

LIVELIHOOD SHIFTS IN HAUSA NIGER: THE GENDERED IMPACTS OF CLIMATE
AND SOCIAL CHANGE

by

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Chapter One: Introduction

Vulnerability and adaptation to climate risk have been widely discussed in the publications of the Intergovernmental Panel on Climate Change (Parry et al., 2007) and by researchers concerned about the implications of climate change both generally (e.g. Kelly and Adger, 2000, Füssel and Klein, 2006) and in all of the world's regions where people live (e.g. Adger, 1999, Eakin, 2006, Downing et al., 1997). Yet a focus on the ways in which people have long been dealing with climate changes and volatility has been less the center of focus than immediate, technical adjustments offered by government policies (Nelson, et al. 2007). Although they do not occupy the heart of the climate and adaptation debate, however, a number of studies have dealt with the ways in which people use their resources in order to accommodate to the changes that affect their livelihood systems, including climate (Eakin, 2006, Watts, 1983, Oluoko-Odingo, 2011). Studies like Eakin's (2006) and Oluoko-Odingo's (2011), in particular, highlight the ways in which communities and households may differ from one another. Yet more understanding is needed of the processes through which household capacities come to differ. Further, studies on community and interhousehold vulnerability are needed to clarify the ways in which populations in particular geographic areas deal with change, and how and whether their adaptation strategies are useful to prepare all households for long-term, future change.

Diversification of livelihoods, including migration and increasing use of non-farm income, are among the documented strategies for dealing with climate change (summarized in Boko et al., 2007). As population growth parallels changes in climate, agricultural intensification often forms a further element of livelihood diversification (Tiffen and

Mortimore, 1994, Aune and Bationo, 2008) Such strategies are generally seen as supporting communities' ability to adapt (Ellis, 2000, Mortimore and Adams, 2001, Block and Webb, 2001, Bryceson, 2004). The differential capacities of households and individuals to adopt diversification strategies, however, is not sufficiently understood. Further, as highlighted by Bryceson (2002), such studies tend to ignore the ways in which diversification affects inter- and intra-household dynamics. As livelihoods are reconfigured by forces including climate change, relationships between and within households may also shift as households and their members are differentially affected. A few studies on livelihoods suggest that women and men in the same household may experience different livelihood changes as a result of broader societal shifts (Carney, 1993, Angeles and Hill, 2009). More empirical work is needed on the ways in which men and women secure their livelihoods under changing circumstances (Oberhauser et al., 2004). In order to best understand how households and individuals are prepared to deal with change, I believe that the lens of vulnerability must be applied to communities in order to differentiate among those who are more and less capable of handling the future transformations of their circumstances. We must better understand community vulnerability as "the convergence of multiple processes and outcomes [that are] manifested as the inability to cope with or adapt to climate variability and change" (O'Brien et al., 2004). Vulnerability must further be analyzed at scales from community-wide, to interhousehold, to intrahousehold if we are to be certain of the effects of change on all sectors of a community. We can then have a better chance of understanding whether and how reactions to climate change such as livelihood change, including forms of diversification, affect both households as a whole and individuals within those households in

particular. This study's perspective on vulnerability will include analysis of community vulnerability, interhousehold vulnerability, and of individual vulnerability. Community vulnerability is seen through the lens of change in the study village as a whole over time, without comparison to other villages. Individual vulnerability is analyzed through the lens of gender-- in other words, gender differences are defined as individual differences in vulnerability.

The goal of this thesis is two-fold: 1) to clarify the ways in which households of a village in the climate-volatile Sahel deal with both biophysical stresses and with social change which may or may not be related, and whether their actions increase or alleviate their levels of vulnerability; and 2) to determine whether the changes undergone in the village have differential effects on the male and female members of households in order to determine how forces such as climate change may affect women's vulnerability as compared to men's vulnerability.

The thesis is composed of four chapters, with a chapter to answer each of the research questions above. Chapter two addresses the question of how households of the study site deal with climatic and social change, and the ways in which their choices affect their vulnerability to future change. In chapter two, I argue that while climatic variability may be a force causing increasing vulnerability in the study site, a variety of social and economic forces are ameliorating village welfare. Yet, with welfare improvements, there is also increasing differentiation among households. So, while economic welfare of some may be improving, vulnerability is increasing for households with fewer capabilities to adapt.

Chapter three examines how climatic and social change, in particular the historical trends toward more conservative interpretations of Islam for women's role and trends in agricultural intensification, are affecting women's role in agriculture and in the household more broadly. I argue that intensification as well as new views of women's role are diminishing women's economic and social roles in the village.

Chapters two and three each have a literature review. Since the geographic context and the research methods used apply to all chapters, both background and methods sections appear in this introductory chapter.

Background

Tounga Sarkin Noma is a village with just over 300 residents that lies seven kilometers west of the city of Birnin 'Konni in the Tahoua region of Niger (see map, following page). The village is 1.5 kilometers north of the main east-west highway, a fact which helps provide the village with fairly easy access to transportation by bush taxi and by donkey cart in the dry season. The village is also a fairly short distance from the Nigerian border, with most who enter Nigeria doing so from Birnin 'Konni, which is just 7km north of the Nigerian city of Illela, which is a major commercial center. The village was established seven generations of chiefs ago, when Sarkin Noma, then resident of the village of Gozerawa to the north, decided to use his wealth to establish his own farming space. The majority of the current households in the village have one or more members who are descendants of those who subsequently took power from Sarkin Noma's line when his son-in-law could not adequately control the family's wealth due to Sarkin Noma's twelve off-spring all being

daughters. At the time that Sarkin Noma founded the village, the entire area cultivated by him was held and worked in *gandu*-- farmed by his entire family as one unit.

Figure 1: Map of Niger and of the area near the study site, Tounga Sarkin Noma.



Gandu has long been a traditional household farming arrangement for the Hausa, with women and young men often being granted their own plots at marriage (*gamana* or *gayama*).¹ In the Tounga Sarkin Noma area, women have also inherited plots of land from their parents, usually near the village in which they were born. In *gandu*, the expectation is that all members of the household contribute their labor to the family plots, whose produce

¹ For extensive definitions of this and similar Hausa terms, see Hill (1972).

belongs to the entire household, while only individuals work *gamana* plots and are permitted to keep their own harvest. It is unclear whether women previously widely participated in *gandu* arrangements in most households, although a few either still do or did until recently. Women's use of *gamana* is more common today, but the produce is often treated as food to be used in the case of a husband's absence. Some women's *gamana* production has also been integrated into the general household stores.

Household stores of grain are placed after harvest in large, bulbous, mud-built structures which are elevated off the ground with openings only at the top to help prevent rodent entry. Users must climb ladders to enter into these granaries (*runhwa*), usually in pairs. One enters the structure to retrieve an entire grain bundle (sorghum or millet) and tie it to a rope, which the other pulls up and out. Since the operation involves climbing on home-made ladders (I infer), and because the majority of grain stores are produced by men,² only men usually enter the *runhwa* to retrieve grain. A man leaving for an extended period of time may have a certain number of bundles removed, or may leave directions with a male relative on how much is to be accessed at a given time. Once grain is removed, either men or women thresh the grain³, and women winnow and then daily pound enough grain into flour for the household to eat that day.

Women's work is centered first on the household, with daily production of millet/sorghum porridge (*tuwo*) or drink (*hura*) being their first responsibility. Women also perform all other cooking tasks (except for the rare grilling of meat), gather wood from the

² Consistent with Islamic men's responsibility to feed and clothe the entire family.

³ This depends upon household arrangements, such as whether or not the household's wives are secluded.

bush, carry water from one of the two village wells, sweep the compound daily and wash clothes. They are the primary caretakers in the household, washing and feeding small children, and taking care of any household member⁴ who is ill or too aged to produce their own food or carry their own water. They are usually the sole caretakers of children, although many men spend time with their youngest children in relaxed contexts, letting them sit with them in village plazas (*hili*), for example. In addition to their domestic duties, many women produce food for sale in the village, or buy and sell items like sauce ingredients (dried peppers, tomatoes, spices) or jewelry, makeup and clothing. Food produced for sale in the village is often sold by daughters of ten or eleven years who are nearing marriage, to help make money for the marriage. Other items may be sold out of the home, or by women who go from house to house with their wares. Some also farm millet, sorghum and beans, as well as more minor crops like rice and hibiscus. All married women (and older girls) tend to be busy during the majority of the day, year-round. Men who have become involved in irrigated cold-season onion growing, also tend to be busy throughout the majority of the work day most of the year.

Most of the households in the village consider themselves farmers (with two Fulani herders being the exceptions), and are attached to the belief that millet and sorghum are the center of their existence and are produce that are not to be sold, as they constitute the family's sustenance for the year. Despite this belief, most households depend to a rather substantial extent-- a few for even more than half of their food-- on men's outside income from labor migration, working for fellow farmers, cutting wood for sale in the city, buying,

⁴ Often including family like parents or cousins who live in other villages.

slaughtering and roasting sheep and goats for sale, gathering and selling traditional medicine, and agricultural sales such as sales of beans, bean hay and grain stalks (as livestock feed).

Women's income often goes to support needs for major family events like marriages, births, illnesses and funerals.

When either men or women have extra income, it is often invested in livestock, which can be sold if need arises in the form of food shortage, illness or wedding. According to all accounts, livestock ownership has been on a steady rise since the end of the mid-1980s drought. Some lost nearly all their livestock at that time due to the need to sell them for food and the inability to feed the livestock. All households now have at least some claim to livestock, although in a few cases it is simply through *habbanaye*, which grants individuals the right to a reproductive female (usually a goat or sheep) until she gives birth twice, and allows them to keep one or both offspring. Some households have built up substantial numbers of animals, and their assets amount to the equivalent of, at the most, 9 cows (see Methods for more on equivalency). More on assets and income is covered in the following chapters, which provide a fuller picture of the history of the village's income and assets and how they are currently distributed among men and women.

One additional piece of background must be provided to make sense of the circumstances that provided the information in this study. As I was a Peace Corps volunteer in the village from 2004 through late 2005, and continued to provide project support throughout the following fifteen months during which I lived in Birnin 'Konni, my role in the village for three years was as a source of funding and project impetus for agricultural, savings, education, health and youth development projects in the village. My role also

included being an outsider and yet a child of the village. An androgynous figure who worked with both women and men and did not quite seem to be either one, as an unmarried female adult. The role as source of funding and project impetus, however, is of significance for understanding some responses that some village residents may have offered me. In my questions, some seemed to see opportunities for future income-earning projects funded by outside entities. As such, there were a few moments when respondents seemed to be offering me the response I “wanted” (“I really want to do cold season gardening.” “Your coming brought us understanding.”). By and large, respondents seemed to be offering their honest assessments of their lives, but I think it important not to disregard the potential for future help to influence respondents’ answers.

Methods

This study is based on surveys and interviews conducted in Tounga Sarkin Noma during six weeks in the summer of 2010, but also relies heavily on evidence gained from three years of living and working in and near the village from 2004 through 2007 as a Peace Corps volunteer. Historical precipitation data for Birnin ‘Konni are also used. Fieldwork in 2010 was composed of a survey, interviews and participant observation. The survey was constructed to provide an understanding of current household income and assets and how they differed between households and across genders. The interviews aimed to provide a broader scale picture of the processes that resulted in particular differences, especially through understanding village history within living memory. The two methods, together with participant observation of livelihood activities, were intended to provide answers to questions of community, household and gendered vulnerability as posed in the introduction.

Survey

The 2010 fieldwork involved surveys of forty-two individuals (members of twenty-three of the village's twenty-four compounds). Survey respondents included 18 women and 24 men. The survey asked respondents to describe household composition, including enumerating all members of the household. Next we discussed the numbers of livestock in the household and who owned them. Livestock included both food animals such as cattle, sheep and goats and work animals like donkeys. Respondents next told me how many fields they owned, and with female respondents I also discussed their mother's field ownership and location. Then we discussed 2009 and, if remembered, 2008 harvest totals for all crops grown, and whether any of those crops were sold at any time during the subsequent year. Cold season crops and sales and animals sales were then discussed. Respondents were asked to discuss any income generating activities they pursued. Any additional assets, such as motorcycles or motorized pumps were then listed. Finally, the uses of income and assets were discussed through questions on how an individual's family funds such needs as food, clothing, livestock purchases, marriages and healthcare.

Interviews

Semi-structured interviews were conducted with fourteen individuals. Interviews focused around questions of both broader village history and on climate and livelihood history in particular. Interviewees were asked to discuss such history within their living memory, and a timeline was initially established by discussing Niger's presidents and the hunger periods experienced in the village to establish approximately when village events took place. Four interviewed individuals were women, and although I wished to interview

more women, it proved difficult due to the necessity (in many households) to talk to husbands first, and also due to the busy work schedule of women. Some women also seemed shy or nervous of talking with me on livelihood topics at all, although most eventually agreed to at least be surveyed.⁵ Several of the survey respondents also voluntarily provided additional information related to interview questions of interest. Most interviews were conducted with single individuals, but several group discussions were also held. One such discussion, with three older members of the chief's household, helped to establish a timeline for village history, including major famine names, children born in the years of major famines, the history of the establishment of the village and of village leadership. In that meeting, interview subjects also described how life in the village has changed during their lifetimes. Another group discussion with a group of leading men in the village helped to further flesh out the ways in which the village has experienced livelihood change during the lifetimes of those present at the meeting, including changes in taxes, customs policies, agricultural practices and climate. I also conducted two interviews with pairs, one pair of women and one of men, which were further fleshed out through individual interviews.

Rainfall data and analysis

In addition to information obtained in the village, the thesis makes use of precipitation data from three different sources. Despite the fact that precipitation data obtained are all drawn from the same original source of data, the government rain gauge in Birnin 'Konni, the data do not accord perfectly. One data set (KNMI Climate Explorer), and the most thorough, represents the time period from 1938 through 1980, with apparently

⁵ A number of men were similarly nervous or uncomfortable.

complete daily data from February 1945 through December 1980, with the exception of typically dry season months in 1964, 1965 and 1966. Another (Tu Tiempo, 2001-2011), has information for the same rain gauge starting in 1957 and running to the present, but the years through 1964 and possibly 1965 appear to be missing data. Daily information is recorded, but some days have no recording, zero or otherwise. Their totals do not match up perfectly with those of KNMI for months or for annual totals. The third source of data, from the official Nigerien Institut de la Statistique has only annual totals listed, and starts in 1971, extending to 2009. Its totals do not match perfectly with either of the other two sources, and appear to stay closer to middle-range numbers for annual totals than either of the other two do. Since none of the data sources cover the entire period in question and are clearly accurate, I chose to use a mean of all three, dropping out the most anomalous numbers (e.g. 4 mm of rain for a year and up to 160 mm for a year that is not known as a drought year). From 1973 to 1980, the numbers used for comparison are thus an average of all three data sources, while before that period they are averages of the two available numbers or are represented by the single available number. Graphs of the three data sources and of the mean was prepared and are presented in Chapter Two. The graph of the Birnin 'Konni precipitation mean was used to compare against informant's statements about climate history in the village.

Interview and survey analysis

Information on population growth was derived from historical descriptions from interviews, and compared to concurrent trends in Niger as a whole and in the region. The current population total is based on a nearly exhaustive census of the village, with the

exception of the household that was not interviewed or surveyed. Numbers for the non-surveyed household are estimated based on my knowledge of the residents of the household.

Land-use change is also based on interviews and surveys, as well as walking to fields with participants and observing some field boundaries. One major source of data for this comparison was female respondents' descriptions of their own and their mothers' land tenure and agricultural participation, a topic on which all female respondents gave data.

Respondents answers were coded according to their own land-owning status, mother's land-owning status and current and past farming participation. Additional comments on women's participation in farming or land tenure status was coded with the above data.

Information on access to markets through transport was drawn largely from interview data and from observation, and information on new markets, including the onion market was drawn from both interviews and surveys. The same is true for information on soil regeneration, the cereal bank and cereal-loan institution (*warrantage*) and on the arrival the new source of employment in the form of the Nigerian government minister.

Based upon the interviews and surveys, household and individual differences in income and assets were assessed. Households were initially defined as compounds (*concessions*). All compounds represent a group of individuals that farm or have farmed as a corporate entity either presently or within the past twenty years. For purposes of analysis of food security and assets, compounds were subdivided according to whether or not the members of the households share fields and granaries.

Economic elements of household vulnerability were determined through measures of household assets, including measures of the previous year's grain totals as a partial measure

of household income and as a way to estimate land holdings. One measure used for comparison was moveable assets. As the most consistent reporting was of cattle, sheep, goats, donkeys, motorcycles and motor-powered water pumps, these were the assets used for comparison. Fowl were excluded since their reporting was inconsistent. Values for each of the moveable assets was derived from informants' information on prices paid or received for a given sale, and a mean of the reported values was used to compare an asset to other assets. Most reported values varied very little, with sheep being the exception, since prices for sheep are especially high at Tabaski (Eid Al-Adha) and far lower if sold at other times of year, so that the mean for sheep is about 50% higher than the median (~18,000 F CFA vs. 12,000 F CFA). Respondents' numbers of each asset were multiplied by the asset's value, and each respondent's moveable asset total was derived by adding up the total of asset numbers times asset values.

Food security/food sufficiency for a given household was derived from the previous year's (2009) grain production totals. Bundles of grain (millet + sorghum) for a given household were totaled. Information from respondents on how much grain was needed to sustain a given household for a day was used to create an annual per person grain need. One individual was calculated to need 0.45 bowls of dry grain per day.^{6,7} Multiplied by 365 days, a person then needed 33.1 bundles of grain bundles of grain per year. The village's mean

⁶ Each unmarried (i.e. never married) individual was counted as a child. Since nearly all girls in the village are married by age 12 or 13, most females counted as children are accurately counted as non-adults. Although males, too, marry young in the village (in the mid to later teens), many teenage males consume adult amounts of food. Here, they are counted as children in all cases because they often leave the household for extended periods in dry season, and are not consuming household resources at that time. The measure is an overgeneralization, but is uniformly applied across households, so should apply minimal distortion in cross-household comparisons.

⁷ The number was calculated based on a mean of four individuals' descriptions of household needs. On a per person, per day basis, the estimates were: 0.48, 0.38, 0.51 and 0.43 bowls.

bundles per person per year were 19. The highest was 38.3 bundles per person per year, and the lowest was 1.78 bundles per person per year. Percentage food self-sufficiency (food security) was calculated based on dividing the household bundles per person per year by the annual need value of 33.1 and then multiplying by 100.

Data on two men's profits in onion gardening was used to calculate total profits. All inputs, labor payments, and income from onions were used to calculate profit in F CFA. Through the thesis, F CFA to dollar equivalents use the value of 500 F CFA to the dollar.

Information on women's cold season gardening was derived from observation, experience and interviews. Women's reasons for quitting cold season gardening were coded according to type.

Information on women's income generating activities was derived from interviews and surveys and was coded according to whether or not women were cloistered.

Chapter Two: Changing Vulnerabilities

Introduction

Context: Climate Risk and Climate Change in West Africa

The West African Sahel is a region of the world that has long been subject to highly variable rainfall on both interannual and interdecadal time scales (Nicholson, 2005). Most rain falls in the northern hemisphere's summer months, with the heaviest rains usually falling in July, August and September. In the southern Tahoua region of Niger, rains may start as early as April and last into October, but may also begin in June and last only through August. Annual rainfall for Birnin' Konni, the closest rainfall gauge to the study site, has been known to range within a single five-year span from as low as 250 mm to over 600 mm (Tu Tiempo, 2011, Institut National, 2008, KNMI, n.d.). The variation in both timing and extent of rainfall is typical of the Sahel more broadly (Nicholson et al., 2000). A 30-year-long dry trend between the late 1960's and early 1990's, with a particularly notable drought in the early 1970's, first brought significant scientific attention to the study of the region's climate, but it seems clear that variability with periodic annual droughts and long-term drier periods are typical of the region (Hermann et al., 2000; Hulme et al., 2001). A recent "greening" of the Sahel as a whole, with increased vegetation greenness as determined through analysis of the Normalized Difference Vegetation Index (NDVI), parallels (and appears partly due to) an apparent partial recovery of average rainfall since the droughts of the mid-1980s (Hermann et al., 2000). Yet, that "recovery" does not amount to a return to rainfall levels of the 1960s, and may encompass continued and possibly increasing variability. Thus, variability is the main defining feature of rainfall in the Sahel.

The future climate of the Sahel is likely to be similarly marked by variability. Within the context of predicted global climate change, the Sahel is predicted to be, on average, drier than it is today. In addition, the African climate has warmed as compared to 100 years ago and is likely to continue to warm, on average, 2 to 6°C during the next 100 years, a change which will further tax water resources (Hulme et al., 2001). Yet, as Nyong et al. (2007) note, “records show that the region has experienced marked rainfall declines and droughts that exceed those predicted by models of future climate...” So, residents of the Sahel have long been accustomed to dealing with substantial variability, and in a long-term sense, future changes may not represent an entirely new paradigm.

Past Research on Climate and Vulnerability

Despite the difficulty of understanding human change in such variable contexts, the intense research focus on climate change, as well as the welfare of Sahelians, calls for attention to be paid to placing human change in a climate context. Much of the work on global climate change has focused on climate as a major driving factor in determining future human vulnerability and need to adapt. Yet much of the literature has a highly technical and instrumental focus, examining human reaction to climate change as though climate were the *only* factor to which humans must adapt. The focus of the fourth IPCC report on adaptation, for example, while it addresses a variety of studies on adaptation, and examines several nodes of human activity that would be affected by climate, does not deeply examine the background factors that lead to climate vulnerability (Boko et al. 2007). The IPCC definition of adaptation, “adjustments in practices, processes, or structures to take account of changing climate conditions,” (Schneider et al. 2001) and of vulnerability, “the degree to which a

system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes” (IPCC glossary 2001) do not provide substantial scope for understanding the social, economic and political forces that may lead to vulnerability in the first place.

As such, a significant focus of adaptation research has been on helping developing country governments to outline policies that will help their citizens to adapt (Smith and Lenhart 1996, Thomas and Twyman 2005). The focus is on immediate, technical adjustments that respond fairly directly to climate risks without much consideration of the wealth of factors that affect human choices (Nelson et al. 2007). For example, particular means of improving crop production in order to increase drought resistance has sometimes been offered as an important solution to “feed Africa” and prevent the ravages of global climate change. Such solutions, however, ignore the many varieties and sources of change in the lives of Sahelians and other Africans. As Radcliffe et al. (2009) point out, the views that drive such solutions fall into old traps of environmental determinism, and ignore the wealth of ways in which rural people like those in this study are affected by factors outside of environment. Mortimore and Adams (2001) examine such an environmentally deterministic view (although they do not frame it in those terms) of Sahelian farmers who dealt with the drought of the 1970’s. The scientific and development perspective that they saw emerge from the drought was one of Sahelian farmers as being drawn ineluctably into poverty (and therefore environmental degradation) by the climatic crisis they were experiencing in the 1970’s. Mortimore and Adams conclude that the view was proved wrong by the multiple ways in which farmers adapted their farming, livestock and household systems to maintain

their livelihoods in the face of new challenges. Similarly, Barbier et al. (2008) examined farmers' vulnerability to climate variability and found that, from the farmers' perspective, climate was only one of many challenges that they faced, and not the most important. For them, "growing land scarcity and new market opportunities" were much bigger drivers in their decisions than was climate. In the Sahelian system climatic change, for some time at least, will not necessarily fall much outside of the range of past experiences of drought and heat. As such, climate may not be the primary force with which local populations have to contend. As Watson (in Radcliffe et al., 2009) reminds us, global climate change is likely to have major impacts, but simplifying the issues that drive any community-- including Sahelian farmers-- to climate alone, will marginalize the other issues in their lives. Issues of social, political, economic and institutional change may be far more powerful creators of vulnerability among those populations who are often characterized as those most vulnerable to climate change.

So, if climate change cannot entirely be set aside as an important force in the lives of Sahelians, yet social, economic, political, historical and institutional forces may have an equal or greater role in the choices that they make, how can we best understand those choices? Human choices are constrained by all the factors above, including environmental challenges such as climate risk. The instances where those constraints limit choices in such a way as to negatively impact the livelihoods of people may best be seen as individual, household or community vulnerability. So, a definition of vulnerability in terms that encompass factors both including and beyond climate is necessary. Previous scholars' definitions of vulnerability encompass a wider range of ideas and inputs than does the IPCC

definition. Watts and Bohle (1993) depend on a definition of vulnerability which encompasses “risk of exposure to...shocks,” “risk of inadequate capacities to cope,” and the risk of “slow or limited” resiliency. In addition to more broadly defining the “shocks” to which populations may be exposed, the Watts and Bohle definition adds the idea of resiliency to IPCC definitions. They conceptualize the shocks to which populations may be exposed as three “spaces” of vulnerability: vulnerability due to entitlement relations (in places experiencing “fluctuations in productivity and prices”), vulnerability in “power/institutional relations” which drains resources away from an area, and vulnerability due to “endemic crises and conflicts...due to entrenched processes of commercialization... and marginalization.” Their description of the “space” of vulnerability allows for a more nuanced view of both vulnerability and, by association, adaptation. Watts and Bohle thus clarify the social, political, economic and ecological forces that are obscured by the vague term “susceptibility” in the IPCC definition and give the concept of vulnerability a complexity that more closely approximates reality.

Vulnerability, with its connotation of susceptibility, and without the biologically/evolutionarily-loaded connotations of “adaptation”, provides a perspective for seeing societies as complex, interacting entities, without clear boundaries, but whose weak points can be understood and analyzed. Adaptation, on the other hand, assumes a change in reaction to a particular stimulus, and assumes that that stimulus can be found and understood. It often even assumes (despite the best Darwinian understanding of its function in organisms) progress toward a certain goal (e.g. in Jared Diamond’s analyses of the Maori and Moriori in which it a perfect adjustment to habitat is the goal and result of each culture’s

change over time). In the case of development, it is often an assumed progress toward a developed-world lifestyle. By relying instead on the term vulnerability, on weaknesses in a system or society, it may be easier to conceive of forces as being helpful or hindering to a given group. As Adger describes, it, “The concept of vulnerability has been a powerful analytical tool for describing states of susceptibility to harm, powerlessness, and marginality of both physical and social systems, and for guiding normative analysis of actions to enhance well-being through reduction of risk” (2006). The term, unlike adaptation, does not contain an expectation of a given outcome or endpoint. In other words, in approaching a community from a mindset of addressing its vulnerabilities, it may be easier to find out from the community members what they are lacking and help them to find out why. In adaptation, the lack would be more easily assumed and addressed without a full understanding of the community’s history, politics, economy and institutions. For that reason, I analyze the livelihoods of my study site from the perspective of vulnerability. Most scholars writing on communities and climate tend to use both terms under the assumption that where a community lacks vulnerability, it has somehow adapted to the forces affecting it. Addressing vulnerability alone instead allows us to turn the camera back on those forces and scrutinize them and their effects on communities. Rather than asking if a farmer is making useful choices, we can ask what constrains those choices and how constraints might be lifted and what the outcome of such a change might be in a given community’s livelihood outcomes.

Defining Vulnerability

Vulnerability has been assigned a variety of other definitions, and the history of the term draws from several different areas of study. Adger (2006) sees the term as drawing

from Amartya Sen's (1981) ideas on entitlements, as well as the hazards literature, itself made up of natural hazards (e.g. Burton, 1994), "pressure and release" (e.g. Blaikie et al. 1994) and political ecology approaches. The two approaches have fed into more current literature on sustainable livelihoods and vulnerability to poverty as well as literature on social-ecological resilience (e.g. Nelson et al. 2007, Folke et al. 2002). In defining vulnerability, Adger (2006) sees the "key parameters of vulnerability [as] the stress to which a system is exposed, its sensitivity and its adaptive capacity," and believes that those characteristics apply to all definitions of vulnerability. Kelly and Adger (2000) and O'Brien (et al., 2004) see vulnerability as having been defined or applied in two different ways. Kelly and Adger interpret the more commonly used or traditional view of vulnerability in the climate literature as being what they call "end point" vulnerability. In other words, it is an outcome of particular emissions scenarios causing climatic alterations, which have an impact on the biophysical characteristics of a place and thence cause human populations to adapt. End point vulnerability, then, is the result of a long chain of events that begin with negative climate impacts. "Starting point" vulnerability, on the other hand, assumes that the factors which currently decrease a community's ability to deal with stressors define vulnerability. The two definitions, often conflated in climate discussions, say O'Brien et al. (2004), tend to confuse scholars and policy-makers. Since "end point" vulnerability tends to encourage a focus on the results of a given climatic scenario, it centers the discuss on mitigation and government policy regarding those locations most likely to be affected by a given climate scenario. "Starting point" vulnerability puts a focus on individual and group susceptibility, and provides a broader scope to examine the forces affecting groups, forces that go beyond

climate alone. To return to Adger's (2006) definition of vulnerability, end point vulnerability focuses only on the stress to which a system is exposed (and usually only the climatic stress). The sensitivity and adaptive capacity of the system, as well as non-climatic stressors, are far better understood through the lens of starting point vulnerability. O'Brien et al. (2004) recommend using the term "net impacts" to replace end point vulnerability, and letting the term vulnerability apply only to the "convergence of multiple processes and outcomes manifested as the inability to cope with or adapt to climate variability and change." Vulnerability thus becomes a term which applies broadly to the social, political, economic and historical processes which determine the adaptive capacity and "sensitivity to perturbations" (Adger 2006), which a community experiences. As O'Brien et al. (2004) note, too, it is a term that can then differentiate among different elements (individuals, households, communities) within a given geographic context in order to assess where technical, economic or policy assistance is needed to overcome the problems resulting from exposure to new risks.

Some geographically-specific analyses of vulnerability have been done by a various scholars (discussed below), sometimes using the term adaptation, but still focusing on rural peoples' lives in a way that exposes vulnerabilities and the forces creating them rather than zeroing in on individual choices as adaptation resulting from the net impacts of a given stressor. As Kelly and Adger (2000) (as well as Cutter et al., 2003) point out, before 2000 work assessing climate change's "consequences for human well-being" was rare, and despite the work described below, much still needs to be done. Making sense of vulnerabilities in a number of different geographic contexts (as suggested by Cutter et al., 2003) is especially

important because of the economic, political, institutional, and perhaps most importantly historical contingencies that restrict current choices. Thus, although researchers have studied human vulnerabilities to climate change in the context of the many other vulnerabilities communities face, more such research is needed so that we may understand the extent to which vulnerability (to climate and other forces) varies due to different confluences of forces that affect a particular society or community. In particular, the ways in which vulnerabilities vary within communities and households need to be better understood in order to develop policies that best support those most in need of assistance.

Case Studies in Climate and Vulnerability

In this section I examine three case studies of vulnerability that provide three different geographic views, and more importantly allow insight into some of the elements of vulnerability that are the focus of this thesis. Watts (1983 a & b) highlights the ways in which traditional social structures preventing vulnerability may be altered by market forces, concluding that transitions to capitalist economies increase vulnerability. Eakin's (2006) study also highlights the influence of markets, and also the effects of agricultural intensification. But Eakin also notes the importance of off-farm income and the influence of education and health on household vulnerability. Oluoko-Odingo (2011) examines how credit, off-farm income, health, education and household size contribute to vulnerability in the form of food insecurity. Each calls attention to features of livelihoods that affect household vulnerability and that extend well beyond climate alone.

Some of the earliest work on the relationship between climate and social change was undertaken by Watts (1983a & b) studying 19th and early 20th century Hausa communities

in northern Nigeria. Watts examined drought in northern Nigeria and its relationship to hardships experienced by Hausa communities in time periods affected by the droughts. In scrutinizing drought prior to British colonial presence in Nigeria as compared to drought once the British had begun to wield substantial administrative influence in Hausaland he found that biophysically speaking, drought before the advent of the British differed little from later drought. Hausa communities, however, experienced drought in the two periods quite differently. After the advent of British administration, when drought hit in 1914 (and again in later droughts), there was widespread famine among the Hausa, which had not been the case in prior droughts, despite shortages. Watts surmised that there were non-biophysical causes to the impact of the drought among the Hausa, and in examining the forces affecting Hausa livelihoods, Watts noted that British tax structure had influenced Hausa farming choices to such an extent that the Hausa had begun to produce more cash crops in order to be able to pay taxes, the crops they grew for tax payment were subject to world commodity price fluctuations, and they were growing fewer of the foods on which they were accustomed to survive. In addition, social structures which had previously redistributed foodstuffs to those most in need had been dismantled or financially appropriated by the British administration. More broadly, the power of human actors to influence the livelihoods of rural people was greater than was the power of climate. Hausa society had learned to minimize its vulnerabilities to the vagaries of the weather, but the very means they used to allay food shortages, especially social contracts wherein foods were gathered through tax, stored, and redistributed when needed, were limited under British rule. Watts' work nearly coincided with that of Sen's (1981) work on entitlements, which similarly set out the various

means through which communities are deprived of access to the resources which they need, and similarly concluded that in many cases deprivation and vulnerability were a result of political, economic and social forces rather than strictly environmental (including climatic) influences.

Eakin (2006) outlines a similar set of vulnerabilities for farming communities in late 20th and early 21st century Mexico. As in the Sahel, the climate in the area of Puebla and Tlaxcala States is often variable and requires flexibility in farming decisions. In mountainous Puebla and Tlaxcala, both drought and unexpected freezes affect the viability of farming. Precipitation in good years is just adequate for the traditional maize crop. Climate is undoubtedly an important element in the lives of rural farmers in the area, and predictions estimate still greater variability for climatic conditions in the Puebla and Tlaxcala mountains. So, farmers' choices and opportunities will decidedly be constrained by climate, but the other factors that affect their decisions will have equal if not more influence, according to Eakin. Eakin focuses most on climate, along with agricultural markets and policy, but notes that a variety of other factors, ranging from soil degradation to pest proliferation to technology change are also important to farmers in her study area. In describing farmers' alternatives within the context of fairly rural, isolated communities, Eakin is quick to point out that farmers' choices may be markedly affected by factors that have little to do directly with farming. For example, farmers may even out their incomes through various forms of non-agricultural income, and as a result their choices may be constrained by the availability of basic education, of off-farm employment, and by ability to migrate for work. Further, even on-farm income is affected by distant forces. Some of the farming communities Eakin

studied had come to rely on irrigated vegetable crops. When trying to sell those crops, often to Mexico City markets, the farmers were subject to whatever price was named by buyers, which was often influenced by circumstances out of the control even of buyers. A crop in another region might have flourished, for example, lowering its value for Puebla or Tlaxcala farmers, or crop failure in the U.S. may increase exports to the U.S., increasing local prices. When combined with the increasing influence of international markets on what farmers are able to grow (especially as NAFTA has allowed massive imports of maize from the U.S., decreasing the profitability of growing traditional maize crops), the factors affecting farmer livelihoods and vulnerability in Tlaxcala and Puebla appear to be centered around social factors, many of which are out of the control of those whom they affect.

In Kenya, Oluoko-Odingo (2011) determined that poverty was the main contributor to the food insecurity of communities in the largely rural, heavily agricultural district of Nyando. More generally, Oluoko-Odingo focused on how factors affecting Nyando households merged to affect food insecurity. The socioeconomic status of the household, the health of its members, climatic factors and the availability of labor were all analyzed for their effects on household welfare. Nyando households were found to consume nearly all of their crops, with 69 percent “consum[ing] all they harvested,” and yet were also highly dependent on off-farm food purchases to fulfill household food requirements. In addition, off-farm employment tended to be inadequately remunerative, and credit was difficult to access. Interestingly, in a district whose main source of livelihood the author characterized as being subsistence agriculture, only 56.7 percent of household members were engaged in agriculture, which was taken as an indication that off-farm opportunities were a necessity

due to such factors as “unfavorable weather, lack of inputs [and] diminishing agricultural lands.” Moreover, the study found that smaller households containing one to three people were less likely to produce adequate food to allow for sales of food. Health factors were also an important influence on household welfare, with the author estimating that disease accounted for “20 percent of the variation in household food production” and contributing to individuals inability to participate in off-farm work or ability to complete necessary on-farm work. Oluoko-Odingo portrays climate challenges in the area in terms of drought and floods, and notes that some households were dependent upon relief programs for survival during such climate events, and therefore concluded that such households were highly vulnerable. While Oluoko-Odingo’s chosen definition of vulnerability-- “the degree of loss resulting from a potentially damaging phenomenon or insecurity of the well-being of individuals or communities in the face of a changing environment” (IGAD-DMCN 2002 in Oluoko-Odingo 2011)-- relates more closely to the end point vulnerability or net impacts of O’Brien (et al. 2004), the factors addressed in the study substantially assist in understanding the vulnerability of the district (in a starting point vulnerability sense). Poor health care, inadequate education, lack of access to credit, and insufficient sources of cash from off-farm work all contributed to making the communities in the study more vulnerable in the face of future climate risks.

The Context for Niger

Vulnerability of communities facing potentially increased climate risks due to global climate change shares many general features across different geographic locations. Most are influenced by market forces whose prices may be completely out of the control of local

farmers, and increasingly by international trade agreements which may affect what farmers can afford to grow. Some may be influenced by tax structures that require cash income. Many are influenced by their relative isolation from institutions providing healthcare and basic or secondary education. In the African context, especially, non-governmental institutions and choices made by development officials in developed-country governments are important factors influencing farmer vulnerability. Although climate is not necessarily the primary factor with which farmers concern themselves when making choices, climate is one of a suite of influences that farmers face, and which each may affect the web of other powers in rural people's lives. Each of the forces has the potential to either increase or minimize farmer vulnerability, and it is for that reason that it is important to understand the particular confluence of influences in a given geographic context so that better decisions can be made regarding institutions and policies that may affect rural welfare.

Changing Vulnerabilities in Tounga Sarkin Noma

Two Contradictory Trends

In interviews and surveys with individuals in the rural, farming community of Tounga Sarkin Noma, the web of forces affecting farmers came across clearly in interviews. People were concerned about climate in certain regards, and certainly acknowledged the influence of weather on their crop outcomes. In discussing changes in the village over time, however, they were equally and perhaps more focused on the ways in which markets, government policies, availability of transport, and non-governmental organizations affected their lives. As detailed below, overall, people tended to see climate as having been a negative factor in an otherwise improving livelihood outlook. Rains have worsened and ephemeral ponds now

rarely appear, they said, but with more hands to grow food, more agricultural products being salable in area markets and the advent of irrigated farming in the dry season, most informants saw themselves as better off than they were twenty to forty years ago. An important way in which people perceived improved livelihoods was in an increase in the acquisition of material goods like clothing and motorcycles, as well as increased ability to invest in the West African equivalent of a savings account: livestock.

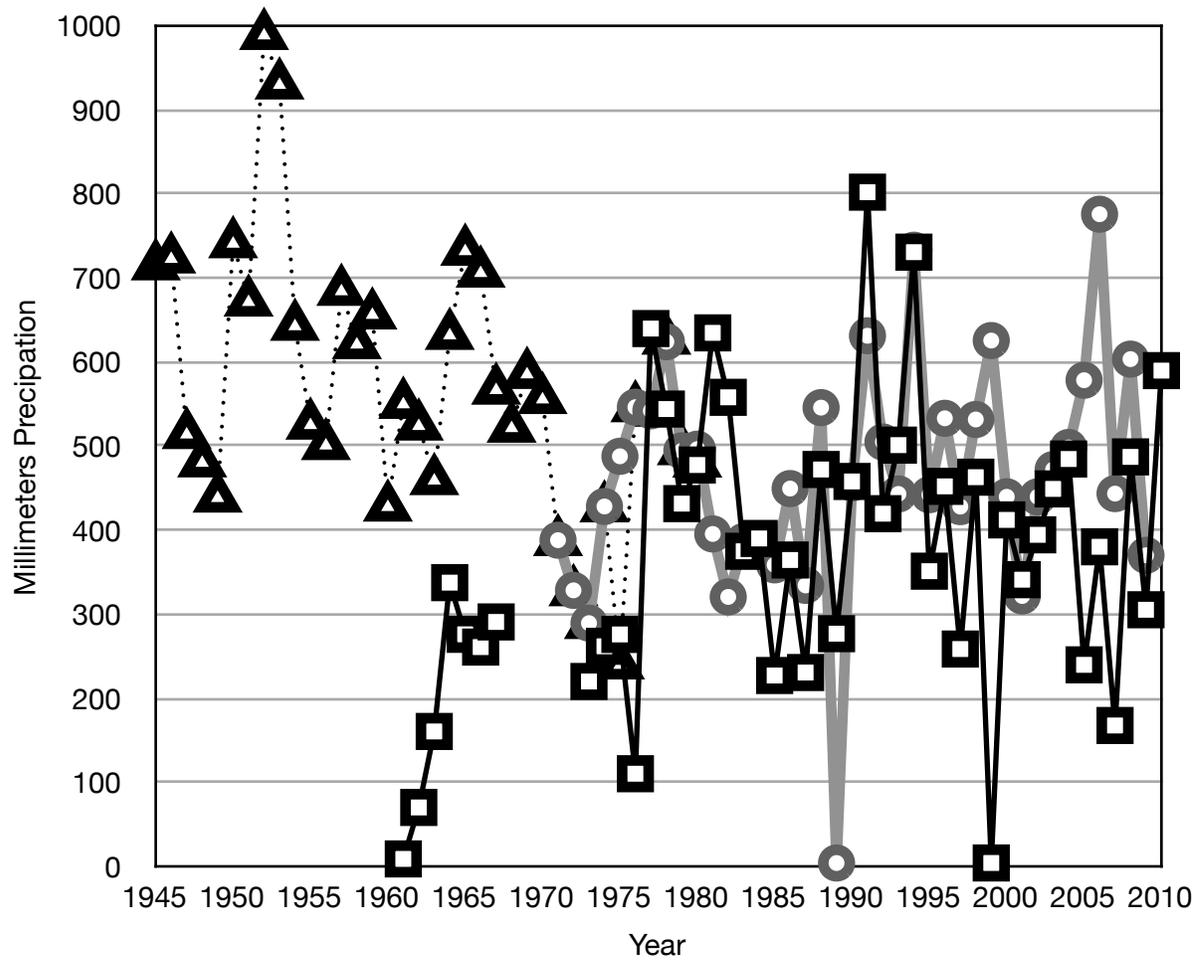
Climate: Perceptions and Reality in Precipitation Data

Residents of Tounga Sarkin Noma who were old enough to remember commonly reported that rains in the 1950s and 1960s were better than they are today. Informants also commonly reported that aside from the particularly difficult one or two years during a drought, the rains in the 1970s and 1980s often resulted in better crops than today. Individuals reported that there was more rain, but also reported that rains, particularly in the last five years, tend to have worse timing than they remember before, being too sporadic early in the season when farmers have already planted their millet crops in response to first rains or too heavy late in the season so that crops are spoiled. Prior to the past decade or fifteen years, some reported, the lowlands north of the village were regularly inundated during the rainy season. Villagers caught fish in these ponds, they said, and used the waters as they receded to grow crops like tobacco, cotton and beans after the rainy season had ended.

While, as discussed in the methods section, the direct precipitation data from the nearest rain gauge (in Birnin 'Konni) has flaws, it does provide a measure of coincidence with the memory of the villagers. In the last ten years, rains substantial enough for villagers

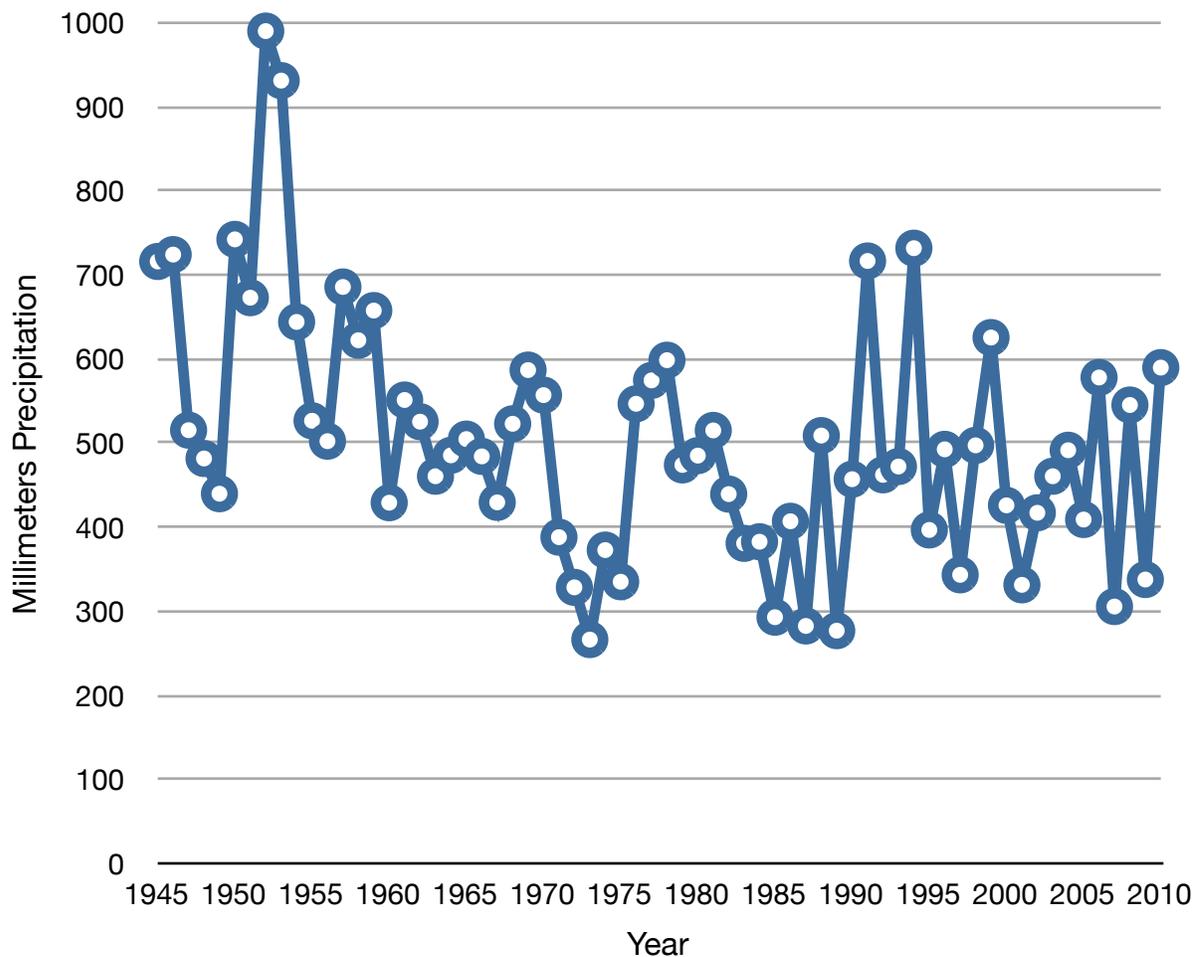
to be able to plant without replanting (arbitrarily assigned as at least 10 millimeters in a month with at least 30 millimeters in the following month) have not arrived until May or later, with only one exception, in 2010. Between 1973 and 1982, on the other hand, there were three years in which substantial rains had begun by April (three years in the same period had rains that did not begin until June or July, two of them being known drought years of 1973 and 1974). Five years in a row, from 1985 to 1989, are listed as having had rains that did not begin substantially until June. None of the years of the 1990s had such late rains, and three years had rains begin as early as April. Certainly, the data appear to support the 1970s as having commonly had early starting rains outside of drought years, and earlier even than in the 1990s and early 2000s. [text continues after graphs]

Figure 2. Precipitation in Birnin 'Konni According to Three Different Data Sources



- data from <http://www.tutiempo.net/en/Climate/BIRNI-NKONNI/12-1958/>
- Totals from Bureau de la statistique
- ▲ <http://climexp.knmi.nl/selectdailyseries.cgi?someone@somewhere>

Figure 3. Mean Annual Precipitation in Birnin 'Konni Based on Three Data Sources



Rain totals (see graphs) also appear to coincide fairly well with villagers' reports of good years and bad years. (Villager recall of the timing of droughts according to years between them was less clear, and unsurprisingly histories do not accord any better with the rainfall data than they do with each other in terms of how many years passed between droughts). Until the 1970s, rainfall totals were consistently above 400 mm.⁸ During the

⁸ Note that millet rainfall needs have been listed as 450-650mm (Brouwer and Heibloem 1986).

early 1970s, totals dropped to below 400 mm for four years in succession. Similarly, in the early 1980s, steadily falling rainfall totals through 1984 were followed by alternating years of low rainfall and moderate rainfall. While several villagers recalled the droughts as being single year events, the precipitation data makes it clear that conditions in preceding years at least contributed to the difficulty of single drought years, and possibly made hardships in multiple years. Moreover, the periods surrounding the drought years in the 1970s and 1980s appear, indeed, to have been adequate rain years, as villagers recalled-- adequate, but not returning to the highs of the 1950s. Since the late 1990s, however, there have been a series of low years alternating in two or three year cycles with more adequate years. Five of those years had rainfall totals of less than 400mm. Villagers' perception of the 1990s and 2000s as largely being more difficult and unpredictable than their previous experience (aside from documented droughts) thus appears to hold up well.

Beyond Climate: Social, Economic and Political Factors in Rural Vulnerability

Population Growth and Land Availability In Tounga Sarkin Noma, according to village informants, population has grown very quickly in the last forty years. One mid-thirty-year-old informant reported his own household as a representative example, noting that when he was a child, his household contained only three working adults, whereas it now contains twelve, with a proportionate increase in the number of children. He estimates the population of the village as a whole as having grown to six times as many inhabitants as when he was a child. His estimate of the current village total, at 300, very closely approximates my census of the village. Other informants reported similar trends. The village reflects the population growth in Niger as a whole, where the growth rate currently stands at 4.1 % (Unicef) and

Table 1: Surveyed households, with households defined as families sharing field and granary resources.

Households by Shared Fields*			
Household Number	Number of Individuals in Family	Number of Adults in Family	Number of Children in Family
1a	6	2	4
1b	6	5	1
1c	6	3	3
2	20	7	13
3	18	5	13
4	9	2	7
5	15	5	10
6	7	3	4
7	11	5	6
8	16	5	11
9	10	4	6
10a	8	2	6
10b	11	4	7
11	12	2	2
12	18	7	11
13	5	2	3
14	10	4	6
15	3	2	1
16	12	4	8
17	12	5	7
18	6	4	2
19	10	3	7
20	7	3	4
21	12	6	6
22	13	6	7
23	13	4	9
	*Note that some individuals/households are left out of the survey in this formulation.		

where the 1970 population of 4.8 million has grown, as of 2010 to over 15.8 million (U.S. IDB). With falling infant mortality, down to 160 in 2009 from 305 per 1,000 in 2009, Niger's total fertility rate (i.e. expected children per woman) is still 7.1 (Unicef), with many men having multiple wives. The village reflects all of these growth trends.

Founded by a Hausa family from nearby as an independent village, according to village oral history, and also located close to Niger's main east-west highway and the trading crossroads of Birnin'

Konni, the village is surrounded by other villages, many of which are significantly larger than Tounga Sarkin Noma. Gozerawa, for example, only two to three kilometers away, has

an estimated population of well over 1000, and Chetaou, about two kilometers away across the highway, has an estimated population of at least 750. Thus, the village began with agricultural lands that were delimited by the presence of other villages' farm lands, and which are beginning to be bought by city-based landowners as well. Like other villages in the area, Tounga Sarkin Noma has a mix of uplands appropriate for millet cropping, lowlands appropriate for sorghum, and some seasonal ponds where rice can be grown. Over the last forty years new areas have been opened up to rainy season farming. For example, the area that was formerly inundated most years to the extent that it could be used for fishing in the height of rainy season and for recessional agriculture toward the end of rainy season is now dry enough in most rainy seasons that it is used for rainy season agriculture. The area is now used for sorghum and part of that area is also now used for irrigated cold season gardening. So, in recent years, land previously unused for farming has been opened up to field use. Some of those areas, as several respondents reported, were formerly bush lands, uncultivated and used only for grazing as recently as thirty to forty years ago. A substantial portion of lowland cropping area was opened up to cultivation during President Mamadou Tandja's time, or during the past decade. In addition, respondents in their thirties and forties reported that when they were young, fields were often fallowed, and few farmers carried manure to their fields because the fields were sufficiently fallowed to recover the needed nutrition for millet and sorghum crops. Rainy season fields are now commonly manured, and manuring increased substantially during the past decade. Fields are fertilized only by manure in the overwhelming majority of cases. In cases where households do not have adequate manure to fertilize all of their fields, certain fields are neglected. Farmers reported

that they have experienced inadequate yields in those fields to which they were not able to provide manure or sufficient manure.

Although land use grew as population increased in the village, land use increases were not proportionate to the increase in population growth. While family size increased by as much as three or four times, with landholdings periodically divided among offspring when the number of householders proved too unwieldy to work as a single unit, land in use does not appear to have more than doubled. Thus, land per individual appears to have decreased markedly.

Despite the decrease in land per person, in discussing population growth and land availability, several informants emphasized the benefits of population growth. When asked what accounted for the improved welfare of the village over the past forty years, some named, as one factor among others, the increased availability of labor. They noted that as more children, especially boys, grew to an age where they were helpful in the fields, the family was able to produce more food and better sustain itself. In light of Oluoko-Odingo's findings from Nyanda, Kenya (2011), the finding is relatively unsurprising. A certain minimum number of individuals is needed per unit of land when producing, as this village does, entirely with hand tools. Some farmers noted that with support from entities such as the non-governmental organization CARE and (to some extent) from the state-supported agricultural extension office, they began to weed their fields (by hoe) a second time within the past twenty to thirty years. They described the change as having resulted partly from being taught the benefits of additional hoeing of the fields, but also named the increased availability of labor as a factor in making it possible. The progressive hoeing of all fields

owned by a family can often take weeks, and without sufficient labor, it could not be completed on all fields in time to return to previously hoed fields prior to the beginning of the bean (cowpea or black-eyed pea) harvest, which is the earliest rainy season harvest in the village, and a highly labor-intensive one as individual beans are picked from plants widely scattered over interplanted fields of millet and beans. So, although decreased or otherwise inadequate land is reported as a problem by some households, who say that they are not able to produce sufficient food on their holdings to feed their entire households, population growth itself is not yet seen as a problem in the village due to the benefits of many hands in the labor-intensive form of rainy season agriculture practiced in the village. Such labor availability is perhaps even more important for irrigated, dry season agriculture. Despite stated farmer perceptions, however, the most vulnerable households may, in fact, be suffering from a shortage of lands to produce the food they need to fully supply their households.

Access to Markets In a variety of ways, the relatively small village of Tounga Sarkin Noma has significant advantages over many of its neighboring villages, especially to the north. The village is very close (1.5 km) to the major east-west highway that serves most of southern Niger, including all of its major cities, and has fairly regular access to bush taxis along that highway (although that access is often mostly limited to the important market days in the area, three days out of the week). The village is only seven kilometers away from the city of Birnin 'Konni, and as a result when roads are dry villagers are able to travel by donkey cart to carry loads of goods like bean hay to sell in the city, avoiding the costs of bush taxi transport. The Nigerian town of Illela, just over the border from Birnin 'Konni and an easy trip by bush taxi, carries many goods used by villagers at lower prices than they can

find in Niger, and villagers are often able to return across the border with goods on which they can make a profit by selling at higher prices to their neighbors. While many villages that are further from paved roads and cities than Tounga Sarkin Noma have more difficulty accessing goods and services, as they are often on roads served by bush taxis only once a week, residents of Tounga are able to buy and sell goods and access health services relatively easily. The exception is in the rainy season, when all the dirt roads that lead to the village become inundated, and it becomes nearly impossible for donkey carts to pass. In 2003 and 2004, CARE International conducted a Food for Work project in the village, paying villagers in USDA surplus, fortified, bulgar wheat to construct a laterite road over high ground. The road gave better access to the village during the 2004 and 2005 rainy seasons, but by 2006 rain erosion of the road and heavy wind deposition of sand on it had substantially decreased its usefulness. As a result, in the early rainy season, when villagers are often in need of selling assets like livestock or remaining stocks of bean hay in order to provide sufficient food to their families until harvest, it becomes more difficult to access the most remunerative markets.

Despite rainy season difficulties, Tounga has long been well-placed for access to markets relative to its northern neighbors. As recently as 15 years ago, villages to the north rarely had bush taxi access, and their primary access to outside goods was therefore through those who brought them into the village on foot, camel or cart. As a result, manufactured goods were more expensive for them, and traders from villages like Tounga would buy goods cheaply in Illela, Nigeria, and sell the goods to the more inaccessible villages on trading trips of several weeks. Such trade was facilitated in the early 1990's by a change in the policies of

customs officials. Up until 1993, customs officials would patrol bush roads, confiscating or taxing the goods that people were carrying to sell. Under President Mahamane Ousmane, the practice was stopped, and, as a result, some of Tounga's residents were able to make up for shortfalls in their rainy season income through trading to neighboring villages.

Another way in which transport has been important to market access for residents of Tounga Sarkin Noma is in regard to access to labor markets. From at least the 1970's through the 1990's, labor migration by younger men was a common way for families to make up for shortfalls in income from rainy season production. Men traveled (and some continue to travel) to work in locations as close as Birnin 'Konni and as far away as Lagos, Nigeria and Abidjan, Côte d'Ivoire during the dry season. Some traveled for Qu'ranic school, and did not make money, but most traveled in order to earn income through physical labor like earth moving, farming and unloading trucks. A few also work in service occupations like manicuring or barbering on an itinerant basis in the bigger cities. Men usually sent money home several times during the dry season, often with friends, and returned home with both money and goods to help the family through the end of the dry season and start of the rainy season when rainy season food stocks are often running low or are gone altogether. Although families have and do depend on income from male family members working away from the village, two current village perspectives on labor migration are worth noting for the way in which they seem to minimize the importance of that dependence. One often-stated trend noticed by farmers was that with the advent of dry/cold season gardening (discussed under "Institutional Change"), fewer men are traveling for income, as in many cases they are working for their households to grow irrigated dry season

crops or are working as paid laborers for others households with irrigated fields. In addition, most respondents who discussed labor migration framed it as a last resort. Labor migration is considered dangerous⁹ and expensive due to the transportation costs involved in accessing the slightly more remunerative jobs in major cities like Lagos. There is also a sense that men should be home with their families. So, despite good access to transport into nearby smaller cities, and the necessity for income during the dry season, labor migration is not considered favorably even by those whose relative vulnerability to food shortages in hungry season force them to search for off-farm sources of income. In the minds of most, labor migration is too uncertain for its benefits to fully outweigh its risks, but some have no other options.

The means which people in the village have more recently adopted to lower their vulnerability carry, in most cases, a decreased element of risk. For example, people now sell bean hay, a crop which in the past was solely used in the home, and for which there was not formerly a market in the area. Bean hay is often sold as a crop that allows families to buy more food in the dry season as grain stocks begin to run low. Beans, too, are often treated as a cash crop now. Many families reported that although they “do not sell crops,” they do sell their beans as soon as they are harvested. Beans are often a source of income to provide for the clothing needs of the family for the year, and sometimes for purchases of livestock. Some households in the village now also sell their grain stalks from the millet and sorghum harvests, although households with more livestock usually try to keep as many of their grain stalks as they can manage. (Grain stalks and bean hay are major sources of food for livestock through the long dry season, once wild plants from the fields have dried up and

⁹ Due both to high rates of road accidents and due to lawlessness in cities like Lagos.

can no longer be gathered for food.) Thus, newly marketable rainy season products may contribute some of the explanation for why villagers reported improved welfare over past periods. The question of whether or not households are more or less vulnerable as a result of new sales does not seem entirely resolved, however. For example, income from marketing, particularly from beans, often pays for new clothes, but in the past beans were eaten at home, and clothes came from cotton grown in the fields. Both the bean crop and the cotton crop are vulnerable to crop failure, and thus the source of clothing remains, ultimately, vulnerable to the quality of the rainy season harvest. Certainly, access to outside goods seems important to help mitigate local crop shortages and to provide access to other goods not available locally. Yet, the markets that provide the possibility of cash income for goods produced and a variety of goods from the outside can also make farmers vulnerable to forces beyond their control.

An important example of the potential for such vulnerability has appeared in the village in the form of intensive onion production in the dry season, as will be discussed below. An even broader and more devastating example of such vulnerability came to the country as a whole during 2005, after widespread cereal shortages in the 2004 growing season. In 2004, a combination of drought and locusts ruined crops in areas throughout Niger. Some areas had minimal harvests compared to normal, while others had none at all. Food was in short supply in some areas, especially toward the “hungry season” of 2005 before planting began again. The reasons for the food shortage were contentious, but ultimately appear to have been related to a variety of factors, including hoarding of grain by those with large stores, the refusal of the government to open its stores of grain, and inadequate transportation of grain from areas with sufficient grain to areas without. Farmers

who had grain to sell benefitted, as prices rose steeply. Yet at the end of rainy season, as farmers were harvesting their far more substantial 2005 crops, food aid arrived in the country. Prices quickly dropped drastically, as the market was flooded with food. Farmers who had been depending on good prices for crops to help make up for their bad year were suddenly facing abysmal prices for what they had grown. It can be argued, then, that vulnerability of farmers with good crops was greater because of exposure to the wider agriculture markets. However, it might also be argued that, had the markets worked effectively,¹⁰ grain would have been available to those in the hardest hit areas long before the end of the 2005 growing season.

Other market forces have become important to Tounga Sarkin Noma, in particular market forces affecting the new cold season crop of onions. As the story of onions has much to do with institutional change, it will be covered in the following section.

Institutional Change During the first decade of the 21st century, Tounga Sarkin Noma began to experience significant involvement from outside entities, mainly CARE and Peace Corps. One resident of the village reported that during the early years of Tandja's presidency (2000-2010), the village would hear of aid being given out, but did not usually receive any of it. This resident saw improvements in village welfare as being directly attributable to work done by CARE and by Peace Corps Volunteers. While it is evident that a variety of influences have been important in changing the welfare of the village, with sometimes ambiguous or multi-faceted effects on vulnerability, both CARE and Peace Corps have introduced new methods and institutions to the village, and so their effect on village

¹⁰ i.e. according to economic models of how markets are "supposed" to work

vulnerability is important to examine. In addition, some other institutions, including government organizations, have had effects on the village in the recent past, and their impact will also be addressed.

In approximately 2002 or 2003, under its household livelihood security framework, CARE began a food-for-work project to improve degraded soil in the village. Residents dug “half moons” and *zai* holes in hardpan areas so that the area could recover and potentially be used for agriculture.¹¹ Few of the respondents reported this soil regeneration as having been a major reason for improvement of village welfare, but other soil improvement measures were regularly mentioned in discussions of change. Manuring of fields was by far the most common form of soil improvement mentioned in the context of improving well-being through improved harvests. Manuring appears to have developed partly as a direct response to the disappearance of fallowing, but those interviewed also reported that CARE and to a lesser extent government agricultural extension agents taught them to increase their use of manuring, and specifically showed them how could be more efficient when used in conjunction with *zai* holes. Thus soil improvement, and particularly expanded manure use, does appear to have had a fairly significant influence on farmer welfare. In the face of the disappearance of fallowing, manuring was a major reason for the maintenance and, at least for a time, the improvement of harvests from Tounga’s fields.

¹¹ *Demi lunes* or half moons are 2-meter by 1-meter semicircles dug in such a way as to catch materials being removed by wind or water erosion. Soil deposition creates loose soil in the arc of the semicircle, and water also catches in the arc, making it possible to grow trees or crops where the soil has loosened and water accumulates. *Zai* holes are round holes, about six inches in diameter and 6 inches to a foot deep, where manure often is placed. *Zai* holes are also meant to catch deposited soil and water to provide nutrition and moisture for crops in degraded or extremely dry soils

Another way in which both CARE and Peace Corps intervened was in creating new village institutions. In 2005, under the guidance of both CARE agents and myself, a group in the village formed an agricultural cooperative, with membership open to any adult in the village, male or female. The first action of the cooperative was to select officers who then underwent training (with an educator hired with Peace Corps project funds) in the management of grain banks. Subsequently, cooperative members who could afford the entry costs joined the grain bank through the contribution of a sack or a partial sack of millet or sorghum. The idea behind the grain bank was that members would be able to borrow grain when stores ran low in their households, and return the grain after the subsequent harvest. The grain bank worked in principle, but those least able to contribute were also often those most likely to need grain during the months just before the next harvest, and those least likely to be able to pay back any grain they borrowed. The system is still in use, but more vulnerable households continue to be those least likely to participate. Another institution was created the following year that was also designed to help farmers overcome late season shortfalls, but in this case through credit. *Warrantage*, also called an inventory credit system, also required farmers to contribute grain stores at the beginning of the season. In exchange, they received cash loans equivalent to the amount that the grain was worth post-harvest (typically the lowest price of the season). The system, like the grain bank system, was designed to help farmers avoid selling any of their grain stocks at the lowest prices of the season. In this case, some farmers used the money from loans to invest in other income-generating activities that generated profit. As a result, they were able not only to reclaim their grain at a time of year when the price was far higher (yet paying the same amount they

had originally been loaned), but also make additional income from the loan. Unlike the grain bank system, *warrantage* provided an income boost to farmers at harvest while *also* reserving grain for them to use during the hungry season. Several respondents reported that *warrantage* loans allowed them to participate in cold season gardening or to upgrade the technology they used or the number of laborers they were able to hire. Yet, just like the grain banks, those who were able to (or comfortable with) contributing their grain long-term in exchange for cash tended to be those whose households were already better off. So, while the grain bank and *warrantage* system both seem to have been influential in improving village welfare, the improvement was an element in increasing income disparities, and may be doing little for the most vulnerable households.

In 2004-5 in Tounga Sarkin Noma, as a Peace Corps agricultural extension volunteer witnessing food shortages in other villages in the region (Tounga had a good 2004 harvest), I undertook to introduce a female-focused, food-security and nutrition project in the form of irrigated cold season gardens. The village had, in the past, carried out recessional agriculture as the rainy season ponds evaporated, but had never participated in irrigated agriculture before. Initially, the project was planned as a women's garden, where women could grow vitamin-rich plants for use in their households or for sale. As plans progressed, it was agreed that the project would be shared between men and women. To make irrigated agriculture possible, two open wells were dug in a field with a high water table (a sorghum field in rainy season), which was about one kilometer from the village. One well would be assigned to the women's garden while the other would be a men's communal garden. For the first season, an extension agent was recruited to teach methods of arid-land gardening and

planting of crops with whose cultivation the village was not familiar (tomatoes, lettuce, peppers). Men, however, a few of whom had made a field trip to a village already conducting cold season gardening, chose to plant the Birnin 'Konni-area cash crop of onions. Women planted tomatoes, lettuce, peppers and a local squash. Women and children worked to prepare beds and irrigate the women's gardens, while men and older boys worked the onion plots. Due to the form of the wells chosen, all irrigation was conducted by hand, with water drawn up from the 3-4 meter wells and poured into irrigation trenches. Trenches had to be carefully constructed to ensure water ran all the way to the most distant trenches, and someone (usually a child) had to open each plot by hand to allow water to enter. Due to the level of skill and time involved in trench irrigation, some women watered with the method initially taught, filling watering cans and carrying them to plots. As time went on, most watering was conducted by children sent out to maintain plots, except for a few particularly dedicated women who continued to visit their plots twice daily. At the end of the season, women had been able to harvest a variety of vegetable crops, most of which were consumed at home, and men sold their onion crops for a small profit.

The following season's story continues with both men and women, but I take up the remainder of the women's story in the next chapter. A group of men, seeing a potential source of new income in the dry season in onions, planted even more plots of onions the following year, using both of the original wells. One or two who could afford it dug more inexpensive pipe wells in their own fields during the second year, which required the purchase of gas-powered pumps. By their own assessment, men again made a small profit during the second season, and more pipe wells were dug or planned for the following season.

Also during the third season, one family greatly diversified their crops, planting bananas, papayas, lettuce, peppers and other annuals crops in addition to onions, and succeeded in garnering a crop for most of them. Between my departure from Niger in 2007 and my return to the site for research in 2010, attempts at cold season gardening continued to expand. Several farmers attempted the lower-cost method of watering by hand (still using a trench system), but all who have tried onion cultivation with the hand watering system have given up after only a season or two, citing insufficient yields. In the 2009 season farmers experienced their first major challenges in machine-irrigated onion cultivation. Heavy rains came late, after the rainy season harvest had been gathered and onion seedlings had been planted. Some seedlings were drowned. In addition, a pest attacked the onion seedlings and destroyed a significant portion. It was an insect pest with which the villagers had no previous experience. The combination of setbacks meant that the crop had to be replanted.

One of the keys to the profitability of onions is in the timing of their harvest. The majority of onions are sold to middlemen who export onions to coastal countries like Nigeria, Benin and Côte d'Ivoire. Onion cultivators reported that the earliest onion harvesters can sell to these middlemen for as much as 30,000 F CFA (~\$60) per *kwando* or bag of onions. Far more typical of growers in Tounga is the onion grower who harvests in time to receive a price of about 15,000 F CFA (~\$30) per bag. The price, then, is best in the earliest part of the harvest season, and continues to fall (to well below 15,000 F CFA) to the end of the harvest period. Since growers in Tounga Sarkin Noma had to replant most of their crops in 2009, their prices at harvest were lower than usual. While most farmers still considered the fact that they were earning income from agricultural labor without leaving

home to be the key consideration, regardless of whether their prices were a bit lower than usual, the onion market (in 2009 at least) may have been providing farmers no benefit beyond the timing of income. A careful analysis of one farmer's investments in inputs (fuel for the pump, labor, fertilizer, seed) and subsequent income from onion sales revealed that not only did he not make a profit from his onions, but, in fact, he lost the equivalent of \$200 on the investments made in onion farming (\$500 expenditure, \$300 income from sales). Although this farmer had additional sales from tomatoes he grew (as the only highly crop-diversified cold season farmer), the sales only brought in another \$50, thus bringing his loss to \$150. Another farmer lost about \$100 on inputs and labor for his onion crop, and came out with about \$250 of cash profit for the year, after having had \$350 income from rainy season crop sales. Still another individual reported that he grew okra to cover the cost of his pump's gasoline. Again, to most farmers participating in onion cultivation, the fact of having income at the point in the season when onions are harvested, as grain stores are running low and before rains have begun for the next rainy season planting, is one important element of onion growing, alongside the fact of being able to avoid leaving home to work as a migrant laborer. Yet, depending on both conditions of cultivation and the onion market, onions may ultimately be a drain on farmers' incomes, rather than a boost. Intensive, irrigated onion growing (without crop diversification) has the potential to make farmers more vulnerable to income loss. For the moment, however, farmers who can afford to participate do make a small profit in good years. So, they consider onion growing to be their primary source of alternative income beyond rainy season crops.

Whatever profit is made, however, is made by those who have the capital to initially acquire the tools and seed, and in most cases the labor, to be able to cultivate onions. While rainy season cropping requires only simple and inexpensive tools (mainly short hoes), and seeds are usually saved from previous harvests for planting, rainy season gardening requires purchases that are well beyond the cash that many farmers commonly have in hand. A used motorized pump, bought second-hand in Illela, Nigeria, costs \$40 to \$60. A bowl of onion seed, enough to plant a field that can be watered by a single pump, costs \$200 unless a grower produces his own seed. Few go to the trouble of producing their own seed due to the space and labor requirements overlapping with those of rainy season crops or else requiring additional irrigation during the dry season. So, it is difficult to acquire the cash necessary for successful machine-irrigated cultivation. Most farmers avoid selling their crops at the end of rainy season, when prices are low, and sell only beans in order to buy clothes for the family. So, the only way most have of acquiring the inputs needed for onion cultivation is through contributing grain to the *warrantage* system. Since most families consider it a necessity to keep all of their millet and sorghum in order to feed their families through to the next harvest, and are unsure of being able to pay back a loan from *warrantage*, many are reluctant to participate in the *warrantage* system. Consequently, it is the farmers with money or grain to spare who can afford to begin cold season gardening each year.

By the 2009-2010 cold season, there were three farmers who still produce irrigated cold season crops, although male members of most other households expressed interest or intent to participate. Of the three farmers who were successfully producing onion crops (if at a loss), two were among the three households with the greatest assets in the village. Assets

measured for this category included large livestock (goats, sheep, cattle, donkeys) as well as motorcycles. Measured in “one cow” equivalents, the four most asset-rich households had the equivalent of between 6 and nearly 10 cattle. The two next most asset-rich households had the equivalent of 5.5 cattle and the mean was 3.7. The other household involved in cold season gardening had assets equivalent to just over 3 cattle, but it was one of only three households in the village whose 2009 rainy season grain harvests represented adequate or very nearly adequate grain for the year to provide for all members of the household. The two cold season gardening households with the greatest assets also had 79% and 91% food sufficiency in terms of grain from the 2009 harvest. The mean grain sufficiency for 2009 harvests in Tounga was 61%. Clearly, then, it was the better-off households who have been involved in irrigated cold season gardening.

Thus, the influence of increased market and institutional involvement on household vulnerability has had mixed and partial benefits. Certainly, being able to sell goods like bean hay and grain stalks during the hungry season has helped to minimize the extent to which households must liquidate more long-term investments like large livestock. As the rains and fieldwork begin, farmers can feed their livestock field weeds while selling their dry feedstock to urban livestock owners so that villagers can buy food to tide over the shortage period before the next harvest. In the case of intensive cold season gardening, however, the benefits are far less clear. With a growing schedule which does not allow for the earliest planting of onions, and a consequent market for onions that is not likely to provide a consistent profit after all the expenditures required, onions do not seem necessarily to be a particularly beneficial crop to the growers. Moreover, with the high costs of entry, even were

it profitable, most farmers in the village could not afford to participate. At best, onions

Table 2: Household Assets and Food Security. Assets were standardized to their equivalents in number of cows based on asset values ascribed by survey respondents.

Household Number	Asset Total in Cow Equivalents	2009 Bundles of Grain Harvested Per Person	Percent of Per Person Food Needs Fulfilled by 2009 Harvest
1a	2.1	22.5	68%
1b	2.2		
1c	1.1	22.2	67%
2	4.0	14.1	43%
3	7.0	26.1	79%
4	2.7	16.4	50%
5	9.8	30.0	91%
6	3.2	"little"	
7	1.8	6.3	19%
8	2.4	16.2	49%
9	2.2	10.7	32%
10a	5.4	20.0	60%
10b	6.4	24.4	74%
11	3.7	20.0	60%
12	7.5	20.8	63%
13	0.6	11.4	35%
14	4.2	little	
15	2.1		
16	4.5	22.4	68%
17	5.6	36.0	109%
18	1.2	10.0	30%
19	3.2	18.3	55%
20	4.6	1.8	5%
21	2.3	25.0	76%
22	3.3	38.3	116%
23	3.2	31.3	94%
Mean	3.7	20.2	61%
Standard Deviation	2.2	9.2	28%

provide a smoothing of income by providing income just before the rainy growing season, but at worst they are the crop of local elites whose own long-term welfare may be worsened by growing them.

Other institutional changes hold the possibility for some benefits for the village. Soil fertility maintenance and regeneration techniques help to provide more abundant harvests.

Cereal banks and *warrantage* cereal-loan banks do offer the possibility that the more vulnerable could obtain assistance, perhaps if the barriers to entry were lowered (perhaps with one-time outside

contributions making up the difference), or if the contributions of the more affluent were somehow to subsidize those of the less affluent.

Changing landscapes of labor While the work of the majority of farmers in the village fits under the categories so far described-- whether labor migration, agricultural labor, agriculture, service work or trade-- one new category of work has developed within the last few years. In 2009 or early 2010, a wealthy Nigerian government minister bought land lying between the village and the highway from several of the farmers.¹² Since then, a pair of villagers has acted as guardians for his property in exchange for a monthly salary. In addition, he has hired local workers to build wells, construct a house, create an irrigation system and irrigated fields and manage his cattle herd. It is unclear what the long-term effects of this new presence will be on the village. For the time being he is providing a constant salary to two local men, and also providing opportunities to experiment with a wide variety of irrigated crops. They are crops that some village farmers would not have been able to afford and most likely would not have been able to risk growing. Among them are longer-term perennial tree crops. In the changing landscape of Tounga labor and agriculture, this minister's money and influence may alter the choices of Tounga Sarkin Noma's residents.

The most vulnerable: who and why? In Sahelian rural settings, those with the least and poorest land and with the fewest salable assets are those most likely to suffer from shocks, whether in the form of difficult climatic years or in the form of other pressures from

¹² It is worth noting that one of the farmers who sold him land is one of the least food-secure in terms of grain harvest, with 2009's harvest being so small that both husband and wife told me they harvested just "a little" grain-- so little they did not think it worth counting.

taxation to lack of paid labor availability. In Tounga Sarkin Noma, of 22 households that provided information on grain availability, seven reported 2009 grain harvests that amounted to less than half of their food needs for the year (see Table 2).¹³ A further nine households reported harvests of half to three-quarters of their food needs for the year. In addition, eleven of twenty-six households reported assets equivalent to fewer than three cows, and four of those had fewer than the equivalent of two cows. Eight had both fewer than three cow equivalents and less than 75% of their food needs met by the 2009 harvest. Households like those eight, and others with low assets and inadequate food production, must depend on off-farm sources of income for their livelihoods. Yet these same households are often more limited in their options for alternative sources of income. It requires cash to travel to distant sources of employment in Nigeria and requires grain stocks to receive credit for other dry season investments for trade or cropping. Liquidating livestock for those needs means decreasing a buffer against an even worse subsequent year. Thus, the most vulnerable households must often depend on local sources of income in the form of performing farm labor for neighbors.

Conclusions

While village residents largely reported an improvement in welfare over the past thirty years, much of the improvement they reported came from sources other than their own farms. There were also positive reports about agriculture, however, despite limitations on land availability and fertility that began to appear during the past thirty years. Nearly all land under the jurisdiction of the village is now under cultivation, and none is fallowed.

¹³ Two other households reported their 2009 harvest as “little”, with the implication that it was so little as not to be worth counting.

However, manuring is making up for some of the gaps in fertility due to the loss of fallowing. Increased labor availability has made it possible to cultivate crops twice, increasing their productivity. Many respondents reported that the presence of “more grain now” than in the past, due mostly to increased labor availability, was a partial explanation for improved welfare in the village. The question that remains regarding rainy season cropping, however, is how the next generation of land division will play out for family grain availability. As nearly all land belonging to the village is now under rainy season cultivation, and the village fertility rate continues to be high, the potential for land scarcity and insufficient harvests to support family members is likely for the next generation. Ester Boserup (1965) and Tiffen and Mortimore (1994) would likely conclude that the village will adopt (and is adopting) an appropriate innovation in order to maintain its livelihoods, but just what kind of innovation the village is prepared to undertake that will substantially decrease vulnerability of the village as a whole, and of the most vulnerable families in particular, is still unclear. Tiffen and Mortimore (1994) in particular would paint the increased population (and increased labor availability) in the context of increased access to external markets (including through labor migration) as likely to generate more capital and therefore more investments resulting in diversification of the economy and the generation and use of new technologies. Some of Tiffen and Mortimore’s assessments seem to hold true for Tounga Sarkin Noma. Cultivation has intensified with increased labor. Market access has, indeed, generated some capital for the village and allowed families more flexibility in their resource use, as they are able to exchange some rainy season crops for cash and then for other goods,

from clothes to motorcycles and even livestock used to save for the future and mitigate against future shortages.

Yet, while some of the innovations have provided for diversification of the economy, with some farmers adding onions to their crops and others able to afford to buy animals and sell meat in the village, several of the innovations have proven more ambiguous for the more vulnerable members of the village, and even for the village as a whole. Cold season gardening, for example, spreads risk through the year, allowing those who participate to earn agricultural income separate from the rainy season and to offer paid labor to more vulnerable farmers in the village. Yet, the onion crop also appears to provide the possibility for overall loss of income for the farmer growing it, and to increase the exposure of all those involved to market and weather volatility. On the other hand, the saving and borrowing institutions created in the village appear to provide some clear potential benefits for those households with substantial rainy season income and savings. However, due to their barriers to entry (needing to have sufficient grain to contribute in the first place), these institutions may create increased income and opportunity disparities between households. Although more vulnerable households may benefit on small basis through the incomes they are able to earn from others who can afford to invest, they are unlikely to be able to invest themselves in income diversification or new forms of agriculture because their participation in paid labor, according to most, was only enough to fill in food gaps in their rainy season harvests. Thus, while the overall thesis that population growth results in new benefits may hold true in some respects, it also appears that while it provides increased income for some, it may not assist the most vulnerable households to prepare for challenges in the form of difficult weather or

unexpected social change. The vulnerability of already vulnerable households may either remain stagnant or even worsen as lands are further divided and new income opportunities remain most available to those who already have means.

Chapter Three: Gender and Vulnerability

Introduction

The last chapter dealt with community and inter-household vulnerability resulting from the confluence of climate risk, land availability and fertility, market access and shifting institutional influences. This chapter builds on that foundation to examine how changing biophysical and social forces are affecting vulnerability at a still more intimate scale-- that of intrahousehold dynamics. Shifts in the social structure of Tounga Sarkin Noma have resulted from a confluence of forces whose sources, at first glance, may appear quite unrelated, but which have interacted in such a way as to profoundly affect the role of women in the household as regards both work and resource access. Women's role in agriculture has been reduced and altered, and women's access to land has also decreased. In light of the significant participation of women in agriculture in almost every context in Africa, it is important to understand the forces that have led women in this particular context to lose their engagement with agriculture. One key element to understanding these forces is the history of Islam and women in the Sokoto Caliphate, and how its lasting influences have affected women's role in the contemporary household in the southern Tahoua region. I will begin, therefore, by addressing the history of Islam and women in the area and then return to how conservatism has interacted with population changes and agricultural changes to deeply alter the extent to which women participate in agriculture in the area surrounding Tounga Sarkin Noma.

Women's Changing Role Under the Sokoto Caliphate

Women's Roles Before the Jihad In the early 19th century, Hausaland underwent a substantial shift in women's roles due to the advent of a stricter and more conservative variety of Islam. Available evidence on pre-Islamic Hausa culture seems to indicate that women's role in rural, agricultural Hausa households was much the same as that of other rural African women. Evidence from Barkow (1972) and Greenberg (1947) demonstrated that women in non-Muslim or Arna Hausa populations in mid-20th century Nigeria were far more freely engaged in life outside of their households than was often the case for the area's Muslim women. Significantly, Arna women at that time were substantially involved in agricultural work. Both Barkow and Greenberg use that evidence to suggest that rural women in pre-Islamic Hausa society (prior to the 19th century) were similarly more involved in life outside of their households, and including in agriculture. While when Greenberg and even Barkow were working in Nigeria, women in Muslim communities there were largely secluded, women continued to live far more public lives in places like Tahoua's immediate neighbor to the east, Maradi. In Maradi's urban area, women do not appear to have adopted seclusion before 1940, and rural women in the area held onto Arna, or pagan, identity long after the urban areas became predominately Muslim (Cooper, 1994). Even as recently as the 1990's, Cooper (1994) notes that while rural (and urban) people have adopted many features of Islam, their practices are "highly syncretic" with continued reliance on Arna priests for "intervention in their affairs, particularly those related to love and agriculture." Moreover, in rural Maradi, being Muslim does not require that a man bar his wife from agriculture, nor does it preclude a woman from choosing to farm (Cooper, 1994). Yet as Maradi's male

traders, influenced by practices in Northern Nigeria, increasingly adopted wife seclusion, more and more of Maradi's urban women became secluded after 1950. Rural women, too, have begun to adopt seclusion, although Cooper (1994) assigns their reasons for adopting seclusion to avoidance of the arduous labor of agriculture and its low status rather than to religious reasons, an assessment which may not fully apply to Tahoua rural women, as discussed in the Results and Discussion section of this chapter. In summary, rural Hausa women appear to have been substantially involved in agriculture prior to adopting Islam, and some did not see Islam as a reason to bar women from agriculture. Yet, as conservative practices of northern Nigeria were increasingly adopted in the Maradi area, partly through the increasing influence of traders, women became more likely to become secluded and also more likely to withdraw from agricultural participation.

In other regards, women's role prior to the jihad that brought about the Sokoto Caliphate appears to have been more public and influential. In pre-jihad Hausaland, female political leaders were reasonably common, holding "important titles and offices" (Mack, 1988). Some of the power once wielded by women is echoed by the head cloths adopted by female Islamic teachers in northern Nigeria who teach (exclusively) other women (and whose focus is solely on increasing Qu'ranic knowledge among women). Their head cloths were created in imitation of the Inna of Gobir, the sister of the sultan of Gobir, who wielded considerable political and spiritual power in her own right as a practitioner of the spirit tradition of *bori* (Mack, 1988). Within the context of ruling powers, pre-Islamic female slaves similarly had more power than did female slaves after Islam. Female Kano palace slaves, for example, wielded influence not only through their role as concubines and

therefore the bearers and nurturers of future rulers (a role whose influence among rulers was known to be substantial, if hidden), but also through far more public roles such as the acquisition and distribution of grain for the palace populace and the control of the palace dye pits. Control over grain embodied power because it was the first form of state-imposed tax in the area, with authority over its collection and distribution representing a substantial locus of power within the palace. Similarly, the dye pits were economically important to Kano because of the importance of dyed goods in the trans-Saharan trade. Yet even such relatively ambiguous forms of power as the authority wielded by economically-influential slaves were to be diminished for women under the Muslim caliphate which swept away other forms of authority in Hausaland at the turn of the 19th century.

Uthman dan Fodio's Influence on Women's Role

The jihad which occurred in Hausaland in the first years of the 19th century was the culmination of an Islamic integration which had progressed through stages throughout West Africa. While it began as the religion of outsiders trading across the Sahara (“minority”/“quarantine” Islam), it was slowly integrated with other West African religions in the cities (“court” Islam). Ultimately, the leaders of a series of jihads introduced Islam to the populace at large while pushing for a more pure Islam, free of associations with non-Islamic traditions and embraced by both urban and rural peoples (“majority” Islam) (Robinson, 2004). One such jihadist leader was Uthman dan Fodio, descendent of generations of generations of well-educated Sufi Fulani who were part of a movement advocating for more public engagement and broader Islamic education (Mack and Boyd, 2000). Uthman led a movement which overthrew existing leaders throughout Hausaland and

beyond within under a decade. While Uthman dan Fodio's movement encompassed a number of goals emphasizing a more complete adoption of Islam, I focus here on his strictures regarding women.

Uthman dan Fodio's actions regarding women were at least partly in reaction to poor treatment of women he saw within the confines of ordinary marriages. He deplored Muslim married men who “fail to dress, house and feed their wives adequately, show favouritism between [wives]... beat them... [and] do not educate them” (Boyd, 1989). Yet, he had strong and particular views on what the women themselves should be doing, ranging from a belief that women should not participate in (then typical) communal farm work nor herding, to a belief that they should avoid going to the well and the market, and should dress in the veil that he believed Islam dictated. In regards to his own wife Maimouna, he felt that she had grown up “enjoying a degree of freedom [which was] unwarranted,” although quite typical of young women at the time (Boyd, 1989). He convinced her that it was unacceptable to go to the market to encounter her friends (Boyd, 1989).

Uthman dan Fodio's work carried forward through his children, of whom the most prominent woman was Nana Asma'u. Nana Asma'u was a very public figure, an advocate for women's Islamic learning and for women's rights in divorce and custody, a teacher trainer, writer and healer. She advocated for women's spiritual equality and emphasized the active role of women in the Muslim community (Boyd 1989, Mack and Boyd 2000). Yet, while Asma'u herself was a very public figure, she was a women's figure, a women's educator and healer, and a writer for women. She was not a political leader, nor did she advocate for a more broadly public role for women. Certainly her and her father's influence

appear to have been important for women's Islamic education, as women and girls in Hausaland today often participate in Qu'ranic learning, including reading, writing and memorization of the Qu'ran and Hadiths. Modesty in the form of seclusion and education can go hand in hand, as described in the life history of Hajiya Ma'daki, who was raised attending Qu'ranic classes, was secluded all her life (veiled when in public), yet opened a girls' school in Katsina (Mack, 1988). Yet at least equally common are examples like Hajiya Husaina, who was strictly secluded until her husband's death, and until that time never visited the commercial center of her own city of Kano. Neither she nor her daughters were allowed to attend school (Schildkrout, 1988). The Caliph's heritage regarding women was therefore mixed. In some cases, women's (religious) education was supported and substantially increased, yet women's power in public spheres was substantially reduced. For an additional example of the latter, one can return to the female palace slaves in Kano. Jihadist leaders there took power from them: control over the dye pits and over grain acquisition and distribution were both turned over to male slaves in the years following the jihad. The change "dovetailed with religiously sanctioned retrenchments of women's socioeconomic and political cultural powers, a way of marking Fulani religiosity in contradistinction to the Hausa-led past" (Nast, 2005). Thus, despite positive changes in the role of women brought about with the jihad in the form of education and (to some extent) rights in custody and divorce, in a variety of ways women's public presence and influence was reduced. While some have argued that, as a consequence, women exerted more power through their private spheres, the argument does not seem to fit the case of the village of Tounga Sarkin Noma, as will become clear in the following sections.

The influence of Uthman dan Fodio's Caliphate on women's role in the areas under the influence of the jihad resulted in a Fulani-Hausa society in northern Nigeria and southern Niger that slowly emphasized a more private role for women, in which women were discouraged from participation in the public sphere and were encouraged to depend on their husbands for their support. While many women, particularly in urban areas, used the opportunities provided by seclusion and withdrawal from agriculture to become petty traders and to keep the income for their own uses, others have simply found their rights to economic participation curtailed and their ability to make new social ties hampered by the limitations of seclusion.

Contemporary Trends in Women's Role

In its location in the southern Tahoua region, Tounga Sarkin Noma is flanked by regions whose influence on it and on women's role in the village is diverse. To the east is the region of Maradi, whose early rebellion against the Sokoto Caliphate has been tempered by the strong influences of merchants who have slowly encouraged the region to adopt the more conservative forms of Islam from the former Caliphate (northern Nigeria), which include women's seclusion (Cooper, 1997, Cooper, 1998). To the west and north are Dogon Dutsi and the Adar region, both of which have longstanding associations with the spirit tradition of *bori*, that has variously been opposed to and integrated with Islam (Masquelier, 2001 and Echard, 1991). To the south lies Sokoto, Nigeria, the original center of Uthman dan Fodio's jihad. As previously mentioned, the Maradi area has increasingly adopted the practice of secluding wives, and women have increasingly withdrawn from agriculture as well. Some women have chosen to "acquiesce to seclusion in order to limit the demands upon their

labor, only to find that their husbands interpret their dependent status as justification for denying them their traditional usufruct rights to land through marriage” (Cooper, 1994). The areas of Dogon Dutsi and Adar, on the other hand, have maintained stronger associations with *bori* spirit practices, which in some ways grant more power and influence to women than Islam. Yet, both Adar and Dutsi have come under increasing Islamic influence, as well, with *bori* traditions being increasingly marginalized and practiced much less openly with the most influential spirits increasingly possessing only men (Masquelier, 2001 and Echard, 1991). Meanwhile, northern Nigeria has maintained the conservative traditions inspired by Uthman dan Fodio, including the widespread practice of wife seclusion. Increasing trends of sending girls to Qu’ranic primary school¹⁴ and boys to public primary school¹⁵ appear, in fact, to be supporting increased female seclusion by preparing girls only for lives lived within the confines of the household. Secluded women and women in general in Muslim Nigeria now have minimal if any involvement in agriculture (Robson, 2000). In addition to being at the center of a region that has come under increasingly conservative influences, Birnin ‘Konni and its surrounding villages are influenced by frequent radio broadcasts by religious leaders, who tend to emphasize a fairly conservative brand of Islam, including the rights of husbands to control their wives (alongside the Qu’ranic obligation of husbands to support their wives) (personal observation). The trends and influences in the areas surrounding the village of Tounga Sarkin Noma, then, seem to be toward the adoption of an

¹⁴ Qu’ranic primary school is a four-year course that does not prepare students for entry to secondary school.

¹⁵ Public primary school is a six-year course permitting secondary school entrance.

increasingly conservative form of Islam that encourages some to adopt wife seclusion and many to assume that women need not have a role in agricultural production.

Coquery-Vidrovitch (1994) points out that, with Islam as justification, secluded Hausa women are among the only “stay-at-home” wives in Africa. Women in Hausaland have a reputation for being merchants operating out of their households (Hill, 1969, Coles and Mack, 1991), a form of occupation which still allows a fairly high level of seclusion in which women do not leave their households during the day and never without their husbands’ permission (Dunbar, 1991). Occupations like hairdressing, sales of cloth or other goods, and even sales of cooked food can be undertaken by women without leaving their households (Cooper, 1997, Callaway, 1987). Yet, seclusion does limit the potential economic activities of women (Dunbar, 1991), including limiting their ability to make new contacts with women not already in their circle who might be new customers or suppliers and limiting their contacts to the local area (Hill, 1972). Although the variation in seclusion is substantial, some forms of seclusion discourage women from participation in farming and from any economic activities that involve exiting the household (Dunbar 1991, Cooper 1997, Watts 1983). The influence of surrounding regions is encouraging those in the area of Birnin ‘Konni to adopt some of the more restrictive practices.

Intensification, Gender and Vulnerability

Alongside a trend toward increasing seclusion in the area of Tounga Sarkin Noma has been a trend toward women’s withdrawal from agricultural production. The literature on agricultural intensification and gender provides some background to understanding the social processes that have been occurring in southern Tahoua. Two scholars, in particular, have

examined how changes in agricultural and social practice have altered women's roles, often increasing their vulnerability. On the north bank of the Gambia River, Schroeder (1993) examined market gardening systems which women had developed under pressures of donor financing, falling groundnut prices (the primary cash crop and a men's crop), access to new markets in Senegal and deregulation of food and fertilizer prices. Crops were grown on land owned or controlled largely by men. Women's horticultural crops began to constitute a substantial portion of the cash income for households, over which men and women bargained among themselves about how the money should be spent. Some women avoided the issue altogether by spending all of their market proceeds on goods needed for the household before returning home from market. Women's labor in their gardens also took them away from the home at a time of year when men expected additional domestic labor from them, inspiring resentment. As women slowly began to assert rights to land through the ("shady" because not sanctioned by landowners) practice of tree planting (as trees belong to the planter), male landowners became increasingly concerned over potential loss of their land. Male landowners subsequently reasserted their rights to land by planting their own trees and eventually shading out the women's gardens, making it impossible to grow crops. Thus women's vulnerability to income loss or lack was increased as landowners reclaimed their land through tree growth, and women's rights to subsidies from non-governmental organizations called into question (Schroeder 1993).

Carney (1993) analyzed similar processes in southern Gambia, while assembling the history of how land use, labor allocation and land rights developed from the nineteenth century on. Among the findings most applicable to this study were the "unwitting

legitimization of male control over the surpluses” that resulted from a 1960’s-1980’s international development venture to encourage irrigated rice growing to protect Gambians against drought. The process tended to increase women’s workload while decreasing their rights to land. Women subsequently attempted to assert their rights to *kamanyango* (individually worked) plots, but often came into conflict with the “claims of junior males for individual land rights” (Carney, 1993, p. 414). As international development schemes began to focus on women in the 1980’s, they increasingly encouraged the creation of women’s horticultural plots to “bolster female income-earning opportunities” (Carney, 1993, p. 415). Women in The Gambia have long been vegetable growers, but the new gardens were often supported by NGO’s whose “support for well construction has proved crucial to women’s negotiations with male landowners and village elites for access to land for communal vegetable gardens” (Carney, 1993, p. 417). Women are sometimes granted rights to farm year-round, and sometimes only during the dry season, with the plots being used for cereal production in the rainy season. Vegetable gardening is highly labor-intensive in terms of both cultivation and marketing, but has substantial returns when women sell at weekly markets, often surpassing their husband’s earnings from peanut cash crops. The irrigated horticultural plots became a way for women to reassert their rights to using land and controlling its produce, rights which had been lost as irrigated rice growing allowed men to increasingly control both land and women’s labor. While women’s role within the agricultural landscape is still contested, as men expect to draw on their labor to work irrigated “family” rice plots without not allowing the proceeds from the labor to pass to women, women have found ways to establish new rights to use of land, and of their own

labor and produce through NGO support for horticultural projects (Carney, 1993). Women's role in agricultural systems even outside of seclusion-promoting areas like Hausaland is often contested, and in particular their rights to land and crops (and their own labor) become contested when land is desired for other uses, when women are involved in cash cropping, and when there are competing demands on women's labor.

Household Decision-Making and Intrahousehold Bargaining

A trend of a decreasing public role for Muslim Hausa women and of agricultural intensification come together in the village of Tounga Sarkin Noma, but to construct a fuller picture of why women's agricultural participation matters, and its lack may leave women more vulnerable, I now address the literature on household dynamics. Gender matters in household function and decision-making, and our knowledge on the ways in which gender influences household decisions and finances is still inadequate. Evidence suggests that even when men are absent from households, patriarchal systems of decision-making may remain (David 1995 in Ellis 2000). Further, the ways in which income is used within households may be affected by gender. For example, a study in western Niger found that the gender of an income earner affected both how income was spent overall, and specifically how income was spent on food (Hopkins et al., 1994). A number of studies have found that the way in which household income is spent is determined by the gender of the person spending the income (Hoddinot and Haddad, 1995, Quisumbing and Maluccio 2000, Quisumbing and de la Briere 2003, Agarwal 1997). Data from four African and Asian countries suggests that assets controlled by women within a marriage are more likely to support children's education (Quisumbing and Maluccio 2000), and other data suggests that women spend more on food

and less on alcohol and cigarettes than do men (Hoddinot and Haddad 1995). In short, women's control of household resources and ability to spend them as they see fit may have substantial impact on the women themselves and on others in the household. When women have less control over household spending, children may have less access to education, the household may be less food secure, and more superfluous items (e.g. alcohol and cigarettes) may be purchased. All of the above may contribute to making women and their families more vulnerable.

The role of women in Hausaland is influenced by a confluence of forces, historical, environmental, economic and political. The history of wife seclusion in northern Nigeria, and of minimal female involvement in agriculture there, are increasingly becoming part of the contemporary reality of women in Niger. As agricultural intensification and commodification affect the social order in parts of southern Niger, and are influenced by a mindset that simultaneously discourages women from agricultural involvement, women's role is shifting. Although the ultimate effect on household and individual vulnerability is as yet unclear, some of the results of interacting social, environmental, economic and religious forces are examined below.

Gender in Tounga Sarkin Noma

Decreasing Women's Participation in Rainy Season Agriculture

In Tounga Sarkin Noma in rainy season, all members of the household but the very youngest are busy with a variety of tasks, from pounding and threshing grain for the day's food to preparing, sowing and cultivating fields. Yet among women there is a noticeable split between women who spend their days entirely in the household, on domestic tasks like

food preparation and washing clothes, and those for whom the domestic tasks are merely another set of tasks to be fit in around fieldwork (or assigned to daughters). According to those who discussed women's farming participation with me, the latter are a shrinking group. My perception of the farming group is that these are the women who are the busiest, always on the way to another task, often spending any "down" time at home preparing food for sale or selling their neighbors goods they have acquired in Birnin 'Konni or Illela. Explanations for why rural women may adopt seclusion tend to accord with this impression, that women who are not secluded have more work than women who are.¹⁶ Yet, the greater work load of women who farm has its benefits. The women who actively farm also are the most social in the village. They often stop in at other households to greet their friends on their way to and from the fields, greet others in the village plazas (*hili*), and regularly have visitors stopping by their houses to say good morning or make a purchase. They often travel to the city or other villages to make purchases and sales. If women involved in agriculture are on the decrease, then women may also be losing some of their social connections, independence and sources of independent income.

According to informants in Tounga Sarkin Noma, in previous generations women often had control over fields that were entirely their own, whether granted to them at marriage by their husbands or inherited directly from parents (the latter of which was more common among women interviewed). Both women and men in Tounga Sarkin Noma reported a gradual shift away from women's control over land in the fields controlled by the

¹⁶ i.e. Cooper's 1994 assessment that women chose seclusion to decrease their workload, particularly heavy labor.

village. Several women reported that whereas their mothers or fathers had passed land to them, they had passed their land to their sons or ceded the land entirely to their husbands. Others similarly reported that land their mothers had owned passed to male relatives upon their mothers' deaths. When asked why women are less likely to have farm land than in the past, informants' consistent response was that there are too many people in the area now, and therefore not enough land for women to have their own fields. One young mother shared her hope that she would inherit a field from one of her parents, but very few younger women in the village have fields, from either inheritance or from being granted the use of a field by a husband. Several middle-aged women reported that their husbands granted them a field to use upon their marriage, but none of the young women interviewed had been granted a field by their husbands.

Of twenty-three respondents who discussed women's farming in the area (twenty of whom were women), thirteen women reported that their mothers had farmed in the past, either in Tounga Sarkin Noma itself or in villages immediately surrounding the study village. Only four respondents, however, reported that they themselves were currently involved in farming (one of these has one sister-in-law in her household who also farms). Three reported having farmed until recently, but having had to give up farming and pass the work to their children (largely to sons) due to illness or age. Several reported that they had inherited fields in their birth villages, but brothers were farming them and sharing only a small amount or none of the crops.

Five women in the village participate in rice growing. Three of these are among the four informants who reported farming in rainy season, while two others were observed in the

activity and reported by others as participating. Rice farming differs from cultivation of the other two grains grown in the village in that it requires significantly more soil moisture, and can only be grown in wetter years. As a result, rice is only grown in two small lowland areas near the village, both of which remain inundated during the rains in wetter years, although they usually dry up before rice is harvested. Because of its high water needs, villagers reported that the 2010 season was the first season in the past five years that had been sufficiently wet for its cultivation. Rice was also cultivated during either the 2004 or 2005 season. Rice is strictly a women's crop in Tounga, and men, when asked, explain that the crop can only be grown in two small spaces, and that rice is used as a household food supply when men are absent (and therefore are not removing grain from the grain storage chambers for the household). The intermittent nature of the rice harvest, its complete undependability from year to year, would also seem an explanation for men choosing not to grow it. Men, according to Islamic law and current cultural mores are expected to provide for the entire household. Rice, since it can only be grown in some years and not others, does not constitute a crop that men can depend on to carry out their duty as household providers.

The gendered nature of rice production thus seems to have rather substantial power implications, that may apply more broadly to other elements of contemporary gendered agriculture in the village. Rice is viewed as largely as an extra crop by men. Yet men who leave the household during the dry season often leave every year, and in particularly difficult years, may leave no male relative behind to ensure women's provisioning from the household (but male-controlled) grain stores. If rice is the crop that women are to depend upon in men's absence, it would appear that women may easily be left vulnerable during

men's extended absence from the household, as in many years rice stores would amount to nothing at all. Allowing women to grow rice seems almost to be a method of granting women the illusion that they are providing for their households against absences or shortages, but without the benefit of a reasonably certain crop, as millet and sorghum are-- thus minimizing the chance that they will have substantial influence over household welfare (and perhaps therefore the right to negotiate the use of crops and cash income).

Several women informants expressed the opinion that women who farmed did so because their spouses had passed away (and children were not yet old enough to farm for them) and/or because their households were too impoverished to do without their help. Whether such an assessment has a basis in reality is difficult to pick apart. Two of the four active female farmers interviewed are widows, but both also were active farmers while their husbands were alive, began farming while young girls, and farmed throughout their marriages. Their four households do not fit any one mold in terms of assets or food security. One household had over four cow equivalents in assets, and had 68% of their food needs provided by rainy season crops from 2009's harvest. Another had over three cow equivalents, and had well over 100% of their food needs provided through 2009's harvest, the highest percentage in the village. The third had medium assets and food security relative to the rest of the village with just over three cow equivalents and 55% of their year's food needs covered by the 2009 harvest. The last had low assets and food security relative to the rest of the village, with just over one cow equivalent and just 30% of food needs provided by 2009 harvests. Thus, in terms of poverty, food security and marital status, the households appear to span the spectrum of the village. It is unclear whether women's participation in

agriculture is, in fact, the reaction of a vulnerable household to the need to bolster its adaptive capacity. That may be the case for some, and the relative food security and asset base in some of the female-farming households may be a result of women's supporting the household resource base. On the other hand, it may be that the family decision to farm is based on more complex factors, and that the explanations for why women farm in some households and not in others may be more strongly related to family tradition, head-of-household religious status, and the choices negotiated within the household. Religious status of the head-of-household, in particular, will be further examined in the section on seclusion in the village.

In rainy season farming, women have a source of influence within the household. They can contribute to grain stocks, whether they are used provisionally in a husband's absence or as a regular household source of grain. Women who participate directly in farming tend to encounter more social interaction and have the potential to contribute their stocks to bolster their social networks within their families and their friend groups. If they have full rights to a field they may have assets that can be passed to children and have further assets to sell or rent should dire need or lucrative opportunity arise. As holders of food stocks and assets and as members of substantial social networks, women have more leverage with which to influence the choices that are made and the ways in which money is spent within the household. For these reasons, I suggest that participation in rainy season farming decreases women's vulnerability and bolsters their adaptive capacity in the face of both climate and social/economic/political challenges. As further discussed regarding cold season

gardening, below, limits on women's participation in farming may increase their vulnerability.

Women's Participation in Cold Season Gardening

Project history The narrative of cold season gardening began in the last chapter with an explanation of how both men and women came to be involved, how the first season progressed for both genders, and how the men's adoption of cold season onion gardening came to have substantial influence in the farming year of some and the imagination of many other men in the village. In the second year of cold season gardening, men's and women's participation continued to diverge. While men used the original site, opened new wells in other sites and continued to plant almost exclusively onions,¹⁷ women were moved to a new site that was closer to the village. The claim was made that the original site, at one kilometer from the village, was too far for women to walk twice daily (as necessary for watering). The new site was less than half the distance, but also had another significant difference from the original site. The original site was the rainy season field of a male head-of-household, informally ceded to gardeners only during the dry season. The new site was one of the two rice-growing locations in the village zone, and thus already a female-controlled piece of land.¹⁸ As women again planted their seeds and began to cultivate their garden crops, another difference emerged. The field was close to a major animal path, and during dry season itinerant herders commonly drive animals within close proximity to the plot. Further, the plot proved to be more susceptible to pests, especially rodents, than the sorghum field in

¹⁷ There was one, highly diverse exception, as discussed in chapter two.

¹⁸ It is technically part of the village commons, according to the male project secretary.

the broad lowlands had been. The male secretary, who had spent the first year offering considerable portions of his time to help the women to water (including supervising some children who were sent to water while he watered his own onions), had suggested that a thorn fence would probably be necessary for the site. He offered to assist the women in rounding up a male work party to build the thorn fence, at least for the first year, until funding might be found for a permanent, chain-link fence, but the work-party never happened, possibly because of the secretary's over-commitment to other cold/dry season projects. As a result of the lack of fence, the rodent problems, and growing difficulties of some gardeners in finding time to water themselves or find trustworthy waterers among their children, most of the women's crops in the second year were ultimately a failure. Consequently, women abandoned the project, not planting again in the third year.

A variety of explanations are offered by women for their abandonment of the project, and seven of the twelve participants interviewed said that they would still be interested in gardening if certain resources were available. Some said that the well at the first site did not have enough water to water all the plots each morning and afternoon. Others decried the laziness or the lack of cooperation of some of the other participants. One of the leaders felt that the fact that two of the three female leaders of the project had to withdraw due to illness and family problems contributed to the project's demise. Three participants said they would be glad to return to gardening if there were a permanent fence, and one added pesticides to the list of necessities. Two others said that if they had seeds they would attempt it again. Yet another said she would like to try again if others participated, and another if she could afford to pay someone to water for her, as watering takes up too much time.

Implications for Women's Power and Social Place Several elements of the cold season gardening story seem to have further implications for women's role and vulnerability in the village. For example, the move from the original, male-controlled site to the second, female-controlled site when men saw the potential for a cash crop boon from onions echoes some of Carney's (1993) findings in the Gambia, when men assumed control of rice fields as they became a relatively lucrative, irrigated cash crop. In Tounga Sarkin Noma, aside from the limitations of the women's well at the original site (which had less water than the men's), the site appears to have been better as it had far fewer pest and livestock challenges. As men saw that they could make money from onions in a season when many had to otherwise migrate for work, they appropriated the best land to themselves and relegated the women to land which they did not use even in rainy season.

Women's limited ability to water may have been further limited by men's appropriation of the most capable child labor for help in irrigating their own fields, first with hand watering and later with motor-powered pumps. Women's time is always constrained because of their domestic responsibilities to thresh and pound grain, cook food, mix millet or sorghum drink (*hura*). Although those who farm in the rainy season manage to work around those responsibilities, part of what enables them to do so is the increased presence of labor in the household during the rainy season (because some who leave for labor migration are present only at rainy season). Also, cold season gardening is far more exigent in that it requires twice daily trips of about two hours each, and cannot be put off for a day when other requirements call. Women therefore depended on the assistance of either men or children. Only one man (the male secretary belonging to the chief's household) ever offered

substantial assistance, and his assistance tapered off significantly in the second year since his own crops were in a different site. Children, then, without assistance, and possibly the younger and less capable children whose labor was not commandeered by male relatives, had major responsibilities for watering, and may have been less effective than the adults would have been.

Finally, fence-building is seen as men's work, yet the women's garden was seen as a women's project, with the male secretary as the only male involved. With his time much taken up by his own crops (and perhaps feeling that it was up to the women to succeed in their second year), he did not manage to arrange the construction of a thorn fence that would have prevented the livestock problems that may have been the greatest reason for the demise of the women's second garden. Further, men may have perceived the women's garden as less important ("only" a little extra food rather than a chunk of cash-in-hand in preparation for rainy season cropping), and not worth devoting their time to. When women's crops failed, women lost incentive to continue, and men no longer had to worry about any responsibility to help the women, and could concentrate entirely on their own crops.

All of the women's actions in cold season gardening were dependent upon male influence or support.¹⁹ Cold season gardening further highlights the dependency of women already raised. Most women are entirely dependent on husbands for the bulk of the grain they consume each year. Women are dependent on men's will regarding land (and well) use and ownership. They depend on men to assist with certain categories of heavy labor, without

¹⁹ Aside from the possibility of a further influx of financing from me as a Peace Corps volunteer to pay for fencing.

which their own projects may fail. Some even depend on husbands' generosity to allow them to use extra grain to create their own stream of income, as will be discussed in the following section. Women's dependency represents one of the most consequential elements of vulnerability in their livelihoods and social lives, an idea that will be further explored in the Conclusion to this chapter.

Trends in Women's Social and Economic Role: Seclusion and Other Forms of Isolation

According to the oldest informant with whom I discussed the fact of seclusion in Tounga Sarkin Noma, who is about seventy years old, women in the village were not secluded as of about fifty years ago. He says that when he married his first wife, no women in the village were secluded. Only one post-menopausal woman reported having been secluded during her marriage, and her age is estimated to be fifty-five to sixty years old. Her likely age and her early marriage at around 10 or 12 years old indicates that seclusion may have begun with her marriage, most likely not much after the time when the seventy-year-old informant was married. She was the wife of the head Muslim religious leader (*imam/liman*) for the village, and her son succeeded her husband in that role. Aside from her two daughters-in-law, six other households in the village have at least one woman who is cloistered.²⁰ Three of those households are headed by the village's Muslim religious leaders. Two of the three households with highest assets (which also have higher food security) are also among those with cloistered wives, with one of these also being the home of a religious leader. Two of the households with cloistered wives, however, fit neither the categories of

²⁰ When some women in a household are not cloistered, they are wives of different men from those whose wives are cloistered.

well-off nor religious leadership. To a large extent, then, seclusion in Tounga Sarkin Noma fits known categories of seclusion: religious leaders and the well-off choose to seclude their wives. In theory, a husband must be well-off to seclude his wife, since he is supposed to provide her all that she needs to live without leaving the household. Such needs may include paying for someone to carry water for her, threshing grain for her, acquiring wood for fires and providing sufficient farm income so as not to require her assistance in agriculture. Since one cloistered household has low to medium assets (just over 2 cow equivalents) and just 34% food security from the 2009 harvest, and another has medium assets (just over 4 cow equivalents) and very little food security, it is clear that not all husbands are following such proscriptions. Nonetheless, seclusion of wives has grown in Tounga Sarkin Noma since its introduction 50 years ago, a fact which may be explained by increasing interaction with nearby conservative areas like Maradi and Sokoto, as well as by conservative religious radio broadcasts.

Along with seclusion comes the assumption that women are able to leave off agricultural labor and therefore acquire more of their own income elsewhere. Agricultural income can taken for granted as a contribution to communal household welfare, but income from petty trade is usually accounted in the literature as women's independent income. Seclusion is therefore assumed to allow women to enter more heavily into earning incomes which their husbands do not have a right to, since they are supposed to provide for all daily needs for secluded wives. Three of the cloistered households in Tounga Sarkin Noma, however, do not participate in any form of trade or sales-- do not, in fact, have any source of income aside from what their husbands provide them. The other four do participate in petty

trade or service, whether preparing and selling millet porridge (*tuwo*), peanut oil, peanut

Table 3. Household Assets by Gender			
Household Number	Asset Total	Women's Assets	Men's Assets
1a	2.1	1.0	1.1
1b	2.2	0.0	2.2
1c	1.1	0.4	0.7
2	4.0	2.2	1.8
3*	7.0	0.2	6.8
4*	2.7	2.2	0.5
5*	9.8	3.1	6.7
6	3.2	2.3	0.9
7	1.8	0.3	1.5
8	2.4	2.3	0.0
9*	2.2	1.0	1.2
10a	5.4	0.3	5.2
10b*	6.4	6.0	0.4
11	3.7	1.0	2.7
12	7.5	5.2	2.3
13	0.6	0.6	0.0
14*	4.2	4.0	0.2
15	2.1	1.1	1.0
16**	4.5	4.5	0.0
17	5.6	3.5	2.2
18**	1.2	1.2	0.0
19**	3.2	3.0	0.2
20	4.6	1.8	2.7
21	2.3	1.0	1.3
22**	3.3	2.2	1.1
23*	3.2	1.1	2.1
TOTAL	96.3	51.4	44.8
Mean	3.7	2.0	1.7
Standard Deviation	2.2	1.6	1.9
*cloistered wives			
**farming wives			

* This is partly because of the highly outgoing personality of one of the wives, and partly because of the advantageous position of the compound doorway (where the wives nearly always sit when not pounding grain) which allows a view of one of the major village paths.

resin (*kuli kuli*) or bean cakes in the village, or braiding hair. Yet, cloistering does limit their economic interactions, because it limits their social interactions. While a household like that of the head religious leader has regular visitors,²¹ others are structured such that wives have difficulty making contact with their neighbors outside of the compound. One entrepreneurial young wife was making a regular income from braiding hair, for instance, but when she went with her husband for six months of religious education

in Maradi, her customers all began going elsewhere. Since her return, of some months duration, she had not yet been able to recover any of her customers, partly, I believe, because others rarely visit her and because her compound walls do now allow outsiders to note that she is back home.

Further, while it may be true that cloistering freed some of the women from agricultural obligations and allowed them to pursue income-generating activities, most of the other women in the village, including (and even especially) those directly involved in agriculture also pursue petty trading activities and service trades. The most active trader I know, who regularly prepares food to sell in the village and travels to Birnin 'Konni and Illela to sell plant goods she has acquired in the bush and buy goods to sell in the village is also one of the most involved of the female farmers. In the absence of any sons old enough to help with the work, she farms her own fields while her husband and co-wife each farm their own, and yet still finds time to run some of the most active business ventures in the village. Other women farmers buy and sell greens, make and sell bean cakes, prepare and sell sweet potatoes and prepare and sell sweets made of sugar and flour to customers in the village. Two of them also act as the main village mid-wives since the retirement of the elder mid-wife, who was also an active farmer. Some of the non-farming, non-cloistered women also make and sell food in the village, or sell some of the milk from their cows. The most intensely involved traders and service providers, however, are also farmers.

The reasons for women's' income earning choices are no doubt complex, and built on choices made when they were young, often choices made by their parents of whom they would marry. Yet, their income earning and social status have important relationships.

While the restriction of seclusion narrows a woman's ability to make new contacts and create new trade relationships, as well as social relationships, the active and public role of farming broadens a woman's opportunities for new contacts, while also engendering a confidence that she can perform the same tasks as men can. Seclusion thus increases a woman's chances of limited social networks, narrow economic contacts and consequent vulnerability in the case of the death of a husband or other additional stresses on the household. Such women, I posit, are less likely to have breadth of choice in remarriage due to both inadequate social contacts and lack of funds, and are more likely to experience losses in assets in the future. Women who are not secluded, but who are not involved in agriculture may not experience the extent of isolation of secluded women. They can still make social contacts when drawing water at the well or (briefly) when carrying the mid-day millet drink to the fields where their husbands are working in rainy season. Yet women who do not farm are on a middle point of a continuum between seclusion and agricultural participation. They may have more freedom to socialize outside of their households, but from my observations many venture less outside of their households, and certainly less into the city than do women who farm. The vulnerability of non-farming, non-secluded women when husbands are absent, or when climatic or economic forces make a farming year more difficult, is therefore higher than that of women who farm.

Gender Differences in Assets and Income

Gendered differences in labor and land tenure make substantial differences in women's social and economic well-being. Yet, in the context of a village where women are dependent on their husbands for their day-to-day food needs, and often for the materials from

which they make their own income,²² how does women's welfare appear when measured in terms of assets and income? The question is complex to answer in the Hausa context. For example, few women and nearly all men own (control) fields, so when land tenure is taken into account, men easily emerge as far better off than their wives in nearly every case. If assets are measured by moveable assets, on the other hand, including livestock and expensive resalable consumer goods like motorcycles and gasoline-powered water pumps, women overall come out ahead of men in the village, with just over 51 cow equivalents as compared to nearly 45 for men. In four of the seven cloistered households, men's moveable assets are greater than women's, while in the other three households, women's assets are slightly or substantially (in one case, with 6 vs. 0.4 cow equivalent) greater than men's. Interestingly, two of the three households where women's assets are greater are households in which women do not engage in any income generating activity, indicating that there are other factors beyond income from trade and farming that explain some women's welfare, perhaps involving gifts from relatives, for example. In all four of the farming women's households, women's moveable assets are greater than men's. Moveable assets thus complicate the picture, and make it clear that women are not entirely without resources.

Income is even more difficult to accurately assess in a rural farming economy like that of Tounga Sarkin Noma. People do not record their income, and some do not even calculate whether they are making a profit on a given activity, like buying the materials necessary to make fried foods for sale in the village (although many certainly do, often those

²² As in some of the non-farming women's cases, where they use "extra" grain from what they have been given to make family meals to sell as prepared food in the village and from which they keep the income for their own uses, usually for naming ceremonies and weddings.

who seem to be better off than others). In terms of direct farm income from grains to consume at home and beans and hay which is used both at home and for sale (e.g. 30 bundles of grain as compared to an average of 98), women generally come out far behind men in total production, a fact which may be explained by differentials in field size but may also be due to women's ability to devote time to their crops and commandeer the labor of others relative to men. Other forms of income are far more difficult to compare, as men with income from labor migration, for example, must spend income on living away from home and on travel to and from home. Women's in-village sales income is often sporadic and daily totals depend upon who else is selling a given item on a given day and upon whether or not children consume the prepared foods at home (as one cloistered wife noted often happened when she prepared sweets for sale). Although the lack of record-keeping does make comparison difficult, a few examples may offer some sense of the differences in individual income among men and women. One man who migrated to Nigeria for work in 2009-2010 was able to send 80,000 F CFA home to his family (about \$160) while he was away for four months (he gave manicures on the street). Midwives (or at least the main woman to attend) earn 3,000 F CFA (~\$6) for most births, with perhaps 15-20 births per year in the village. One group of women who sell millet porridge (*tuwo*) daily say they make 1,000 to 1,500 F CFA per day, but did not say how much they had to spend on sauce ingredients. One woman who gave careful accounting of her profits reported that some of her food sales, like tofu, often result in no profit, while others like peanut brittle (*loga*) can provide a profit of 1,000 F CFA. She, like many other women, reported that she makes and sells such goods "when she can get the ingredients" (i.e. afford to buy them and find someone going somewhere where they

are sold). In short, a full assessment of income differences may be impossible, and there are probably many equivalencies in men's and women's incomes, but men's control of rainy season grain income would appear to constitute a major control over household resources. The exception to that control is that most of women's income is under their own control, and is not automatically considered an element of household income in the way that men's is. Women's income, therefore, is probably more likely to go toward livestock acquisition (going some way toward explaining the slight differential in total moveable assets) and to family celebrations.

Conclusions

Women's participation in the broader life of the village varies from highly engaged with the land and with neighbors and relatives to very much sheltered from both. To a large extent, their economic participation appears to parallel their social participation, with women who are more intensely involved in agricultural and trade activities having more interaction with others in the village. The number of women who are participating in broader village life in this way has been on the decline. While intensification of agricultural systems that have paralleled population growth are a substantial explanation for the trends seen, I argue that the influence of increasingly conservative interpretations of Islam have encouraged trends that limit women's broader participation. In other words, I believe that the newer local interpretations of Islam that have come to dominate, under influence from the Sokoto and Maradi regions, have served to support individual and family decisions to allow land to pass to sons rather than daughters, to deny new wives usufruct rights and to discourage women's participation in both rainy season and cold season gardening.

As a result of shifts toward greater men's control over women's participation in agriculture and, especially through their control over other economic and social contacts through acceptance (by both men and women) of wife seclusion, I believe men's power over household decision-making has increased while women's has diminished. I further argue that women's control over household resources has shrunk. While on the surface such changes may seem to alter only women's standing and social networks, they also have substantial material implications for women's welfare and vulnerability. As the literature on intrahousehold bargaining suggests, when women's resources are limited, so, too, is their say over use of whole household resources, which can have implications for whether resources are spent on children or on unnecessary items (only men in the village purchase cigarettes or motorcycles-- and half of the fifteen motorcycles in the village are not used for income generation). In addition, when men leave to work away from the village for extended periods, women have traditionally been expected to depend on the crops they have produced on their own. With labor migration increasing when agricultural years are worse (aside from households involved in cold season gardening), women are more likely to be left without access to even the food resources they need if they are not involved in agriculture. They may be left dependent on loans through their social networks-- which are also more limited when their economic involvement is more limited.

The trend toward women's decreased agricultural involvement has increased women's dependence upon their husbands, and made them more vulnerable to climate effects on agricultural production, to death of a spouse or to other social, economic and political forces which could limit the ability of a husband to care for his wife or wives.

Ultimately, both agricultural intensification and the life-limiting choices it brings about partly due to newer interpretations of Islam in the area, leave women with fewer resources and capabilities on which to fall back in the case of disturbances to the household's welfare.

Chapter Four: Conclusions

The goals of this thesis were to examine the ways in which climatic and social change affect the vulnerability of residents of a Sahelian village and to interrogate the differences in vulnerability between and within households. It investigated vulnerability at different scales, beginning with a broader village picture, narrowing to differences between households and finally analyzing gender differences. Probing vulnerability at a variety of scales made it possible to better understand the implications of the choices farmers and households are making in Tounga Sarkin Noma. While climate has made rainy season farming more difficult in recent years, some of the choices made and opportunities created appear to have decreased overall vulnerability in the village. Yet, some of the choices which have decreased overall vulnerability have increased inequality between households, and have increased women's vulnerability within households.

As Tounga Sarkin Noma's population has risen steeply during the past few decades, agricultural land has come under annual use, with consequent potential for degradation of soil fertility. Yet, as predicted by other examples (Tiffen and Mortimore, 1994, Aune and Bationo, 2008), farmers have reacted to population change with intensified use of land resources. As fallowing has diminished and disappeared with increasingly intensive land use, farmers have increasingly manured their fields when possible with the livestock resources available to them²³ (which some sources suggest have increased over time). They have also opened former bush land to full time agricultural use. As both Aune and Bationo

²³ Livestock whose feed includes crop residues like bean hay and grain stalk, but which also include field "weeds" in the rainy season and the seed coat (*dusa*) of grains being milled (pounded) into flour.

(2008) and Oluoko-Odingo (2011) suggest is likely, labor intensity also increased,²⁴ as population increase provided additional family workers. While intensity of fertilization appears to have only made up for the removal of fallowing from the system, increased labor intensity has decreased household vulnerability by providing more grain for households.

Another significant change in Tounga Sarkin Noma was growing access to markets, both for agricultural products and for manufactured goods and labor. While Watts (1983 a and b) argued that the transformation to a capitalist economy was ultimately harmful to an subsistence economy, that does not necessarily seem to be the case for Tounga²⁵. In fact, villagers saw their access to new markets to be advantageous. For example, most informants who described the ways in which they perceived livelihoods to have improved counted access to manufactured clothing and other goods (e.g. plastic ware) among such improvements. Women spoke of the value of having multiple sets of clothes, as opposed to the single *pagne* wrap washed and worn over and over. Further, farmers felt it was advantageous to be able to sell more of their beans and to be able to sell bean hay and grain stalk crop residues that did not formerly have a market. Sales of stored agricultural goods gave them flexibility in when they could sell the goods, as well as the opportunity to sell such goods to buy food for their families as needed. Markets for labor, too, were growing in the area, and while many young men still leave to work in distant cities during the dry season, some individuals are able to stay in the immediate area and work for others. Staying

²⁴ With additional workers providing for more frequent cultivation, for example.

²⁵ One element that significantly complicates such a comparison is that Tounga may have *increased* its market connections over the last thirty to forty years, but already had some market connections, especially to Illela, Nigeria, even longer than thirty or forty years ago. Yet the point that increased market access may improve welfare and decrease vulnerability still is an important counter to Watts' (1983a) argument.

closer to home, too, is perceived as advantageous and a positive result of more access to markets, especially markets for dry season, irrigated crops. In most cases, then, access to markets is viewed favorably by farmers and may be beneficial in decreasing community and household vulnerability.

There are, however, drawbacks to market access. Cold (dry) season cash crops in Tounga Sarkin Noma, as elsewhere in the Birnin 'Konni area, have come about largely as result of access to distant coastal markets through middlemen²⁶. They, too, have provided improved welfare and decreased vulnerability for some. Yet, as Eakin (2006), described for farmers of irrigated crops in Mexico, the very access to cross-border markets can sometimes provide for increased vulnerability. In Tounga, that vulnerability takes several forms. Farmers who grow onions are vulnerable to price fluctuations beyond their control. Onion growers across the country all try to sell their crops at once to middlemen with better access to information on both local production and distant sales options. Further, households with fewer resources are vulnerable to limited dry season choices, as they cannot afford to participate in onion growing. Women also have no opportunities to participate in onion growing, with consequent limitations in their income options. The picture for markets may be largely positive, but the pitfalls of market involvement may sometimes increase both individual and household vulnerability to lost income and to non-participation in new economies.

CARE and Peace Corps have brought additional change to the village in the form of new agricultural savings and credit institutions, soil improvement and the already discussed

²⁶ As well as through the Peace Corps projects which initially introduced the practice to the village.

advent of cold season gardening. The agricultural savings and credit institutions created, like cold season gardening, may have exacerbated the inequalities among households. The grain bank and the inventory credit system (*warrantage*) provided opportunities for communal storage of grain and for credit based on grain stocks. Yet both systems are used most by households with more substantial rainy season harvests.²⁷ Although the two systems may not deepen the vulnerability of households to food insecurity, they do allow some households and not others to gain access to credit. It is generally the households with the least grain who are least able to contribute to the grain bank or take a loan through the *warrantage* system. As such, the already vulnerable households have fewer opportunities than better-off households do to invest in alternative sources of income during the dry season. Ultimately, access to credit may amplify differences in vulnerability among households.

Adger's (2006) "key parameters of variability" include "the stress to which a system is exposed, its sensitivity and its adaptive capacity." While many of the stresses in Tounga Sarkin Noma are fairly similar across households (weather, prices, health factors), the sensitivity of households and their resultant adaptive capacity vary, sometimes significantly. Some households have few assets to tide them over bad years and an inability to produce all the food their households need for the year. Such households often have fewer options for cold season income-generating activities because they lack capital to invest in goods to sell or in cold season gardening or distant labor migration. Other households have assets to manage through a short string of worse years, are more likely to have sufficient food from rainy season harvests and have the resources to invest in more choices outside of the rainy

²⁷ As Watts would have predicted.

season. Sen (1999) frames these variations as differences in capabilities, rather than vulnerabilities. Vulnerability is an important perspective for understanding how systems are failing to support a given sector of the population, but a capabilities approach provides a useful lens for understanding how to overcome such failings. In Tounga Sarkin Noma, a capabilities approach may be particularly important in considering how to decrease the vulnerability of certain households and of women, as discussed in the following section.

In chapter two I discussed trends affecting households, including intensified agriculture, new market access and new agricultural savings and credit institutions. Chapter three focused specifically on women and how farm and household shifts have affected them. One of the major trends is the intensification of agriculture, both in the form of more intensive use of land and labor for rainy season crops and in the form of irrigated dry season agriculture. Both forms of intensification appear to have had a disproportionate effect on women's role in agriculture, diminishing their access to agricultural lands as well as their participation in all forms of agriculture. Changes in market access, too, have favored men in providing outlets for new cash crops (onions) and new opportunities for labor in the area without any similar increase in opportunity for women. Meanwhile, new agricultural savings and credit institutions, by providing access only to farmers, limit credit access to women who are involved in agriculture, a shrinking group. The shifts which have helped some men and some households to improve their welfare have not, for the most part, had similar effects on women's ability to cope.

Women in Tounga Sarkin Noma are more likely to be vulnerable to stresses than are their husbands. They are dependent on their husbands for many resources, and are more

dependent now than in the past. Women are less likely to have access to farm land than in the past, limiting their opportunities (capabilities) to produce food or cash crops to sustain their families if, for example, they are widowed. Their participation in rainy season farming has decreased over time, and their participation in cold season gardening, limited from the beginning, has entirely halted. The current beliefs regarding men's and women's roles contribute to limiting women's participation not only in agriculture, but in broader trade activities, and even their abilities to create and sustain social connections. The limits to women's role in Tounga Sarkin Noma reflect the limitations of women farmers in Carney's (1993) and Schroeder's (1993) work in the Gambia, but are even more restrictive. While some women in Tounga play an active role in work and social life, most women's social and particularly economic roles are far more limited than those of their spouses. Yet, entire households, and individual men, too, are also highly vulnerable to the stresses which an agricultural household in the Sahel can experience. Sen (1990) emphasizes that "acute inequalities survive precisely by making allies out of the deprived." In Tounga Sarkin Noma, women accept seclusion because of the minimization of heavy labor it involves, yet become increasingly unequal partners in their households as a result. Resource-poor men choose wage work in their neighbors' onion plots because of the advantages of not traveling far from home, but become dependent on a precarious system that is itself dependent on market fluctuations. The question of how to begin to address some of their vulnerabilities is addressed below.

Implications

Sen's (1999) capability approach conceives of people as requiring "the substantive freedoms--the capabilities--to choose a life one has reason to value." Choice and freedom to choose ways of life are, in this view, central to establishing broader and more fundamental human well-being. Sen tends to speak of capabilities very broadly, and is reluctant to define which particular capabilities are necessary to living "a life one has reason to value." In order to assist those most vulnerable in a given climate context, however, it is necessary to begin to define such capabilities, even if the list must be partial and evolving in response to new conditions. Among the capabilities important in an agricultural village are access to information about new crops and new ways of growing them, as well as how to obtain market access for salable crops. The capability to obtain credit for new ventures or to acquire capital for enlarging a given activity is also important, especially in a context where diversifying livelihoods are often depending on off-farm income sources. For women, a variety of capabilities seem necessary, from earning independent income to being able to negotiate the use of resources within the household. By looking at individual and household choices from the perspective of capabilities, we can better identify some of individuals' and households' most fundamental needs.

Peace Corps and CARE projects in Tounga Sarkin Noma were intended to increase capabilities. Soil improvement projects were calculated to increase household food security capacities, both in producing soils with better nutrition and through directly providing food to households in hungry season. The purpose of the *warrantage* credit project was to increase the capabilities of farmers to access cash without losing the stores of grain needed to

sustain their families. Cold season gardening was first conceived as a project to build women's capabilities to provide vitamin-rich foods to their families during the dry (cold) season. Credit and gardening projects, however, built the capabilities of the most capable, rather than providing the most vulnerable with new opportunities. In contemplating future credit projects, implementers must consider how to apply them to more vulnerable households and individuals rather than building the wealth of the wealthy. It is difficult to conceive of how to construct credit projects that do not create insuperable debt burdens for more vulnerable individuals who take loans. Lessons are currently being learned from microcredit research, and perhaps some can be applied to improving credit projects in the Sahel. Like the credit program, gardening projects built the capabilities of those with already substantial capacities relative to their neighbors, and they also eventually cut women out of participation entirely. Use of land and irrigation resources are often contentious in intrahousehold and intracommunity gender discussions, with women often losing access to both. It will be ever more important to consider how to build men's acceptance and cooperation with projects involving women's use of land and water resources as population growth continues in areas like Tounga.

In Tounga Sarkin Noma and villages like it, one important capability of farmers is access to information on what works. Farmers need networks of information exchange with other farmers and with researchers in order to understand agronomic limitations as they shift. Even more importantly they need more information to understand the economic and social implications of their choices. If, for example, everyone is growing onions independently, farmers have little control over prices and information. Farmer networks can provide insight

into the alternatives farmers might choose, the potential for alternative markets, and the experiences of other farmers in terms of what is useful and what is not. In Tounga, onion farming grew out of a single networking trip to observe and talk with other farmers. A broader, integrative network of farmers that included the insights of researchers and extension agents could help prepare farmers to deal with fluctuation and change. While farmers in the village have some, limited access to networks, in the form of friends and extended relatives in surrounding villages, most do not have access to a broader scope of information from the entire onion growing region, nor from much beyond their own *commune*.²⁸ They also lack any sort of sustained access to extension agents or researchers. The extension agent who participated in cold season gardening, who was the agent assigned to the village, had not visited the village before. He lacked funds for fuel for his motorcycle, and so almost never traveled. Such agents, if they are adequately trained, can provide a sense of the bigger picture, of who the ultimate buyers of onions are, of which other crops might work as cash crops in the area, of other paths to market. All such information could be helpful for diversifying Tounga's cash crops and making them more broadly marketable. It could also potentially help farmers access inputs at lower costs, allowing more vulnerable households to participate in growing new crops or participating more in marketing the crops they have. A broader network of information and exchange also might make it possible to share rainy season crop varieties across precipitation gradients. Such a move could help to minimize the risks of not harvesting a crop due to late-onset rains by giving regions access to shorter-season varieties that have been farmer-tested. Certainly, increasing access to

²⁸ A political district that tends to be somewhat smaller than an American county.

effective basic education could make such networks even more effective by, for example, providing a means through which farmers could share available written information on their crops.

Since knowledge and information are important capabilities for farmers dealing with climatic and social conditions which are gradually (sometimes swiftly) transforming, additional research weighing alternatives is important. The lack of sufficient agronomic research on staple African crops like millet and sorghum is a well-known problem, and is one element of research important to farmer well-being. Equally important, however, is research on cash crops on which farmers will likely depend more and more. Such research must be conducted in on-farm (as well as research center-based) contexts, and must include the reality of the economic and social contexts with which farmers live. Only through working directly with farmers, and expanding the research perspective to include the real-world limitations of village crop production, will the research become truly useful to farmers. Similarly, the capability to access inputs is necessary to help the most vulnerable households to increase field productivity. When manure is insufficient, lower-priced, appropriate inputs could be provided with training on their safe and effective use. Such information could be an element of farmer-researcher-extension agent networks.

Finally, the capabilities of women clearly need to be further developed. While Tounga's women are some of the hardest working, most savvy people I know, they lack access to basic information, to social networks and to education. Some of women's lack of information comes from their geographic limitations. Like women in Nigerian Hausaland (Robson, 2000), women in Tounga have increasingly circumscribed movement patterns.

Non-farming women spend much of the day in their own compounds, unless drawing water or, in some cases, threshing. Secluded women spend the entire day within their own compounds. Women who desire to engage in income generating activities would benefit from increased contacts for acquiring customers, sources of goods to buy and networks of information on what works in agricultural systems and in trade. Nonetheless, considering how to increase women's capabilities is perhaps the most difficult element of vulnerability to address in the village. Any shifts in women's role must be discussed within the household and agreed to by husbands, and shifts toward increasing women's participation in intensified agriculture appear to merely increase the likelihood that women's participation will be co-opted. Women's increasingly limited contacts will further limit their abilities to engage in economic activities, as well as networks of support, unless means can be found of reversing the trend of women's isolation. My personal observation of women in Niger indicates that as women become more educated, they are more likely to have broader social networks and more income-generating options.²⁹

So, perhaps one of the most important elements of increasing women's capabilities to be informed farmers, traders and family members is to increase girls' education. The first class to complete elementary school in Tounga Sarkin Noma graduated last year, and of over twenty pupils to pass the leaving exam, only one was a girl. As knowledge of the factors influencing the likelihood of girls' completing their education increases, the most useful

²⁹ Up to a point, at least. There are certainly extensive anecdotes about the wealthiest individuals being those with much less than a high school education, but most of the well-off women I have known were well-educated, with at least a junior high (*college*) certificate.

factors³⁰ ought to be used as a basis for drawing more girls to school. Since those who are now women will not have opportunities to return to school, women's knowledge networks ought to be developed. Such women's networks could provide fora for gaining new information about markets, products, dealing with spousal abuse, health issues, and much more. It would be neither easy nor effective to require men to give women more access to farm land. Yet, giving women access to information and ideas could gradually increase their financial and social capabilities to access land, if their education guided them toward agriculture as a livelihood choice.

In providing women with opportunities to increase their capabilities, one important move would be to ensure that women were among those with access to credit subsidies. While women's domestic work certainly prevents them from undertaking many activities, lack of credit may be an even more important constraint. A number of women explained to me that they have participated in trades like production of prepared foods in the past, or do periodically, but do not currently have the capital to do so. "When I can get some capital (*jari*)," they said, "I will start again." Women's capabilities to fill the gaps in their household incomes and to fend for themselves in the absence of husbands often require only a small amount of help, but that help is all too often lacking.

A final word on the process of change

Attempted improvements to village welfare all too often depend on brief encounters with development agents and swift needs assessments. While much information can be gained in such encounters, the sort of fundamental change required to improve the

³⁰ e.g. school feeding programs, latrines, improvements in basic health care

capabilities of the most vulnerable requires a sustained commitment and a real understanding of the village context. Such an understanding is not gained by study alone, nor by experience of the village alone, but must be obtained through a combination of both.

One of my favorite anecdotes from Peace Corps is that of a volunteer couple and their friend. Both volunteers were initially shocked by the role expected of the volunteer wife in the village, as well as by the way in which many village wives were treated by their husbands. Through a two-year-long conversation with one of their friends, a male head-of-household, they came to discuss such intimate issues as wife-beating and sexual choices. He was fascinated by their equal relationship and their courtesy to one another. They persuaded their friend to try conversing with his wife rather than hitting her when she displeased him. To offer to massage her aching back when he wanted to ask her for a favor. As he slowly adopted their suggestions, he said he was amazed at how much kinder they were being to each other, and how much easier it was to get things done within the household.

While most development cannot be as intimate as this deeply-evolved friendship was, some of the changes in the role of women and in the elucidation of the straits of the most vulnerable households will require sustained conversations. Moreover, such conversations should not be carried out in the expectation of adaptation to a particular “Western” ideal of women’s role or of methods of poverty elimination in a village, but must listen carefully to what is said by the women and by the poor-- and by village leadership, as well. I believe Sen (1999) is right to be reluctant to specify the capabilities necessary to any particular set of circumstances. Yet, allowing those who live in a given place to gain perspective on their circumstances through increased education and through open discussions with others-- both

those who share their circumstances and those who do not--will permit them to define for themselves which capabilities are necessary for them to live a life they “ha[ve] reason to value.”

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