albert 1993:121, Lallemand 1977). Similarly, it has been argued that older women continued farming their small fields as a form of pension (Paarup-Laursen 1996). However, the data above shows that young men had just as

many reasons to pursue independent food and income sources as vulnerable widows, because they could use that to accumulate personal savings, and thereby improve their bargaining power once they wanted to split off and form their own household (see Section 6.2.2). These examples illustrate the various components of Sen's cooperative conflict model (Sen 1990). The behaviour observed is not just in reaction to the lack of a fall-back position – a common finding of an analysis based on exogenous drivers of 'vulnerability', concluding that it is the result of a lack of options. Instead, Sen's model shifts analysis to endogenous factors determining one's *relative* bargaining position within the household. Such an analysis explains why husbands sometimes feel undermined in their authority when their wives increasingly pursue independent income streams, as her behaviour decreases his relative bargaining position (Pottier 1994). Such a situation can lead to men claiming rights over a newly-profitable but traditionally-female livelihood sphere, in order to reclaim their economic dominance. This is observed in Burkina Faso, where men increasingly participate in the sale of forest products, a traditionally female activity (Gausset *et al.* 2005, Guiro-Ouedraogo 2009, Helmfrid 1998, Pasgo 1990). Similar developments have been observed for commercial bean growing in Tanzania (Fairhead 1990:246) and cassava growing in Zambia (Gatter 1993). The strategies which women use to improve their bargaining position are addressed below.

6.1.4. Women negotiating access to more food

Due to the plethora of reasons described above, different household members pursued independent food sources. The section below focuses on how women, in particular, negotiated access to more produced, purchased, collected and received food. Focus group discussions on historical developments showed that women had always had the drive towards more autonomy, but that in the past they usually achieved it mainly through home-grown and collected food, whereas currently women are increasingly participating in purchasing food.

Increasing home-grown food production

In order to increase the amount of food they could grow themselves, women primarily required more access to land. Increasing their monetary- and labour investments per area, on the same plot of land, was less feasible because (i) on average women had few savings (see below) and (ii) women had fewer rights to using household labour, as this labour was primarily allocated to their husband's field. As such, instead of pursuing intensification (more fertiliser and labour per hectare), women pursued a strategy of extensification (more land area) to increase the amount of food they produced. However, due to the nature of land rights in

Mossi culture (see Chapter 3), women could only access more land by going through the intermediary of their husbands (see quote below).

Quote 124. My field was flooded this year. I need to change location. But there is no more space. My husband will have to ask [for land] elsewhere [and then I will ask to farm on a part of his plot] (woman #331, Jan 2011).

In the past, women were said to have had more difficulty convincing their husbands to lend them a plot to farm (see Quote 125 below). Presently, it was common for each wife to have her own plot (for exceptions see Quote 126, below).

Quote 125. Life was not easy 100 years ago. Men refused to give [their wives] land because they were afraid she'd become too independent... or they'd just give her a bad plot of land... and as soon as she had worked it hard and restored soil fertility, he'd take it away out of jealousy and farm it himself! Thankfully such 'stories' are finished now. But similar thing still happens to non-locals today – when a tenant asks for land, the owner sometimes takes [the plot] back just when it is starting to be productive again (woman #331, Jan 2011).

Quote 126. We all have our own field. But not all women do. Our neighbours for example are very conservative. Their husbands did not give them a field. They grow their vegetables and spices in a row around the perimeter of their husband's field. In the old days everyone did it like that (women focus group #511-522, Oct. 2009).

However, the land area allocated to a woman by her husband was often a small area (see Annex 2 for statistics) and located on poor-quality soil, “especially if I wanted to use it to grow my peanuts and red groundnuts” (Kirakoya A., June 2011). This afterthought reflects the power struggle between husband and wife. He had an interest in her contributing to communal cereal production, but if she spent too much time farming her own field this would result in her spending less time farming her husband's field. If all crops grown contributed to a communal food store which was equally shared among all household members, it should make no difference from *which* field they stemmed. However, it was evident from the sections above that women *also* used their fields to grow cash crops, the income from which did *not* flow back into the communal pot. One can therefore conclude that a husband only allocated his wife/wives small areas of land because he did not want her to gain too much independence and thus lose respect for her husband by growing too many cash crops.

Increasing food purchase

Both women and men stated that women were increasingly participating in food purchase. This was both a product of an increasingly monetarised society with more expenses, and hence of an increasing incapacity or unwillingness of men to meet *all* of his wife's requests. Most men stated that they encouraged their wives to contribute to meeting household expenses (see Section 3.1.1), though she did require his permission before launching a new trading activity (see quote below). Permission was also frequently sought by using another family member as an intermediary, which indicates the delicate nature of such a request. Some men, notably the more elderly and more traditionally Muslim, still believed that a woman spending too much time on the market could fall into adultery. Such women had no other choice but to sell their goods from home. Such attitudes reflect the need of the husband to control his wife's independence, thus discouraging diversification.

Quote 127. I wanted to start selling cakes so I ask my husband for permission. I waited until it was my turn¹¹³ [to bed with him] and asked him then. As the proverb goes "it is best to sleep on it" (woman #822, Nov. 2009). Other studies have confirmed the double meaning of the proverb (Bonnet 1982).

Even though men recognised the benefit of women contributing to raising money to cover the household's expenses, they were reluctant to see the activities of their wives become too profitable (see quotes below). As such, women walked a delicate tightrope where they asked their husbands for as many contributions as he was willing to give, and also earned as much as they could to cover remaining expenses. The latter activities were concealed to still give the husband the impression that she required his support.

Quote 128. Before, it was not ok for women to raise any livestock. Now it is becoming ok (woman #312, Jan. 2011)

Quote 129. Many women raise livestock in hiding, away from their husbands. He gets jealous. He will never accept her having more animals than him (Sawadogo H., Jan. 2011).

If their husbands could not or refused to sufficiently help a woman with her expenses, some women went a step further and obtained a 'lover' who would support them materially (see quote below). Although to my knowledge such a strategy was not practiced within the

¹¹³ In polygamous marriages, women took turns cooking for the whole household. When it was their turn to cook, it was also their turn to sleep in their husband's house that evening. On other nights she slept in her own house. Note that every adult man and woman had their own houses.

interviewed households, research suggests that a certain degree of extra-marital relations (*yoobo* in Mooré) has always been tolerated in Mossi society (Lallemant 1977). Such practices are particularly visible in urban areas, where it is very common for women to have several 'boyfriends' simultaneously from whom they receive material support. It is equally common for married men to have 'lovers' – affectionately called their 'second office' – alongside their wives. Such practices have also been reported in other African cities such as Nairobi (Spronk 2009). From the woman's point of view, these strategies in rural and urban areas all follow the same rationale. Having a 'lover' allows her to indirectly gain access to a steady source of income, which, due to the lower status of women in society, would be hard for her to obtain directly. This finding reiterates the importance of including status or 'political capital' in livelihood analysis (Baumann and Sinha 2001), as it influences access to other assets such as financial resources.

Quote 130. Many women have a 'joking relationship' with a man in the village. It can be an important source of money for them (Sawadogo H., Jan. 2011).

Increased gathering of wild foods

The quantity of wild food a woman gathered seemed to be principally limited by the amount of time she had available (see Chapter 5). Tree ownership was less of a constraint, as the right to harvest wild foods was found to be liable to negotiation. Normally, only individuals who belonged to the same household as the tree owner (household head) were allowed to harvest its fruits. However, this rule was found to be less tightly enforced if the household had many alternative income sources or a full granary (less need) or if the household ascribed a low cultural value to wild foods (low interest).

In all of the interviewed families, women would negotiate access to additional wild foods if their household head did not or could not feed the whole family with his granary store. Even though in other cases such negotiation could result out of a desire to have an autonomous income source in the form of wild food sales, in the case of wild foods such a 'self-serving' motivation was not accepted in Mossi society (see quote below). Nonetheless, focus group discussions showed that people, especially young men in search of additional income, increasingly collected wild foods for commercial purposes, but often did so in hiding, for example at night.

Quote 131. I allow other people to collect from my trees, but if they come with sacks to gather large quantities for selling, I chase them (man #510, Oct. 2010).

As a result of having to compete with people who gathered wild foods for commercial purposes, women rarely had access to sufficient quantities of wild foods to satisfy their requirements for sauce ingredients, even though this was one of the wife's duties (see Section 6.1.1). Studies in other regions of Burkina Faso also documented competition between tree product users, sometimes even between husband and wife (Gausset *et al.* 2005). As a result of such competition, there was a noticeable shift in the way women obtained their supply of sauce ingredients. It has been argued that economic development has facilitated men's responsibility to provide food and income, but has made it more difficult for women to fulfil their responsibility to cook and to provide the sauce for the daily meal, due to the decreasing availability of fallow land from which to gather firewood and wild foods (Helmfrid 1998). Whereas previously sauce ingredients were mainly gathered from fallow areas, there was a trend towards increasing privatisation of the resource. Women selectively protected trees to be able to use the leaves as sauce ingredients and also planted leafy vegetables on their fields. Through such actions of selective protection and planting, a woman designated these resources as 'private', giving her a right to complain if someone else collected those wild foods. In short – in contrast to home-grown and purchased food – in the case of wild foods, it was not controlling husbands who prevented women from accessing more wild foods, but it was increasing competition over the resource.

Increasing the food received from friends and relatives

Finally, a woman could also increase the amount she received from friends and relatives outside the household. This usually carried a time cost, because a substantial time commitment was necessary to visit distant relatives and ask for a contribution (see Chapter 5). In addition, as in the case of excessive food purchase, some husbands were found to oppose the idea of family members receiving excessive contributions (see quote below), presumably because it undermined the respect the husband received for being the sole breadwinner. Such tensions were the result of jealousy and mistrust within the household. In some cases, such tensions were higher in polygamous than monogamous households due to tensions among co-wives, whereas in other households co-wives got along well.

Quote 132. My son has stopped sending me money because he knows it does not reach me, but is all taken by my step-father, who spends it on kola nuts [for himself] (woman # 612, May 2010).

Concluding remarks

In summary, women developed a series of strategies to acquire more food via the four identified food channels. While earlier accounts by Suzanne Lallemand from the 1970s suggest that women did not always have the possibility to 'negotiate', it is likely that her account is biased. In accordance with the emancipation culture at the time, she is too negative regarding male oppression and does not sufficiently stress women's 'possibilities' for subverting that power (Roost-Vischer 1997). The historical data above shows that women's tendency to pursue independent food and income sources is not a new trend; but that it is simply manifesting itself through different channels. The concealed nature of these strategies, however, has stayed the same. As argued previously, women had a vested interest in upholding an 'outdated' household model which portrayed their husband as the sole breadwinner.

6.2. Negotiation between households

At compound level, just like at household level, there were tensions between honouring family solidarity and a drive for increased independence. Adult married sons were expected to stay living in the same compound with their elderly father. It was considered socially unacceptable (a 'curse') for sons to leave before their elderly father passed away. Those households living in the same compound were also expected to share food and money if things turned bad. This principle was demonstrated by the Ouedraogo family in Koukabanko village. The wife of [man #470] passed away in April 2010 following a measles infection. As it was a polygamous marriage, the co-wife then cooked for the whole household, including the children of the deceased wife. However, if he had not had a second wife, it was explained that a woman from another household within the same compound (wife of a brother-in-law of the deceased wife) would have cooked for the household, until a new wife was found. If there were too many motherless children, these would have been distributed¹¹⁴ among relatives so that they all found a new home where to eat and live. In short, being part of a larger family compound acted as a form of safety net.

Communal living was not only beneficial for sharing food reserves, but also for sharing agricultural equipment and other assets. Not every household had their own plough or donkey cart (see Annex 2). Married brothers in the Tao family compound (Sima village) shared the

¹¹⁴ Note that it was not the family in which the death occurred that requested relatives to adopt some of the children, but it was the relatives who offered to take them up, in line with Mossi culture (one does not openly ask for help).

same plough. Other households in the Ouedraogo family compound (Koukabanko village) borrowed fertiliser from one of their brothers. Women frequently borrowed cereals or seeds from their mothers-in-law to sow the new crop, as they had often eaten all of last year's stock by planting time. Larger families were thought to fare better as they were able to pool risk. However, communal living also caused tensions, both as a result of household members refusing to fully participate in communal tasks, as well as household members being dissatisfied with the benefits they were receiving in reward for their efforts. Both are discussed below.

6.2.1. Evading communal responsibilities

Similarly to the dynamics within a household, tensions also arose within a compound if the head of the compound or another compound member requested an 'excessive' contribution, or, conversely, if a compound member refused to help with communal obligations.

In order to divert 'excessive' requests, qualitative data repeatedly showed that more successful family members formulated strategies to avoid helping relatives living in the same compound, as well as those living elsewhere (see quotes below). Interestingly, younger men stated this had always been a source of conflict, whereas older men noted a decreasing sense of solidarity among younger generations. As a result of such tensions, men and women reported concealing a part of their assets (see Chapter 5) in order to appear poorer than they were, thus evading requests for help.

Quote 133. My trading is supposed to be for me. The reason it is not improving is because I keep using the profit to support the whole family [instead of re-investing it back into my trading]. As the proverb goes, "where there is one rich man and nine poor, there will soon be ten poor" because income is invariably redistributed! I only take care of the most urgent problems [otherwise I get too many requests] (man #850, May 2010).

Quote 134. The more money I make, the more people ask for help so maybe it is better to stay poor. I tried making cakes to sell on the market but my grandchildren ate most of them (woman #511, Dec. 2010).

One member of the largest family compound (consisting of seven households) reported pre-empting requests of relatives, to be able to control when to fulfil requests in accordance with his seasonal income flows (see quote below). This avoided him being caught out by a large

request at the end of the lean season, when he himself was struggling. Being able to plan around the year's seasonal patterns was a vital strategy (see Chapter 5).

Quote 135. I bought each of my married brothers [they are each household heads] half a sack of fertiliser at the start of the agricultural season. Receiving such generous help discouraged them from asking for more help later in the lean season (man #440, May 2010).

Tensions emerging from an unequal contribution of different family members became most apparent when farming the communal field, which belonged to the head of the compound. This task formed part of the communal activities expected from compound members, however any time spent farming the communal field resulted in less time farming the household head's or the wife's field. The three brothers of the Tiemtoré compound (Koungressince village) reported tensions that emerged out of the perception that one was working harder than the other on the communal compound field. As a result, after their father passed away, it was decided to split their father's communal field into three, but continue living in the same compound. This was not only thought to increase productivity, but also avoided the eldest brother – who was designated head of the compound after his father's death – from being tempted to allocate food unfairly (see quote below). Interestingly, if a family did want to keep farming together, it was suggested to give the responsibility for communal food management to the *youngest* brother, "as he would be too conscientious to abuse it" (Bonkougou A., June 2011).

Quote 136. In good times it is better to split fields, even if brothers get along well – because the eldest brother will always have the temptation of taking the whole harvest for himself and selling it, or giving it to his favourite wife, so it is best not to give him the opportunity to do so (man #810, Jan. 2011).

The qualitative data above reveal an important dilemma. The more help (in the form of money or labour) that was given to others, the fewer savings were left for the individual. There was a clear trade-off between protecting one's own welfare and helping relatives secure their welfare. In consequence, less help was given to those who were considered less 'needy' than the individual him- or herself. Such a judgement was made based on the perceived status of the other party. While interviews stated that such a judgement was easily made because "everyone in the village knew each other", it is clear that everyone benefited from *understating* their wealth, as this would both result in fewer poor relatives requesting help, and also in more rich relatives offering help.

While it was considered impolite to refuse giving *any* help, relatives who were considered not to be in need were simply given a symbolic as opposed to a substantial contribution. This made it more difficult for individuals to exploit the solidarity customary in Mossi society. Contributing just enough was also necessary to uphold family solidarity; it was seen as an investment which guaranteed one's right to receiving help in the future. Contributing too little could undermine the individual's social safety net. These nuances demonstrate the delicate balance between contributing too much or too little to the communal welfare of the larger family.

6.2.2. Dissatisfaction with rights received

Compound members, just like household members, contributed to communal tasks expecting to have their subsistence needs met, and receive help when such was requested. One of the main reasons cited by elderly household members for encouraging their sons to stay living in the same family compound was because the sons could take care of the elderly in their old age; it was a form of pension (Paarup-Laursen 1996). Such a succession of responsibilities from one generation to the next is dictated in Mossi society. The main reason mothers found a daughter-in-law for their son was because the daughter-in-law would eventually take over the mother-in-law's responsibilities, cooking both for her husband and her elderly parents-in-law. This pattern was also found in the interviewed households, with either one daughter-in-law cooking for all the elderly in the compound, or the responsibility rotating round each household.

Some elderly women mentioned not being adequately taken care of by their daughters-in-law (see quote below). This was the main reason they cited for refusing to give up their autonomy and continuing to farm their little field. Similarly, some compound or household heads confiscated food or money sent by relatives to another household member (see Section 6.1.4). Precisely because access to communal resources and family solidarity was not always guaranteed, the elderly additionally accumulated personal savings, which were more secure than communal savings. This precautionary attitude encouraged diversification of household food sources.

Quote 137. People here are ungrateful. I was the village midwife for many years and helped many people. Now I am old but nobody will give me my *zaca* [Muslim tithe]. My daughters-in-law give me nothing; they have enough worries of their own (woman #413, Nov. 2009)

At the other end of the spectrum, it could be possible for compound members to take advantage of the safety net of the family compound, and request help when they were not actually in need. Such behaviour was reported to be rarely successful, as everyone in the village knew each other well and could easily distinguish those who were truly needy. If someone who was clearly not needy asked for help, they were simply given a symbolic contribution (see Section 6.2.1). Such behaviour reveals an important dichotomy; namely that the right to *communal* help and support was in part contingent on how able the individual was to help *him- or herself*, based on his or her individual wealth reserves. In consequence, 'nagging' may have been a deliberate strategy by elderly individuals who could no longer engage in physical labour to accumulate individual savings, and had no other way of ensuring their welfare except by 'demanding' more help from their relatives (see quote below). While younger women could potentially leave their husbands and return to their parents if they were dissatisfied with the rights received (see Section 6.1.3), elderly women did not have that option as their parents were probably no longer alive.

Quote 138. [Woman #413] does not actually have as many problems as she says she does. One of her relatives 'lent' her a grand-daughter, who cooks for the old woman and farms her field for her, so that there is a good harvest. This is just her way of dealing with her situation. Every time I come here [to do interviews] she nags (Kirakoya A., March 2010).

If men, specifically heads of households, were dissatisfied with the benefits they received from communal living, these tensions usually resulted in these households splitting off from the main family compound. However, it was culturally unacceptable for the household of the eldest married son to split off, as he would eventually succeed his father as head of the compound, and would take care of his elderly parents. If he nonetheless wanted to pursue trading activities like his younger brothers, this caused tension because it stifled innovation and the freedom to pursue one's own activities (see quotes below).

Quote 139. I really wanted to trade cloth like my little brother. Look how well he has done for himself. But I am not allowed to leave for many months of the year because I am the eldest and am responsible for everyone. My elderly father no longer has a regular income source (man # 220, April 2010).

Quote 140. I cannot leave the village like my brothers did. My father is old, I need to help him guard his animals or they will be stolen again. Besides, my brothers are not much better off in the city [so it's not worth leaving the village] (man # 520, April 2010).

In some cases, compound heads would even encourage their younger sons to leave, if tensions were too great and it was evident that the amount of food produced was insufficient to feed the whole compound (see quote below). This allowed these sons to focus on their trading activities and send food home, thus diversifying household food sources. As long as sons came back home for the agricultural season and helped farm, they were freer to follow their own activities during the year.

Quote 141. Lots of young people have left this village but not because there was tension in the family, but because there is lack of farm land [and thus lack of food], ever since they threw us out of the [neighbouring National] Park [whose borders were delimited recently] (man focus group #810-850, Sept. 2009).

Quote 142. I have five sons in Ouaga and one here with me. I sent five away because there were too many mouths to feed and much arguing. But up to now they have not had much luck. One got married and could not feed his wife so she lives with us in the village (man #510, March 2010).

The compound head had a vested interest in preventing a complete separation, as the monetary or labour contributions of his sons formed part of his social safety net or 'pension'. However, once personal interests of the sons overtook the duty of helping the family back home – a transition which often occurred as soon as the sons got married – the strategy of sending sons away no longer benefited the village relatives significantly. It is important to move beyond the simplistic analysis that larger families had a larger social network, simply because they had more relatives. The crucial factor was not the number of relatives, but how close ties were within the family.

Married sons, however, had less of a vested interest in communal living. Focus group discussions clearly showed a conflict between generations, with elderly interviewees lamenting a loss in values in the younger generation (see quote below).

Quote 143. The gold trade has blinded young people. They no longer want to do any real trading [e.g. livestock trading] and want easy money. Yet often there is no gold to find. It is a game of luck (man #460, Nov. 2009).

Elderly interviewees blamed increasing monetarisation as an important force encouraging the break-up of large polygamous families. The desire to control one's own food and income streams encouraged young men to leave the family compound to seek work elsewhere. The flourishing illegal border trade with Ghana and Togo (southern field site) and the expanding

informal gold-digging sector (northern field site) both provided the promise of 'easy money' in the non-agricultural sector. Especially around the gold mines, rumours of youths, who had found 1,000,000 FCFA worth of gold over night and immediately bought a big motorcycle, were rampant.

In contrast, younger interviewees revealed that they only had a small vested interest in communal living not due to a shift in values, but because they – in contrast to their elderly parents – were healthy enough to earn sufficient income, should the communal safety net of the extended family not suffice. As a result of their better bargaining position, they were therefore less inclined to recognise the risk sharing benefits of communal living, because they were less dependent on them. Their individual savings made them more able to cover the monetary cost of household fragmentation. However, other studies examining marriage practices have cautioned that fragmented households were not always able to cover the social cost of the increasing individualisation of family units. In a 'love' marriage, in contrast to an arranged marriage, the family lineage would not intervene to ensure that both sides were adhering to the rights and responsibilities discussed in Chapter 3 (Section 3.1.1). In consequence, spouses in such fragmented households were more dependent on the household alone, and also more exposed to marital violence (Helmfrid 2004). No longer having access to the social safety net of the wider family made the nuclear household significantly more exposed to shocks, as they could *only* use their individual wealth to buffer shocks.

It was not clear from the study sample whether there was a permanent shift in the direction of increased fragmentation of household units. I would argue that the tension between younger and older generations is as old as time and allows society to find a healthy middle ground between risky and risk-averse behaviour.

6.2.3. Finding a compromise: the extended household

The examples above demonstrate the strategies undertaken by many families to strike compromise between contributing too much or too little to communal activities. I argue that the nested design of the extended household facilitated a compromise between the centrifugal and centripetal forces governing family size. Relatives continued to live in the same compound, but farmed separately and allowed household members, especially the younger sons, to leave for several months of the year to follow their own activities. By living near each other, they could manage their assets separately but still receive help without necessarily having to ask directly. Historical data from other studies suggest that while all household members used to farm one large field, the *pugkeenga* of the head of the compound

(Hammond 1966, Izard 1977, Kohler 1971), this practice has gradually disappeared. Marchal (1987) suggests that the node of authority and decision-making regarding the allocation of farming roles and responsibilities has been gradually devolved from the compound head to the level of the household head.

As concluded in Chapter 5, the capacity to plan the year's food-acquisition strategies made a big difference to the household's capacity to meet its food needs. Similarly, planning and coordinating the households' and compound's strategy was a successful way of minimising tensions within the family. For example, one woman explained that if a set time was allocated for farming the collective, household and women's fields, there was less resentment regarding unequal labour allocation.

Planning the use of the various granaries of the households and compound during the year also increased the capacity to meet food needs year-round. This was achieved by households splitting and merging during the year in accordance with the granary store used. When the granary of the compound head was used during the lean season, all households of the compound effectively merged together to eat out of the same pot (see quote below). This strategy also saved time, as the cooking rota included a larger number of women, giving each one more time to pursue her own activities. If, however, there were tensions in the family compound, the compound head would distribute an equal amount of grain to each household without merging the cooking responsibilities. This arrangement was made to avoid any dissatisfaction among wives arising from an unfair allocation of food. By splitting and merging households during the year, the costs and benefits of living in a smaller or larger unit could be balanced by adjusting the size of consumption group over the year.

Quote 144. My [household's] stock is finished now; we are eating the sorghum from the collective family field (man #831, Sept. 2010).

The fact that the family compound is made up of several smaller nested units (the households of married sons) has several important benefits for risk management. Firstly, it allowed production and consumption groups to be of a different size from each other, so that the risks facing production and consumption could be managed separately. Secondly, it allowed both production and consumption groups to vary in size over the year, because households could split and merge to pool risk at strategic moments. Consumption groups could also be varied by having a different consumption group depending on the type of meal (breakfast, lunch or dinner). In short, different strategies could be pursued at different scales. A household living in a larger family compound could enjoy the benefits of separate financial and physical asset

holdings, without sacrificing the benefits of social capital pooled across the whole compound. I argue that century-long exposure to risk and to the centrifugal and centripetal forces governing family size have resulted in the extended household being the dominant household type in the Sahel, precisely because it strikes a balance between innovation and insurance.

6.3. Outlook: juggling multiple objectives

This chapter addressed the second research question of how the household's role within the wider family compound influenced its food security strategy. By investigating 'who' supplied food during the year, this chapter revealed that a diversification of food sources was not only a risk management strategy to ensure food access (see Chapter 5 and Chapter 7), but also to ensure access to income, security and general welfare. In short, examining livelihoods from a narrow 'food first' perspective obscured the wider livelihood objectives of interviewees.

If wealth were equally shared within the household or family compound, as assumed by unitary household models, it would not be necessary for individuals to keep separate wealth reserves (food, income, livestock and other material goods). However the data above clearly show that as a result of power dynamics within the household or family compound, access to communal assets was not always guaranteed. As such, having independent food or income sources in parallel to the household head provided each person with a buffer in times of need. Conversely, pooling food or income sources and sharing across households and family compounds also formed a buffer in times of need. In consequence, each individual faced a trade-off between accumulating individual savings and accumulating household or family savings; both strategies for managing risk. The former were smaller but with guaranteed access, while the latter were more substantial but with less secure access. The data revealed that individuals tended to accumulate savings in both forms, but conceal the former, so that they retained their right to the latter. The visible modesty apparent in Mossi society (see Chapter 3, Section 3.4.4) – considered by some researchers as a virtue of peasant societies (Scott 1976) – could simply be considered a strategy to spread risk because it guaranteed access to informal safety nets. The central role of shame, pride and modesty reiterates the importance of taking into account local objectives and values when analysing livelihood strategies (Adger 2006, O'Brien 2009).

The data reveal the importance of not only presenting households as the locus of competing interests, but recognising that both shared and separate interests coexist. Analysis along gender lines often emphasises the former, yet this data set reveals that bargaining also takes place among men and among women. Sen's cooperative conflict model can be applied to

explain the factors affecting bargaining behaviour both between and among gender groups. Such an analysis, employed in this thesis, does not portray women and other disadvantaged household members as 'victims', but as actors having a genuine interest in staying within the household and thus constantly balancing the costs and benefits of their welfare maintenance through negotiation. Employing such an approach sheds new light on the drivers behind livelihood construction in complex collectivities such as extended households.

Examining large extended households purely from the perspective of food security and agricultural production has often led to them being labelled as inefficient. One study concluded that "while households are supple institutional forms for raising children and for providing common goods like domestic services, love, or insurance, they may not be the most effective for coordinating agricultural production" (Kevane and Gray 1999:1). However, strategies such as farming individual small fields or concealing food, which seem contradictory from the narrow perspective of food security, are in fact in line with a wider objective of risk management. Similarly, farming on unproductive soils would be considered inefficient from the perspective of food production, but is justified under the objective of risk minimisation (see Section 6.1.3 and Chapter 7). These nuances reiterate the importance of considering wider livelihood objectives in the analysis of food security strategies.

A misconceptualisation of the risk minimising objectives underlying the formation of large extended households has however led to agricultural policy which discourages their formation. The European type of nuclear family was widely promoted by the colonial administration as the ideal unit for economic development of Burkina Faso (Helmfrid 2004:15). It was also encouraged by the post-colonial administration, with President Sankara introducing a new family law which banned polygamy and encouraged nuclear families (*ibid*:23). While less present in the study sites, elsewhere in Burkina Faso Christian missionaries have played an important role in advocating the conjugal family as the foundation for a new kind of society (*ibid*:18). In my opinion these policies do not sufficiently take into account the important risk management function that extended households fulfil, probably because that function is less important in the less volatile European environment from whence these policies stemmed.

In Burkina Faso, the informal safety net provided by the extended family is very important. However, how was the right balance between accumulating individual savings and accumulating 'collective'¹¹⁵ savings achieved? Having access to both was important for

¹¹⁵ The term 'collective' is used loosely to denote savings or assets 'owned' by a group of people. Collective 'ownership' reflected the fact that a given group of people had rights over, or entitlements to these assets. However, the assets themselves were usually physically stored within the house of granary of one individual in the group, usually the eldest male.

managing risk. The results of this chapter show that most individuals were both 'receivers' and 'providers' of the informal safety net created by communal assets. As such, the balance highlighted above depended both on the motivations of the individual in his role as 'receiver', benefiting from the informal safety net created by communal assets, as well as his motivations in his role as 'giver', sharing his assets with others, thus contributing to the communal safety net. Sen (1990) refers to this distinction as the production of shared goods ('giver') and the sharing of these goods ('receiver').

Firstly, in his role as 'receiver', the individual benefited from understating his own asset holdings, in order to retain his right to access the family's informal safety net. Negotiation emerged as a key strategy to increase and retain access to the informal safety net. For example, negotiation was a standard part of the local land tenure system, ensuring that a balanced land distribution was constantly re-negotiated, thus avoiding a polarised asset distribution. This flexibility allowed the comparatively rigid social norms to be adapted to the variability of the ecological and economic environment – a dilemma posed at the end of Chapter 3.

Conversely, from the point of view of the 'giver', contributing was akin to making an investment which guaranteed one's right to receiving help in the future. This realisation emerged from experience, perhaps from a past shock which had demonstrated that the 'giver' can also sometimes become the 'receiver'. Such an attitude was encouraged through traditional societal values such as solidarity and charity, as well as encouraged by Islamic teachings (see Chapter 3). However, the attitude of 'charity' was at least partly contingent on the 'receiver' being in need of help. If this was not the case, 'charity' was reduced. This aspect is the flip-side of the negotiation outlined above. For the 'giver', negotiation was a strategy to *decrease* the access of others to his assets, which were used by others as an informal safety net. An individual having had a successful harvest, or pursuing a successful income-generating strategy, would have less need for such 'charity'. Historical data from neighbouring Ghana corroborate this finding, suggesting that 30 years ago the household head was responsible for providing grain staple for two collective meals per day, whereas today these responsibilities have fallen to one meal per day, as markets are more reliable (personal comment, Dr. Ramatu Al-Hassan). A similar evolution could be present in this study. In the northern field site it was customary to provide two collective meals per day, but in the southern field site, where harvests were higher and less variable, only one collective meal was provided. While it was not possible to explore historical developments of this practice, it is likely that, as in Ghana, the provision of 'charity' was constantly reassessed and adapted to changing circumstances.

These findings stress the fact that the assets necessary for livelihood construction were under constant negotiation. The Western individualistic conception of resources involving 'ownership' did not capture the constant flux of rights over resources. As concluded in Chapter 5, assets could be conceived as a concentric pool of decreasing entitlements. But how was this 'pool', and the contestation within this pool, managed as a coherent whole? It is evident that the behaviour of each individual was not independent, but highly interdependent on the behaviour of other individuals in the same household or family. But how did their strategies interrelate? Were the motivations of 'givers' and 'receivers' reconciled to foster the resilience of the whole group? Or did different members benefit in sequence, 'taking turns' to be 'receivers'? Analysis at the level of the whole household, or the whole family compound is necessary to shed light on such wider dimensions. To address some of these questions, a system-oriented analysis, examining the strategies of different individuals as a coherent whole, is undertaken in the following chapter.

Chapter 7: Trajectories of resilience

The two previous chapters describe the factors affecting the choice of each of the four food sources at a given point during the year. This chapter examines how the contribution of the sources was adapted over the seasons and combined to form a coherent approach to risk management. Diversification of livelihood strategies has been identified as an important risk management tool, and heralded as a vital feature of sustainable livelihoods (Ellis 2000). However, the ecology literature demonstrates that the property of resilience – the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change – is conveyed by more than just the diversity of livelihood strategies. Does the degree of diversification of all food sources always make the whole system more resilient in the face of seasonal food shortage? As such, this chapter addresses the third research question of the thesis: How is resilience constructed over the whole agricultural cycle?

To address this research question, a quantitative methodology for measuring resilience is proposed, tested, and is referred to as resilient livelihoods analysis (RLA) from herein. RLA entails examining the relationship between the three components of resilience and the outcome indicator, the household's food security level. The household's food security level, ranging from very low to low to medium, was defined through a participatory wealth ranking exercise at the beginning of field work (see Chapter 4). Note that this classification reflected the average food security level of the household. Within each classification, food security levels varied during the year. Next, the findings from the RLA are triangulated with trends emerging from the qualitative data (see Section 7.3). Throughout, quantitative analysis is supplemented with quotes where possible, which can be related back to the numbered household data points plotted in the graphs with the help of the codes in the Annex 2. Finally, the suitability of the resilience concept for livelihood analysis is discussed.

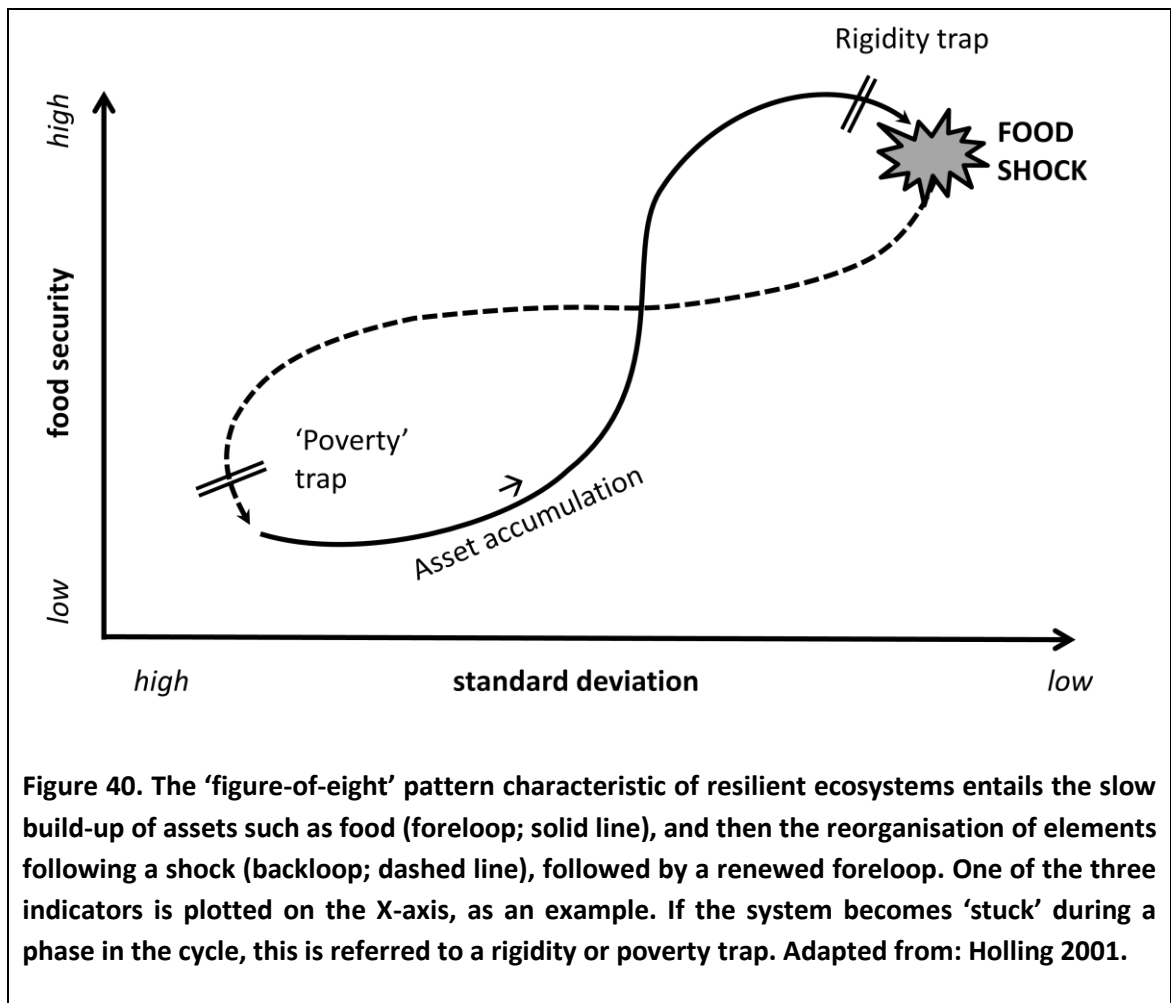
7.1. The characteristics of resilience

For the purpose of this thesis, livelihood resilience was quantified for each household using three characteristics: diversity, standard deviation and covariance of the livelihood system. The three variables were based on models of socio-ecological resilience, presented in Chapter 2 (Section 2.3.3) and defined in Chapter 4 (Section 4.4.4). First, persistence is observed via the

diversity of food entitlements, defined as the median level of seasonal food source diversification over the whole study period, referred to as 'yearly diversification' from herein. Secondly, transformability was observed via the capacity of food sources to respond by changing food demand over the study period, measured through the median standard deviation of all food sources. Lastly, adaptability was captured through covariance, based on the median covariance of every pair of food sources. Due to the non-normal distribution of the data, medians were chosen as indicators of central tendency.

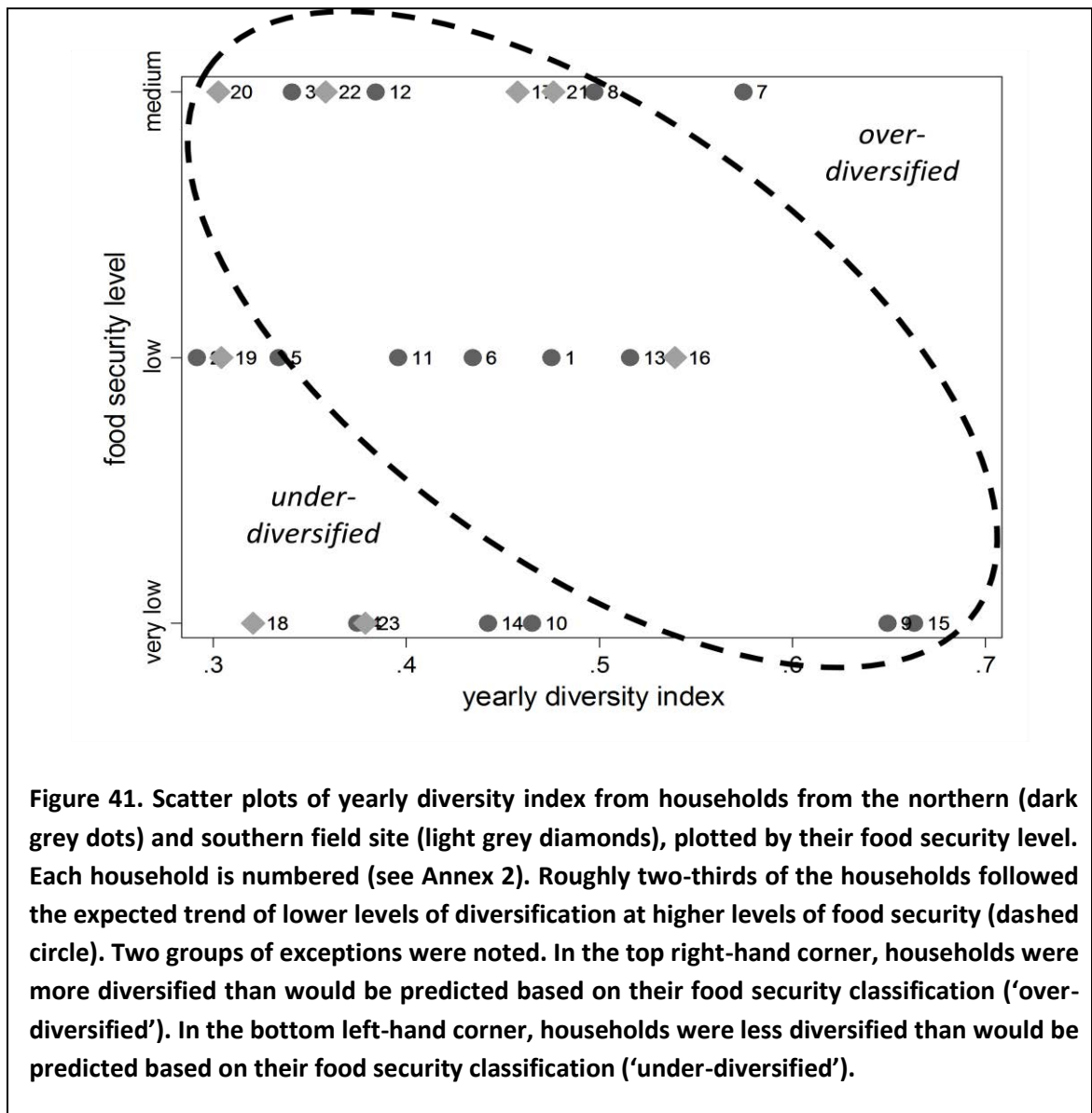
Resilience theory predicts that these three indicators of resilience change as a system progresses through different stages (Holling 2001). To facilitate understanding, Holling's figure-of-eight is adapted for livelihood systems and depicted in **Figure 40**, below. One of the three indicators is plotted on the X-axis, as an example. The figure shows that asset accumulation enabled the transition from a low to a high food security status.

While many studies have examined livelihood diversification at a given point in time, here each resilience variable was computed to cover the whole study period, in order to be able to assess the whole year as a coherent unit. The relationship between each of the three characteristics, as well as their relationship with the outcome indicator – the household's food security level – is examined in turn, below. The results are interpreted in Section 7.3.



7.1.1. Yearly diversity

Resilience theory predicts that a diverse number of food sources are initially necessary to accumulate assets – in this case food – but that diversity declines with increasing food security levels (Holling 2001). This idea is based on the premise that food can be successfully accumulated through few entitlement channels, i.e. those which 'work best'. The data shows that roughly two-thirds of the households exhibited the expected pattern of decreasing yearly diversification with increasing household food security (see **Figure 41**).



Solely based on this data set above, it was not possible to explain the causal processes which led certain households to fall outside the expected pattern. However, in Chapter 5 the availability of labour emerged as an important factor affecting the extent to which households diversified into different strategies. Disaggregating the diversification data by labour supply confirmed this result, revealing that yearly diversity clearly declined with increasing food security, if labour was held constant (see **Figure 42**). 'Over-diversified' households were those with abundant labour, while 'under-diversified' households lacked labour. The effect of labour supply could be seen most clearly when comparing households with one, two, or more wives. In households with one wife, she was very busy with household chores and had little time for other activities. With one or more co-wives, however, wives were on cooking duty on alternate days, giving them more time to gather wild foods, trade on the market, and tend to their own private fields (see Chapter 6 for a description of task division within the household). This

analysis suggests that the ‘under-diversified’ households identified in **Figure 41** were constrained by their lack of labour, even though there was a ‘need’ to find additional food sources to compensate for their low food security level. Taking this logic one step further, it is evident that the diversification level of ‘over-diversified’ households was driven by a factor other than ‘need’, as these were classified in the high food security category. This aspect is addressed in Section 7.2.1.

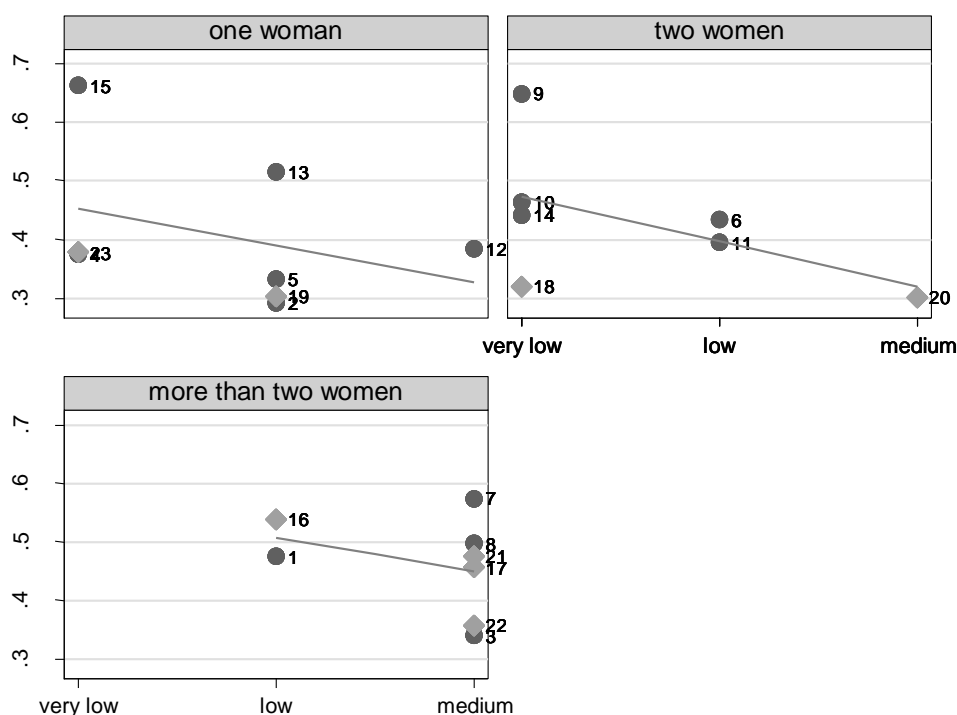


Figure 42. Scatter plots of yearly diversity index from households containing one, two or more than two women, from the northern (dark grey dots) and southern field site (light grey diamonds), plotted by their food security score. Each household is numbered (see Annex 2). Yearly diversification declined significantly with increasing food security level if labour is held constant.

Which processes enabled diversification? How did diversification relate to the other components of resilience? In order to further investigate the pattern above, the relationship between the three indicators of resilience was explored in turn.

7.1.2. Level of standard deviation

According to resilience theory (Holling 2001), one expects diversity to decline as a system accumulated wealth (or food), and standard deviation of each food source to decline as the system became increasingly stable and less volatile. The data shows that three-quarters of the households exhibited the expected pattern of declining standard deviation with declining yearly diversification of the household (see **Figure 43**). In accordance, one would expect standard deviation to decline at higher food security levels; a pattern roughly reflected by the data (see **Figure 46**). The exceptions to this pattern are more fully addressed in Section 7.2.1.

At one end of the spectrum (bottom left-hand corner of **Figure 43**), resilience theory predicts that households specialise in a few livelihood activities, which did not vary much during the year (Holling 2001). And if these households stayed locked in this state (akin to Holling's rigidity trap) they would not be very resilient to shocks because they had fewer strategies to choose from in the case of shock, reducing the transformability of the livelihood. Similar to the diversification data discussed above, labour availability played an important role in this. The three households in the bottom left-hand corner all suffered from low labour availability (see **Figure 45**). One was the only female-headed household in the sample; a woman who lived alone with her two teenage children, and did not have the spare labour to allocate to different food-acquisition activities, and focused on farming. The other two households were those of two married brothers, living within the same family compound. Despite having one and two wives, respectively, these two households still suffered from low labour availability, and therefore focused mainly on farming. This is the result of the three women participating surprisingly little in food-acquisition activities – a result of power-related tensions within the household, as addressed in Chapter 6. As discussed, one of these wives was divorced as a result of these power-related tensions in May 2010.

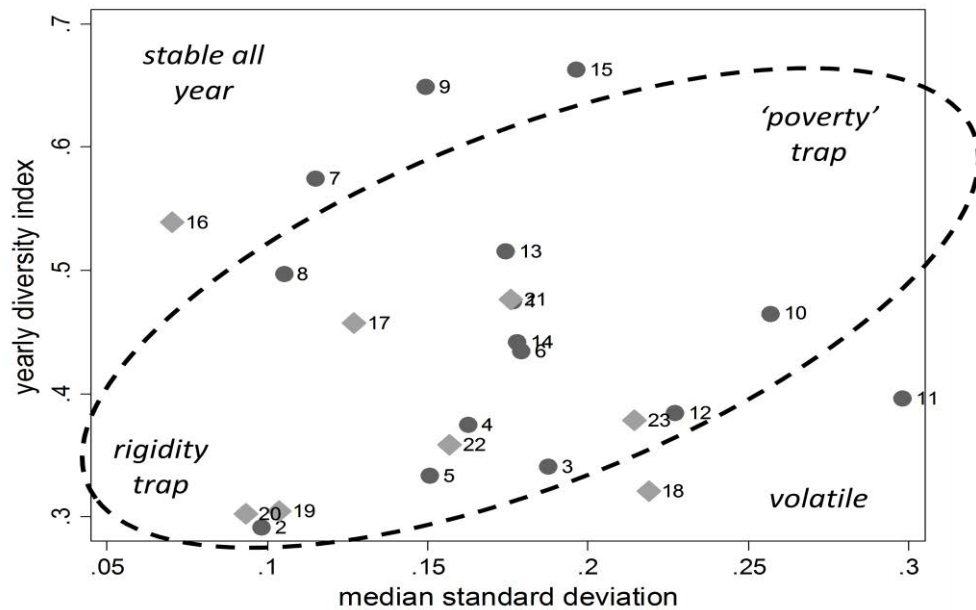


Figure 43. Scatter plot of yearly diversity index and median standard deviation for households from the northern (dark grey dots) and southern field site (light grey diamonds). Each household is numbered (see Annex 2). Just under three-quarters of the households exhibited the expected pattern of declining standard deviation with declining yearly diversification (dashed circle). Two groups of exceptions were noted. In the top left-hand corner, households were consistently diversified all year round ('stable'). In the bottom right-hand corner, households greatly varied their food source use ('volatile').

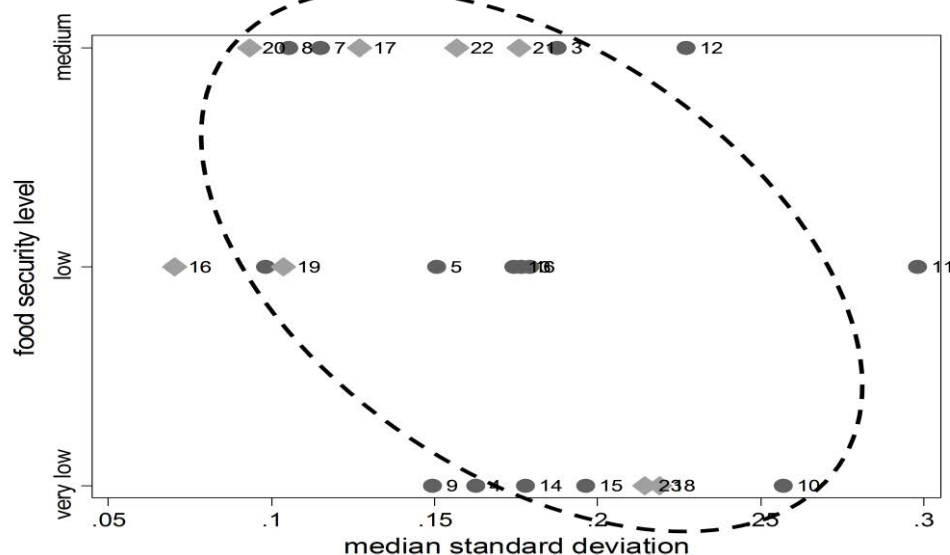
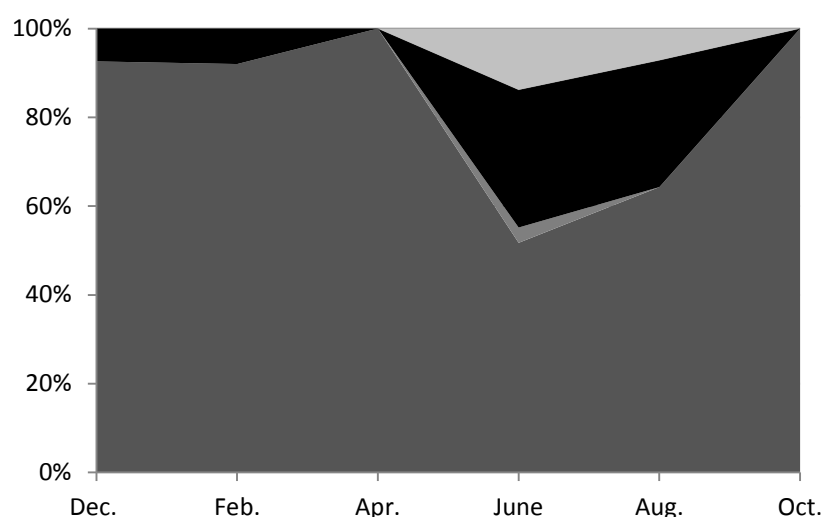
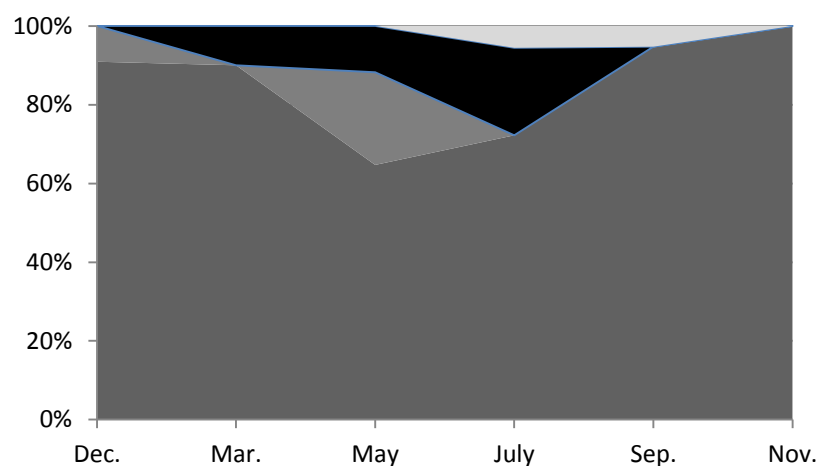


Figure 44. Relationship between the median standard deviation and household food security, for households from the northern (dark grey dots) and southern field site (light grey diamonds). Each household is numbered (see Annex 2). Resilience theory (Holling 2001) would predict standard deviation to decline at higher food security levels (dashed circle), which approximately fitted the pattern of the data.

Figure 45. Seasonal food source use of two households, indicating the percent of food stemming from each food source. The four sources (from bottom to top) are home-grown cereals (dark grey), purchase (medium), gathered (black) and received (light grey). The food sources are summed for the men and women of the household. These households focused on home-grown food as their main food source, due to a lack of labour participating in food provision.



Seasonal food source use for household #2, the only female-headed household in the sample, headed by woman #141.

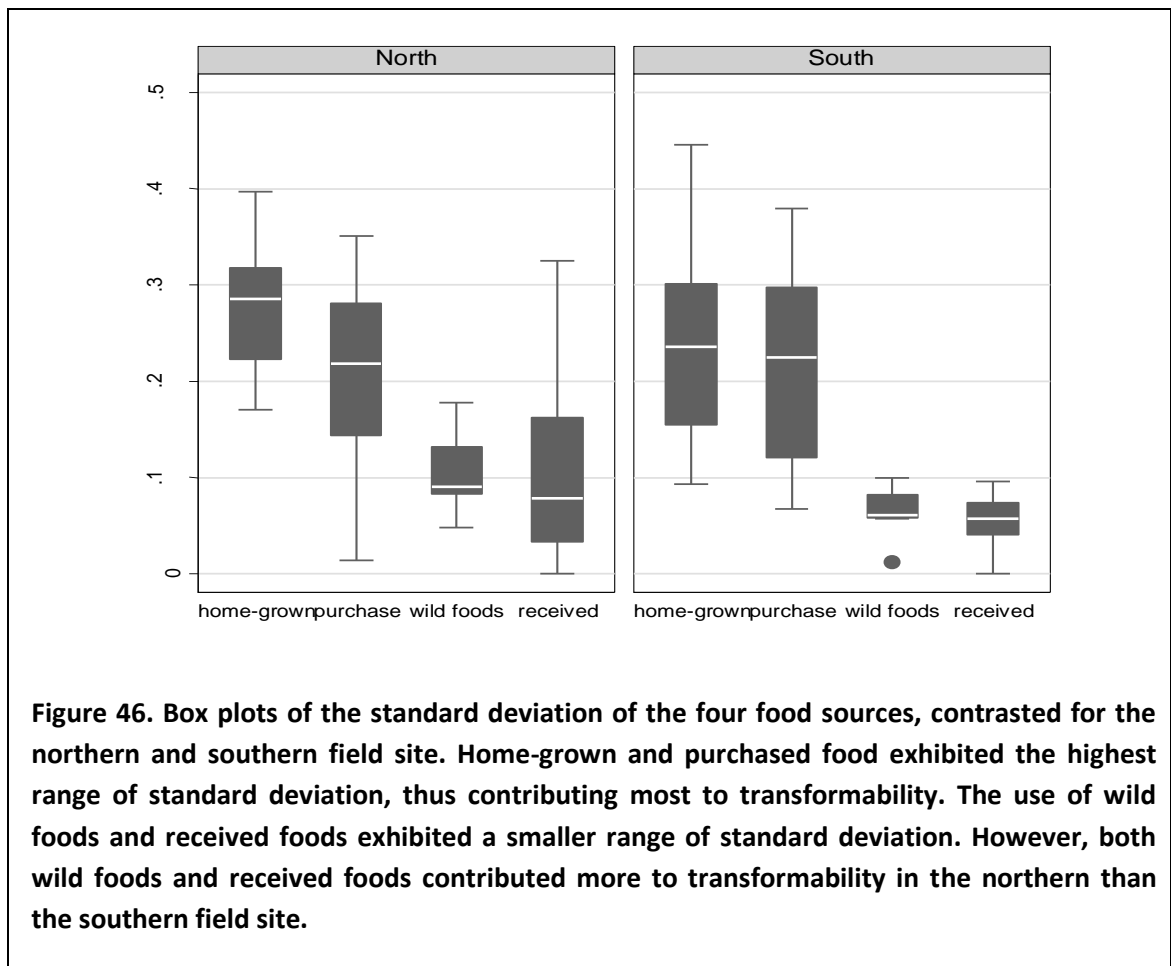


Seasonal food source use for household #20, headed by man #720 (one wife). The household (#19) of his brother (man #710) with his two wives, exhibited a very similar pattern.

At the other end of the spectrum (top right-hand corner of **Figure 43**), resilience theory predicts that households have a diverse set of strategies which fluctuate and adapt frequently over the year (transformability) (Holling 2001).

Mathematically, a higher level of standard deviation¹¹⁶ reflected a high degree of both increasing and decreasing changes in use. This dynamic phase is part of the wealth accumulation period of the livelihood cycle, conveying added flexibility upon the livelihood system. Disaggregating the data by food source demonstrated that variations in consumption of home-grown food and purchased food contributed most to transformability (see **Figure 46**). The use of wild foods and received foods contributed less to transformability, though more so in the northern than the southern field site. This was to be expected because food security levels were generally lower in the northern field site, meaning the granary lasted less long. Lower food security levels thus created a stronger need to compensate with other sources, as hinted at in **Figure 44**. The fact that both the use of wild foods and received foods varied little suggests that either few opportunities were available to obtain such foods, or that consuming these foods carried a non-affordable cost. The reasons for this behaviour could only be explored by examining the qualitative data (see Section 7.3.1). Overall, *a priori*, the quantitative data suggest a visible sequence in the choice of strategies used. Home-grown food production and purchased food exhibited the highest variation in use, suggesting they were most able to adjust to any changes in food demand. Once home production dwindled, purchased food was the preferred strategy for filling seasonal food gaps. As such, these two sources were responsible for the bulk of the buffer capacity of the livelihood system, referred to as 'transformability' in the resilience literature. However, if these two sources were still insufficient, received food became an important additional strategy to fill food gaps. This phenomenon is evident from the higher variation in received food at high levels of diversification (see Section 7.1.2). Wild foods were used throughout to fill food gaps – both at low and at high levels of diversification. Wild food use had the added benefit of exhibiting neutral levels of covariance with other food sources. The fact that different strategies were employed to varying degrees suggests they had different barriers of entry and exit (see Section 7.3.1).

¹¹⁶ The standard deviation values were generally small as they were calculated from percentages, not absolute values.



Finally, the distribution in **Figure 43** also identified certain households which fell outside the expected pattern; namely ‘volatile’ households in the bottom-right corner, and ‘stable’ households in the top-left corner. Both are dealt with in turn. ‘Volatile’ households greatly varied the degree to which they used each food source (high standard deviation) but did not achieve a high level of diversification. In other words, they household used a variety of food sources *in sequence* as opposed to concurrently, resulting in a low level of diversification during each season. **Figure 47** gives an example of such a household. The behaviour of these ‘volatile’ households reflected a conscious decision to maintain the diversity, necessary to compensate for their low food security level, by expanding their food sources in sequence, as opposed to concurrently. Usually such a trade-off was the result of insufficient labour availability, which made concurrent diversification less feasible.

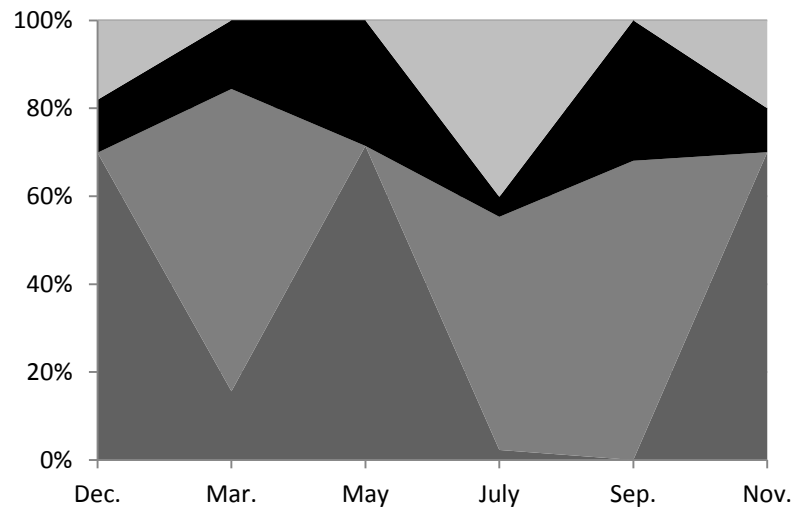


Figure 47. Seasonal food source use of household #11 (a man with his two wives), indicating the percent of food stemming from each food source. The four sources are home-grown cereals (dark grey), purchase (medium), gathered (black) and received (light grey). The food sources are summed for the men and women of the household. This ‘seasonally specialised’ household showed highly varying contribution of food sources during the year. It was part of a family compound of seven households.

In contrast, ‘stable’ households were diversified all year round, consistently using many sources all year round. **Figure 48** gives an example of such a household. Some of these households were classified at a lower food security level, whereas other were in a higher category, suggesting they maintained a high level of diversification for different reasons. This dimension is explored in Section 7.2.1.

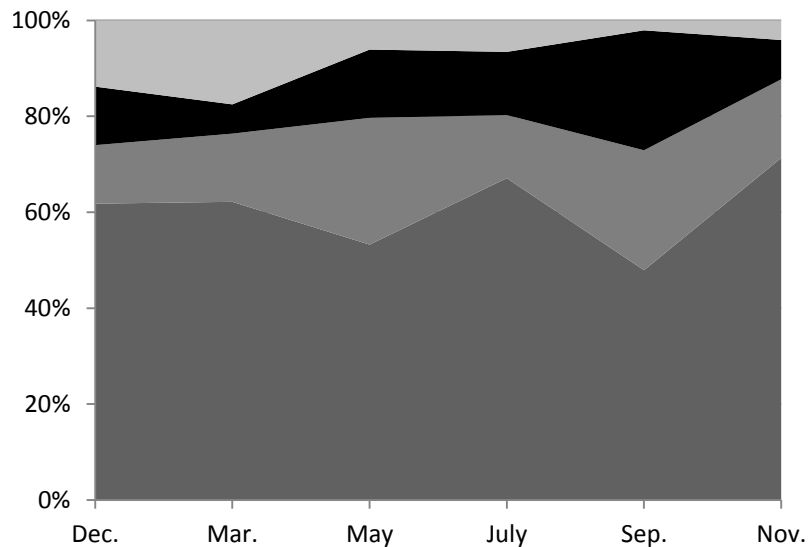


Figure 48. Seasonal food source use of household #17 (a father and son with three wives in total), indicating the percent of food stemming from each food source. The four sources are home-grown cereals (dark grey), purchase (medium), gathered (black) and received (light grey). The food sources are summed for the men and women of the household. This household used a wide range of food sources, whose contribution varied little during the year. It was part of a very small family compound, consisting only of one household.

7.1.3. Covariance

According to resilience theory (Holling 2001), one expects diversity to decline as a system accumulates wealth (or food), and covariance to become increasingly stronger (less negative) as the system becomes increasingly interdependent (see **Figure 49**). Roughly half of the households followed this expected pattern. In accordance, one would expect covariance to become increasingly positive at higher food security levels; a pattern roughly reflected by the data (see **Figure 50**).

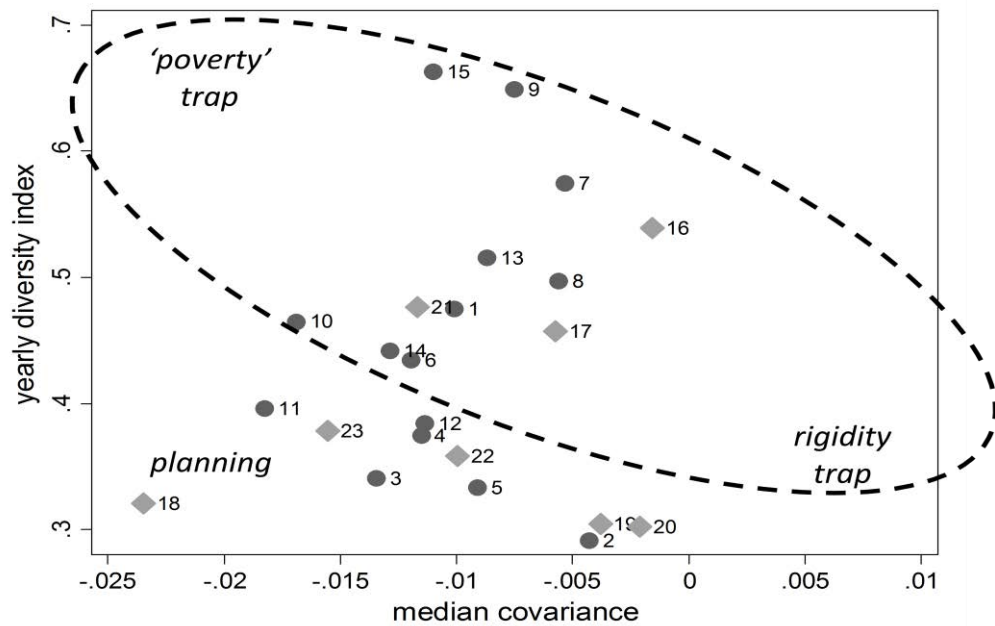


Figure 49. Scatter plot of yearly diversity index and median covariance for households from the northern (dark grey dots) and southern field site (light grey diamonds). Each household is numbered (see Annex 2). Roughly half of the households exhibited the expected pattern of stronger (more positive) covariance with declining yearly diversification (dashed circle). None of the households attained the high levels of positive covariance predicted at low diversity levels (rigidity trap), nor the negative covariance predicted at high diversity levels ('poverty' trap). Instead, households in the bottom left-hand corner fell outside the predicted pattern, exhibiting a high degree of negative covariance, thought to be evidence of conscious planning.

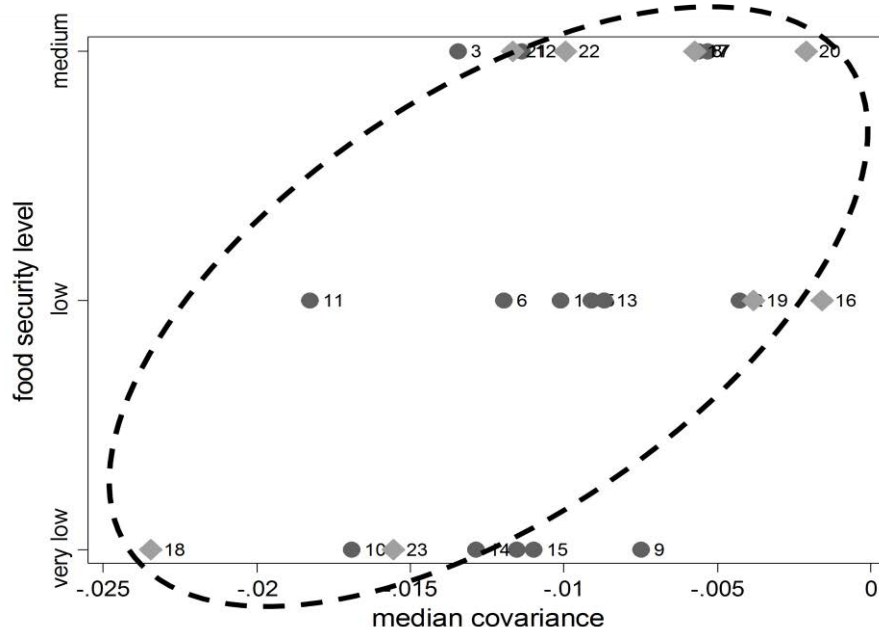
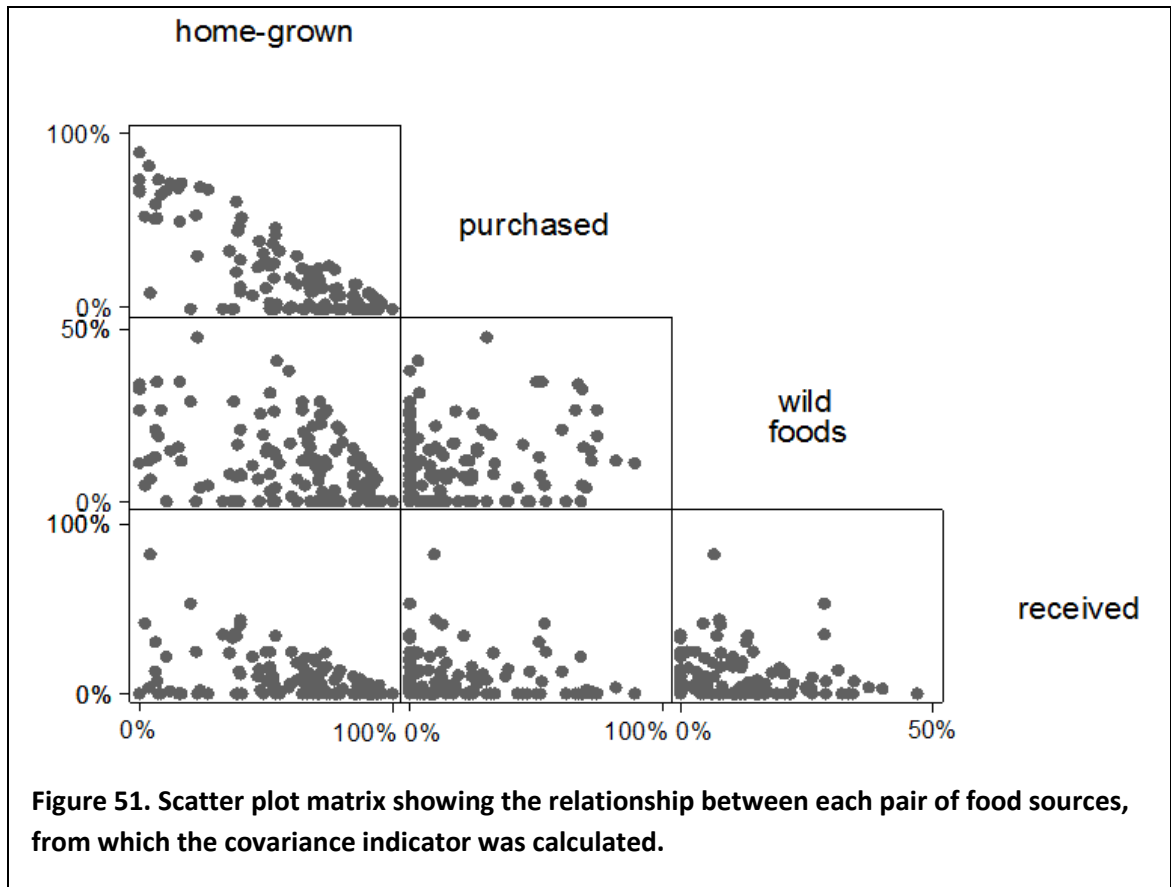


Figure 50. The relationship between the food security level of the household and the median covariance of all four sources, for households from the northern (dark grey dots) and southern field site (light grey diamonds). Each household is numbered (see Annex 2). Resilience theory (Holling 2001) predicts covariance to become increasingly positive at

higher food security levels (dashed circle), a pattern roughly reflected by the data.

The reader is reminded that the covariance indicator was calculated based on the relationship between each pair of food sources. **Figure 51** shows that some pairs of sources showed a clear negative covariance, i.e. if the use of one source increased, the other declined. If however, the degree of use of two sources increased in synchrony, their covariance was positive. If no clear trend emerged, their covariance was neutral (zero).

The covariance of each source is plotted in **Figure 52**. It shows that only home-grown food exhibited negative covariance, meaning it was part of a reactive strategy: the decline in home-grown food was always compensated for by the increase of another food source. In contrast, the other three food sources exhibited both positive and negative covariance, meaning they varied *in reaction* to change in other sources, as well as *proactively* before other sources changed. This dual role conveyed adaptability to the whole livelihood system. Wild foods exhibited the fewest incidences of negative covariance, suggesting wild foods were not used to supplement declining use of another strategy, but used year round. The difficulties encountered in interpreting the data are addressed in Section 7.2.4.



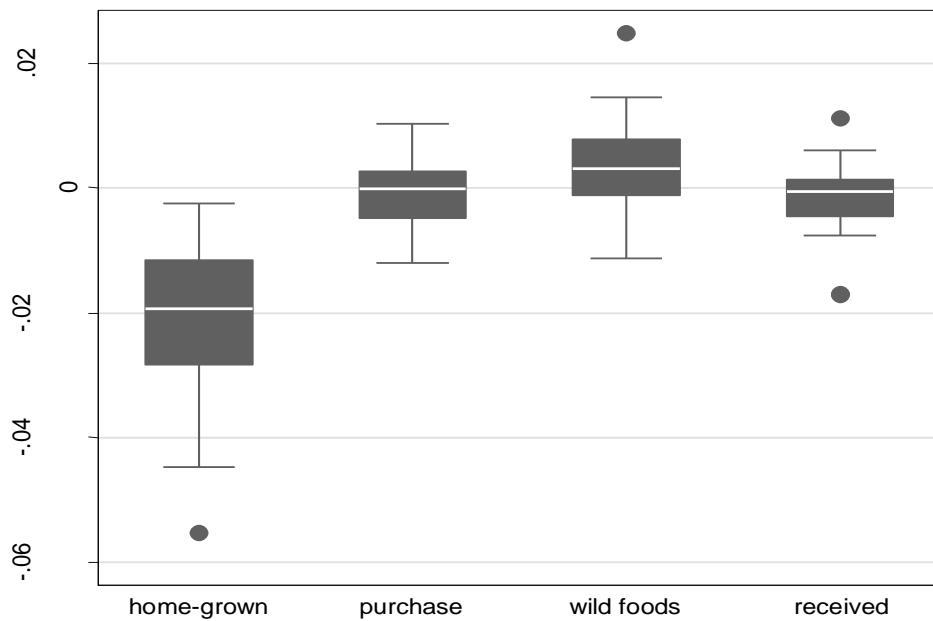


Figure 52. Box plots of the covariance of each food source. There was no significant difference between field sites. Home-grown food exhibited only negative covariance, indicating that its use declined as other food sources increased, in line with a reactive strategy. The other three food sources exhibited both positive and negative covariance, meaning they varied in reaction to change in other sources, as well as proactively before other sources changed. Wild foods exhibited the fewest incidences of negative covariance, suggesting wild foods were not used to supplement declining use of another strategy, but used year round.

Finally, resilience theory (Holling 2001) predicts that as a system accumulates wealth (or food), standard deviation declines while covariance becomes increasingly stronger (less negative), as the system becomes increasingly interdependent. Plotting standard deviation and covariance against each other showed this trend very clearly (see **Figure 53**). The fact that the two indicators were so closely correlated suggests that they describe a similar feature of the livelihood system. Going back to theory, standard deviation and covariance are indicators of transformability and adaptability, respectively – both processes which govern change within the system.

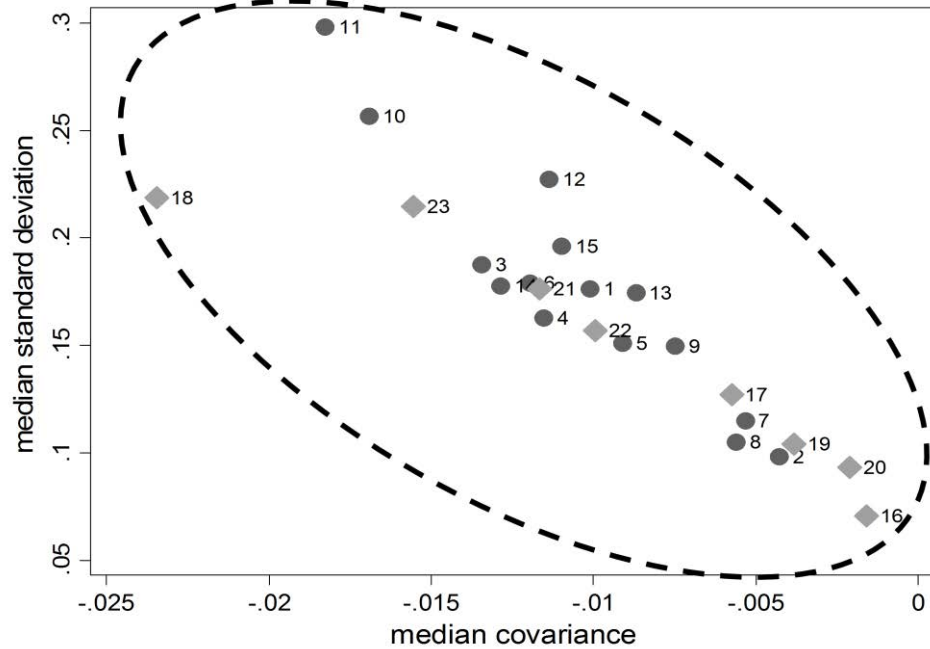


Figure 53. The relationship between the median standard deviation of all sources and the median covariance of all four sources, for households from the northern (dark grey dots) and southern field site (light grey diamonds). Each household is numbered (see Annex 2). All households exhibited the expected pattern of stronger (more positive) covariance with declining standard deviation (dashed circle). The fact that the two indicators were so closely correlated suggests that they describe similar processes governing change; namely transformability and adaptability.

7.2. The processes of resilience

The discussion above demonstrates that while the majority of households fell within the pattern predicted by resilience theory, there were some notable exceptions. Firstly, both in the distribution of the diversity index and the standard deviation index, higher levels were observed than would be predicted based solely on the household's food security classification. It is suggested that this is the result of households pursuing other objectives in addition to maintaining their food security. Secondly, covariance levels were more negative than predicted by theory, suggesting a degree of conscious planning. Both aspects are addressed in turn, below.

7.2.1. The objectives underlying diversification

Both the distributions of the diversity index and the standard deviation index suggested that households pursued other objectives in addition to maintaining their food security. The U-shaped distribution predicted by the risk literature proposes two competing objectives (see Chapter 2, Section 2.2.1). Either a U-shaped curve is predicted, where poorer households diversify their livelihoods out of need (the need to spread risk or maintain income), whereas richer households diversify their livelihoods out of choice (the desire to accumulate wealth which can be reinvested). Alternatively, an inverse U-shaped curve is predicted, where poorer households – while requiring diversification to manage risk – do not have access to additional strategies necessary to diversify their livelihoods, whereas richer households do not require diversification to manage risk because they have already accumulated sufficient savings to buffer risk. In order to further investigate these predictions, the diversity indicator was disaggregated by season, allowing process examination over a smaller temporal scale.

The seasonal diversity index showed that livelihood diversity was not constant during the year. It was lowest right after the harvest when the majority of food stemmed from the granary, and highest during the lean season to make up for the shortfall (see **Figure 54**). Plotting the data on a spidergraph shows that, on average, the contribution of the granary continuously diminished from the second to the fifth survey round (S2 to S5), while all other sources increased (see **Figure 55**). There were more instances of high diversification in the northern than the southern field site during the year, though there was no difference for villages near or far from the market.

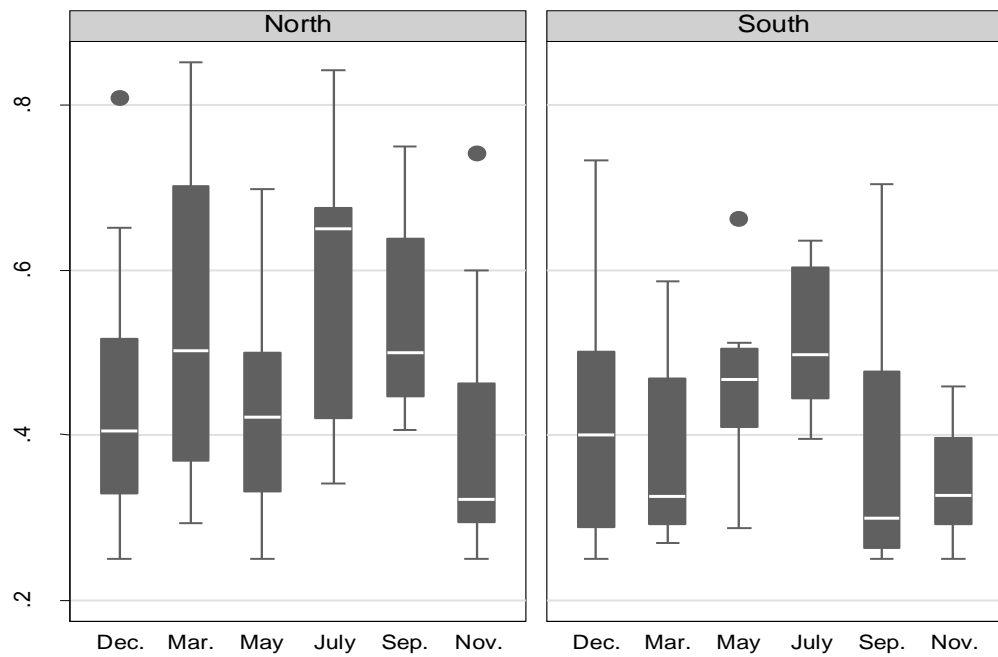
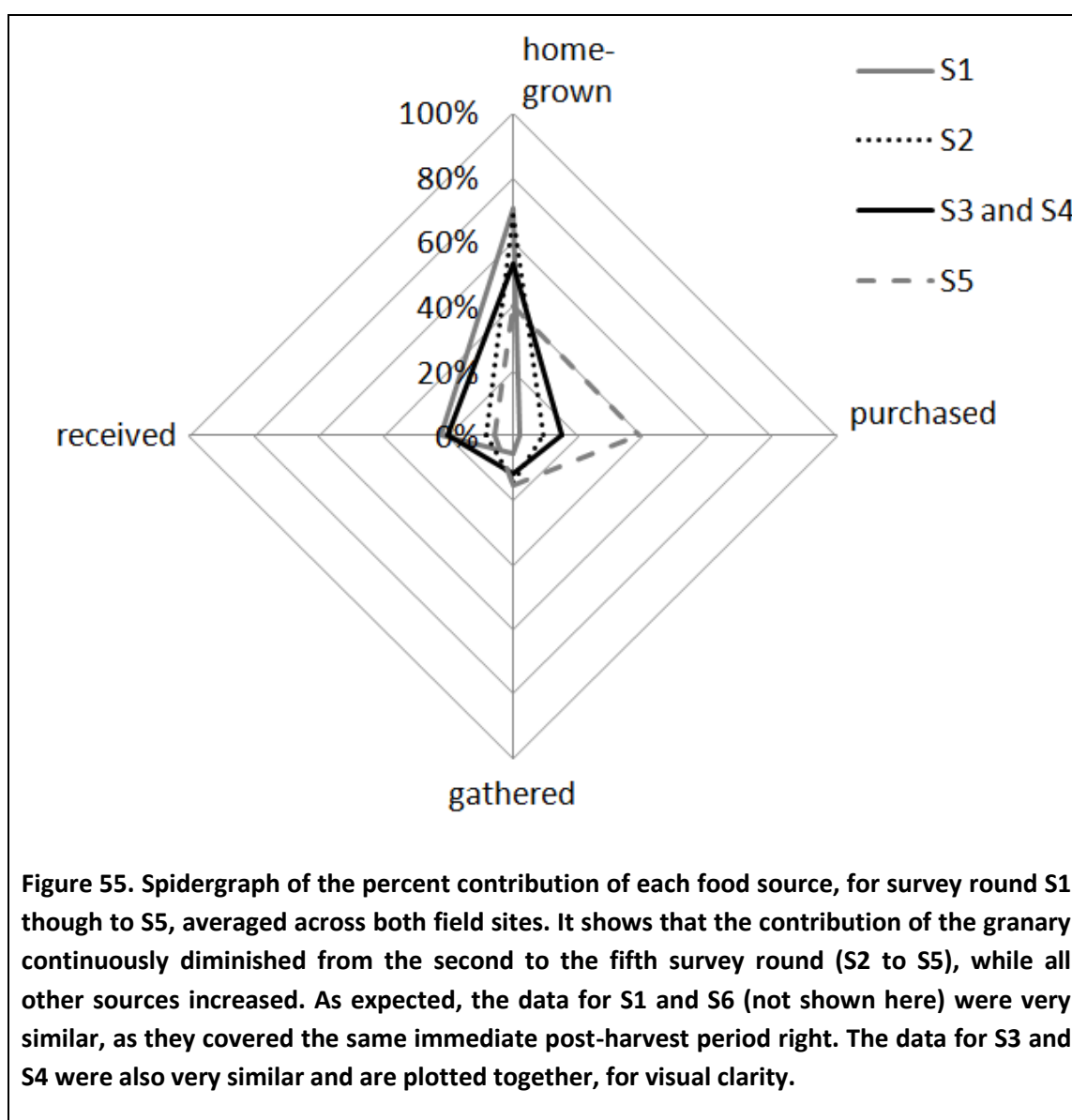


Figure 54. Box plot of the seasonal diversity index, plotted over the six seasons, for each field site, indicating the median (white line), the inter-quartile range (grey box), the 95% confidence interval (hooked lines) and any outliers (grey dots). There were more instances of high diversification in the northern than the southern field site during the year (two-sample Wilcoxon rank-sum test, d.f.=1, $p<0.01$), though there was no difference for villages near or far from the market. Seasonal diversification was higher in the rainy season (July) than in the dry season (March-May) in the northern field site (two-sample Wilcoxon rank-sum test, d.f.=1, $p<0.01$) as well as in the southern field site (two-sample Wilcoxon rank-sum test, d.f.=1, $p<0.05$).



Seasonal diversification due to need

The fact that diversification was higher in the northern field site, and at both sites during the lean season (see **Figure 54**), suggests that the shortfall of home-grown cereals pushed households to diversify. Qualitative analysis showed that households diversified in reaction to cereal shortfall, particularly through purchase (see quotes in Chapter 5). In both field sites, those households in the lowest food security category had a higher seasonal diversity score than those in either of the higher food security categories (two-sample Wilcoxon rank-sum test, d.f.=1, $p < 0.05$). There was no significant difference in diversity between the two higher food security categories.

The fact that the diversity score in **Figure 54** dropped already in September (S5) in the southern field site, and only in December (S6) in the northern field site, can also be traced back

to the level of food security. In 2010 the rains came late in the North, but early in the South, resulting in the granary being replenished earlier in the southern field site. As a result, diversity fell, as the new harvest became the main food source.

Seasonal diversification due to opportunity

The results above suggest that households diversified their food sources to meet food needs. However, physical food shortage was not the only motivating factor; obtaining food from diversified sources also helped vary the diet (see Chapter 5). Undertaking a seasonal analysis revealed that households in fact diversified for different reasons during the year. Diversification in the lean season was driven by need, as outlined above, but in the dry season a different factor was at work, as the granary was not yet running low. Qualitative analysis showed that households also diversified as a precautionary strategy, in order to reduce dependence on the granary store, particularly through the storage of wild foods (see quotes in Chapter 5).

A statistical analysis of the effect of labour confirmed this distinction. Households with extra labour diversified more in the dry season (January – March), whereas labour had no effect on diversification in the lean season. When comparing monogamous and polygamous households, it becomes apparent that the latter had a year-round higher food source diversity – both to meet food needs and to diversify the diet – whereas monogamous households did not have sufficient spare labour to engage in a variety of food-acquisition activities all year, and only did so *in extremis*, during the lean season (**Table 19**). For those households classified in the lower food security categories, a lack of labour – for example due to illness – was a significant barrier to ensuring food supply (see quote below).

Quote 145. What am I supposed to do? There is no [easy] solution. I am ill; I cannot work. I relied on selling animals to get by but some of my sheep were recently stolen. It is my two wives who help how they can (man #620, Dec. 2009).

Conversely, labour alone was not necessarily a sufficient reason for the household to diversify its food sources. If the household had a good harvest and traded successfully, these two sources were sufficient to meet food needs and diversify the diet (see quote 146). It should not be forgotten that it was possible to diversify *within* one food source, for example by growing several crop types, and thus still ensure food security with a comparatively low level of livelihood diversification (see quote 149).

Table 19. Scatter plots showing how livelihood diversification (seasonal diversity index) changed over the seasons for households of the northern (dark grey dots) and southern field site (light grey diamonds). Results are displayed for households with increasing food security, from left to right, and with increasing numbers of women per household (progression from Figure 56 to Figure 57 to Figure 58). The results suggest that households with a labour shortage (one or two wives) diversified out of need, therefore exhibiting *decreasing* diversification with increasing levels of food security. In contrast, households with abundant labour showed the opposite trend, exhibiting *increasing* diversification with increasing levels of food security.

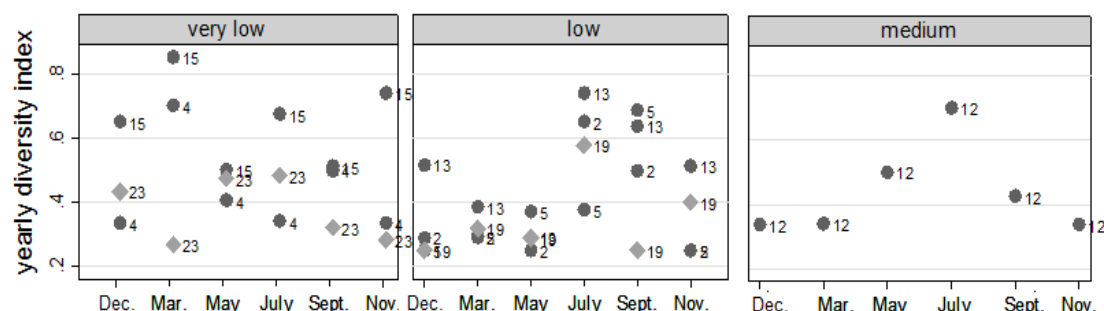


Figure 56. Seasonal diversity, plotted over the seasons for households containing only one woman, grouped by food security level. The graphs show a *decreasing* trend in diversification from left to right. Households in the lowest food security category (left graph) were diversified all year round, whereas households in the medium security category (right graph) were only diversified in the lean season. However, some 'under-diversified' households in the two left graphs formed exceptions to this trend.

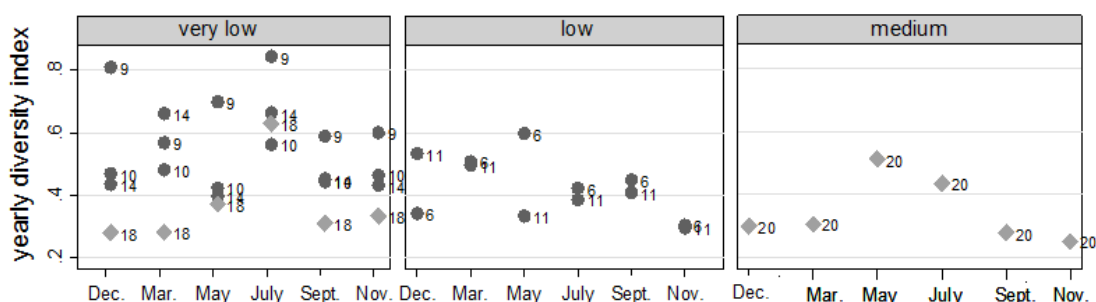


Figure 57. Seasonal diversity, plotted over the seasons for households containing two women, grouped by food security. As above, the graphs show a *decreasing* trend in diversification from the left to the right graph, with the exception of 'under-diversified' households in the left graph.

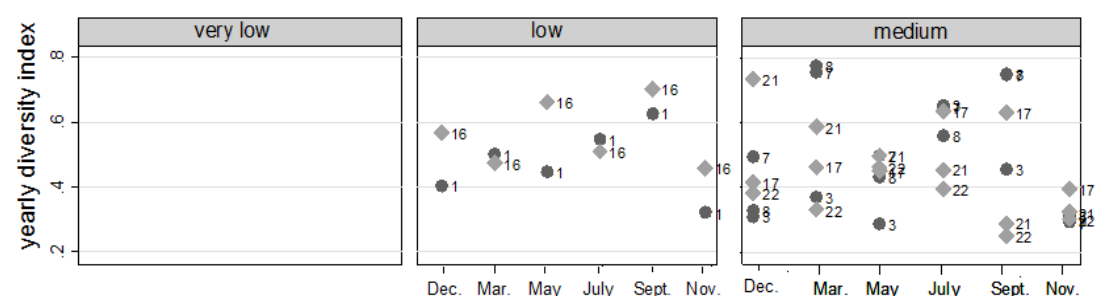


Figure 58. Seasonal diversity, plotted over the seasons for households containing more than two women, grouped by food security. The left box is empty because the sample included no households, ranked in the lowest food security category, which contained more than two women. The graphs show an *increasing* trend in diversification: Households in the low food security category (middle graph) were relatively diversified all year round, whereas households in the medium security category (right graph) were highly diversified all year round. Some 'under-diversified' households formed an exception to this trend (right graph).

Quote 146. Between myself, my wives, my son and his wives, we have a lot people who can work. But I earn little with my work of repairing bicycles. It is my son who trades on the border who earns most of the income. It is better if the rest of us focus our efforts on farming (man #820, May 2010).

Quote 147. We don't have a strategy. We just all help; each family member tries to contribute. I planted maize early. My wives planted peanuts and okra early. That way we had an early harvest while waiting for the millet to ripen (man #820, April 2010).

The two opposing forces – need and opportunity – predict a U-shaped or an inverse U-shaped distribution of yearly livelihood diversification against food security, depending on which factor dominated. The exceptions in **Table 19** suggest that there was no clear factor dominating, with other drivers also influencing the distribution of the data. By triangulating these results with the conclusions of Chapter 5 and 6, one can conclude that access to strategies – which depended on many factors including purchasing power, proximity to markets, relationship with relatives and power dynamics – also influenced the degree of diversification. The households in the lowest food security category were not necessarily the only ones with ‘low access’, as predicted by theory. Chapter 6 demonstrates that ‘access’ was highly negotiable, explaining the heterogeneity in **Figure 59**. All of these intersecting factors influenced the livelihood diversification sources, with no one factor dominating (see **Figure 59**). It is concluded that diversification was not only a mechanism to minimise the risk of food insecurity, but was also employed to accumulate ‘wealth’ or food, and to attenuate power imbalances within the household. Furthermore, being diversified or undiversified was not a permanent state within a given household. Instead, the degree of diversification changed constantly, as a result of the factors outlined above. As such, it is more appropriate to conceptualise ‘diversification’ as a trajectory which changes over time (see Section 7.2.3).

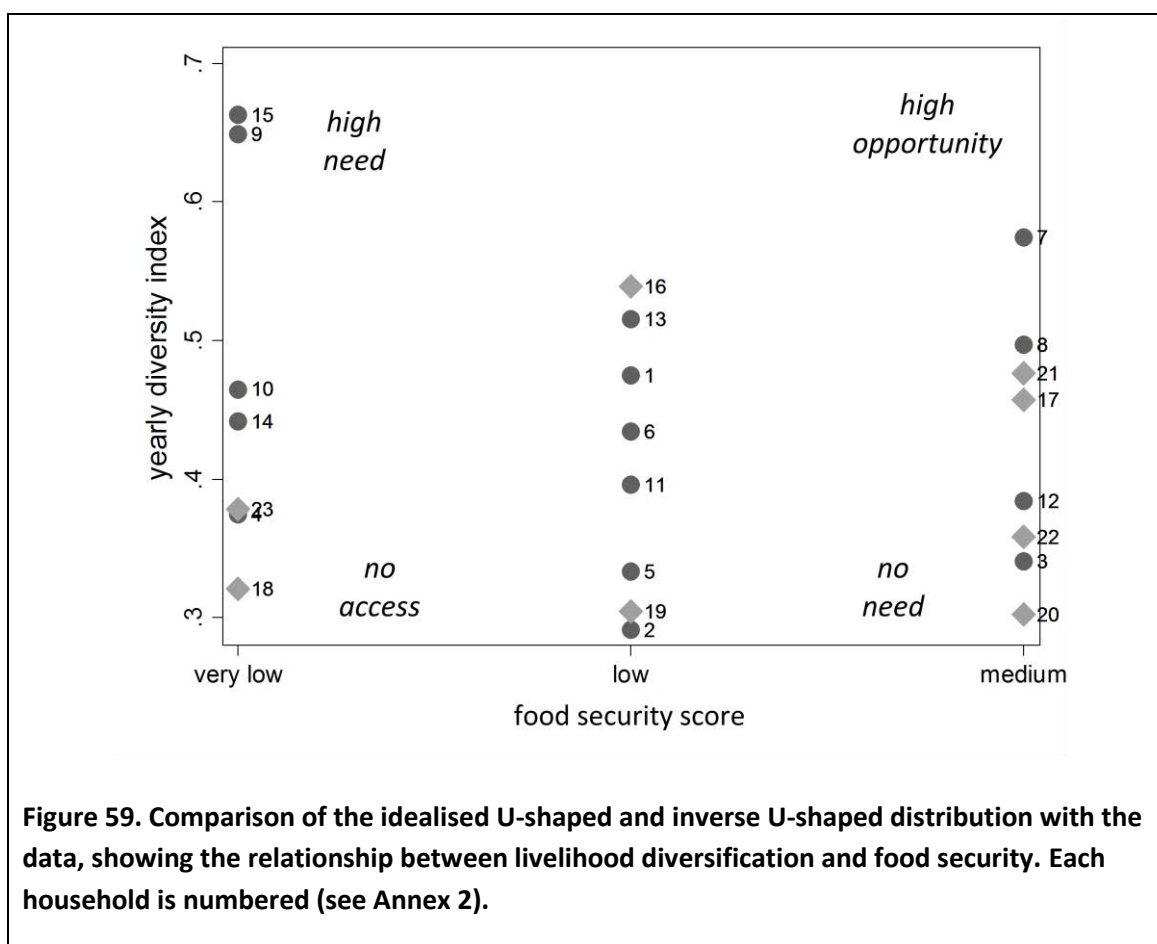


Figure 59. Comparison of the idealised U-shaped and inverse U-shaped distribution with the data, showing the relationship between livelihood diversification and food security. Each household is numbered (see Annex 2).

7.2.2. Conscious planning

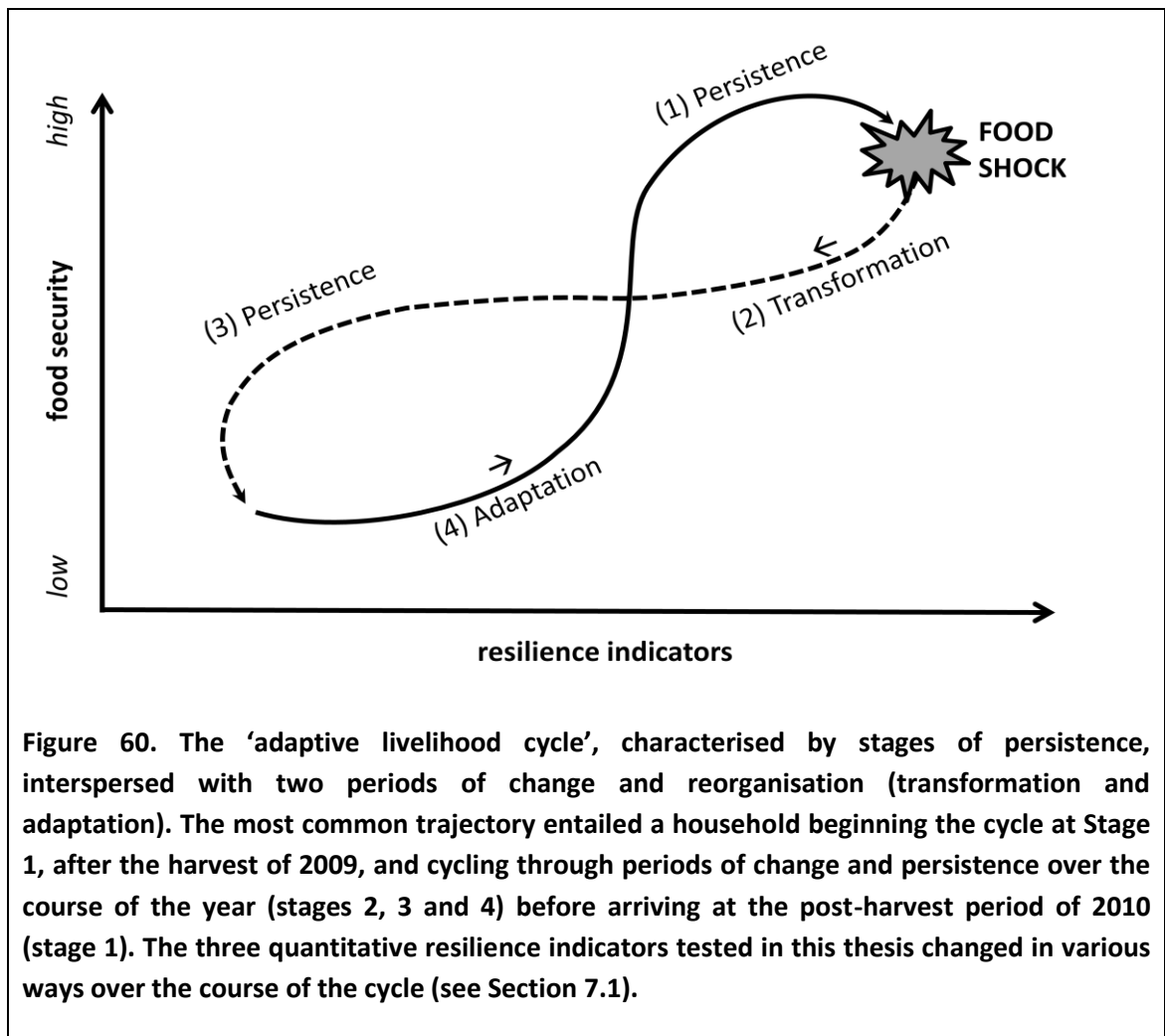
The presence of exceptions in the data, as well as the multiple objectives uncovered above, suggest there was conscious planning involved in livelihood construction. The low incidence of positive covariance in the data set (see Section 7.1.3) also suggests conscious planning which rendered data analysis difficult (see Section 7.2.4). Trends in the diversification data clearly illustrate conscious planning. It was concluded that the 'under-diversified' households in **Figure 41** were not as diversified as would be expected, predicted on their food security score. A lack of labour was thought to be the main reason preventing a higher degree of diversification. However, these 'under-diversified' households exhibited an interesting strategy. These 'seasonally specialised' households focused on different sources over the year, but still achieved a higher degree of diversification by sharing with *other* similarly specialised households within the same compound. As a result, when combining the strategies of several households within the same compound, together, they were able to maintain a higher degree of diversification than they could achieve individually, due to a shortage of labour. The household in **Figure 47** is an example of a household which achieved a higher degree of diversification by combining its strategies with those of other households in the same family

compound. Such households could for example predominantly purchase cereals at one moment in time, while another household in the same compound predominantly used its granary during that season. This gave these households the possibility of sharing, *in case* either of those strategies was not sufficient.

Conversely, the household in **Figure 48** gives an example of a household which was highly diversified, because it did not have the option of combining its strategies with other households, as it was the only household in that family compound. This analysis demonstrates that diversity could be achieved over different relational scales. While an individual household was specialised, diversity could be achieved at the level of the compound. Both approaches conveyed resilience, but over different relational scales. This finding demonstrates that diversification depended not only on the needs or opportunities facing the individual household, but also on which strategies other neighbouring households engaged in. In short, behaviour of one household was not independent of the behaviour of other households, as assumed by neoclassical economic models which are based on western-style households as opposed to extended households.

7.2.3. Trajectories of resilience

Using three different indicators of resilience demonstrated that resilience was conveyed not only through a diversity of food sources at one moment in time, but precisely because these diverse food sources could be used at different moments during the year, as well as over different relational scales. The four food sources could be combined in different ways to convey resilience over the course of year, as manifested in the adaptive livelihood cycle (see **Figure 60**). Transformability was mainly conveyed through varying contributions of home-grown and purchased food, which were complemented by the more consistent, albeit smaller, contribution of gathered and received foods (see Section 7.1.2). Adaptability was achieved by deliberately compensating for declining granary stocks (negative covariance) through the reactive as well as proactive change in use of the other three food sources (see Section 7.1.3). The quantitative data did not reveal any particular features which allowed a system to 'persist', apart from the fact that households demonstrated an accumulation of wealth (food). Other characteristics of the 'persistence' phase were identified through qualitative data analysis (see Section 7.3).



The most common trajectory entailed a sequential progression starting with a period of persistence after the 2009 harvest (Stage 1), followed by two periods of change occurring after: one in the dry season, and another in the rainy season. An example of such a household is given in Figure 61. However, not all households progressed through the cycle at the same pace, or started the cycle at the same stage. **Figure 60** depicts a simplified version of reality. In practice, qualitative data showed that the four stages overlapped over time, with processes of adaptation and transformation occurring concurrently during the year, both in the dry season and in the rainy season (see Section 7.3). **Figure 62** gives an example of a household which only progressed through one period of 'change' due to shortages in labour availability. Nonetheless, the Resilient Livelihoods Analysis undertaken in this chapter can be used to identify key features which contribute to fostering the resilience of a livelihood system (see Section 7.4).

Figure 61. Household #7 (medium food security category) underwent two phases of ‘change’ during the study period, as evident from the two peaks in seasonal livelihood diversity. However, the trajectory generally remained near to the food-secure top-right corner of the adaptive livelihood cycle, characterised by a low standard deviation. This household was able to pursue a diverse set of food sources year round due to abundant labour and proactive planning.

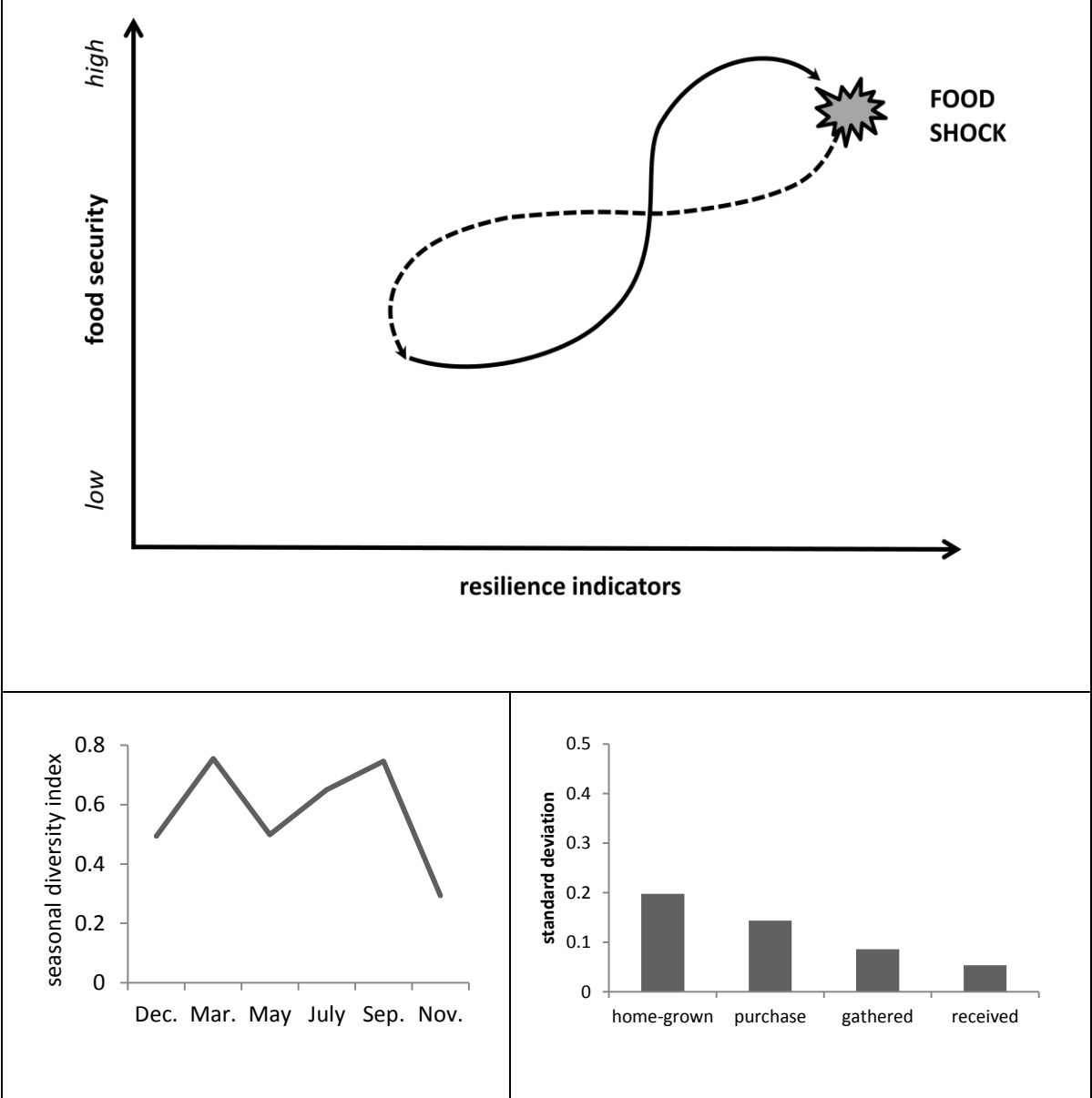
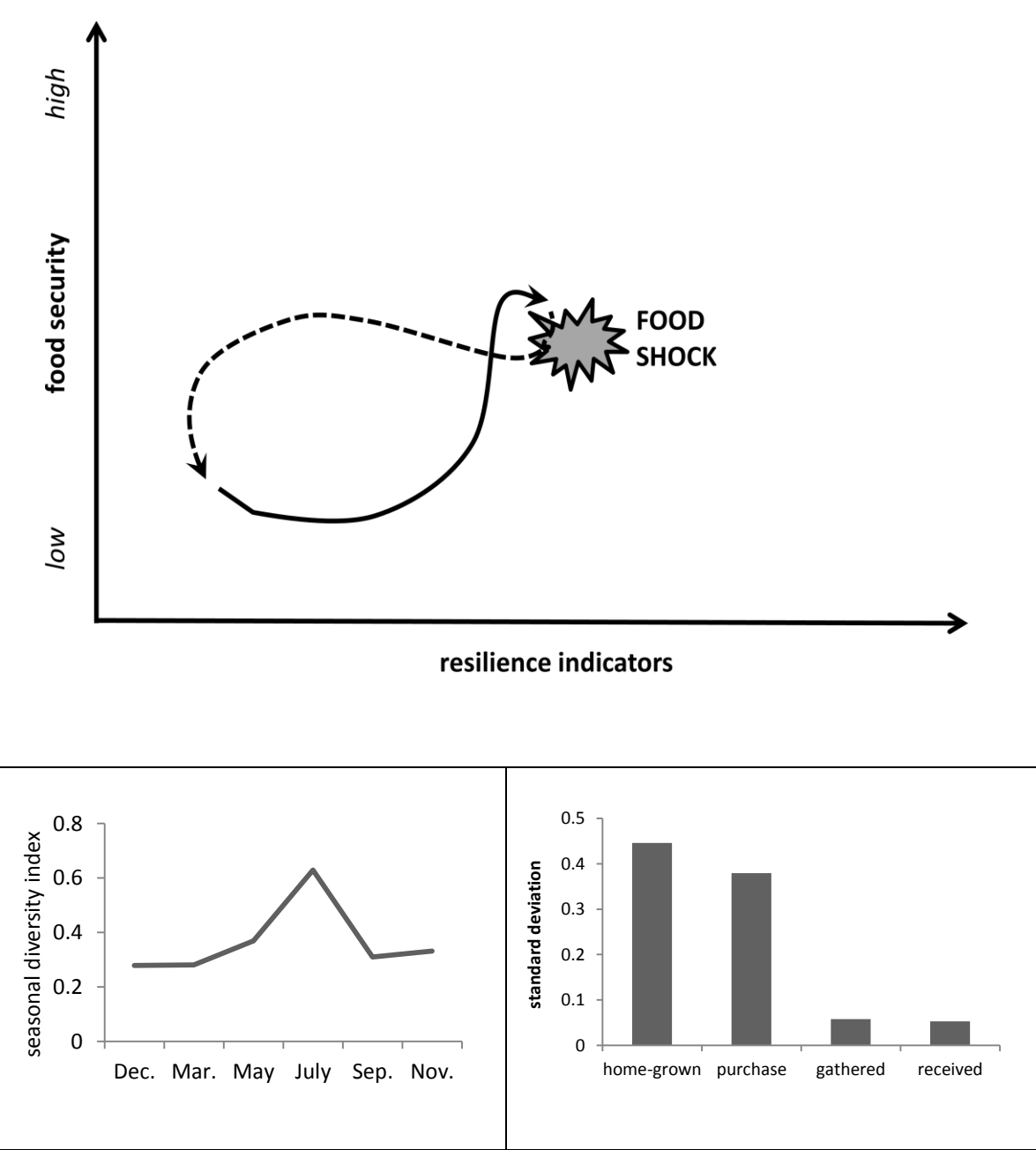


Figure 62. Household #18 (low food security category) only underwent one phase of ‘change’ during the study period, as evident from the one peak in seasonal livelihood diversity. The trajectory generally remained near to the food-insecure bottom-left corner of the adaptive livelihood cycle, characterised by a high standard deviation. The household head was ill and could not engage in physically demanding activities. He sold a lot of his remaining livestock to purchase food, as evident from the high standard deviation. His two wives ensured the rest of food provision. Labour shortage constrained the progression through the adaptive livelihood cycle.



7.2.4. Methodological shortcomings

As was to be expected, condensing the description of a livelihood system into three quantitative numbers resulted in substantial loss of information. The limitations of translating the three characteristics of socio-ecological resilience for livelihood systems are discussed in turn.

The analysis above suggests that the diversity of food sources declined with increasing levels of food security. Similarly to ecosystems, an increasing dependence on fewer food sources made the livelihood system less resilient if no other food entitlement channels were accessible. Households with lower food security levels used a higher diversity of food sources. It is possible that a clearer result would emerge if, instead of measuring *functional* diversity (capturing the diversity of entitlement channels), *total* diversity was measured instead (capturing the diversity of food sources, i.e. differentiating between *which* crop was home-grown, which one was purchased, gathered, etc.). Further testing is necessary to verify if the latter method would substantially improve data quality. Overall the indicator captured the desired process, even if results were a bit grainy. However, based on the way the diversity index was calculated, the indicator only captured households which diversified every season, not those which were specialised in a given season but still diverse all year round. The benefit of having a seasonal diversity index was that it revealed the high variation in diversification *during* the year, which would be masked by an annual average. To address these drawbacks, future studies can use two diversity indicators, one for a given point in time and another averaged across the study period, to be able to examine both dimensions.

The indicator of standard deviation captured the variation of use over the year. However, the indicator made no difference between increasing or decreasing use¹¹⁷ of a given food source. For example, the indicator could not be used to distinguish between decreasing use due to proactive planning (closing the granary or purchasing less when prices were high), or decreasing use as a result of a reactive switch from a diminishing granary to increasing food purchase. Such a distinction was only possible if results were disaggregated by food source. Standard deviation also makes no distinction between random variations (e.g. the number series 1, 5, 3, 6, 2, 4) or serial correlations over time (e.g. the number series 1, 2, 3, 4, 5, 6). Given six fluctuations, the standard variation is the same whether periods of high and low use alternate, or whether three periods of high use are followed by three periods of low use. Yet bunched downward fluctuations in use may result in lower food consumption. Finally, the

¹¹⁷ Similar criticisms are made of using the standard deviation of consumption as an indicator of poverty (Dercon 2002).

indicator of standard deviation could not be used to make any statement as to whether the additional food purchase was made from sustainable income sources. If food security was achieved by selling all of the household's livestock to buy food, this could hardly be considered a factor encouraging livelihood resilience. A more nuanced analysis can be achieved by triangulating the standard deviation with other quantitative and qualitative data (see Section 7.3).

The last element, covariance, was perhaps the most difficult to translate for livelihood systems. Conceptually, if a household's livelihood is closely linked to the livelihood of a close relative, a shock in this neighbouring livelihood system can also affect the studied household. The general premise appears to be that as a livelihood increases in complexity, being made up of more and more livelihood strategies, an increasing interdependence arises. As a result, if one strategy (such as the main income-generating source of the household head) fails, the whole system is affected, and shifts. Similarly, at a larger scale, national economies can become more vulnerable to trade shocks if they are more tightly connected to and thus dependent on globalised trade. In resilience thinking, 'connectivity' highlights the 'dark side' of social capital often ignored in livelihood analysis, meaning that relatives can be both beneficial and detrimental to household resources. In my opinion, what is meant by 'connectivity' in resilience thinking is closer to interdependence – if for example a household would become increasingly specialised in one agricultural activity, gaining both its income and food from it, the whole livelihood would be affected if a shock affected that activity. Interestingly, in the data set above, no households demonstrated a higher degree of 'connectivity' (positive covariance). On the contrary, many exhibited a high degree of negative covariance, suggesting conscious planning. In other words, households purposefully avoided the connectivity described above, which is why no households were observed in the 'rigidity trap' or 'poverty trap' predicted in Figure 49. This finding does demonstrate that the processes driving connectivity do apply to livelihood systems, even though the processes were not observed because the system consciously avoided them. Absence of evidence was not evidence of absence. It is concluded that the indicator was correctly defined, even if it was difficult to interpret. It is easy to confuse the term connectivity with high social capital – a mistake made by Fraser *et al.* (2005) – in which case the underlying processes would make households *more* resilient. However, the data above clearly demonstrate that the opposite is the case.

Overall, the resilience indicators were specifically defined to capture the resilience of each household to seasonal food insecurity. While efforts were made to make the definition as precise as possible, several elements added complexity to the interpretation of results. Firstly, food security levels changed not only between households, based on the classification given in

the wealth ranking exercise, but also over time. Disaggregating the data by seasons showed that diversity levels changed with changing food security levels over the seasons, as expected. However this extra time dimension made the yearly diversification data more difficult to interpret. Secondly, it was evident that other objectives apart from food security motivated the resilience trajectory of the household. This was an unavoidable caveat of narrowly defining resilience with regard to a specific shock or stress (seasonal food insecurity). However, it reiterated the need to triangulate the data with qualitative results, which clearly confirmed that other objectives in addition to food security were important (see Chapter 6). Similarly, the fact that resilience was defined at the narrow relational scale of one household masked resilience dynamics at higher relational scales, over the whole family compound and over kinship networks in general. It is important to remember that resilience at one scale is affected by resilience at other scales. For example, the findings presented in Section 7.2.2 show that low resilience (or diversity) at the scale of one household could be compensated by high resilience (and diversity) at the scale of the family compound. This nuance was an unavoidable caveat of narrowly defining resilience at a specific relational scale (one household). It stressed the need to compare findings with processes acting at higher relational scales – even if these were only discussed in a qualitative manner. Other studies have also stressed the need not only to look at dynamics evident within the study period, but also take into account ‘deeper’ drivers like identity, core values, and worldviews (Folke *et al.* 2010). The indicators chosen in this study represent the necessary compromise between choosing ‘fast’ indicators which could be easily measured during the study period (Carpenter *et al.* 2001), at the expense of understating the effect of ‘slow’ variables such as values and worldviews which changed insufficiently during the study period to allow quantitative measurement. Nonetheless, shifts in such values can be addressed through qualitative methods such as historical discussions in focus groups, as addressed in Section 7.3.

In short, resilience theory proved a useful analytical tool for identifying combinations of strategies which successfully contributed to enhancing the resilience to food insecurity. Disaggregating the three resilience indicators by food source, improved the predictions which could be made based on the relationships between individual food sources. However, the data could only be used to indicate correlation, not to explain causation. Some causative processes, such as the presence of multiple objectives, as well as evidence of conscious planning, were detectable based on this quantitative data set alone. However, to achieve a more complete picture of causative processes, the data needed to be triangulated with other quantitative and qualitative data. This triangulation is undertaken in the next section.

7.3. The resilience of livelihood systems

The previous section examines how the three characteristics of resilience relate to each other, and to the food security status of the household. It revealed key features which enabled the system's capacity to change (adapt and transform) as well as to persist. This section further explores which features enabled the capacity of a resilient system to persist and change, based on patterns in the qualitative data. The analysis focuses on the features which were observable over the temporal scale of the study; however, processes acting over longer temporal scales are briefly addressed in Section 7.3.5.

Resilience theory would predict that in order for a system to 'persist', it first needed to accumulate sufficient wealth and savings. Savings can act as a buffer against shocks; a form of consumption smoothing also predicted by the risk literature (Alderman and Paxson 1992). Secondly, one would expect accumulated wealth to be managed 'cautiously' or 'sustainably' to avoid falling into debt, and thus losing the 'cushion' of savings. Conversely, to foster a system's capacity to change, resilience theory would predict existing livelihood strategies to be adapted to changing food needs (adaptation), as well as pursuing new livelihood strategies in case the current ones are no longer sufficient (transformation). Both processes necessitate flexibility within the system. The processes governing persistence as well as change are discussed below.

7.3.1. Accumulation wealth sustainably

The income and expenditure streams quantified during every survey round showed that income-generating activities with low barriers of entry and exit were preferred. The reason for this became evident from the qualitative data. It revealed that it was difficult to obtain credit to be able to start those income-generating activities which required an initial investment. Both formal and informal credit proved difficult to obtain. Firstly, the regulatory system underlying formal credit was too rigid, making it hard for the farmer to obtain credit at the time of the year when it was most needed (see quotes below).

Quote 148. Yes if you have an ID card you can buy subsidised cereals from the social services but the town is far, you need to wait long, it usually comes too late, in August when I have no more savings (man #810, April 2010).

Quote 149. It is hard to get credit from the [Farmers Credit] Bank (BTEC). You need to open an account, wait for three months, put in a deposit of 5000 FCFA... all of that only so I can borrow 15,000 FCFA to buy a sack of millet. I prefer to find another way (man #250, March 2010).

Secondly, obtaining informal credit depended substantially on levels of trust, as this was the only guarantee of repayment (see quotes below). It was not customary to give collateral. Only individuals who dug for gold were in regular-enough contact with rich traders, who were in a position to lend if they knew the individual was trustworthy. This nuance reveals another dimension of gold digging which is often overlooked. Even though gold digging itself is risky and not necessarily profitable, it gives access to a network with a high turn-over of cash. This network can be a very important source of credit in rural areas where other options are rare. Other reliable sources of credit were wealthy relatives.

Quote 150. Taking out credit is very bothersome. Only those who can repay easily get a loan, yet they are not the ones who need one (man #260, March 2010).

Quote 151. It is difficult to get credit. All you have is your word so it needs to be someone who trusts you. I am old; few people think I will be able to repay (man #510, April 2010).

Quote 152. I can borrow money easily from other gold diggers. They know me well (man #270, March 2010).

Quote 153. The families who do well in this village are the ones who have relatives in town. Those can lend them money to start a trade. The rest of us don't have that option. We have to sell our animals or our [cash] crops (men focus group #210-270, Jan. 2011).

As a result, income sources with low barriers of entry and exit were preferred over those with high barriers of entry and exit (see quotes below). This allowed people to easily start an activity, but also easily abandon it once it was no longer lucrative, thus allowing individuals to accumulate wealth *as well as* remain flexible (see Section 7.3.4). Activities requiring high initial investments were therefore avoided because they 'committed' an individual to one activity. Particularly women preferably pursued several small activities which could be easily interchanged. As long as a strategy could be easily stopped (low exit barriers), both low-risk and high-risk strategies such as gold digging were pursued. As no initial investment had been made, no initial investment was lost if the high-risk strategy failed.

Quote 154. Women just do what they can. I sold some cakes, when that did not work, I started boiling yams and selling those to the gold diggers. That worked better. You just try one at a time. If it doesn't work, you switch (woman #312, Jan. 2011).

Quote 155. Gold digging is a lot of luck. Sometimes you find nothing. If I have the choice, I prefer to trade, for example buying up cereals and re-selling them when prices are high

but I have no start-up capital to start doing that [activity]. For gold you need no start-up capital. You just need your physical strength (man #240, Nov. 2009).

Quote 156. I want to start trading *pagne* cloths again. I used to do that when I lived in Bobo. But I don't have the money right now to buy up a new stock. For now all I do is sell firewood. I can just walk into the bush and collect that (man #250, March 2010).

Quote 157. If I need money in the rainy season I take advantage of a rainy day [when we don't go to the field] to dig for gold (woman #321, March 2010) (*author's comment: women dig for gold in surface pits which do not collapse like the deeper shafts do*).

Comparing the four food sources revealed that they did not have the same entry and exit barriers. Home production and purchase were preferred because it was considered culturally unacceptable to eat large amounts of wild foods year round. There was a cost to eating too many wild foods because they were considered shameful. As discussed in Chapter 5, wild foods were culturally associated with a more 'desperate' coping strategy, and eating them signalled a low level of food security to other villagers. In addition, several interviewees were of the opinion that consuming too many wild foods caused digestion problems. In addition to wild foods being less preferred, it was also difficult to collect large quantities of wild foods, as trees were distant and widely scattered. It was easier to purchase than to gather a large quantity of food. The fact that wild foods were still used, despite these caveats, suggests that it was principally used to diversify the diet, instead of providing large quantities of food. Instead, all households used wild foods all year round regardless of their food security level. As a result, the degree of use varied little, resulting in a low level of standard deviation.

Due to these constraints, wealth was accumulated in small incremental steps, instead of through one large investment. Similar behaviour has been observed by other studies in Burkina Faso and elsewhere (Jodha 1978, Mortimore 1989, Paarup-Laursen 1996), suggesting the existence of a longer time horizon than predicted by the risk literature. Livestock herds were a common form of accumulating wealth, for example by buying one animal per year (see quote below). The literature also confirms that livestock holdings are a common form of self-insurance against risk (Fafchamps *et al.* 1998, Merton 1971). As a result of slowly accumulating wealth over time, older household members often had larger animal herds. Similar findings were documented in other regions of Burkina Faso (Bolwig 2001), stressing the importance of the lifecycle stage of the household in affecting the level of human capital, rates of asset accumulation and degree of risk-aversion (Cavendish 2000, Sen 2003).

Quote 158. In a good year I use the money I make to buy a goat or sheep, as there is no need to buy extra cereals (woman #812, April 2010).

In conclusion, households predominantly accumulated wealth by pursuing a range of income-generating strategies which required little start-up capital, but were not necessarily very profitable. This choice represented a compromise between taking the risk of investing in one potentially more profitable strategy, and not wanting to concentrate on only strategy because of the risk that it might fail. This finding provides a more nuanced view than the economics literature, which proposes that profit-maximising behaviour is necessary to accumulate disposable income. This data set demonstrates that income was generated *both* through risk-taking as well as risk-minimising behaviour, whereas the former is often ignored by the risk literature.

7.3.2. Managing the investment

Once necessary savings were accumulated, interviewees predominantly demonstrated 'cautious' risk-minimising behaviour. This stage corresponds to the 'persistence' phase of the adaptive livelihood cycle (see Section 7.2.3). During this stage, many interviewees stated that they would only spend their savings under severe hardship because their savings were used as running capital for their trading activities (see quotes below)¹¹⁸. This demonstrates the importance they attributed to having savings. Such behaviour also exemplifies that livelihood maintenance was deemed more important than assuring food provision, with interviewees often choosing to go hungry instead of investing their assets or labour unsustainably. Cooking surveys also revealed that breakfast was deliberately skipped in the dry season to conserve grain reserves. Such behaviour echoes findings of the 'coping' literature (Davies 1993, Frankenberger and Goldstein 1990), thus discrediting the 'food first' hypothesis.

Quote 159. I would never spend my running capital, I prefer to sell some of my animals if I need money (man #850, April 2010).

Quote 160. If times get really hard I can always use the running capital from my trading activities (75,000 FCFA) to buy food but then it will be hard to start up again next year (man #630, April 2010).

Quote 161. Last rainy season I spent the running capital from my trading on food. Now I sold five cups of sorghum (2250 FCFA) to restart my activities. I buy up beans and cook

¹¹⁸ The running capital of the activities pursued by women was usually smaller and could be more easily recovered, if spent.

them and sell them on the market. With the profit I was able to buy 3 cups of fertiliser (3000 FCFA) for my fields (woman #431, June 2010)

Similarly, interviewees were very careful with the sale of their animals stock, which represented a significant saving (see quotes below). An unsustainable debt cycle of asset devaluation was not observed, where livestock were sold to buy cereals and next year's harvest was sold to buy back livestock, at increasingly deteriorating exchange rates. Instead, seasonal income flows showed that livestock sales were predominantly made at the end of the dry season when prices were highest, and sales fell dramatically during the rainy season as prices fell (see **Figure 63**).

Quote 162. I prefer to try my luck and dig for gold than to sell my animals. I have so few. Only if I find no gold will I start selling them (woman #422, March 2010).

Quote 163. My goat died [therefore I have nothing to sell]. If I have money maybe next month I will buy a chicken and wait until it has little ones (woman #412, Feb. 2010)

Quote 164. If my savings are insufficient to buy cereal I will not sell more animals, otherwise next year will be even worse. I prefer to reduce the weekly *mondé* and mix in leaves (man #510, April 2010).

Quote 165. Earlier in the year I sold my red sorghum to buy millet. I would normally sell some animals during this time as prices are good, but my sheep were stolen and all my goats are pregnant females. I prefer to wait and see (man #610, April 2010).

Quote 166. I do better than my brother because I am organised. Every year I try to buy up a cow when it is small and resell it later. With the surplus I can buy cereals (man #720, April 2010).

Recognition of the risk of falling into debt was also evident in the purchase and selling behaviour of cereals (see quote below). The seasonal income and expenditure data showed that households with low perceived food security bought earlier in the year when prices were lower, whereas households with a medium or high perceived food security bought late in the year when prices were higher. This suggests that households with a lower level of food security chose a less risky option, presumably because they had fewer saving and therefore had more to lose.

Quote 167. People are much more careful with food than with money. Nobody would ever sell all their crops (Sawadogo H., Jan. 2011).

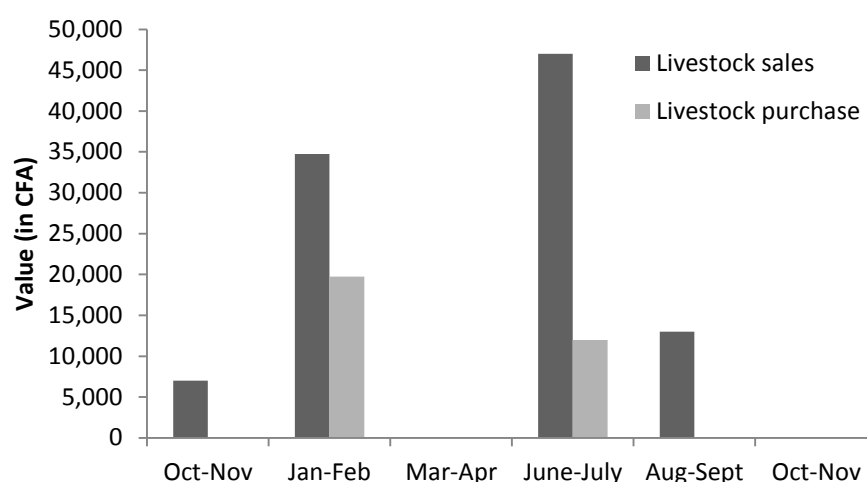


Figure 63. Seasonal variation of cumulative livestock sales and purchases made by all seven men in the Tao family compound (Sima Village).

Falling into debt was also avoided because of the recognition that poor decisions today could affect food security in the future. There was a reluctance to making large investments if these would require more investments in the future, therefore committing one to this activity (see quotes below). Such a decision would reduce flexibility.

Quote 168. I am old. I need help to farm my field. But what is the point of paying someone to help clear a larger area to farm if you then have no money to pay someone to help you sow and harvest that land? I prefer to do it alone (woman #611, Dec. 2010).

Quote 169. I don't like to ask for credit. I prefer to be free and not be dependent on someone, than to be tied down by debt (man #230, March 2010).

Interviewees demonstrated a clear understanding that shocks from one year could carry on to the next (see quotes below). The principle also explains the cost of asking for food from friends and relatives (see Section 7.1.2). As a result, the less risky option was chosen. Long-term reasoning was also evident from the way that meal sizes were reduced. Interviewees stated repeatedly that if meal sizes were reduced, this applied to adults and not young children who were less able to tolerate hunger. Therefore the benefit of saving cereals in the short-term was clearly offset by the cost of harming the health of vulnerable household members in the long term.

Quote 170. This year was hard because I was pregnant during the field work season, so I was not able to sow as much. I harvested little. Some of my field was flooded also. Next year will not be easy (woman #621, Dec. 2010).

Quote 171. If you don't eat well during the rainy season you run the risk of not finishing [to sow] your whole field and then you will have troubles next year [because you have not harvested enough] (man #240, Feb. 2010).

Quote 172. People know that it will back fire if they ask for too much [food]. If you ask for too much today, you will get less tomorrow, and maybe you will not be able to ask the day you really need it. This is one of the main reasons why people don't like to ask for help (Kirakoya A., June 2011).

Cautious behaviour was also evident in the use of cereal reserves. A range of cunning strategies were reported to help individuals to avoid using up their food reserves, which can also be considered savings, too quickly (see quotes below).

Quote 173. If your sauce stock is diminishing you can make your leaf sauce more liquid. That way your stock will last longer (woman # 241, March 2010).

Quote 174. I prefer to give my wife pearl millet first. It is a lot of work to de-husk it. This means she will use it sparingly. Later we will eat sorghum when she is tired [of de-husking] (man #250, April 2010).

Quote 175. When I buy cereals we eat those first because they are already de-husked and keep less well than the ones on stalks, in the granary (man # 510, April 2010).

Quote 176. When you have little money, you can buy the spilled flour from the flour mill (125 FCFA per cup) instead of buying the grains whole from the market (woman #471, Nov. 2009).

Quote 177. If I have money left over I will still buy some millet, even if my husband still has enough stock. You never know. I cannot only rely on him (woman #472, Feb. 2010).

In summary, the data above suggest that savings in the form of cash, food or livestock were managed 'cautiously' because savings were an important buffer against risk, and a source of cash which could be reinvested into other livelihood activities. Such behaviour was accentuated by the recognition of how difficult it was to accumulate savings in the first place.

7.3.3. Experiencing unpredictable shocks

Despite the 'cautious' attitude outlined above, the seasonal income and expenditure data showed that shocks often occurred which disrupted the activities which had been planned. The most serious shock was illness, because it prevented all income-generating strategies which required physical work (see quotes below). The only remaining option which did not require physical labour was selling assets, or having a family member sell the assets for you. The effect of illness demonstrates the devastating effect of a covariant shock, i.e. a shock that affected the majority of livelihood strategies. Resilience theory predicts that high levels of covariance reduce the resilience of a system precisely because of such a domino effect (see Section 7.1.3).

Quote 178. If you are healthy you will always find a way to get by (woman #812, Dec. 2010).

Quote 179. I have been ill. I cannot fetch firewood or make shea butter. As soon as you fall ill life becomes very difficult (woman #822, Dec. 2009).

Quote 180. Usually I de-husk rice and re-sell it, but I was ill after giving birth and had to stop (woman #821, Jan. 2010).

Quote 181. Normally I gather leaves at this time but I have been ill (woman #422, Feb. 2010).

Quote 182. My brothers live far away in Bobo. I wanted to go visit them in January [to ask for help] but my new-born child was ill; I could not leave (woman #471, March 2010).

Quote 183. I am ill I cannot work. I rely on selling animals to get by but some of my sheep were recently stolen (man #620, Dec. 2010).

Quote 184. I am ill I don't have the strength to work [a lot] I get easily out of breath. All the money my husband and I make goes towards paying my medicine. We have stopped all secondary expenses (woman #831, Dec. 2009).

Quote 185. I have no big sons, I farm alone, my wife is ill. Things will be very difficult if I fall ill as well, so we need to eat enough to stay healthy (man #830, April 2010).

Pregnancy was a severe shock for women, because it stopped them from being able to do physical work for several months before and after giving birth (see quotes below). Especially if

pregnancy fell in the middle of the agricultural season, it could strongly affect her capacity to farm and thus the amount she would harvest. When faced with no other option, women would continue working while carrying their baby on their backs. In recognition of the high time cost of pregnancy, mothers of twins hold a special status in Mossi society. As is the case in neighbouring Togo (Ball and Hill 1996, Guilmain-Gauthier 1987), twins are considered a curse, because both babies cannot be carried on the back at the same time to allow her to continue working. In consequence, mothers of twins have the same status as blind people and cripples – they are entitled to go from door to door and ask for food contributions.

Quote 186. I could have gathered more leaves but my baby was crying all the time; I could not stay away long (woman #711, Dec. 2009).

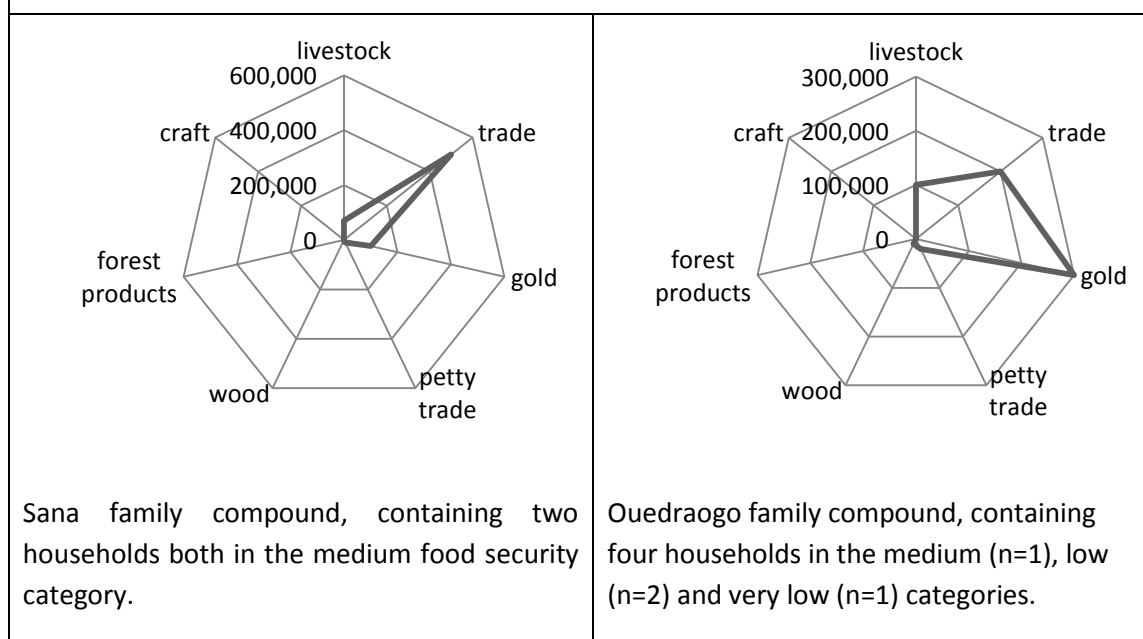
Quote 187. I have a young baby, he stops me from getting work done because I need to take care of him. During the summer holidays my older children are home [from school] though, and they can take care of the baby as I go work. Sometimes I also leave it with my mother; thankfully she lives in the same village (woman #622, Dec. 2010).

Quote 188. Both my daughters-in-law gave birth last year, they have not been able to help us with farm work (man #510, Jan 2011).

Some unavoidable shocks were inevitable and unpredictable. This was one of the reasons that a diverse set of livelihood strategies was maintained, *in case* one of them failed. Several women reported pursuing a range of trading activities in case they could not find enough buyers for one of their products. Primarily relying on one trading activity would be too risky (see an example in **Figure 64**). However spreading labour ‘too thinly’ over many activities also carried an efficiency cost (Dercon 2005, Ellis 2000, Robinson *et al.* 2007). Some interviewees ‘complained’ about the number of activities they engaged in, suggesting a too high level of diversification was not preferable (see below).

Quote 189. I am forced to sell *soumbala*, cook *bassi* [sweet porridge sold on the market] and keep de-husking rice because if I stop one [activity] I will lose my market. It all works by word of mouth here. If you don’t show up at the market for a few days, people forget about you, and another is always waiting to take your place. But I am tired from having to do all three activities (woman #521, Jan 2011).

Figure 64. Comparison of the cumulative income streams of two family compounds, showing on family relying mainly on trade (left) and another exhibiting more diversified income sources (right).



7.3.4. Managing risk through flexibility

The qualitative data revealed that expected as well as unexpected shocks were addressed via three mechanisms: the flexible allocation of labour, the flexible investment of cash and learning capacity. Each aspect is addressed in turn. This period represents the adaptation and transformation phase of the adaptive livelihood cycle.

Flexible labour allocation

In contrast to unexpected shocks, predictable seasonal shocks could be attenuated through careful planning of labour allocation. Chapter 5 outlined the inherent seasonality of the agricultural calendar, and the labour bottlenecks which were experienced every rainy season. The rainfall data presented in Chapter 3 reveals both instances of insufficient rainfall, as well as flooding, which households had to respond and adapt to. Such seasonality could be addressed in several ways. First, tasks could be shared among household members (see Chapter 6). Secondly, tasks could be delayed or brought forward in the year, in order to avoid the busy rainy season. This also allowed households to be less affected by the seasonal inflation of asset prices. Through careful planning, some interviewees deliberately took advantage of such seasonal price hikes to make a profit (see quote below).

Quote 190. I hoard leaves and vegetables and sell them when prices are high in the dry season (January – March), they fall in the rainy season (June-September) [opposite of cereal prices] (woman #812, April 2010).

Having such a flexibility to allocate labour also allowed individuals to engage in additional income-generating activities if more income was needed (see quotes below). Chapter 5 demonstrated that labour allocation among different strategies was determined by cash needs. Such flexibility in labour allocation emerged as a vital component of resilience because it allowed an individual or a household to avoid the covariance of food sources, i.e. avoid them finishing all at once.

Quote 191. I was able to buy two tomato tins of fertiliser (2000 FCFA) with the money I gained from my petty trading; I re-sell dried fish, peanuts and maggi cubes on the market. In rainy season I switch and sell coffee and sugar (woman #111, June 2011).

Quote 192. If I have no luck with gold digging I will go back to selling cakes (woman #222, Jan. 2011).

Quote 193. I have not had much time to dig for gold. I was fetching firewood. In the rainy season you cannot find any, you need to stock in advance (woman #251, March 2010).

The analysis above suggests that strategies which could not be moved to a different period of the year thus represented a barrier to adaptation. The seasonal income and expenditure flows discussed in Chapter 5 suggest that ‘modern’ inflexible income and expenditure shocks such as school fees, fixed Muslim festivals, or cotton payouts¹¹⁹ negatively affected food security because they could not be adapted to the seasonality of the livelihood system (see quote below). Similarly, not being able to access formal credit at a convenient time during the year reduced flexibility.

Quote 194. I did not have the money to pay all my son's school fees at the start of the year [Sept. 2010] but I need to pay all now at the latest (25,000 FCFA) otherwise he cannot sit his Baccalaureate exam (woman #811, July 2010).

¹¹⁹ Farmers buy cotton seeds and fertiliser on credit from SOFITEX, the national cotton agency. Cotton is harvested in December or January, after the main cereal crop. SOFITEX agents then come to villages, weigh and buy the cotton harvested, deduct the value of borrowed seeds and fertiliser, and pay the farmer the difference. Usually this lengthy process is only complete by April or May. In the meantime, sparkling white mounds of cotton can be seen waiting in the middle of the dusty brown country side.

Flexible cash investments

Shocks are not only buffered through flexible labour allocation, but also by holding savings. Having savings permitted money to be moved between different livelihood sectors in case one was affected by a seasonal shock (see quotes below). A specialised livelihood depending on only one food or income source was more vulnerable to shocks, as exemplified by a resilience analysis undertaken of Norse Greenlanders, who attempted to meet all their food requirements in Greenland solely through farming (Dugmore *et al.* 2009). In Burkina Faso, the most common risk-spreading strategy was also to move away from agriculture, allocating savings or labour from non-agricultural sectors into the agricultural sector to be able to increase agricultural output. The quantitative data showed that diversification away from agriculture was primarily achieved through purchase if it was need-based while diversification due to opportunity was primarily achieved through wild foods (see Section 7.2.1). As such, risk could be distributed between several livelihood sectors and adjusted as needed, thus minimising covariance.

Quote 195. If I find a lot of gold I will buy a donkey cart, and a donkey, and will build up my livestock herd (man #130, Jan. 2011).

Quote 196. There is little gold this year. I sold one of my goats and some of my red groundnuts to buy 10 tins of fertiliser (10,000 FCFA) [to improve my harvest] and a tin of sorghum (3750 FCFA) as food reserves just in case (woman #411, June 2010).

Quote 197. I have used the money [10,000 CFA] that I received as gifts for my baby's baptism to buy cereals and other things (woman #631, March 2010).

The benefits of pursuing a diverse range of activities during phases of 'adaptation' and 'transformation' contrasts with the benefit of concentrating on few activities during phases of 'persistence'. This dichotomy stresses the cyclical nature of livelihood change. Resilience theory does not suggest that households permanently stayed in a diversified or undiversified phase. The data above demonstrate that savings were beneficial *both* during phases of persistence as well as change. In the latter case, savings permitted a flexibility of investment between different livelihood sectors – an aspect understated in the risk literature, which predominantly situates the accumulation of savings as a strategy to minimise risk.

Learning capacity

The capacity to learn which strategies worked best in response to different shocks and during different seasons was a vital element emerging from the qualitative data. This echoes

conclusions of the literature stressing the role of local knowledge and innovation in asset management (Pretty 2003) and climate change adaptation (Berkes and Folke 1998). The importance of learning capacity was evident in several elements. Firstly, the capacity for household members to learn from previous seasonal drought shocks allowed them to better meet their food needs in the future. Every individual in the sample not only learned from personal experience, but also from the experience of others handed down in the form of stories, anecdotes, proverbs and fables, as confirmed by other studies (Bonnet 1982). It is argued that the important role of proverbs and elders in African societies is an important factor encouraging a 'prudent' attitude to livelihood construction (Dowden 2008). As such, the strategy chosen by household members affected the strategies of the whole household, of the family compound, and of neighbours and relatives who learned from good and bad examples. The fact that patterns at one scale feed into patterns at higher scales is a typical feature of resilient systems, known as panarchy (Holling 2004). Learning also took place at different scales over time, with decisions made on a daily, monthly and yearly basis.

7.3.5. Long-term resilience or robustness

The sections above identify the processes acting at the temporal scale of the study period, i.e. over the course of one agricultural year, from harvest to harvest. However, resilience theory also predicts that trajectories, such as depicted in **Figure 60**, act not only over short but also over longer time scales. As it was not possible to gather primary data over several decades, the relationship between short- and long-term resilience was addressed with the help of focus group discussions, where historical changes in farming traditions as well as plans for the future were discussed. This approach was based on the idea that the Sahel has always been volatile, and the strategies which have been successful in dealing with uncertainty in the past are likely to be able to deal with uncertainty in the future (Mortimore and Adams 2001, Thomas *et al.* 2007). This approach was justified by the reactions of the interviewees, who did not perceive recent climatic changes as particularly unusual or severe. Instead, the general attitude was to continue as they have always done, but minimising risks of specific shocks such as flooding where possible (see quotes below). There was a noticeable trade-off between minimising risk and increasing investment.

Quote 198. This [lack of rain] really is nothing. We have seen a lot worse. In the 1970s it was really bad (woman #111, Jan. 2011).

Quote 199. The rains have been sufficient over the last five years. The problem has been the flooding. It destroys crops. We need to sow two or three times. Every time you need

to buy new seeds to sow, if you have none left from last year. It is possible to change to a site where there is less flooding, but the problem is that the sites near the river are most fertile. If you move away, you need to spend more money on fertiliser. It is a risk you take (men #210-260, Jan. 2011).

Quote 200. I will ask my husband for more land to farm so that I can contribute more food. I already asked him for more this year, and I will ask again next year. However I may have to change farming location, it is getting crowded around the houses (woman #461, Jan. 2011).

Discussions revealed that 'seasonally specialised' households (see **Figure 47**) were considered less able to react to unpredictable events during the year because they had fewer options at any moment in time (see quote 201). A 'diversified' strategy (see **Figure 48**) was preferred because it provided alternatives which were specifically less susceptible to the risks of climate change (see quote 202).

Quote 201. I am worried for the future. It is not good to rely on one strategy. If the harvests stay poor I want to seek dry season work but I cannot leave. Already my younger brother leaves regularly [to work], so I need to stay here. What if the children fall ill? I will stay and buy more fertiliser for my fields (man #430, Jan. 2011).

Quote 202. If the rains stay poor I will start farming new lands far from the river. There will be less flooding. I will put more effort into livestock keeping. Animals cope better with drought; you can always move around with them (man #460, Jan. 2011).

Historical discussions revealed that livelihoods had always included non-farm as well as farm activities, in order to spread the risk underlying rain-fed agriculture (see quote below).

Quote 203. We only found gold here in the 1980s. Before people did other things to get by. Our grandfathers travelled by donkey to Mali in the dry season to buy salt and resell it. Or they travelled to the coast to buy up cocoa. Women spun cotton and sold it (man #460, Jan. 2011).

However, despite the increased challenges facing rain-fed agriculture under climate change, interviewees showed no intention of fully leaving the agricultural sector (see quote below). This attitude did not indicate a preference for agriculture, nor the attitude that obtaining food through farming was *less* risky than obtaining food through purchase or through another entitlement channel. The attitude simply reflected that perception that specialising in any *one* strategy was considered risky – be it farming or trading. As a result, farming was pursued even

in the face of poor rain-fed yields, because it entailed a fall-back position when trading activities failed. Similarly, trading was pursued even if unprofitable, because it entailed a fall-back position when farming activities failed.

Quote 204. People will never stop farming. If the harvests really stay poor they will just invest more in their lands and start making zaï [traditional labour-intensive way of improving soil fertility] already in January, so that they have time to [apply zaï to] the whole area of their fields by the time the rains come (Sawadogo H., Jan. 2011).

Earning additional income was seen as key, because the profit could be invested back into food production (see quotes below). This conveyed added flexibility because profit from one sector (such as livestock sales) could be invested into another sector, thus spreading risk.

Quote 205. If the harvests stay poor I will use the profit from my cake selling to buy cereals, instead of food for my children (woman #431, Jan. 2011).

Quote 206. If the harvests stay poor I dig for more gold. I will cook lunch before heading out, and spend all day there. The kids will eat alone at lunch. In the evening I will make dinner and reheat the same sauce to save time (woman #441, Jan. 2011).

Quote 207. If the harvests stay poor I will just keep doing what I have always done. I will put my money where it is needed most. And hope for the best (woman #221, Jan. 2011).

The interviewees stressed that strategies not only entailed a balance between farm and non-farm activities, but also encouraging all household members to participate in food provision. Several anecdotes were told of villagers who had relied too much on one son or one household head and had gone from boom to bust in the space of a few years. Only focussing on gold digging was cited repeatedly as particularly precarious. The repeatedly-cited devastating effect of illness demonstrated the drawbacks of a too specialised livelihood, especially if the main breadwinner fell ill (see Chapter 6). Not only food security but also a drive for autonomy within the household were cited as a factor driving diversification (see quote below), as discussed in Chapter 6.

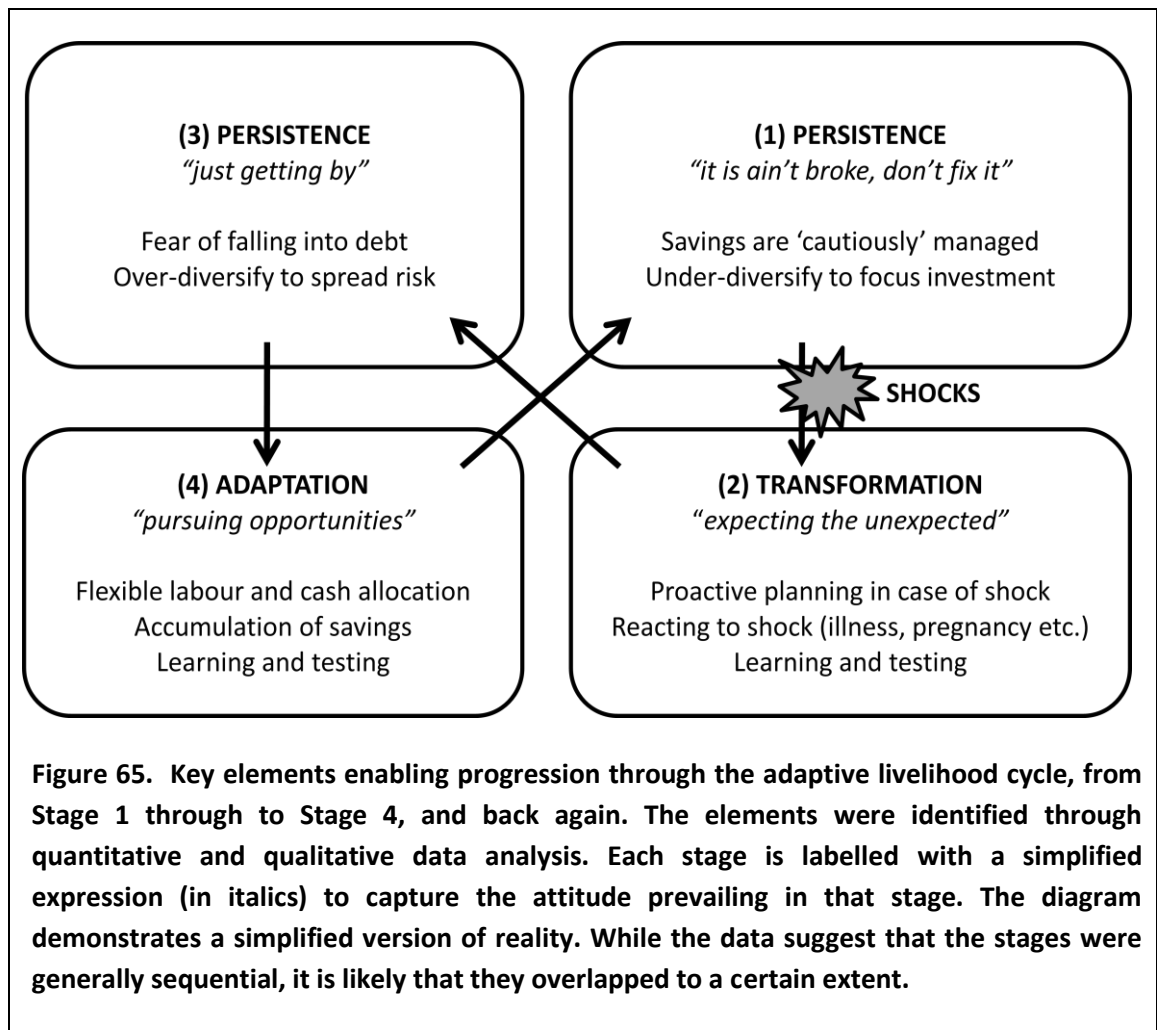
Quote 208. There have always been as many strategies as there are household members (man #510, Jan. 2011).

In summary, a historical analysis revealed that similar processes driving persistence as well as change acted over longer temporal scales over and beyond the course of the study period. It is concluded that the identified drivers contributed both to fostering resilience over the course

of one agricultural year, from harvest to harvest, as well as fostering long-term resilience. This realisation is useful for policy planning, allowing policy to focus on the processes which make a livelihood system more resilient when faced with unpredictable events, for example as a result of climate change.

7.4. Patterns of persistence and change

The results of this chapter reveal key drivers which enable both the phase of 'persistence' as well as the phase of 'change' (adaptation and transformation) predicted by resilience theory. Key elements are reiterated in **Figure 65**, below. Behaviour includes both strategies necessary to 'persist' in the face of risks, as well as strategies to adapt and react to these risks. During progression through the cycle, both risk-taking and risk-minimising behaviour was observed. Risk-taking included testing new or different strategies, and learning from how well these worked. During the 'transformation' phase, such learning and testing enabled the livelihood system to move from an 'under-diversified' state to a more diversified state, thus taking advantage of new opportunities. During the 'adaptation' phase, such learning and testing enabled the livelihood system to move from an 'over-diversified' state to choose and focus on those strategies which were most successful for accumulation savings.



The strategies outlined in this chapter were second-nature to most interviewees. This was evident from the fact that repeated questioning was necessary to identify the strategies above, because to them they appeared obvious. Interviewees repeatedly stated "I don't have a strategy". Only specific questioning, which used the quantitative data as a starting point, revealed a whole list of 'strategies' which were used under different scenarios. The second-nature of their behaviour suggests that it is an attitude that has been handed down from one generation to the next, as a result of the inherent variability of the seasonal agricultural cycle in the Sahel.

I argue that an intermediate level of disturbance in the Sahel has prevented most households from becoming too specialised, thus always engaging in several non-farm activities *in addition* to farming. Only engaging in rain-fed agriculture would lock households in the 'persistence' phase – a choice too risky in the Sahel. Using the same analogy, it is evident that a too frequent occurrence of disturbances could lock Sahelian households into a 'poverty' trap, not allowing them to accumulate sufficient wealth to improve their long-term living standard. This

phase corresponds to Stage 3 in **Figure 65**, above. Other studies have confirmed that a 'poverty' trap can exist in situations of chronic, recurring disaster (Erikson 1995). However, an intermediate level of disturbance was beneficial because it generated new opportunities which provided new avenues for managing risk. Other researchers confirmed that people in 'marginal environments' coped 'better' because they were in a livelihood zone which experienced more frequent shocks (Reardon and Matlon 1989). Examining the variability of the Sahel through the lens of resilience theory thus suggests that the perception of shocks need to be reconceptualised in the academic literature. Similarly to the savannah ecosystem of the Sahel, which requires regular bush fires to regenerate, its livelihood systems benefit from regular predictable shocks to weed out maladaptive strategies. It is argued that exposure to predictable shocks makes livelihood systems *more* resilient to unpredictable shocks, because they already have a flexible set of decision rules with which to react to change. The fact that rural people are used to predictable shocks means they expect change, including "expecting the unexpected". Such an attitude also conveys 'hope' because it suggests that things can change *for the better* when the situation is not as desired.

It is concluded that the 'resilience' concept is well-suited for understanding the processes enabling of change and adaptation in the Sahel. In contrast, the 'sustainability' concept focuses unduly on risk-minimising behaviour and 'persistence'. Only one of the four stages (Stage 3) in the figure above exhibit the 'classic' risk-minimising behaviour expected of poor households who are too close to the subsistence threshold to take risks. In contrast, resilience theory stressed that while households do pass through this stage, they move in and out of that risk-minimising stage repeatedly, as long as the drivers are present which allow progression through the whole adaptive livelihood cycle.

Chapter 8: Implications and conclusions

This thesis set out to understand how rural Burkina Faso deal with risk and uncertainty, while striving to ensure the food security of their families. It adopted a constructivist approach to exploring the meaning of livelihood strategies in their local context. The findings provide a more nuanced perspective on the objective of risk minimisation – a well-known feature of ‘peasant’ societies – by documenting not only *how* rural people minimise their exposure to risk and thus minimise the seasonal variability of their food security, but also how rural people simultaneously accumulated assets to build a buffer against future risks. This chapter first synthesises the novel contributions which this thesis makes to the academic literature, and then brings the study back to its entry point: how can agricultural policy be designed in order to ensure food security in Burkina Faso in the context of the increasingly interlinked but uncertain drivers outlined in Chapter 1?

8.1. Novel conceptualisation of risk management

The findings of this thesis amply demonstrate the importance of considering wider livelihood objectives enshrined in the Sustainable Livelihoods Framework (SLF) in the analysis of livelihood construction. Strategies do not follow a narrow ‘food first’ objective, but incorporate the objective of food security alongside wider objectives of livelihood security and welfare. The dynamics underlying multiple livelihoods objectives have received insufficient attention, in particular the dynamics emerging from potentially competing livelihood objectives. Conceptually, the sustainable livelihoods framework (SLF) is based on the assumption that the poor behave as ‘strategic managers’ in negotiating their livelihoods outcomes, by selecting a portfolio of livelihood activities according to their entitlements and access to resources, as mediated by the parameters of institutional contexts (Moser 1996). However, by what heuristic do individuals choose between alternative strategies, particularly in risky and uncertain contexts such as the Sahel?

The livelihoods literature has hitherto suggested that households – particularly ‘peasant’ households living in ‘complex, diverse and risk-prone’ (CDR) environments (Chambers 1997) –

pursue the objective of risk-minimisation in the construction of their livelihoods. This risk-minimising objective is embedded in several aspects of the SLF. Firstly, the 'vulnerability context' of the SLF emphasises that livelihoods are constructed in a risk-prone context, particularly stressing the negative aspects of this context with the choice of the term 'vulnerability' context. Secondly, the very notion of 'sustainability' implies a cautious approach to livelihood construction, avoiding strategies which may cause rural people to fall into 'debt', in the broadest sense of the word. Unsustainable practices include liquidation of assets or savings and degradation of natural resources.

In contrast, this thesis reveals that while rural people may pursue risk-minimising strategies part of the time, such behaviour is interspersed with periods of asset accumulation, investment, and risk-taking. The resilience model employed in this thesis situates 'peasant' livelihoods at the dynamic interface between persistence and change. The model emphasises both the negative aspects of risk affecting livelihood strategies, as well as the opportunities emerging through shifts in the CDR context, which can open up new avenues for change in livelihood construction. The 'vulnerability context' of the SLF must be reconceptualised to incorporate the upsides as well as the downsides of risk. The SLF had hitherto focussed primarily on the negative aspects of risk, not sufficiently taking into account the new opportunities which arise through risk and uncertainty. As such, it has contributed to propagating an ideal where all risks are minimised, and actors have complete knowledge and control over their livelihood strategies. Not only can such an ideal not be realised, but resilience theory suggests it is not necessarily preferable. A world without risk would be static, ignoring the element of change that is paramount in allowing systems to evolve. Ecological theory has long stressed the role of risks, competition and contestation in driving the evolution of individual species as well as whole ecological systems. The business world has similarly embraced the opportunities arising from taking risks, as well as the role of competition in driving innovation. A more balanced view is called for in livelihoods literature, situating rural people not as risk-minimisers but also as risk-managers constructing their livelihoods at the dynamic interface between persistence and change.

Resilience theory predicts that the opposing drivers of persistence and change result in cyclical trajectories, exemplified by Holling's figure-of-eight (Holling 2001). The data presented in Chapter 7 finds evidence for a similar cyclical livelihoods trajectory over the course of a whole agricultural cycle, from harvest to harvest. Similar adaptive livelihoods cycles are also found at higher temporal and relational scales. These cyclical trajectories were buffered by a balance of opposing forces: enough risk to drive innovation, but not too much; a sufficient degree of social norms to control behaviour, but not too many to stifle innovation. Too much of a good

thing can be a bad thing. Three critical elements were identified which enabled an adaptive livelihood trajectory; namely the role of negotiation in the face of rigid social norms, the role of intermediate levels of risk-exposure, and the role of social learning. They are addressed in turn, below.

The role of negotiation in the face of rigid social norms

Having access to assets (labour, land, etc.) and control over the resource flows (income, food, etc.) stemming from these assets emerged as a key element in determining the trajectory of the adaptive livelihoods cycle. Both elements were required to convey the flexibility – both over time as well as across livelihood sectors – necessary to enable individuals both to plan for future events, as well as adapt to current events. Livelihoods activities in different sectors were not managed separately but as a coherent whole, with labour and savings regularly reallocated between them.

The role of power struggles in livelihood construction has been amply demonstrated in the literature, particularly with regard to patterns of resource access in the political ecology literature (Neumann 2005, Robbins 2004, Zimmerer and Bassett 2003). The climate change literature has also touched upon the role of power asymmetries between stakeholders affecting the adaptive capacity, and thus the vulnerability of certain social groups (Lemos *et al.* 2007, Nelson *et al.* 2007). However, I argue that examining these power struggles under a ‘resilience’ lens sheds a different light on these aspects. Firstly, power is dynamic. The literature often refers to ‘vulnerable’ or ‘excluded’ groups within society as a permanent state, yet access to power can be negotiated. The results in this study show that while, concurrent with Mossi culture, women had neither rights to own land nor trees, they could negotiate usufruct rights to both. Secondly, the ability to construct one’s livelihood not only depended on control of one’s private assets, but also depended on access to collective assets shared at the level of the household, the family compound, or wider kinship networks. ‘Vulnerable’ groups compensated for their lack of private assets by negotiating access to collective assets. Using a SLF based solely on the asset pentagon of privately-owned assets would significantly understate the resources available and therefore the livelihood activities which can be pursued.

Examining these power dynamics in the light of risk management reveals that they are driven by a trade-off between investing in one’s own savings (small in value, but with guaranteed access) and investing in the wider informal safety net of the family (larger in value, but with less secure access). Comparatively rigid social norms encouraged sharing, reciprocal helping,

investment in informal safety nets and the ideal of solidarity. In contrast, individual incentives encouraged investment in one's own savings, precisely because access to the family's informal safety net was not necessarily guaranteed. This trade-off was most evident in the labour allocation between food-generating versus income-generating strategies. Social norms encouraged the persistence of a traditional livelihood which focussed on farming, with a low diversity of non-farm activities pursued. Food source diversity, one of the three indicators of resilience proposed in this thesis, captures this element. Focussing too much on income-generating strategies was considered 'shameful' – reputation and status emerged as important pivots for discouraging such 'risky' behaviour. Such a 'traditional' livelihood reflects the 'cautious' decision to maintain farming as the principal source of food, in case trading activities were not successful. However, within such a 'traditional' livelihood there was substantial room for adaptation, i.e. for non-farm activities. Chapter 6 demonstrated that women purposefully upheld the 'out-dated' ideal of husbands as sole providers, while simultaneously pursuing their own food- and income-generating activities, in hiding if necessary. Such behaviour allowed them to both continue to have access to the husband's granary as a principal source of food in case their trading activities were unsuccessful, *as well as* have an independent income source which they could re-invest as they pleased, if their trading activities were successful.

While informal institutions are included in the 'policies, institutions and processes' (PIP) component of the SLF, the role of informal institutions in the choice of livelihood strategies is insufficiently theorised. They are usually portrayed as beneficial risk-spreading institutions, yet the social norms which underlie them can also reduce the flexibility of the livelihood. There is a cost both to sharing too much as well as sharing too little. The data of this thesis clearly shows that there were trade-offs *between* different food entitlement channels. For example, purchasing food or gathering wild foods could affect the extent of help received from relatives, because such behaviour affected the perception of the household's food security level by others. Contestation *between* different food entitlement channels is not recognised by Entitlement Theory. Livelihood analysis could benefit from disaggregating the role of power dynamics across temporal scales (daily, seasonal, generational) as well as over relational scales (within the household, within the family compound, or across wider kinship networks). At generational as well as kinship levels, power struggles can be equated with the social norms present in society, which, similar to the negotiation manifested on a daily basis within every household, influence the resources which individuals have access to, and thus the adaptability of their livelihoods.

While partly acknowledged by the natural resource literature, the risk literature insufficiently mentions the downside of communal institutions. Studies, such as those examining

vulnerability in coastal Vietnam, merely stress the benefits of collective action in risk management (Adger 2000). Highlighting the 'dark side' of informal institutions such as communal sharing is important because of the dynamics between persistence and change mentioned above. Resilience at the scale of the whole family compound did not necessarily translate into resilience for every household within that compound. Dissatisfaction resulting from such an institutional arrangement encouraged individuals to 'negotiate' the terms of the institutional arrangement, thus avoiding the 'rigidity trap' which would otherwise result from excessively rigid social norms (Holling 2001). In contrast, the social norms of 'charity' and solidarity underlying such informal institutions played an important role in facilitating risk-spreading. It is vital to recognise that *both* rigid social norms and constant renegotiation of power dynamics are needed to fuel the adaptive livelihoods cycle. Too much of the former could result in a 'rigidity trap' whereas too much of the latter could result in a 'poverty trap'; both of which are akin to getting 'stuck' in one stage of the adaptive livelihoods cycle.

Precisely because social norms are the necessary counterweight to individualist drivers, it is unlikely that informal institutions such as communal sharing will entirely disappear. Already in the 1980s researchers predicted the disappearance of extended-family based collective farming under the pressures of markets and population growth, leading to the fragmentation of households into isolated nuclear families (Marchal 1987, Serpantié *et al.* 1988). Yet in the study site these informal institutions were still found to be active today. More recent research has concluded that while drivers are changing, trends such as regional desiccation, off-farm income-generating opportunities, and agricultural intensification have created conditions that promote both household extension and fragmentation (West 2010). It is now up to policy planners to enable both persistence and change through their policies.

Intermediate levels of risk-exposure

Resilience theory stresses that dynamic livelihood trajectories are possible because of, not despite, risk. Risk enables the adaptive livelihoods cycle because risk levels change over time, and risk levels are experienced differently over different spatial scales. This nuance explains why liquidating some assets in the short term can contribute to livelihood construction in the long term – a realisation missing from the SLF. Precisely because risk levels change over time, both risk-minimising and asset-accumulating behaviour can be undertaken by the same households, during periods of high and low risk exposure. Flexible livelihood construction allows households both to react to current levels of risk, as well as planning for risk expected in the future. The varying nature of risk exposure is comparable to the centrifugal and centripetal

forces identified as governing family size (see Chapter 6). Reactive and proactive behaviour is not mutually exclusive, but can coexist across different temporal scales.

Interestingly, the results of this thesis suggest that rural people expected change. They expected negative shocks; these were not 'shocking' in the sense that they were not 'surprising'. In the words of one interviewee "if we have a good harvest we are worried because maybe next year won't be as good". However, people equally expected positive change. A commonly-heard phrase was "*nan zemsamé*"; something will come of it (lit.: it will go somewhere). This attitude is strikingly similar to the assertion that "something will turn up", famously uttered by Wilkins Micawber, a fictional character from Charles Dickens's 1850 novel, *David Copperfield*. This attitude of hopeful expectation prevalent in Burkina Faso demonstrates that not only were rural people fully aware of the varying nature of risk exposure, but they acknowledged the upsides as well as the downsides of risk. In this sense they held a more balanced view of reality than the risk literature.

Examining the inherent variability of the Sahel region through the lens of resilience thinking reveals that recurring risk is not only a negative aspect hindering wealth accumulation, but can also be a positive driver for change and innovation. The Intermediate Disturbance Hypothesis stemming from the ecology literature predicts that an intermediate levels of risk is preferable (Townsend *et al.* 1997, Ward and Stanford 1983). Too little risk stifles innovation; too frequent risk hinders wealth accumulation. This thesis argues that the historical level of risk in the Sahel have remained within this intermediate band necessary to enable a resilient livelihood system. It is unclear if climate change will exceed this intermediary range. Resilience theory predicts that large-scale covariant risks such as political instability are particularly detrimental. The fact that Burkina Faso has remained comparatively politically stable since independence has been an important component enabling livelihood resilience. However, it is unclear how these dynamics will change. The Burkinabé political environment has become more volatile since the field work period ended, with food price hikes and riots over wages in Burkina Faso in early 2011, as well as the post-election violence in neighbouring Cote D'Ivoire. Excessive levels of political, economic or ecological risk are detrimental precisely because they reduce access to and control over assets, as mentioned above. This can significantly affect the flexibility of the livelihood system.

Learning capacity

The previous section demonstrates that variable levels of risk were expected, and livelihood strategies were chosen accordingly. Such an expectation was the product of a learning process

resulting from personal experience as well as the experiences of other people. The thesis provides evidence of learning both between individuals within the same household, as well as within and between peer groups at a village level. Learning took place both due to exchanges of experiences currently undertaken, as well as the transmission of past experiences via personal stories, fables and proverbs. The SLF does not take into account the feedbacks between current and future strategies. A livelihood system does not exist in isolation, but is the product of past trajectories through the learning resulting from these past trajectories. It is important to remember that the definition of resilience employed in this thesis relates not to a simple return to the status quo after a shock (engineering resilience) but to repeating cycles of adaptation and change which result in different trajectories every time (ecological resilience). The role of 'historicity' is missing from the SLF. While 'institutional memory' has been recognised as an important element of institutional change in the political economy literature, it has not yet been incorporated into livelihood theory.

The three research questions

To summarise, the three research questions posed at the beginning of the thesis revealed the following important dynamics:

(1) How is livelihood diversification manifested in the local context?

Livelihood diversification emerged not only as a strategy to spread production risk – the main narrative evident in the risk literature – but also as a strategy to gain additional income which could be invested in different livelihood sectors, and a strategy to negotiate power dynamics within the household or family compound. Diversification was a dynamic process, varying both over temporal and relational scales. It was considered beneficial during the adaptation and transformation phases of the livelihood cycle. However, it was maladaptive during the persistence phase of the livelihood cycle, where it reduced wealth accumulation. Here, diversification carried a cost of 'spreading yourself too thinly'. This finding nuances the semantic debate in the literature over whether livelihood diversification is detrimental or beneficial. It can be either, depending on where in the adaptive livelihood cycle a household is currently situated, which is a reflection of the current level of risk exposure. It is concluded that livelihood diversification is not a useful outcome indicator for policy design because it can be undertaken for many different reasons, not all of which are related to risk management.

(2) How does a household's role within the wider family compound influence its food security strategy?

Power struggles within the household – an element largely missing from the SLF – significantly affected the choice of livelihood strategies pursued. The informal safety net provided by the household, the family compound, and by other relatives was found to be unreliable. While solidarity and patronage were key values of Mossi society, the extent of help actually given and received was subject to considerable negotiation. Individuals faced a clear trade-off between investing in their own savings (small in value, but with guaranteed access) and investing in the wider informal safety net of the family (larger in value, but with less secure access). While the concept of risk-spreading is not academically novel, this thesis makes an important contribution to elucidating the bargaining apparent both between the varying risk objectives of different individuals within the same household or family compound, as well as the contestation arising from potentially conflicting livelihood objectives. The SLF provides no theoretical concept for how these multiple components are combined to form a coherent whole. The concept of risk minimisation is deemed insufficient, because it does not address how potentially conflicting objectives are reconciled. Minimising the risk of production failure can increase the risk of informal safety nets collapsing. Similarly, minimising the risk of food insecurity of one individual can increase the risk of food insecurity of another individual.

(3) How is resilience constructed over the whole agricultural cycle?

The concept of ‘sustainable’ livelihoods is discarded as a heuristic for conceptualising livelihood construction in CDR environments. Instead, ‘resilience’ was found to be a more suitable conceptual framework because it embraces both persistence and change. Resilience theory combines both elements to explain the rationale underlying livelihood construction. In my opinion, the SLF focuses analysis on identifying the most vulnerable individuals, and examining the factors which would improve their access to assets and thus their standard of living. Such a ‘vulnerability’ approach is symptom-orientated, focussing on reducing vulnerability as opposed to understanding the underlying processes (Dow *et al.* 2006, Plummer and Armitage 2007). It is assumed that livelihood security can be improved by reducing the levels of risk and uncertainty stemming from the ‘vulnerability context’ of the SLF, and that it is therefore preferential for individuals to follow a pattern of risk-minimising behaviour. In contrast, RLA is more process-orientated, examining the factors which allow vulnerable individuals to persist despite their precarious position, as well as identifying the processes which allow them to modify their position through adaptation and change. This process-orientated approach fosters resilience towards an unpredictable outcome, rather than trying to prevent a specific outcome of ‘poverty’ in the face of unknown future shocks (Jones 2011). Crucially, RLA recognises the cyclical nature of livelihood trajectories, examining both processes of persistence as well as change; of risk-minimising as well as risk-taking.

Building on its neoclassical origins, the SLF assumes that households act as independent units in time as well as space, thus focussing on improving the livelihoods of each individual household through growth and efficiency. In contrast, RLA does not assume households to be independent, but acknowledges the existence of feedbacks across scales (Strogatz 2001) – such as between individuals, households, family compounds and communities – and across time. Crucially, the latter recognition focuses analysis on the household’s historical exposure to risk and, via the role of human memory, the importance of learning from past experiences (Goldenfeld and Kadanoff 1999). This ‘historicity’ is missing from the SLF. As concluded in Chapter 2, livelihoods analysis (dominated by the social sciences) has remained remarkably separate from research on ecosystem health (dominated by the natural sciences). As a result, the SLF focuses on endogenous factors, paying insufficient attention to risk exposure. In contrast, RLA uses ecological resilience theory to combine endogenous factors emerging from the social science literature with exogenous factors from the disaster literature, to achieve a more balanced and realistic analysis of livelihood construction in CDR environments. Resilience theory thus provides useful insights into how these elements can be combined to design policy encouraging livelihood resilience (see Section 8.2). The RLA approach echoes the recommendations of development practitioners to integrate poverty alleviation, climate change adaptation and disaster risk management into a single coherent approach (UNDP 2002, UN ISDR 2008, OXFAM 2009, OECD 2009, Plan 2011, SCR 2012). Such a combined approach focusses both on the exogenous aspects of vulnerability (the exposure) as well as the endogenous aspects; the coping capacity of people (Chambers *et al.* 1989). For recommendations on the further development of RLA methodology, see Section 8.2.5.

8.2. Policy implications

The conceptual framework of resilience has wide-reaching consequences for policy planning both in Burkina Faso and in the development sector in general. At its most basic, it embraces the concept of holistic planning. It recognises that different sectors are interlinked, be it when addressing multiple livelihood sectors of a household, or multiple economic sectors of a country. Once multi-sectoral planning is in place, resilience theory stresses the need to build flexibility into the policy planning process, in order to allow policy to adapt to changing conditions. The need for flexible policy planning is often justified by the presence of unidirectional trends such as rising population pressure, increasing land scarcity and increasing urbanisation (Adger *et al.* 2009c). However, flexible policy planning is not only needed to respond to unidirectional trends, but also to cyclical patterns, such as the inherent seasonality of the farming cycle in Burkina Faso.

The focus should not only be on containing or minimising risk, but on managing risk. The findings of this thesis stress the benefits of intermediate levels of risk. Needless to say, this means policy should enable an environment with secure rule of law, minimising covariant risks such as political turmoil, war, floods, and epidemics as much as possible. However I argue there is a curve of diminishing returns in addressing idiosyncratic risk. While it would undoubtedly be beneficial to reduce human disease-related mortality, livestock diseases and crop pests, scarce funding resources should also be allocated to making livelihoods more flexible and adaptive, as opposed to just plugging the holes. In the long term, it is hoped that a shift to risk management rather than risk minimisation will help communities to fend for themselves, and decrease aid dependence.

Finally, on-going monitoring and evaluation is paramount to enabling the learning process necessary to convey flexibility in policy planning. The objectives of any policy must be evaluated against its outcome in order to adapt policy to changing circumstances. As such, participation of stakeholders at all levels is necessary to ensure their recommendations and learning process adequately feeds back into policy design.

Individually, none of these ideas are new. Climate change, for example, has reinvigorated the debate on adaptive policy planning. Similarly, the importance of participation has also been recognised for designing development policies which are appropriate and adapted to the local context (Chambers 1983). However, resilience thinking unites these ideas within one conceptual framework. Furthermore, the three measurable indicators of resilience tested in this thesis – diversity, control over resources (adaptability) and learning (transformability) – supply policy makers with a list of minimal requirements necessary to foster resilience. Risk-management policy has hitherto only focussed on promoting diversity and risk spreading, with insufficient focus on processes enabling change, namely securing access to and control over assets, as well as fostering learning capacity.

Examples are given below for how these concepts can be applied in different sectors. For the agricultural sector – the focus of this thesis – these concepts are discussed in detail in Section 8.2.1, with brief examples for other sectors given in Section 8.2.2. The importance of having process- as opposed to outcome-based policy indicators for all sectors is addressed in Section 8.2.3. Suggestions are made in Section 8.2.4 for addressing the policies of all sectors in a holistic manner through flexible institutional planning. Finally, recommendations for future research are made in Section 8.2.5.

8.2.1. Promoting flexibility in the agricultural system

Several policy bodies have stressed the vital role of smallholder farmers in achieving food security and preventing food price volatility (WB 2007). However, in order to ensure resilience in the agricultural system of smallholder farmers, agricultural policy must promote diversity instead of specialisation (to spread risk) as well as flexibility and learning (to manage risk). Each aspect is dealt with in turn below.

Promoting diversity in livelihood systems is vital due to the risks inherent in agricultural production in Burkina Faso. Not only is water supply too unreliable to ensure food production all year round, but even during the rainy season rain-fed agricultural yields are highly variable. While drip irrigation may be an appropriate solution in certain cases, it is questionable whether the regional aquifers could support sustainable irrigation on a large-scale. Furthermore, yields per hectare are generally low due to low levels of fertiliser and low mechanisation. Some development practitioners suggest that such behaviour is simply constrained by poverty, and that investments would increase drastically either if inputs were more affordable or available on credit, or if living standards improved to allow smallholders to afford more inputs. The results of this thesis do not support this commonly-held view. The data suggest that any monetary- or labour savings made would *not* be re-invested into agricultural production, but would be invested into other livelihood sectors. While the data of this thesis show that rural people are fully aware of the benefits of a diversified approach to food security, agricultural policy has not yet embraced this concept in Burkina Faso. Diversity can be promoted at several scales.

At the scale of the farm itself, intercropping is preferable over mono-cropping, particularly if crops with different water- and nutrient requirements are combined. Integrated nutrient cycling (UNEP 2008) and integrated pest management (ICRISAT 2002) are successful techniques for combining different sectors of the farm, which can also have the added benefit of saving money on fertiliser and pesticides expenses. For example, integrating trees into the farm can improve wild food supply, as well as providing fodder for animals and shade for crops. Because planting trees can cause conflict over land tenure in Burkina Faso, rural people have instead succeeded to integrate trees into their farms by selectively protecting wild trees which germinated by themselves.

At the scale of the village, allocating space to a diverse set of livelihood activities, ranging from farming to livestock-keeping to agroforestry, would enable flexibility. In the households studied in this thesis, multiple land uses were often evident on the same plot, with trees

intercropped with crops in the rainy season, and with pasture in the dry season. Such seasonal flexibility of land use is an important aspect enabling resilience. In addition, the traditional ten-year cycle of fallow agriculture in Burkina Faso rotates land used between agroforestry, pasture and crop land.

In contrast, Burkina Faso's land use policy (*Programme National de Gestion des Terroirs*) has not embraced the concept of flexible land use. Instead, it classes land into three categories: (i) habitation, (ii) food production, (iii) biodiversity conservation. Such a static classification neither allows for changes in land use over time, nor for multiple land uses. For example, forested areas have been classed within 'biodiversity conservation' whereas they clearly also contribute to food security. Arguably, reclassifying land use to take account of regular changes in land use is impractical. However, such flexibility could be enabled by decentralising this process to the village level, allowing them to regularly re-evaluate land uses based on their needs. Such a regular re-evaluation of land use has been part of traditional practices for centuries. While land rights are loosely assigned to each village family clan, usufruct rights over this land are constantly renegotiated. If land allocated to a household is not used – either because a son moved away, or because the household has few children – it is immediately reallocated to a different village inhabitant (Cote 2011). This flexibility of customary land rights allows land assets to be redistributed both within households as well as at the level of the whole village. Access to and control over assets emerged as a vital component of the resilience process studies in this thesis.

A push for legal land titles does not take into account the flexibility necessary to adapt to the variable CDR context of Burkina Faso. While a legalisation of land titles has been promoted on the basis that it improves land tenure security, it can also lock land allocation in a static pattern which is maladaptive from a risk point of view and not necessarily egalitarian either. While President Sankara privatised all land in the 1980s, this transition occurred only on paper, due to the impossible task of monitoring land titles across a whole country. In practice, custody over land remained with the customary institutions of the village. Burkina Faso's decentralisation policy has gradually formalised this unspoken agreement since 1995, creating village committees (*comité villageois pour le développement; CVD*) to formally oversee land use allocation. In theory, these CVD should oversee not only the decentralisation of agricultural policy, but also the decentralisation of other policies from health to education. However, in practice many CVD still lack the funds and institutional capacity to take on board these tasks. Strengthening these structures would further promote resilience.

The adaptive livelihood cycle exhibited in this thesis not only stresses the need for diversity, but also for processes enabling persistence. Having a balance of factors enabling change *as well as* persistence is paramount to keeping the livelihood system within the boundaries necessary for successful livelihood construction. Policy should reflect this same balance. As such – in addition to the processes enabling diversity outlined above – policy should enable informal institutions, informal safety nets, and recognise the importance of social capital and family cohesion in agricultural planning. This is not to suggest policies preventing rural-urban migration – far from it – social cohesion can be enabled even over physical distances, via wider mobile phone coverage, better transport links, and an easier transfer of remittances, for example via mobile phone banking.

Policies encouraging social cohesion and communication would also foster the learning process so intrinsic to the adaptive livelihood cycle. Rural people's radio programs such as "*la voix du paysan*" (the voice of the 'peasant') run by the Naam Farmers Union¹²⁰ have proved a successful way of exchanging ideas and disseminating information. The increasing mobile phone ownership also opens up new avenues for disseminating information, particularly with regard to market prices and rainfall or flooding alerts. Having control over or access to different livelihood strategies requires being aware of them in the first place. Study visits to model farms have proven successful in demonstrating different techniques in practice¹²¹ – particularly visits of southern farmers to the drier North, where northern farmers have developed new techniques for addressing variable rainfall. In contrast, local knowledge regarding how to prepare meals using traditional wild foods – a technique increasingly forgotten by younger generations – has been found to improve significantly following study visits to the tree-rich area of the Bissa ethnic tribe in SE Burkina Faso (Ouedraogo 2010). Investing in education would also increase the uptake of new techniques.

In conclusion, while several encouraging initiatives are already underway, these have not necessarily been formalised into national agricultural policy to form a coherent strategy promoting both persistence and change. Having such a national strategy is paramount to guiding national policy, as well as the activities of foreign NGOs and international donors who may be less familiar with the CDR context of Burkina Faso. Insufficient knowledge of the risk context and the drivers enabling resilience has for example led to the misguided suggestion of

¹²⁰ The radio is run by Burkina Faso's largest farmers' cooperative, founded in 1967 to revitalise the traditional of reciprocal helping (known as 'naam' in Mooré) during the 1960s and 1970s droughts. For further information on the radio station, see <http://naam.free.fr/ADSL/voixpaysan.html>.

¹²¹ Participation is crucial to the successful dissemination of new techniques. Decades of rather unsuccessful efforts to promote fuel-efficient (FE) stoves in Burkina Faso improved drastically once the water- and wood-saving benefits of an FE stove were visibly demonstrated by holding a timed cooking competition of women using a traditional and an FE stove side by side (ADRA 2009).

the World Bank to intensify agriculture in the guinea savannah zone, which includes southern Burkina Faso (Morris *et al.* 2009). However, such intensification would reduce the diversity currently present in the farming system, and while large-scale mono-cropping could increase yields per hectare in the short term, such a system is significantly less resilient to shocks. The consequences of such a short-sighted policy could favour sedentary agriculture at the expense of mobile pastoralist livelihoods, yet evidence from Sudan suggests that the latter livelihood is better adapted to drought because of its mobility (Chavunduka and Bromley 2011).

8.2.2. Linkages to other sectors

Because the monetary and labour investments made into agriculture are made in parallel with monetary and labour investments in other livelihood sectors, these policy sectors cannot be addressed in isolation. Pointers are given below to how resilience thinking can be applied to sectors outside of agriculture. These are purely intended as examples, and require further research on their feasibility.

Spatial flexibility in service provision is important to allow smallholders to benefit from the same services, even when carrying out livelihood activities in different locations during the year. It remains a challenge to provide basic services such as schooling, health care and veterinary services to nomadic communities such as pastoralists. However, experience from Kenya shows that mobile schools can be effective for reaching remote nomadic communities (OXFAM 2009, USAID 2009a). Such schools have not yet been tested in Burkina Faso. However, veterinary services in Burkina Faso are provided by mobile vets, responsible for a certain district, and carrying out scheduled vaccination in every village of the district on different dates. This saves the livestock owner a long trip into the nearest town.

Due to the inherent seasonality of the agricultural cycle in Burkina Faso, temporal flexibility in service provision is just as important as spatial flexibility. Delayed salaries in the formal sector, similar to delayed cotton payouts, can significantly disrupt the accumulation of savings in preparation for the rainy season. Similarly, inflexible large expenses such as school fees can worsen the seasonal variation of expenses. However, in recognition of the fact that most farmers have no savings left at the end of the rainy season to pay school fees in September, many schools now allow fees to be paid in instalments (see Chapter 7). Shortening the administrative process for receiving a formal credit from rural financial institutions would also improve the seasonal variation of expenses. Finally, matching school holidays to the timing of sowing can significantly lessen labour shortage during the rainy season – a practice which is already partially in place in Burkina Faso.

8.2.3. Process- versus outcome-based policy objectives

Resilience thinking implies that instead of focussing on how to assure a specific output (stable or increasing agricultural production), policy should focus on maintaining the resilience and adaptability of the agricultural system, which in turn maintains agricultural productivity in the face of unknown future shocks. The focus should not be on containing or minimising risk, but on managing risk. The resilience literature already advocates for a conceptual shift, approaching sustainability as a process rather than as an end product (Berkes *et al.* 2003:2). What should policy targets be in this case?

Up to now, Burkina Faso has measured the success of food security policies based on the percentage of food requirements covered by the agricultural production of a given province. Every year, the Ministry of Agriculture evaluates the volume of cereals produced in each of the 45 provinces, compares it to the minimum food requirements of the provinces' estimated population, and classes every province's production as deficient (<90%), balanced (90-120%) or in excess (>120%). Based on this information, subsidised cereals and targeted food aid are distributed to cover the shortfall. However, this simplistic analysis does not take into account the other channels through which households obtain food. Assessing the level of food remaining in the granary (KIT 2010) or surveying the 'coping' strategies employed (Savy *et al.* 2005) are equally inaccurate indicators because food sources are not used sequentially, and therefore any observed 'sequence' in behaviour is not a reflection of food security status. Ministerial policy reflects the idealised perception of the subsistence farmer, who covers the majority of food needs through home-grown food. Self-sufficiency is the underlying policy objective. Yet the results of this thesis show that regular food purchase and gathering of wild foods, for example, are not desperate 'coping' strategies, but integral parts of the livelihood. These strategies should be recognised in national food security policy. A more balanced picture would arise if per capita food production were compared to purchasing power, extent of savings, and access to wild foods and to informal safety nets. The extent of food sharing, and thus the role of informal safety nets in ensuring food provision, is also understated by national surveys which hitherto use the nuclear household as a unit of analysis. The findings of this thesis refute the suggestion that the household remains the logical social unit through which to conceptualise the question of food access (Maxwell and Smith 1992).

Nonetheless, documenting and surveying all possible food sources remains impractical. Famine early-warning systems attempt to monitor the main factors affecting food entitlements (food prices, excessive asset sales, rainfall dynamics, etc.) but these invariably provide an incomplete picture. The findings of this thesis show that strategies are highly heterogeneous, and rural

people can use the same strategy for many different reasons, ranging from food-based objectives (minimising variability in food provision, or accumulating food reserves) to food fulfilling a social function (food as gifts during ceremonies, food offered to visitors and relatives to cement social ties, etc.). There is no 'typical' farmer. Every farmer has a different attitude to the situation at hand.

As a result of the features described above, it is more practical to focus on process- rather than outcome-based indicators to monitor and evaluate the success of policies. The quantitative resilience indicators proposed and tested in this thesis suggest three simplified indicators – diversity, standard deviation and covariance – which can be used to carry out a resilient livelihoods analysis (RLA) of a household. As long as one carefully defines the resilience 'of what' and 'to what' is being assessed, the indicators could also be adapted to measure resilience at a different scale. For example, the resilience of Burkina Faso's national economy to drought shocks could be assessed via the diversity, standard deviation and covariance of the agricultural sector. However, the results of this thesis also caution that such simplified resilience indicators do not reveal causation – they are merely indicators of underlying processes, and need to be combined with other quantitative and qualitative methodologies to identify the drivers of persistence and change acting at that particular spatial scale.

8.2.4. Flexibility of institutions

Flexibility in policy design is affected by the way the institutions themselves, which design, implement and monitor the policy, are structured. Firstly, this insight is relevant with regard to the spatial scale at which the institution acts. It has already been mentioned that flexibility can be conveyed by focussing on a smaller spatial scale – for example land managed by a single village, as opposed to a whole district – so as to devolve the authority for decision making as close as possible to those groups who have the relevant information. However such efforts must go hand in hand with strengthening the institutional capacity of such decentralised village-level institutions. However, decentralised village-level institutions do not exist in a social vacuum. The political ecology literature warns that insufficient attention is given to the social processes and networks that support and legitimate such institutions (Leach 2008, Osbahr *et al.* 2007). Evidence from Burkina Faso reiterates this warning: the newly-formed CVD have not always been welcomed by the traditional village structures already in place, who accuse them of propagating political interests, as opposed to the interests of the villagers which they are supposed to represent. More work is needed on the process of legitimising such decentralised village-level institutions. Efforts could build on the success of legitimising

village committee established to provide a platform to discuss rights to trees and to wild foods (Ouedraogo 2010).

Just as institutions do not exist in a social vacuum, they do not exist in a temporal vacuum. They are the product of a historical process which led to their formation. While institutional memory can be beneficial for learning from previous experience, it can also lock an institution into a certain *modus operandi* which prevents flexibility in policy design, akin to the ‘dark side’ of social capital. The post-institutional narrative in the political ecology literature stresses that institutions and decision-making processes are mutually constituted and influenced by historically-shaped ideas about “the right way of doing things” (Cleaver and Franks 2005:16). Such institutional lethargy can be a major barrier to enabling resilience.

The historical trajectory of institutions is most evident in the sectors for which they are responsible. For example, the Ministry of Environment of Burkina Faso was known as MEE from independence until the late 1990s, with the acronym stating it was principally responsible for environmental and water resources. In the early 2000s, it was renamed MECV; the Ministry of Environment and Livelihoods. In 2011, it was re-baptised the MEDD; the Ministry of Environment and Sustainable Development. Perhaps in future it will be re-baptised again to include the dimension of climate change. However, every time the ministry changes its mandate, the sectors relevant to its new mandate are, for historical reasons, located in different ministries. Rainfall data for example, are neither collected by the Ministry of Agriculture nor the MEDD, but by the Ministry of Transport, because initially weather data was collected not for the purpose of farmers, but to fulfil the international requirement of the International Airport of Ouagadougou to publish weather predictions for international airlines flying to Burkina Faso. Having relevant sectors scattered around various ministries invariably hinders the flow of information and the process of learning. However, as sustainable development is such a large cross-cutting issue, combining all the relevant sectors into one ministry runs the risk of creating a monstrosity akin to the Orwellian Ministry of Plenty. For now, Burkina Faso appears to be heading in the opposite direction, boasting a list of 33 ministries¹²².

There is a clear trade-off between having many small and specialised institutions which are experts in their field and highly reactive to changes in their field, versus having only a handful of large institutional structures which are less reactive but have an overview of interdependent and cross-cutting issues. This trade-off not only applies at the level of government ministries, but also to other institutions. For example, the Consultative Group on International

¹²²For a list of the 33 ministries, see <http://www.gouvernement.gov.bf>.

Agricultural Research (CGIAR) is made up of a consortium of 15 specialised structures focussing their research on one sector (water, fisheries, livestock, forestry etc.) or even on one crop (potatoes, rice, maize and wheat etc.)¹²³. As every centre focuses on a narrow topic, they run the risk of becoming too specialised. One of these centres, the Center for International Forestry Research (CIFOR), is active in the domain of forestry research in Burkina Faso, and has regularly adjusted its mandate to include wider livelihood concerns relevant to the forestry sector. As a whole, the CGIAR group has recently sought to strike the balance between specialisation and collaboration by having separate centres, but launching ten-year 'challenge programs' involving several centres, which address a cross-cutting theme such as climate change and food security¹²⁴. This institutional arrangement provides an interesting example of flexible institutional design.

The fact that development institutions and national governments are usually organised along sectoral lines has been identified as a major stumbling block in operationalising the multisectoral approach of the SLF (Hussein 2002:55). In the specific case of food security policy in Burkina Faso, a cross-cutting structure similar to the CGIAR arrangement is necessary to coordinate the policy of the Ministry of Environment, of Agriculture, of Livestock, of Decentralisation, of Health and of National Solidarity. There is already an inter-ministerial structure in place which was set up in 2010 to address the cross-cutting issue of land tenure and land use¹²⁵. The cross-cutting issue of food security could be used to revitalise it. Inter-ministerial coordination is necessary not only to ensure that the policies of different ministries align, but also that they strike the right balance between enabling persistence as well as change, mentioned above. Involving the Ministry of Social Security and National Solidarity in the dialogue on food security could significantly contribute to strengthening the informal institutions mentioned above¹²⁶. The internet also provides new opportunities for information sharing and learning between ministries. The Information Centre on Food Security (CISA) launched in 2007 holds electronic copies of all government reports and national surveys held various ministries on topics relating to food security¹²⁷.

The challenge of flexible institutional design also applies to non-governmental organisations such as TREEAID. NGOs face a clear trade-off between positioning themselves behind a simple

¹²³ For a list of all 15 centres, see <http://www.cgiar.org/centers/index.html>.

¹²⁴ The CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS) runs from 2011-2021. For more information, see <http://ccaafs.cgiar.org/about>.

¹²⁵ For more information on the committee, entitled *Commission Technique Interministérielle chargée de la relecture des textes sur la Réorganisation Agricole et Foncière (RAF)*, financed by the Millennium Challenge Programme, see <http://www.hubrural.org/spip.php?article7785>.

¹²⁶ For the ministry's current mandate, see <http://www.action-sociale.gov.bf>.

¹²⁷ For more information on CISA, see <http://www.sisa.bf/cisa>.

catchy idea, which helps to mobilise funding, but runs the risk of narrowing policy focus. In the case of TREEAID, the success of their poverty-alleviation objective could benefit from integrating income-generating and food-generating aspects of forest products (Tincani 2011). In summary, resilience can be promoted both by institutional redundancy at the local level, as well as diversity in institutional design (Carpenter and Brock 2004, Low *et al.* 2003).

8.2.5. Directions for future research

With regard to the micro-level context within which this thesis was conducted, several elements call for further research. While this thesis has identified key drivers of persistence as well as of change, it was not possible to investigate how these drivers have changed over time, as well as how they may change in the future. The data briefly collected on historical trajectories suggests that – on the one hand – socio-economic conditions are clearly evolving and opening up new avenues for innovation and change, as demonstrated by the increasing participation of women in the household economy. However, population pressure and land scarcity may however be discouraging other traditional livelihood strategies, as was evident from the increasing competition over wild foods. The impact of these conditions on the capacity to change and adapt requires further research. On the other hand, drivers of persistence appear to be evolving less, although older and younger generations were not always in agreement over the changing nature of informal institutions and solidarity. A longer-term study is necessary to understand the dynamics evident within the drivers of change and of persistence, and what these mean for the overall resilience of the livelihood system. Is the buffer capacity of the traditional livelihood system exhausted? Is there evidence for a more permanent shift away from agriculture? Are societal norms changing to incorporate any such shift? Are there potential trade-offs between the drivers of short-term resilience observed over the course of this study, and drivers of longer-term resilience? How do these affect the outcome of nutritional and food security?

To investigate these questions further, RLA methodology needs to be refined to verify its applicability in different settings and across larger scales. Further studies are needed to test the three resilience indicators proposed here in areas with lower risk exposure as well as higher risk exposure (such as emergency situations). A manual is needed to explain clearly how the theoretical framework of the SLF is combined with ecological theory, in order to design a tool which can be easily applied by development practitioners.

With regard to the policy dimension, further research is needed on how to implement the concepts underlying resilience into agricultural and developmental policy. One of the

limitations of this thesis is that it focussed analysis on the micro-scale of the household, and insufficiently tied this analysis into the economic and especially political processes acting at a macro-scale. While suggestions are made in this chapter for how the concepts underlying resilience could be integrated into agricultural and developmental policy, these recommendations remain purely speculative and require further investigation. Particularly integrating flexibility into policy design and institutional arrangements calls for further research. What is the right balance between too frequent and too infrequent re-evaluation of policies, as well as the balance between a too vague or too prescriptive national strategy? How can coordination between policies not only be reconciled in the public sector, but also aligned with interventions in the private sector? In a country where hundreds of NGOs as well as an increasing number of private businesses are participating in the development sector, it is a major challenge to coordinate interventions. Under what mandate could the national government encourage the private sector to align its policies? How can NGOs and private businesses be encouraged to share knowledge and experiences – a process so crucial to fostering adaptation, but discouraged by the competitive nature of development funding? The challenge of holistic planning remains a major hurdle, and urgently calls for further investigation.

8.2.6. Concluding remarks

Writing in mid-2011, it is hard not to draw a comparison with the famine currently on-going in the Horn of Africa, where more than 10 million people are at risk of starvation. In comparison with similarly arid Burkina Faso, what makes their livelihoods less resilient, so that they cannot weather the current crisis? Does resilience theory overstate the case for livelihood systems being able to manage risk? Can a shift to risk management and resilience back-fire and be used as an argument against public sector involvement and aid interventions?

While resilience theory places a strong emphasis on the ability of complex systems such as livelihood systems to adapt and persist in the face of change, it also clearly highlights the boundaries of such buffer capacity. It does not claim that all change can be weathered. Resilience theory particularly highlights the detrimental effects of covariant risk, such as climate change or wider-spread and prolonged political instability. The latter is precisely the factor which distinguishes Ethiopia, Eritrea and Somalia from Burkina Faso. Reducing covariant risk cannot be achieved by individual households, and strengthens – not discredits – the argument calling for national and international structures which address increasingly global issues such as political stability, trade and climate change. Such structures are part of the drivers which allow the ‘persistence’ phase of the resilience cycle.

However, in tandem with the drivers of persistence, resilience theory also emphasises the need for enabling change and adaptation. It discards the neo-Malthusian narrative that population pressure, climate change and political extremism will reverse decades of development progress. In contrast, resilience theory argues that regular exposure to predictable shocks makes livelihood systems *more* resilient to unpredictable shocks, because they already have a flexible set of decision rules with which to react to change. Resilience theory provides a more balanced conceptual framework than ‘sustainability’, which focuses on ‘persistence’, insufficiently incorporating the drivers enabling change and adaptation.

In my opinion, the need for a balanced conceptual framework is more pressing than ever. In an increasingly interconnected and interdependent world, fostering an attitude of ‘hopeful expectation’ is paramount in allowing individuals as well as livelihood systems to take advantage of new opportunities arising through change. Having spent significant time in rural settings in Burkina Faso, the evident optimism and hopefulness of the population forms a stark contrast to the apparent hopelessness of environmental and socio-economic context, and perceptions created by the mass media of Africa as a ‘basket-case’. As a villager jokingly said to me “you wouldn’t survive here for a week!” I agree. Only upon further examination did the multiple avenues for change, opportunity and negotiation become evident over the course of the thesis. The challenge facing policy makers is how to foster this ‘hopeful’ attitude, and create the necessary framework conditions within which such an attitude can contribute to improved wellbeing.

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Annex 1: Quantitative and qualitative questionnaires

This annex contains the following elements. All questionnaire sheets were written in French but are translated into English here.

Quantitative questionnaire sheets

- 1.1. Asset inventory (man)
- 1.2. Asset inventory (woman)
- 1.3. Cooking questionnaire (woman)

These three questionnaires were administered six times during the study period. Sheets 1.1. and 1.2. are similar, but differed slightly in content and in the order of the sections. The best order in which to ask questions emerged from the piloting phase. Sheet 1.3. was only answered by women, as it documented what she had cooked.

Quantitative questionnaire sheets

- 1.4. B1 semi-structured interviews (Nov. – Dec. 2009)
- 1.5. B2 semi-structured interviews (March – April 2010)
- 1.6. B3 semi-structured interviews (July – August 2010)
- 1.7. B4 semi-structured interviews (Sept. – Oct. 2010)
- 1.8. B5 semi-structured interviews (Dec. 2010 – Jan. 2011)
- 1.9. Key informant discussions (throughout)

The qualitative questionnaire sheets are interview guides for semi-structured interviews (SSI) held either as focus groups (usually single-sex) or an individual basis. The approximate period when these SSI took place is indicated above. Semi-structured and unstructured discussions were held with key informants (predominantly TREEAID staff) throughout my stay in Burkina Faso (Aug. 2009 – Jan. 2011), as well as in early 2009 and mid 2011 when I returned for a conference.

The qualitative questionnaire sheets were used as general discussion guides and were not necessarily followed in a linear manner.

1.1. Asset inventory (man)

Sheet # ____/ Date ____/ Village ____/ Household head ____/

Interview start time: ____/ Interview end time: ____/ Total time taken ____/

Name of the person interviewed _____/

P1. Livestock holdings : changes in number of animals owned by the man himself :

		Donkey	Cow	Goat	Sheet	Poultry	PRICE
(# from the last survey)	# males						
	# females						
LESS = died? sold? given away?	# males						
	# females						
MORE = born? bought? received?	# males						
	# females						
Remaining	# males						
	# females						

P2. FOOD RESERVES: How much is left of your stock? Did you receive or buy more?

<u>Cereals</u>	(last recorded stock)	amount left now	amount received	amount bought	price	amount sold	amount given away
Red sorghum							
White sorghum							
Pearl millet							
Beans							
Peanuts							
Rice							
Maize							
Cotton							
Sesame							
Aubergines							
Sorrel							

P3. Did he gather or sell any wild foods?

	(STOCK)	(TOTAL)	(REMAINDER = TOTAL – STOCK) what happened to the remainder?					
Species	(last stock)	amount left	Amount sold	Income made	Amount given	Amount received	Amount bought	Price

P4. CROSS-CHECKING THE WOMEN'S COOKING DATA : During the last four weeks (28 days) there were 28 collective dinners. How many of these collective dinners were cooked using:

- Purchased cereals (purchased by him or someone else, e.g. beans, rice etc.) _____
- Leaf couscous made from wild foods _____
- Home-grown cereals _____

P5. INCOME SOURCES: From where did the money you made since the last survey come from?

Activity	Explanation	Quantity	Income made	Is money left?	How was it spent?
Petty trading		Profit per market day =		[_Y_/_N_]	
Gold digging				[_Y_/_N_]	
Animal sales (→ P1)				[_Y_/_N_]	
Crop sales (→ P2)				[_Y_/_N_]	
Wild food sale (→ P3)				[_Y_/_N_]	
Timber/fuel wood sale				[_Y_/_N_]	
Money received				[_Y_/_N_]	
Savings				[_Y_/_N_]	
Total →					

EXPENSES If possible, explain the source of the money from which you made these expenses.

P6. Large expenses which you made over the last two months (since last survey)?

Money source	Type of expense	Amount spent	Over what time period?	Total
	Expenses for the running capital of your trading, incl. debts...			
	Built/repared a house?			
	Bought fertiliser			
	Bought cereals (→ P2)			
	Bought animals (→ P1)			
	Vaccinated animals?			
	Medical expenses -- incl. transport to hospital ?			
	Clothes and shoes -- for a festivity? -- for wife? for kids?		Which festivity?	
	Festivities (Muslim festivals, NYE, baptism, funeral, wedding...)		Which festivity?	
	Did you travel?			
	Bicycle repairs			
TOTAL EXPENSES (check this against total revenue!) →				

P7. OVERALL IMPRESSION: Do you feel you can meet your needs during *this* seasonal period?

Food needs (circle one!) <i>it's enough / kind of enough / not enough</i>	Money needs (circle one!) <i>it's enough / kind of enough / not enough</i>
<p>WORRIES about food</p> <ul style="list-style-type: none"> Think about it sometimes? Does it cause stress? [_Y_/_N_] Have trouble sleeping? [_Y_/_N_] <p><u>WHY do you worry now?</u></p>	<p><u>If 'not enough': WHY is that so?</u></p>

1.2. Asset inventory (woman)

Sheet # _____ / Date _____ / Village _____ / Household head _____ /
Interview start time: _____ / Interview end time: _____ / Total time taken _____ /

Name of the person interviewed _____ /

P1. Livestock holdings : changes in number of animals owned by the woman herself :

		Donkey	Cow	Goat	Sheet	Poultry	PRICE
(# from the last survey)	# males						
	# females						
LESS = died? sold? given away?	# males						
	# females						
MORE = born? bought? received?	# males						
	# females						
Remaining	# males						
	# females						

EXPENSES If possible, explain the source of the money from which you made these expenses.

P6. Large expenses which you made over the last two months (since last survey)?

Money source	Type of expense	Amount spent	Over what time period?	Total
	Cooking utensils			
	Expenses for the running capital of your trading, incl. debts...			
	Bought fertiliser			
	<i>Bought cereals (→ P1)</i>			
	<i>Bought animals (→ P3)</i>			
	Vaccinated animals?			
	Medical expenses -- incl. transport to hospital ?			
	Clothes and shoes -- for a festivity? -- for herself? for kids?		Which festivity?	
	Festivities (<i>Muslim festivals, NYE, baptism, funeral...</i>)		Which festivity?	
	Did you travel?			
	Bicycle repairs			
TOTAL EXPENSES (check this against total revenue!) →				

P5. INCOME SOURCES: From where did the money you made since the last survey come from?

Activity	Explanation	Quantity	Income made	Is money left?	How was it spent?
Petty trading		Profit per market day =		[_Y_/_N_]	
Gold digging				[_Y_/_N_]	
<i>Animal sales (→ P1)</i>				[_Y_/_N_]	
<i>Crop sales (→ P2)</i>				[_Y_/_N_]	
<i>Wild food sale (→ P3)</i>				[_Y_/_N_]	
Timber/fuel wood sale				[_Y_/_N_]	
Money received				[_Y_/_N_]	
Savings				[_Y_/_N_]	
			Total →		

P2. FOOD RESERVES: How much is left of your stock? Did you receive or buy more?

<u>Cereals</u>	<i>(last recorded stock)</i>	amount left now	amount received	amount bought	price	amount sold	amount given away
Red sorghum							
White sorghum							
Pearl millet							
Beans							
Red ground nuts							
Rice							
Maize							

<u>Sticky sauces</u>	<i>Did you use it?</i>	<i>(last stock)</i>	amount* left now	amount received	amount bought	price	amount sold	amount given away
Baobab LEAVES	[_Y_/_N_]							
Bulvaka	[_Y_/_N_]							
Kapok	[_Y_/_N_]							
Okra	[_Y_/_N_]							

*(the first time this product is collected, this box shows the amount collected. Every following month it indicates the amount left)

Does she currently use other leaves to make sticky sauces ? If yes, which ones?

<u>Other sauces</u>	<i>Did you use it?</i>	<i>(last stock)</i>	amount* left now	amount received	amount bought	price	amount sold	amount given away
Bean LEAVES	[_Y_/_N_]							
Sorrel LEAVES	[_Y_/_N_]							
Aubergine FRUIT	[_Y_/_N_]							
Aubergine LEAVES	[_Y_/_N_]							
Cabbage LEAVES	[_Y_/_N_]							
Peanuts	[_Y_/_N_]							
Acacia	[_Y_/_N_]							
Sukuda	[_Y_/_N_]							
Boscia	[_Y_/_N_]							
Bissap	[_Y_/_N_]							
Aflelia								
Baobab fruit								

*(this box shows the amount collected; every following month it indicates the amount left)

What does she currently use to make leaf couscous ?

<u>Souring agent</u>	<i>Did you use it?</i>	<i>(last stock)</i>	amount* left now	amount received	amount bought	price	amount sold	amount given away
Tamarind LEAVES	[_Y_/_N_]							
Tamarind FRUITS	[_Y_/_N_]							
Pilostigma	[_Y_/_N_]							
wegada	[_Y_/_N_]							

*(this box shows the amount collected; every following month it indicates the amount left)

What does she currently use to make her tô sour? _____ & and her porridge sour? _____

<u>Soumbala spices</u>	<i>Did you use it?</i>	<i>(last stock)</i>	amount* left now	amount received	amount bought	price	amount sold	amount given away
Néré soumbala	[_Y_/_N_]							
Sorrel soumbala	[_Y_/_N_]							

*(this box shows the amount collected; every following month it indicates the amount left)

If she is currently using *soumbala*, which type is she using? _____

<u>Cooking fats</u>	<i>Did you use it?</i>	<i>(last stock)</i>	amount* left now	amount received	amount bought	price	amount sold	amount given away
Shea butter	[_Y_/_N_]							
Balanites oil	[_Y_/_N_]							
Did she buy cooking oil?	[_Y_/_N_]							

*(this box shows the amount collected; every following month it indicates the amount left)

Currently she uses [_] only shea butter [_] shea butter & cooking oil [_] only cooking oil.

P7. OVERALL IMPRESSION: Do you feel you can meet your needs during *this* seasonal period?

<p><u>Food needs (circle one!)</u> it's enough / kind of enough / not enough</p>	<p><u>Money needs (circle one!)</u> regarding essential cooking expenses, the money is <i>enough / kind of enough / not enough</i></p> <p>regarding secondary expenses, the money is <i>enough / kind of enough / not enough</i></p>
<p>WORRIES about food</p> <ul style="list-style-type: none"> • Think about it sometimes? • Does it cause stress? [_Y_/_N_] • Have trouble sleeping? [_Y_/_N_] <p><u>WHY do you worry now?</u></p>	<p><u>If 'not enough': WHY is that so?</u></p>

1.3. Cooking questionnaire

Date ____/____/____ Village ____/____ Household head ____ **Person interviewed:** ____ Wife of: ____

Market today?	This meal was eaten by whom?	What did she cook?				From where came this food? (see codes)	
		Staple cooked :	Quantity	Which sauce?	Quantity	Source of cereal	Source of sauce
	Today		Evening =				
			Lunch =				
			Morning =				
	Yesterday		Evening =				
			Lunch =				
			Morning =				
	Day before last		Evening =				
			Lunch =				
			Morning =				
			Evening =				
			Lunch =				

CODES FOR FOOD SOURCES:

(0) nothing was eaten

(1) it was reheated

(2) woman's granary

(3) mother-in-law's granary (#____)

(4) granary of man1 (man #____)

(5) granary of man2 (man #____)

(6) granary of the compound (#____)

(7) given by her husband

(8) given by father-in-law

(9) received for field work

(10) bought by her

(11) bought by her husband

(12) received through Muslim zaka

(13) received from relative ____

(14) gathered in the bush

(15) borrowed from a co-wife

→DOUBLE-CHECK THE SOURCES! Did she really grow the crop she cooked or did she buy it ? CHECK AGAINST STOCK SHEET.

CROSS-CHECKING

During the last four weeks (28 days) there were 28 collective dinners. How many of these collective dinners were cooked using:

- Purchased cereals (purchased by him or someone else, e.g. beans, rice etc.) _____
- Leaf couscous made from wild foods _____
- Home-grown cereals _____

How many times in the last four weeks (28 days) did she cook leaf couscous in the morning? _____

NUMBER OF PEOPLE EATING

Was someone away in the family compound over the last month? If yes, who _____

Have there been any funerals in the extended family?

Were there extra people visiting who ate with you? If yes who? And how many people in total?

How many children are you responsible for (the children she cooks for)?

- Number of boys =
- Number of girls =

REDUCTION IN COOKING QUANTITY

Did your husband start reducing the *monde* ration of collective dinners?

Did you (the wife) start reducing the size of your individual meals cooked from your own granary stock?

Did you (the wife) start reducing the amount of sauce you use per meal (making it more liquid)?

1.4. B1 semi-structured interviews

This SSI aimed to better understand the socio-demographic characteristics of the household, types of crops planted, size and location of fields. Interviews were carried out on a household-basis.

Explain to me the structure of your household:

- How many wives -- any widows that he re-married?
- How many sons (son of which wife?)
- How do you define a household? The old people who no longer farm – in which household are they?
- Within each household: do all men share fields? Brothers? Also farm for elderly dependants?
- Within each household: is there only one granary? Several?
- Who cooks? How often? For whom? Where do they cook – does each wife have her own kitchen?
- Who eats with whom? Who decides the quantity cooked? Who hands out the *mondé*, when the household head is absent?
- How are cooking arrangements during ‘normal’ days? What happens during ceremonies?

Explain to me the structure of your extended family:

- Do you have mother/sisters? Where do they live?
- Do you share any farm work?
- Do you celebrate festivities together – if yes, who cooks?

Where is your field? Describe it to me

- Do you find it large, small? Why? Does it produce well? What is a good harvest for you?
- Do you have several fields? Are they scattered?
- Do you move location often?

Explain to me your allocation of land:

- Have you always farmed here? From whom did you inherit the land your farm? Did you ask for extra land to farm (which you did not inherit)
- Have you ‘leased’ a part of the land you farm to someone else?
- How much of your land is ‘unusable’ / degraded? Has any land been confiscated or purchased?

Crops planted

- What crops have you just harvested? Which did you harvest first? Last? Why? How long did it take you to harvest?
- Did you help others harvest?

1.5. B2 semi-structured interviews

This SSI aimed to better understand the assets available (verification of data) and the sequence of coping strategies. Interviews were carried out on an individual basis.

Granary

- Is your granary store lasting as you had hoped? Why/why not?
- Is it finishing already? Are you worried?

Eating less

- Did the husband close the granary?
- Is the *mondé* smaller? what was it before ? what is it now? What will it be in the lean season?
- Did you reduce the sauce quantity you are cooking (making ti more liquid)
- If yes, why are you cooking less? If not, why not?

Have you already bought cereals this year?

- At what price? Were you happy with the price?
- Have you already eaten what you bought? Do you prefer to keep it for later?

With what money did you buy cereals?

- Did you sell animals? How many? Good price? Male or female? Why?
- What trading do you do? Is it going well? Why/why not?
- Where will you find money in the rainy season? Will you start of stop an activity?

Have you reduced expenses? why/why not? which ones?

Have you asked for help?

- Can you get formal credit? Why/why not?
- Do you have a bank account? Do you want one?
- If you ask a relative, who do you ask? Why?

Do you consume wild foods?

- Which ones?
- Do you like them? Why/why not?
- Do you store them?
- Do you gather them yourself? Why/why not?

1.6. B3 semi-structured interviews

This SSI aimed to better understand the coping strategies during the 'lean season'. Interviews were carried out as focus groups.

What does your day look like?

- Is it very full? Do you have time to do things apart from farming?
- Do you farm alone? In groups?
- If you gather wild foods, what time do you go?
- Is there tension between household members between who does what, when during the day?
- How did you resolve such tensions?

Do you ever go to the field hungry in the morning?

- What do you do when you are hungry
- What do you do when your child is hungry?

How is the planting going?

- How are the rains? Are you happy with them? Too much/too little? Early/late?
- How did you react if there was too much/too little rain?
- How did you react if the rains were early? If late?
- From where did you get seed to plant? Borrowed? Purchased?

What are you planting first? Why?

Where are you planting which crops? Why?

Are you still doing your trading activities? Why/why not?

1.7. B4 semi-structured interviews

This SSI aimed to better understand the accessibility of forest products. Interviews were carried out as focus groups.

Do you own any trees?

- Which species? How many? Where are they?
- Did you plant these? Are they wild?
- Do you harvest them? Do they produce well?
- Do other people steal? Do you mind? Do you do anything about it?

Rules governing access – these questions were posed of five main species

- Who has a right to harvest species X growing next to your house?
- Who has a right to harvest species X growing on one of your fields which you farm?
- Who has a right to harvest species X growing on one of your fields which you do not farm?
- Who has a right to harvest species X growing in the bush?

What happens when someone asks you if they can harvest, even if they have no 'rights'?

Have you been denied harvesting rights before? Why?

1.8. B5 semi-structured interviews

This SSI aimed to better understand the strategies used and difficulties or opportunities encountered during the study period. Interviews were carried out on an individual basis.

How did the year go?

- Seasonal patterns in labour allocation – was there a time when you were short of labour? If yes, what did you do?
- Was there a season when you were short of cash? If yes, what did you do?
- Did you have any unexpected or usually large expense? How did you address them?
- Did you delay expenses? Did you anticipate expenses?

Helping others and being helped

- Did you help others? What is too much, at the wrong time?
- Did others help you? Did you get what you needed?

What if there were 3 bad harvests in a row (this is an analogy for 'climate change')

- Would you do anything differently?
- What would you do differently?
- Are you worried that things are changing?
- How was it before, what did your grandparents tell you? Do you think it's getting worse?

How did your grandparents live?

- Did they grow the same crops?
- Did they eat the same things (spaghetti? Rice?)
- How did they earn income?
- Did they move around?
- Where there things that women do today that they could not do back then?

1.9. Key informant discussions

Key informant discussions were predominantly held with the following TREE AID staff: Mrs. A. Kirakoya (northern field assistant), Mrs. A. Bonkougou (southern field assistant), Mrs. H. Sawadogo and Mr. A. Savadogo.

Discussions of data quality and trust

- Do you think these results I am getting are realistic? Why/why not?
- How can this question, that I am trying to answer, be addressed differently?
- Any suggestions for how to 'break the ice'?

Discussions of equity

- Do you think the household arrangement for food provision is 'fair'?
- Are there people who exploit it?
- Are women happy with their role? Is their role changing?
- Are young men happy with their role? Is it changing?
- What ways do people have for 'negotiating' their rights?
- What is the role of 'grace' and 'charity' in Mossi culture? Who has a right to this?

Historical discussions

- What were things like before?
- What is different now?
- How do you think things will change in the future?
- Do you think people will be able to survive here?
- Are you hopeful for Burkina Faso?
- Are you worried about political change?
- What about changes in land tenure laws?
- How effective is the decentralisation process?
- Do people listen? Do people care?

Annex 2: Overview of the eight family compounds

Each family compound is presented on a separate page. The dashed circle indicates the boundaries of the households within each family compound, with the household's number indicated in bold in a circle in the top left corner of each household. All interviewed adults are indicated with a code. Women are represented by circles and men by boxes, with the head of the household shaded in grey. Each individual's code is comprised of three numbers:

- The number first indicates which family compound the individual belongs to
- The second number indicates the conjugal unit
- The third number indicates the position within the conjugal unit (0 = husband, 1 = first wife, 2 = second wife, 3 = third wife).

The different generations are arranged from top to bottom. To take the example of the first compound: the eldest male of the compound is listed at the top left (110), with his wives listed below him (111 and 112). Next, his sons are listed (120, 130, 150). These sons are arranged below their mothers, i.e. 120 and 150 are the both the sons of 111, but 130 is the son of 112. Such a distinction is important because allegiances are weaker between step-brothers than between brothers. If married, each wife or wives is in turn listed below each of these sons (e.g. 121 is the wife of 120). Unmarried men (e.g. 150) have no wife listed below them. Widowed women (e.g. 141) have no husband listed above them.

In two cases, the husbands of women did not live in the village, but still sent remittances home (522 and 861). In these cases, the absent husband is written into the diagram to indicate his position in the family, but is not numbered with a code because he was not interviewed. Similarly, deceased individuals are indicated in the diagram where they explain the relatedness between individuals. For example, widow #141 retains her right to live within the compound because he husband was the brother of the head of the compound (110). Similarly, son #250 retains his right to live within the compound because his father was the brother of the head of the compound (210). This information is important because the strength of allegiance within kinship groups (is the individual a direct son or a nephew?) can influence the individual's rights to communal resources.

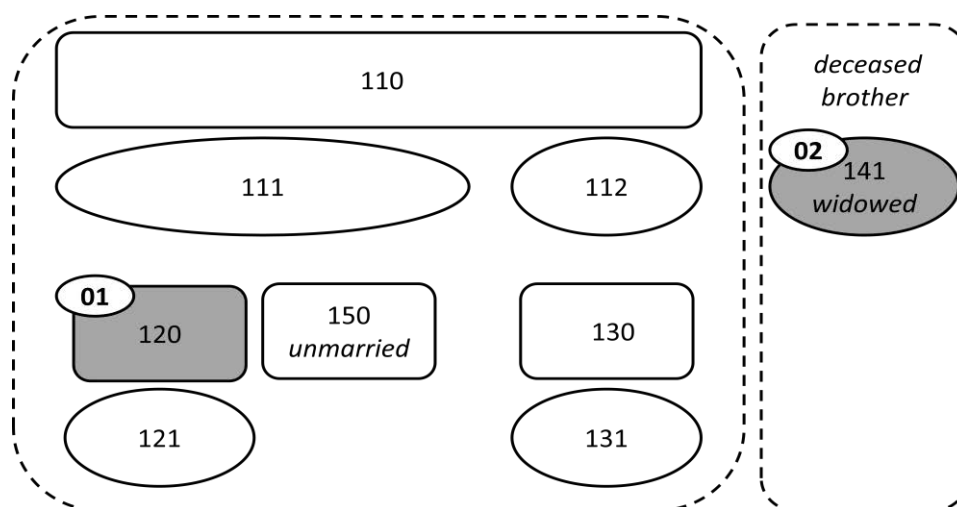
Finally, key household statistics are listed below each compound, first indicating the household code, the head of household and its food security level (very low, low or medium). Next the members of the household are listed. Men, women and unmarried men (shaded in grey) correspond to the individuals interviewed in this thesis. Elderly dependents (inactive)¹²⁸, children and babies (unshaded) were not interviewed. Finally, the landholdings¹²⁹ and farming equipment of household members are listed.

¹²⁸ Active elderly, as defined by the interviewees themselves, were included in the surveys.). Only four elderly people were excluded, who were fully blind and no longer active in any way.

¹²⁹ The size of the fields is approximate and was not verified. For men, the total area stated is often spread over 2-3 different field locations.

Family compound 1, Sima Village (near a market centre), northern field site

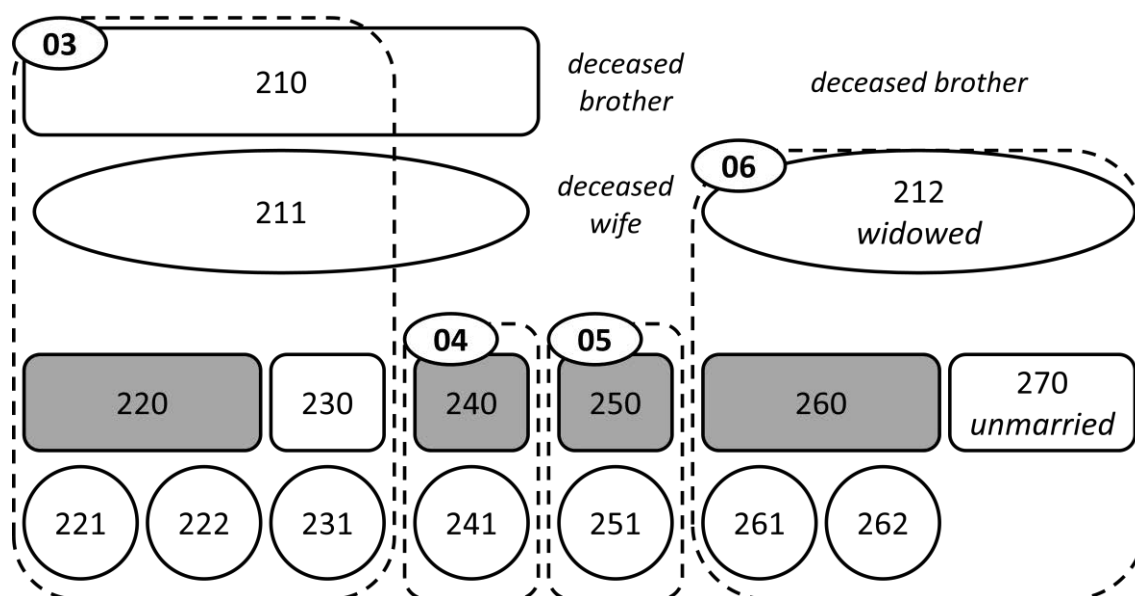
Normally the eldest member of the family (110) is the head of the compound, but in this case he is too old and has delegated this responsibility to his eldest son (120).



household code	1	2
head of the household	120	141
food security level	low	low
elderly dependents	0	0
men	3	0
women	4	1
unmarried son >18yrs	1	0
children <18yrs	9	3
babies <2yrs (by Dec 2010)	2	0
Collective field	1.5ha	0
Man's field	5.5ha + 0.5ha	0
Woman's field	0.5ha each	1ha
Plough	2	1
Donkey cart	0	0
Animals for ploughing	1 cow, 2 donkeys	1 donkey

Family compound 2, Sima Village (near a market centre), northern field site

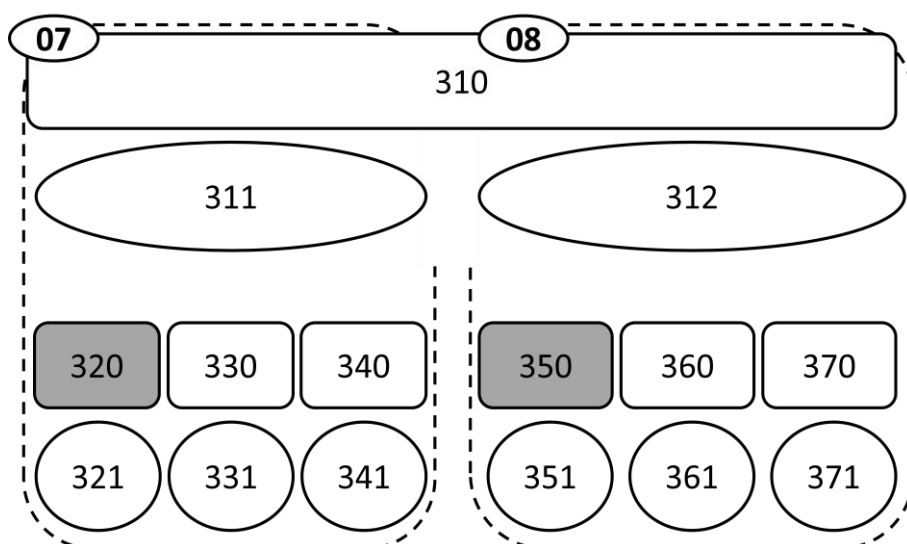
Normally the eldest member of the family (210) is the head of the compound, but in this case he is too old and has delegated this responsibility to his eldest son (220). In his role as eldest, 220 takes care of his parents (210 and 211). N.B. box #210 and circle #211 extend beyond the edge of the household to indicate that 240 is also their son.



household code	3	4	5	6
head of the household	220	250	240	260
food security level	medium	very low	low	low
elderly dependents	1	0	0	0
men	3	1	1	1
women	4	1	1	3
unmarried son >18yrs	0	0	0	1
children <18yrs	7	2	0	1
babies <2yrs (by Dec 2010)	1	1	1	1
Collective field	0.5ha			
Man's field	2.5ha	2.5ha	2.5ha	3ha
Woman's field	0.25(wife)+ 0.5ha (elderly)	0.25ha	0.25ha	0.25(wife)+ 0.5(elderly)
Plough	1	0	0	1
Donkey cart	0	0	0	0
Animals for ploughing	2 cows	0	0	1 cow, 1 donkey

Family compound 3, Koukabanko Village (far from a market centre), northern field site

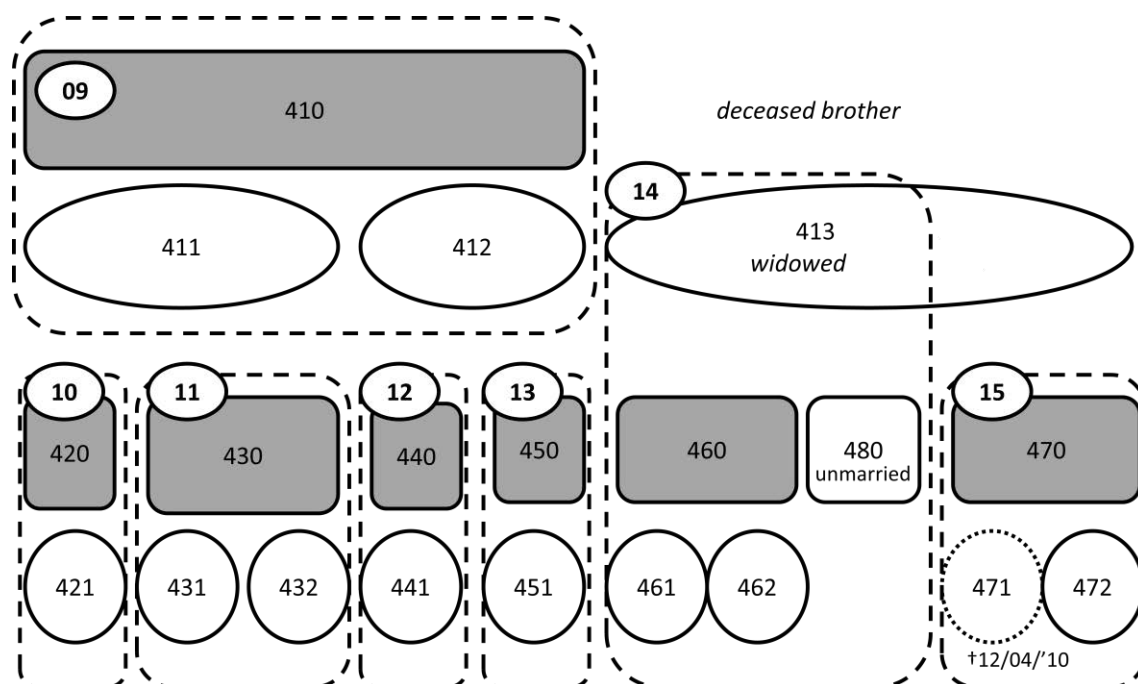
Normally the eldest member of the family (310) is the head of the compound, but in this case he is still active but has delegated this responsibility to his eldest son (320). In this family the boundaries between the two households are more fluid. Both households share the responsibility of cooking for their parents (310, 311, 312) on a rotational basis. During the lean season, both households merged, sharing all meals.



household code	7	8
head of the household	320	350
food security level	medium	medium
elderly dependents	0	0
men	4	3
women	4	4
unmarried son >18yrs	0	0
children <18yrs	5	5
babies <2yrs (by Dec 2010)	0	0
Collective field	3ha	
Man's field	1.5ha	1.5ha
Woman's field	0.3ha each	0.3ha each
Plough	0	0
Donkey cart	0	0
Animals for ploughing	2 cows, 6 donkeys	1 cow

Family compound 4, Koukabanko Village (far from a market centre), northern field site

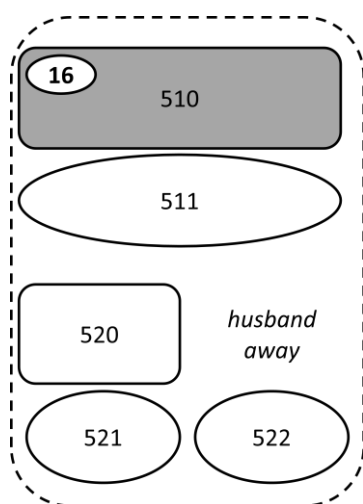
Here the eldest member of the family (410) still remained head of the compound and retained his own separate household unit. Widow #413, mother of 460 and 470, was taken care of by her eldest son (460). Wife #471 passed away in April 2010.



household code	9	10	11	12	13	14	15
head of the household	410	420	430	440	450	460	470
food security level	very low	very low	low	medium	low	very low	very low
elderly dependents	0	0	0	0	0	0	0
men	1	1	1	1	1	1	1
women	2	2	2	1	1	3	2
unmarried son >18yrs	0	0	0	0	0	1	0
children <18yrs	7	6	4	3	2	4	5
babies <2yrs (by Dec 2010)	1	1	1	0	0	2	0
Collective field	1ha					3ha	
Man's field		1.5ha	1ha	2ha	1.5ha	2.5ha	1.5ha
Woman's field	0.25, 0.25ha	0.25, 0.25ha	8x8, 8x8m	0.25ha	0.25ha	0.5, 0.5ha	0.5ha each
Plough	1	1	1	2	0	1	0
Donkey cart	0	0	0	0	0	0	0
Animals for ploughing	1 donkey	1 donkey	1 donkey	1 cow	0	1 donkey	1 donkey

Family compound 5, Donsin Village (near a market centre), southern field site

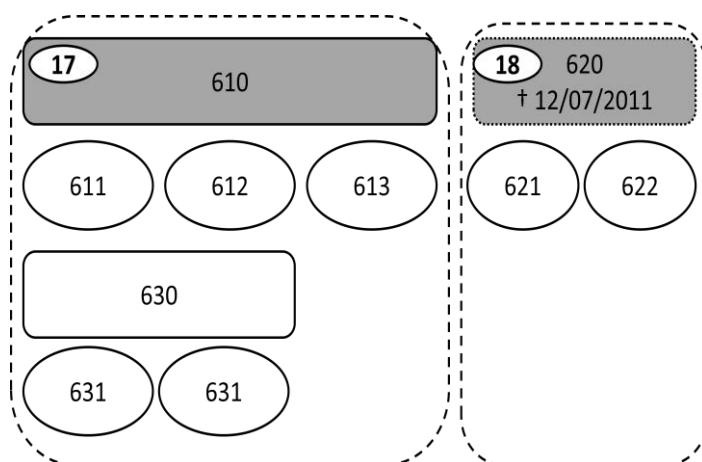
Here the eldest member of the family (510) was also the head of the compound. When initially choosing this family to be part of the study, I was told that the son (520) formed a separate household. However after starting the surveys it became clear that the whole family compound formed only one household, with all assets and cooking arrangements shared.



household code	16
head of the household	510
food security level	low
elderly dependents	0
men	2
women	3
unmarried son >18yrs	0
children <18yrs	4
babies <2yrs (by Dec 2010)	2
Collective field	5ha
Man's field	1ha
Woman's field	0.5, 0.25, 0.25ha
Plough	1
Donkey cart	0
Animals for ploughing	3 donkey and 2 cow

Family compound 6, Donsin Village (near a market centre), southern field site

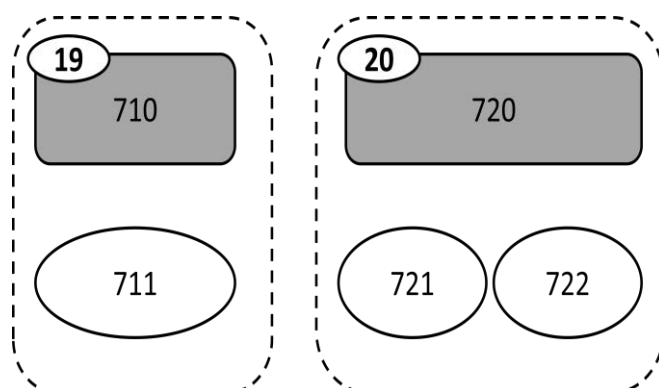
The eldest brother (610) is head of the compound. His younger brother (620) passed away after the survey period, in July 2011.



household code	17	18
head of the household	610	620
food security level	medium	very low
elderly dependents	0	0
men	2	1
women	5	2
unmarried son >18yrs	0	0
children <18yrs	11	5
babies <2yrs (by Dec 2010)	2	0
Collective field	2.5ha	
Man's field	2ha	2.5ha
Woman's field	0.5ha each	0.5ha each
Plough	1	1
Donkey cart	1	0
Animals for ploughing	4 cows, 1 donkey	1 cow, 1 donkey

Family compound 7, Kougrissincé Village (far from a market centre), southern field site

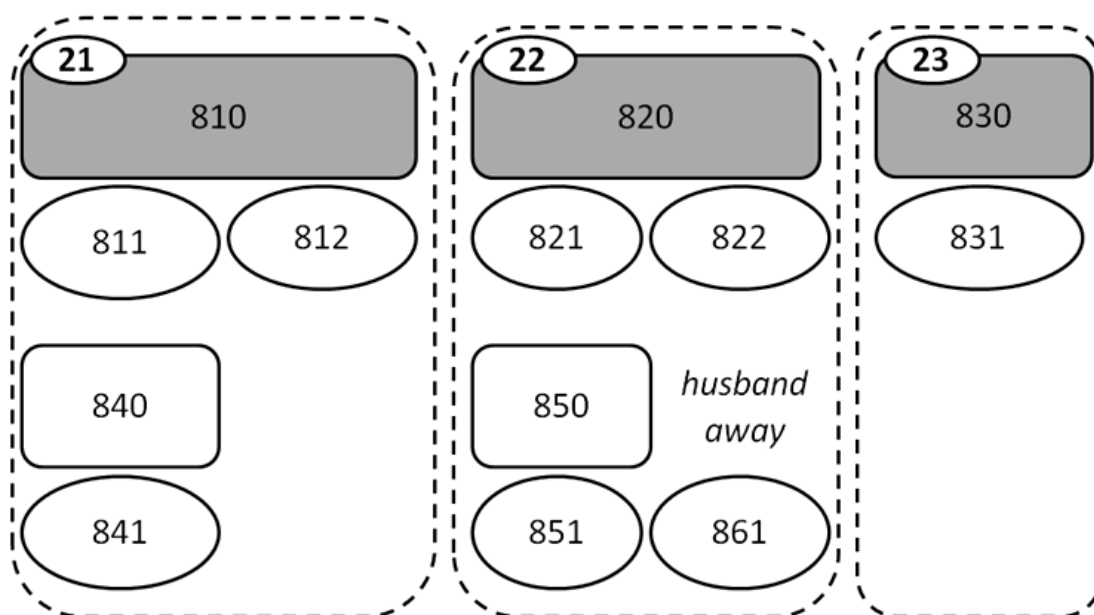
The eldest brother (710) is head of the compound, but unusually it is his younger brother (720) who is responsible for their elderly blind father and his two wives (three dependents). This arrangement was made because the younger brother is better off.



household code	19	20
head of the household	710	720
food security level	low	medium
elderly dependents	0	3
men	1	1
women	1	2
unmarried son >18yrs	0	0
children <18yrs	1	1
babies <2yrs (by Dec 2010)	1	0
Collective field		0
Man's field	3ha	4ha
Woman's field	0.5ha	0.5ha each
Plough	1	1
Donkey cart	0	1
Animals for ploughing	3 cows	1 cow, 1 donkey

Family compound 8, Kougrissincé Village (far from a market centre), southern field site

The eldest brother (810) is head of the compound.



household code	21	22	23
head of the household	810	820	830
food security level	medium	medium	very low
elderly dependents	0	0	0
men	2	2	1
women	3	4	1
unmarried son >18yrs	0	0	0
children <18yrs	6	11	5
babies <2yrs (by Dec 2010)	0	0	0
Collective field	6.25ha		
Man's field	1.5ha	3.5ha+1ha	4.5ha
Woman's field	0.75ha (wife)+ 0.5ha (elderly)	0.75 (wife)+ 0.5 (elderly)	0.5ha
Plough	0	1	1
Donkey cart	0	0	0
Animals for ploughing	2 cows	10 cows	1 cow, 1 donkey

Annex 3: Pair-wise analysis

As explained in the main body of the text, pair-wise analysis was undertaken between pairs of factors identified as important for each food source. To make the calculation of ranks easier, factors were all arranged in a row, with the sum only taken for every column, with the example given in Chapter 4 repeated below.

	has land	lacks land	has labour	lacks labour
has labour	1	1		
lacks labour	0	0		
has land			1	0
lacks land			1	0
SUM	1	1	2	0

Pair-wise ranking was used to establish the severity (S) of each factor. Where possible, an indication of the frequency (p) of each factor was also given for illustrative purposes (second-to-last row). Where no clear information in frequency was available, the default frequency value of 0.5 was assigned (each outcome was equally likely). The last row represents the product of severity and frequency, indicating the overall strength of the hazard, according to which the factors were ranked below every pair-wise table. Obstructing factors are shaded in dark grey and enabling factors in light grey.

3.1. Pair-wise table of factors determining the consumption of home-grown food

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
		extra land	lack land	no gender probl	gender blocks land access	has rights	no land rights	extra labour	lack labour	no fertiliser	no fertiliser	plough	no plough	no shock	flooding/pe st	no theft	theft	lacks food	has food	>1 granary	1 granary	good planning	poor planning	didn't close	closed granary	
A	extra land																									0
B	lack land																									0
C	no gender probl	1	0																							1
D	gender blocks land acce	0	0																							0
E	has rights	1	0	1	0																					2
F	no land rights	0	0	0	0																					0
G	extra labour	1	1	1	0	1	0																			4
H	lack labour	0	0	0	0	0	0																			0
I	fertiliser	1	1	1	0	1	0	1	1																	6
J	no fertiliser	1	0	0	0	0	0	1	0																	2
K	plough	1	0	1	0	1	0	1	1	1	0															6
L	no plough	0	0	0	0	0	0	1	0	1	0															2
M	no shock	1	0	1	0	1	0	1	0	1	0	1	0													6
N	flooding/pest	0	0	0	0	0	0	0	0	0	0	0	0													0
O	no theft	1	0	1	0	1	0	1	0	1	0	1	0	1	0											7
P	theft	0	0	0	0	0	0	0	0	0	0	0	0	0	0											0
Q	lacks food	1	0	1	1	1	1	1	0	1	0	1	0	1	0	1	0									10
R	has food	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0									8
S	>1 granary	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1							10
T	1 granary	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0							9
U	good planning	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	1					13
V	poor planning	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0					1
W	didn't close	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1	0			12
X	closed granary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0			1
plus		14	3	12	1	11	1	12	2	10	0	8	0	7	0	6	0	4	3	4	1	1	0	0	0	0
total score		14	3	12	1	11	1	16	2	16	2	14	2	13	0	13	0	14	11	14	10	14	1	12	1	
severity		0.64	0.86	0.55	0.95	0.50	0.95	0.73	0.91	0.73	0.91	0.64	0.91	0.59	1.00	0.59	1.00	0.64	0.50	0.64	0.55	0.64	0.95	0.55	0.95	22
incidence (p)		0.50	0.50	0.70	0.30	0.90	0.10	0.50	0.50	0.50	0.50	0.70	0.30	0.80	0.20	0.90	0.10	0.50	0.50	0.50	0.50	0.50	0.50	0.70	0.30	
S x p		0.32	0.43	0.38	0.29	0.45	0.10	0.36	0.45	0.36	0.45	0.45	0.27	0.47	0.20	0.53	0.10	0.32	0.25	0.32	0.27	0.32	0.48	0.38	0.29	

Resulting ranking

Rank	Factor	X	S	p	S x p
1	no theft	13	0.590909	0.9	0.531818
2	poor planning	1	0.954545	0.5	0.477273
3	no shock	13	0.590909	0.8	0.472727
4	lack labour	2	0.909091	0.5	0.454545
5	no fertiliser	2	0.909091	0.5	0.454545
6	has rights	11	0.5	0.9	0.45
7	plough	14	0.636364	0.7	0.445455
8	lack land	3	0.863636	0.5	0.431818
9	no gender probl	12	0.545455	0.7	0.381818
10	didn't close	12	0.545455	0.7	0.381818
11	extra labour	16	0.727273	0.5	0.363636
12	fertiliser	16	0.727273	0.5	0.363636
13	extra land	14	0.636364	0.5	0.318182
14	lacks food	14	0.636364	0.5	0.318182
15	>1grenier	14	0.636364	0.5	0.318182
16	good planning	14	0.636364	0.5	0.318182
17	gender stops land access	1	0.954545	0.3	0.286364
18	closed granary	1	0.954545	0.3	0.286364
19	no plough	2	0.909091	0.3	0.272727
20	1grenier	10	0.545455	0.5	0.272727
21	has food	11	0.5	0.5	0.25
22	flooding/pest	0	1	0.2	0.2
23	theft	0	1	0.1	0.1
24	no land rights	1	0.954545	0.1	0.095455

3.2. Pair-wise table of factors determining the consumption of purchased food

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		rich	poor	steady income	seasonal income	several buy	1buys	low price	high price	stored it	didn't store	near market	far market	lacks food	has food	gender ok	gender forbids buying	no shock	income/exp shock		
A	rich																				0
B	poor																				0
C	steady income	1	0																		1
D	seasonal income	0	0																		0
E	several buy	1	0	1	1																3
F	1buys	1	0	1	0																2
G	low price	1	0	1	0	1	1														4
H	high price	1	0	1	0	0	0														2
I	stored it	1	0	1	1	1	1	1	1												7
J	didn't store	1	0	1	0	1	0	1	0												4
K	near market	1	0	1	0	1	1	1	0	1	1										7
L	far market	0	0	0	0	0	0	0	0	1	0										1
M	lacks food	1	0	1	0	1	1	1	1	1	1	1	1								10
N	has food	1	0	1	0	1	0	1	0	1	0	1	0								6
O	gender ok	1	0	1	0	1	0	1	0	1	0	1	0	1	0						7
P	gender forbids buying	0	0	0	0	1	0	0	0	0	0	0	0	1	0						2
Q	no shock	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0				8
R	income/exp shock	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0				2
S																					0
T																					0
total		12	0	12	2	10	4	7	2	6	2	4	1	3	0	1	0	0	0	0	0
plus		0	0	1	0	3	2	4	2	7	4	7	1	10	6	7	2	8	2	0	0
total score		12	0	13	2	13	6	11	4	13	6	11	2	13	6	8	2	8	2	0	0
severity		0.75	1.00	0.81	0.88	0.81	0.63	0.69	0.75	0.81	0.63	0.69	0.88	0.81	0.63	0.50	0.88	0.50	0.88	0.00	1.00
frequency (p)		0.50	0.50	0.50	0.50	0.20	0.80	0.20	0.80	0.20	0.80	0.50	0.50	0.50	0.50	0.70	0.30	0.30	0.70		
S x p		0.38	0.50	0.41	0.44	0.16	0.50	0.14	0.60	0.16	0.50	0.34	0.44	0.41	0.31	0.35	0.26	0.15	0.61	0.00	0.00

Resulting ranking

Rank	Factor	X	S	p	S x p
1	income/exp shock	2	0.875	0.7	0.6125
2	high price	4	0.75	0.8	0.6
3	poor	0	1	0.5	0.5
4	1buys	6	0.625	0.8	0.5
5	didn't store	6	0.625	0.8	0.5
6	seasonal income	2	0.875	0.5	0.4375
7	far market	2	0.875	0.5	0.4375
8	steady income	13	0.8125	0.5	0.40625
9	lacks food	13	0.8125	0.5	0.40625
10	rich	12	0.75	0.5	0.375
11	gender ok	8	0.5	0.7	0.35
12	near market	11	0.6875	0.5	0.34375
13	has food	6	0.625	0.5	0.3125
14	gender forbids buying	2	0.875	0.3	0.2625
15	several buy	13	0.8125	0.2	0.1625
16	stored it	13	0.8125	0.2	0.1625
17	no shock	8	0.5	0.3	0.15
18	low price	11	0.6875	0.2	0.1375

3.3. Pair-wise table of factors determining the consumption of gathered food

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	SUM
	105	many trees	few trees	not stolen	FP stolen	buy FP	don't buy	receive FP	don't receive	store FP	don't store	has rights	no rights	poor woman	rich woman	poor man	rich man	lack food	has food	several collect	1collect s	co-wives	is alone	has kids	no kids	has time	no time	can climb	cannot climb	likes taste	hates taste	is healthy	not healthy	likes tradition	hates tradition	easy to make	hard to make	
A	many trees																																				0	
B	few trees																																				0	
C	not stolen	1	0																																		0	
D	FP stolen	0	0																																		0	
E	buy FP	1	1	1	1																																0	
F	don't buy	1	0	1	0																																0	
G	receive FP	1	1	1	1	1	1																													2		
H	don't receive	1	0	1	0	1	0																													1		
I	store FP	1	0	1	0	1	1	1	1																											4		
J	don't store	1	0	1	0	1	0	1	0																											2		
K	has rights	1	1	1	0	1	1	1	1	1	1																									6		
L	no rights	0.5	0	0	0	1	0	1	0	0	0																									2		
M	poor woman	1	1	1	0	1	1	1	1	1	1	1	0.5																							7.5		
N	rich woman	0	0	0	0	0	0	0	0	0	0	0	0																							0		
O	poor man	1	1	1	0	1	1	1	1	1	1	1	0.5	1	0																					8.5		
P	rich man	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0																					0.5		
Q	lack food	1	1	1	0	1	1	1	1	1	1	1	0.5	1	0	1	0																			9.5		
R	has food	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0																			1		
S	several collect	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0																		10	
T	1collects	1	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0																	3		
U	has co-wives	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1															12		
V	no co-wife	1	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0															4		
W	has kids	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	1	1												14		
X	no kids	1	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0													5		
Y	has time	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	1	1	1											16		
Z	no time	1	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0.5	0	1	0											5.5		
AA	can climb	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	1	1	1	1	0									16		
AB	cannot climb	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									3		
AC	likes taste	1	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.5	1	0.5	1	0.5	1	0								20.5	
AD	hates taste	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0							3		
AE	is healthy	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0						16	
AF	not healthy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						0		
AG	likes tradition	1	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	0				22	
AH	hates tradition	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0				4	
AI	easy to make	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0			22	
AJ	hard to make	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0			5	
		23.5	10	19	2	23	15	21	14	17	13	12	1.5	15.5	2	13	2	12	2	11	6	8.5	4.5	8	3.5	5	1.5	4	0	5	1	2	0	2	0	0	0	
	plus	0	0	0	0	0	0	2	1	4	2	6	2	7.5	0	8.5	0.5	9.5	1	10	3	12	4	14	5	16	5.5	16	3	20.5	3	16	0	22	4	22	5	
	total score	23.5	10	19	2	23	15	23	15	21	15	18	3.5	23	2	21.5	2.5	21.5	3	21	9	20.5	8.5	22	8.5	21	7	20	3	25.5	4	18	0	24	4	22	5	
	severity	0.69	0.71	0.56	0.94	0.68	0.56	0.68	0.56	0.62	0.56	0.53	0.90	0.68	0.94	0.63	0.93	0.63	0.91	0.62	0.74	0.60	0.75	0.65	0.75	0.62	0.79	0.59	0.91	0.91	0.86	0.64	1.00	0.86	0.86	0.79	0.82	34
	frequency (p)	0.00	1.00	0.50	0.50	0.90	0.10	0.80	0.20	0.50	0.50	0.10	0.90	0.60	0.40	0.60	0.40	0.60	0.40	0.50	0.50	0.60	0.40	0.40	0.60	0.10	0.90	0.30	0.70	0.50	0.50	0.90	0.10	0.50	0.50	0.60	0.40	
	S x p	0.00	0.71	0.28	0.47	0.61	0.06	0.54	0.11	0.31	0.28	0.05	0.81	0.41	0.38	0.38	0.37	0.38	0.36	0.31	0.37	0.36	0.30	0.26	0.45	0.06	0.71	0.18	0.64	0.46	0.43	0.58	0.10	0.43	0.43	0.47	0.33	

Resulting ranking

Rank	Factor	X	S	p	S x p
1	not healthy	0		1	0.1
3	rich woman	2	0.941176	0.4	0.376471
2	FP stolen	2	0.941176	0.5	0.470588
4	rich man	2.5	0.926471	0.4	0.370588
6	cannot climb	3	0.911765	0.7	0.638235
5	has food	3	0.911765	0.4	0.364706
7	likes taste	25.5	0.910714	0.5	0.455357
8	no rights	3.5	0.897059	0.9	0.807353
11	hates tradition	4	0.857143	0.5	0.428571
10	likes tradition	24	0.857143	0.5	0.428571
9	hates taste	4	0.857143	0.5	0.428571
12	hard to make	5	0.821429	0.4	0.328571
13	no time	7	0.794118	0.9	0.714706
14	easy to make	22	0.785714	0.6	0.471429
16	no kids	8.5	0.75	0.6	0.45
15	no co-wife	8.5	0.75	0.4	0.3
17	1collects	9	0.735294	0.5	0.367647
18	few trees	10	0.705882	1	0.705882

(continued)

19	many trees	23.5	0.691176	0	0
22	poor woman	23	0.676471	0.6	0.405882
21	receive FP	23	0.676471	0.8	0.541176
20	buy FP	23	0.676471	0.9	0.608824
23	has kids	22	0.647059	0.4	0.258824
24	is healthy	18	0.642857	0.9	0.578571
26	lack food	21.5	0.632353	0.6	0.379412
25	poor man	21.5	0.632353	0.6	0.379412
29	has time	21	0.617647	0.1	0.061765
28	several collect	21	0.617647	0.5	0.308824
27	store FP	21	0.617647	0.5	0.308824
30	has co-wives	20.5	0.602941	0.6	0.361765
31	can climb	20	0.588235	0.3	0.176471
35	don't store	15	0.558824	0.5	0.279412
34	don't receive	15	0.558824	0.2	0.111765
33	don't buy	15	0.558824	0.1	0.055882
32	not stolen	19	0.558824	0.5	0.279412
36	has rights	18	0.529412	0.1	0.052941

3.4. Pair-wise table of factors determining the consumption of received food

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
		lots relative s	few relative s	many receive	1 receives	relatives near	relatives far	time to ask	no time to ask	stored it	didn't store	not ashamed to ask	ashame d	wife can ask	wife cannot ask	lacks food	has food	relatives fine	relatives starving			
A	lots relatives																					0
B	few relatives																					0
C	many receive	1	0																			1
D	1 receives	1	0																			1
E	relatives near	1	0	1	0																	2
F	relatives far	0	0	0	0																	0
G	time to ask	1	1	1	1	1	1															6
H	no time to ask	0	0	1	0	1	0															2
I	stored it	1	0	1	0	1	1	1	1													6
J	didn't store	1	0	1	0	1	0	1	0													4
K	not ashamed to ask	1	0	1	0	1	0	1	0	1	1											6
L	ashamed	0	0	0	0	0	0	0	0	0	0											0
M	wife can ask	1	0	1	0	1	0	1	0	1	1	1	1									8
N	wife cannot ask	1	0	1	0	1	0	1	0	1	0	1	0									6
O	lacks food	1	0	1	0	1	0	1	0	1	1	1	1	1	1							10
P	has food	0	0	0	0	0	0	0	0	0	0	0	0	0	0							0
Q	relatives fine	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0					8
R	relatives starving	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0					1
S																						0
T																						0
	plus	11	1	11	1	9	2	7	1	5	3	4	2	2	2	1	1	0	0	0	0	0
	total score	0	0	1	1	2	0	6	2	6	4	6	0	8	6	10	0	8	1	0	0	0
	severity	0.69	0.94	0.75	0.88	0.69	0.88	0.81	0.81	0.69	0.56	0.63	0.88	0.63	0.56	0.69	1.00	0.50	0.94			16
	frequency (p)	0.30	0.70	0.70	0.30	0.20	0.80	0.50	0.50	0.20	0.80	0.10	0.90	1.00	0.00	0.50	0.50	0.90	0.10			
	S x p	0.21	0.66	0.53	0.26	0.14	0.70	0.41	0.41	0.14	0.45	0.06	0.79	0.63	0.00	0.34	0.50	0.45	0.09			

Resulting ranking

Rank	Factor	X	S	p	S x p
1	ashamed	2	0.875	0.9	0.7875
2	relatives far	2	0.875	0.8	0.7
3	few relatives	1	0.9375	0.7	0.65625
4	wife can ask	10	0.625	1	0.625
5	many receive	12	0.75	0.7	0.525
6	has food	0	1	0.5	0.5
7	didn't store	7	0.5625	0.8	0.45
8	relatives fine	8	0.5	0.9	0.45
9	time to ask	13	0.8125	0.5	0.40625
10	no time to ask	3	0.8125	0.5	0.40625
11	lacks food	11	0.6875	0.5	0.34375
12	1 receives	2	0.875	0.3	0.2625
13	lots relatives	11	0.6875	0.3	0.20625
14	relatives near	11	0.6875	0.2	0.1375
15	stored it	11	0.6875	0.2	0.1375
16	relatives starving	1	0.9375	0.1	0.09375
17	not ashamed to ask	10	0.625	0.1	0.0625
18	wife cannot ask	7	0.5625	0	0