

Political economy, vulnerability and climate: A reassessment

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Introduction

The specter of climate change has resulted in the rapid expansion of scholarship in the general area of “human dimensions of climate change” – a primarily social science literature that has focused on the effects of climate change and its mitigation on human society. Various international organizations have called for more research in this realm and after some hesitancy, social scientists have responded, sometimes defensively (defending turf) but increasingly with gusto. This literature has borrowed, adapted, and recycled a range of terms and concepts such as adaptation, coping, resilience, transformation, and vulnerability with a plethora of scholarly articles and books advocating and critiquing the relevancy of these terms and concepts. With notable exceptions, much of this work is highly abstracted --floating above the realities of the struggles of people who are in fact experiencing climate change. Households, individuals, or communities are conceptualized as being innovative organizations, livelihood portfolio managers, communitarians turned individualists, social capitalists, or passive victims -- all rational OR profoundly and tragically irrational actors.

These abstractions do not fit with messy realities of my own life or the lives of the people with whom I work. The level of abstraction in this literature is understandable on a number of different levels. The research agenda is in large part pushed by international organizations with scholars in this epistemic community publishing plenary-type pieces adapted from their plenary presentations. The perceived need for generalizable concepts and terms to address the global threat is strong. Moreover, this literature is burdened by the view that climate change is new and novel while at the same time, changes in current weather patterns cannot be definitively tied to climate change. Therefore, studies are required to tie probabilistic changes in climate to ongoing social changes which can be seen, at best, as only partly affected by these same (predicted) climate changes. This is far from an ideal framework for empirical research.

In this paper, I do not intend to provide a review of this voluminous literature. This is not to say that the divergent theoretical framings within this literature have not had profound effects on the growth, stagnation or regression of our knowledge about the effect of climate variability on rural communities, households, or individuals. In fact, this will be my argument but the argument will be directed particularly at the small “vulnerability camp” of the human dimensions literature – a camp whose political economic roots make it much more centered in the social sciences than the other camps which primarily developed around borrowed ecological concepts (e.g. adaptation, resilience). I do so not only because this is the “camp” within which I have developed as a scholar (e.g. an insider critique) but because it has the most potential to develop an understanding of climate change’s impact on agrarian societies (insider’s bias?) and its framing, despite common characterizations of it being overly theoretical, makes it potentially responsive to (theoretically-informed) empirical work. In contrast, the social science literatures centered around adaptation and resilience are more immune to such empirical correction – due to in part to their level of social abstraction as well as their particular problems with their concepts such as “adaptation” (e.g. functionalist fallacy) and the highly malleable descriptive character of the resilience concept (both change and stasis).

After a brief description of the vulnerability camp and its position(s) within the human dimensions literature, I will turn to the case of the *Zarmaganda*, a Sahelian area of western Niger. Reanalyzing data that I have previously collected among 54 households in the area, I will trace the social changes and wealth redistributions that occurred from 1983-1995 – a period that includes a regional drought of historic proportions (1984). I will use this case to critically engage with the human dimensions literature – particularly that which has developed around the concept of vulnerability.

Vulnerability to climate change

Terms such as adaptation, resilience, exposure, coping, and vulnerability have been used with increased frequency by social scientists and policy makers (Ribot 2011; Bassett and Fogelman 2013; Orlove 2009; Adger 2006). These terms are not new – in fact, each has its own historical baggage – with its discursive meaning shaped not only by the everyday meaning of the term but also, at least among scholars, by how it has been used in the past. Take the two terms

“adaptation” and “vulnerability”. Everyday uses of the term “adaptation” suggest responsive action while “vulnerability” refers to a state of existence of greater exposure to risk. As such, it would seem that these two terms are not necessarily in contradiction -- couldn't vulnerable people to some threat “adapt” or respond to it? Coupling adaptation to vulnerability would seem to accord greater “agency” to vulnerable people. Without such a coupling, vulnerable people could be seen as passive victims to external threats.

As we know, the use of these terms among social scientists signifies much more than these common-sense meanings. In geography, their use can actually identify members of different intellectual camps. Those that refer to “adaptation” are tied, rightly or wrongly, to approaches that conceptualize social response to the biophysical environment as simply technical responses to production failure. This is the hazards approach to society-environment study where individuals or human society “adapt” to relatively short-term environmental hazards produced by ‘the environment’ through changes in location, technology and organization of production activities. Institutional changes generally develop to facilitate and manage changes in the organization of production. As such, the hazards approach has a deeper intellectual debt to human and cultural ecology in anthropology and geography (Watts 1983a; Bassett and Fogelman 2013).

People, with different understandings of prior uses of the term “adaptation” assign different meanings to it. When the older of us hear the term “adaptation”, it suggests circular functionalist arguments. Extant cultural features are necessarily “adaptations” with stories told to explain their development by the function they serve – stories that, among other things, require assumptions of closed ecosociological systems, solely shaped by their interaction in static equilibrium (Rappaport 1984; Harris 1960). Such treatments of “adaptation” cannot address issues of maladaptation. It is important to recognize that current uses of adaptation differ from that of the cultural/human ecology past – with many studying short-term human responses to hazard as they occur and therefore focusing on productive responses rather than cultural or institutional responses. Such forms of adaptation are less susceptible to the functional fallacy – it is those treatments that seek to explain cultural and institutional changes that develop over longer time periods where the historical limitations of the term adaptation remain relevant.

At least in Africanist agrarian scholarship, a “vulnerability” perspective, as contrasted with the “adaptation” perspective, was first persuasively argued for by Michael Watts in his

attack on the “hazards approach” (Watts 1983a) – a seminal essay in political ecology. This essay, and more importantly, his book *Silent Violence* (1983b), reject the notion that vulnerability is not solely affected by exposure to biophysical hazards but that they are actually produced by a broader political economy with biophysical variation (e.g. droughts) at best triggering famines and food insecurity with social relations of production shaping differential exposures and capabilities to these biophysical perturbations. In this way, droughts in Hausaland of Nigeria expose, through the violence of famine, pre-existing vulnerabilities and their structural foundation. In the context of increasingly rigid forms of surplus extraction, the erosion of the moral economy, and recurrent drought under colonialism, people became increasingly (and differentially) vulnerable because of their different control of productive resources and food entitlements (land, labor, livestock); family life cycle (e.g. Thorner 1986); the uneven spread of cash cropping and differential positions with respect to the market (seasonality of sales and purchases); and the ability of the different political actors to claim food entitlements under duress (e.g. power). This work is arguably the seminal work leading to the development of the field of political ecology (Blaikie 1985; Blaikie and Brookfield 1987) with political ecologists maintaining a strong commitment to such treatments of climate vulnerability while maintain a skepticism toward hazards approaches (e.g. Wisner et al. 2004).

From this perspective as well as that provided by the entitlement approach (Sen 1981), vulnerability is associated with social relations -- people are vulnerable not simply because they are poor but because of how they are poor. With similar assets, a simple commodity producer will be more vulnerable due to the addition of market risk than a subsistence producer. A pastoralist may be less vulnerable to production risk than a small farmer but his vulnerability is heightened under widespread drought conditions through the “scissors effect” on livestock prices in relation to grain prices. Even in the case of the wealthy, their reduced vulnerability is not solely due to their ability to deplete a large wealth stock during hard times but due to their ability to use predictable market swings to their advantage and their ability to control others through patronage and broader political influence.

In these ways, the “adaptation” and “vulnerability” camps associated with hazards and agrarian political economic perspectives on food security issues preceded the rapid rise in the use of these terms by a broader set of people in the context of climate change scholarship. As a result, for many, the claim made by the respective old guards about determinist Marxist

approaches to vulnerability or about functionalist treatments of adaptation may seem confusing and to some extent, off-putting. In fact, the vast majority of the uses of these terms in the literature are made without recognition of their history. As a result, it is not surprising that some policy analysts see “adaptation” as more dynamic and forward-thinking than vulnerability when in fact if we look at the historical use of these terms, a completely reversed argument could be made.

My concern here is less about the terms used. In fact, as I mentioned earlier, the literature on human dimensions of climate change has become overly constructed around terms to the detriment of understanding. The use of the term “vulnerability” in most climate change works today share little in common with political ecological treatments of food insecurity (e.g, Smit and Wandel 2006; Burton 1997; Cannon and Muller-Mahn 2010; Gallopin 2006; Turner et al. 2003; Cutter and Boruff and Shirley 2003; Liverman 1990). What I am concerned about is how, in the scramble to promote the use of “vulnerability” in the human dimensions literature, the insights from in-depth works such as *Silent Violence*, may have been eroded or lost. I would argue that this erosion has come about in two ways: through dichotomization of social and biophysical antecedents to vulnerability; and through the naïve adoption of vulnerability as simply a synonym for unequal capacities within societies.

First, many advocates of a “vulnerability” viewpoint, in attempting to distinguish their view from more technocratic views, have referred to social impacts stemming from a myriad of environmental hazards as socially produced – relegating the role of the biophysical environment as simply a trigger (early example being O’Keefe and Westgate and Wisner 1976). Associated with this is the downplaying of production failure in the etiology of climate-induced social change (particularly famine). People suffer not because their crops have failed but because of the maldistribution of resources and wealth as produced by the global economy. People starve not because of depleted granaries but because they don’t have sufficient entitlements to the food that remains in local markets. Ok, yes.. but can’t both be true? Such arguments are rhetorical in nature and as such, downplay the lived realities of the rural peoples. More importantly, these stances lead to ignoring or downplaying the role of the biophysical environment in contributing to the production of vulnerability. The interaction of weather and edaphic conditions can shape the spatial and temporal patterns of resource availability which in turn can, over time, have social

effects affecting vulnerability. Despite his strong social theoretical commitments, Watts' work illustrates these interactions quite effectively.

Second, new adoptions of “vulnerability” have often done so without sufficient attention to social relations that constitute vulnerability as described by the foundational vulnerability texts such as *Silent Violence* or *Poverty and Famines* (e.g. Cutter and Boruff and Shirley 2003; Turner et al. 2003). Whether one conceptualizes these social relations as social relations of production, actor networks, institutions, moral economy, or social capital, vulnerability is inherently a relational and dynamic concept. Instead, we find, as shaped by common uses of the term, vulnerability as a quality of an individual, community, or state without reference to the social contexts (and the qualities of social relations therein) within which these social entities operate. As a result, we have the construction of vulnerability indexes based on the demographic characteristics of individuals or the wealth of nations without any consideration of not only the relations that produce wealth disparities but the social relations that may be more important in the context of climate hazard (wealth -> entitlements) than static measures of wealth per se. Associated with this tendency are implicit assumptions that “scaling up” is neutral – namely that the vulnerability of nation states to climate change is simply an aggregate of the vulnerability of its political districts, communities, households and citizens.

As O'Brien *et al.* (2007) have argued, the different meanings attached to vulnerability not only strongly shape climate change discourse but actions to reduce or mitigate vulnerabilities. Decontextualized stimulus-response understandings of vulnerability linked to ideas of adaptability and the hazards school – what O'Brien *et al.* (2007) describe as “outcome vulnerability” -- lead to technical or institutional fixes as means to reduce vulnerability. Even those understandings that O'Brien *et al.* (2007) would assign to their second category – “contextual vulnerability” show tremendous variability including those that treat the concept statically equating: poverty with vulnerability, social dependence with vulnerability, or ignorance with vulnerability.

Case Study: “Vulnerability” in Zarmaganda

In order to explore the complexities of vulnerability, I revisit the results of work that I conducted more than a decade ago that traced livestock wealth in *Zarmaganda* – the historical center of the *Djerma* people lying north of the current capital of Niamey in primarily the Ouallam district of western Niger (Hama 1967) . This is an area lying in the true bioclimatic zone of the Sahel (200-600 mm long-term mean annual rainfall) with the two villages where I worked located near the northern edge of where millet cultivation is actually feasible (300 mm/yr). Years of crop failure are common and there is a history of famines associated with periods of broader and longer dry periods (Cissoko 1968). The names of major famines are evocative of peoples’ struggles during the precolonial (*ize nere* – selling of the children; *gaasi borgo* – the pounding of calabashes) and colonial periods (*grande beri* – distended chest, 1913-14; *doo izo jire* – year of the grasshopper larvae, 1931-32; *wande waasu*—get rid of the wife, 1942; and *gaare jire* – year of the manioc meal, 1951-52). Even by Sahelian standards, this is an area of extreme vulnerability – no matter how one defines the term.

During 1994-95, I conducted work within two *Zarmaganda* villages. The central focus of this work was to revisit 56 concessions (*windi*) whose livestock herds were monitored from 1983-1987 by Maimouna Dicko (Dicko and Sayers 1988). The 1984 drought is the most severe drought on record in the region – therefore, Dicko’s data traces the severe decapitalization of *Djerma* herds. Working with the 54 concessions that still remained in *Zarmaganda* in 1994, I used a ‘progeny history’ approach to reconstruct the composition of these herds from 1987-1994 (described more fully in Turner 1999) to trace the uneven reconstitution of livestock wealth (cattle, sheep, goats, horses, camels, donkeys).¹ In addition, I conducted surveys and open-ended interviews of members of the surveyed concessions to gain an understanding of livelihood and investment strategies as well their views of the rights and responsibilities of members to provide for the rest of the concession. While these data were used to address different questions in my previous publications (Turner 1999, 2000; Turner and Williams 2002), these data are

¹ The “progeny history” approach uses the extant herd to trace back through animal matrilineages, additions and losses to the herd back through time. Working with each livestock owner in front of her animals, this approach was used to trace back to animals that were physically-tagged by Maimouna Dicko. The approach is most feasible to reconstruct livestock ownership during periods of net herd growth when livestock lineages are not eliminated. It does a poor job of reconstructing animals simply bought and sold for fattening. Therefore, the approach most likely underestimates sheep (common fattening animal) during the 1985-1992 period when informants’ recall of these short-term presences within herd is more limited.

reanalyzed here to interrogate common uses of vulnerability within the “human dimensions” literature.

Social organization and livelihood strategies in Zarmaganda

The basic features of the domestic organization of the *Zarmaganda Djerma* are similar to other agricultural societies in the Sudano-Sahelian region. The Djerma’s identity is tied to millet farming. Cropland is granted by the village chief to *windi koy* (literally, concession owners), male patriarchs that dictate the agricultural decisions and products of the concession’s fields (Raulin 1963). By “concessions” (*windi*), I refer to the people living within a single group of houses composed not only of the patriarch, his wives, unmarried children, and unmarried siblings but often the nuclear families (*fu*) of married sons and brothers. Both women and junior males have historically been loaned private plots by the *windi koy* to work and profit from individually during periods when their labor for concession fields are not required (Raulin 1963; Ngaido 1996).

While their social identity is tied to farming, the *Djerma* have historically combined farming with livestock rearing and labor emigration as part of their overall livelihood strategy. As such, they embody what adaptation scholars as an important response to climate risk: diversification of productive activities (Agrawal 2008). Despite being yet another example of the financialization of terms used to describe the poor and their livelihood “portfolios”, there is truth to the diversification idea although, in the *Djerma* case, its importance cannot be explained solely by climate risk. While regional mobility among the *Djerma* predates colonialism, increased subsistence threats during the early colonial period due in large part to colonial taxation and the need for cash, greatly expanded dry-season migration to the Gold Coast by *Djerma* men in search of work (Rouch 1961). The Zermaganda is truly a labor reserve today with seasonal to semi-permanent emigration of young men to Niger’s capital city, Niamey, and countries to the south so long-lasting (Painter 1994) that some describe it as being institutionalized as a ‘rite of passage’ for men within *Zarmaganda* society (Diarra 1974).

The members of the 54 surveyed concessions show significant differences in labor emigration participation across age classes and gender (Table 1). Women are more likely to remain in *Zarmaganda* during the dry season while men leave for the south. As a result, women

and children are highly dependent on remittances from sons, husbands and fathers as the dry season progresses. Often remittances do not come. While the spread of cellphone technology has had a significant positive effect, some of the most “vulnerable” situations I have observed in *Zarmaganda* and elsewhere in the Sahel are the numerous cases of women with children, a depleted granary, and no news from departed menfolk during even “normal” rainfall years.² The level of distrust between husbands and wives can be significant during these desperate times of food shortage with women’s vulnerability reinforced by their limited rights to their children in cases of divorce.³

Table 1. Labor emigration history and livestock ownership among members of 54 surveyed concessions by age and gender. Members greater than 19 years of age were classified with respect to the labor emigration history – never, several times or often leaving the village area (Ouallam District) in search of work. Livestock ownership is documented by the percentage of members who have never, at one time but no longer (previously), or currently own livestock (cattle, sheep, goats, camels, horses, donkeys).

	N	Labor emigration history (%)			Livestock ownership (%)		
		Never	Several	Often	Never	Previously	Currently
Women							
20-39 years	163	73.0	12.9	14.1	50.3	10.4	39.3
≥ 40 years	75	32.4	47.3	20.3	25.3	21.3	53.3
Total (>19 years)	238	60.3	23.6	16.0	42.4	13.9	43.7
Men							
20-39 years	131	5.3	28.2	66.4	43.5	26.0	30.5
≥ 40 years	85	3.5	58.8	37.6	16.5	30.6	52.9
Total (>19 years)	216	4.6	40.3	55.1	32.9	28.2	38.9

Livestock have historically been the most important privately-held store of wealth among the *Djerma* (du Picq 1931, pg 525; Streicker 1980). Reflecting the limited extra-local demand for millet, livestock and to a much lesser extent, cowpeas (intercropped with millet) are the major sources of cash from peoples’ agricultural pursuits. While less prevalent today, brideprice

² The vulnerability I refer to here is not simply material poverty but the lack of control and helplessness in these desperate situations. Moreover, livestock wealth held by women have lower entitlements than those of men. Socially, women in *Zarmaganda* do not sell livestock at public markets and therefore depend on men to sell their livestock. This relationship results in women receiving, on average, lower prices for their livestock than men. (Turner and Williams 2002)

was traditionally paid in livestock. Livestock gifts from mothers to daughters still mark important life-cycle events such as the daughters' first and second deliveries (*bongaya*). In the two study villages, both women and men own livestock as separate wealth stores (Table 1). In a 1995 survey, 80 household members were asked in an open-ended fashion what would they do with approximately 5000 FCFA (around 10 USD) gained during a time without pressing consumption needs (savings club, keep cash, give a loan, petty commerce, buy grain to stock....etc). Seventy-eight percent (62) of these respondents named livestock investment as their preferred use of even this relatively small amount of cash.

Early colonial reports described the *windi koy*, through his control over land, grain and bridewealth, as exercising considerable authority over both the allocation and products of the labor of females and dependent males in the concession (Olivier de Sardan 1984, pgs 109-117). This control reportedly loosened throughout the colonial period, particularly with respect to young men, due to the expanding importance of labor emigration (Olivier de Sardan 1984, pgs 243-247) and the gradual introduction of the Islamic and western concepts of land as divisible heritable property (Charlick 1991, pg 12).

These trends have led to some extent to the splintering of the *windi* and customary forms of marriage. Still, the extent of westernization and individualization can be easily over emphasized. Nineteen of the fifty-four households are polygynous. Of 74 married individuals surveyed, 42% and 93% of their spouses are cousins or are considered part of their lineage respectively. The size of the 54 studied concessions (*windi*) in 1994 varied from 3 to 38, with a median of 11.5 members. The number of nuclear families (*fu*) found within each *windi* in 1994 ranged from 1 to 8, with *fu* size varying from 2 to 16, with a median of 5. About two-thirds (37) of the study concessions hold more than one *fu*, a fraction that is higher than that reported for other *Djerma* communities (Ngaido, 1996: 264; Olivier de Sardan, 1984: 245).

Vulnerability and environment in Zarmaganda

Within the “vulnerability camp”, the biophysical environment is most often conceptualized as an external trigger (drought, flood, epidemic) that sets in motion or exposes differential vulnerabilities produced primarily by pre-existing social processes (Wisner et al. 2004). Relating such treatments to the Sahel and to the *Zarmaganda* in particular raises some problems.

First, the nature of the trigger matters with respect to creating differential exposures to differentially vulnerable people. As hazards scholars have noted, different climate hazards have different spatial and temporal patterns which lead to different exposures of harm. Some of these differential exposures can rightfully be described as socially-produced and predictable – social processes produce differential access to different types of land, technologies that reduce exposure, or more risky livelihood choices (Wisner et al. 2004). Still, climate variables display randomness with respect to social settlement and land-use patterns which, in turn, affects livelihood strategies and social interactions. The issue of agropastoral mobility is a case in point – a feature of the Sahelian livelihood that can be seen as an “adaptation” to the high spatiotemporal variability of rainfall but which leads to significant social change and conflict (Moritz 2006; Turner et al. 2011). In some cases, climate processes, while unaffected, resonate with existing patterns of human settlement and land use with significant social effect. For instance, new climate research in the Sahel have shown that early rainfall at one location (at the scale of a typical village territory) increases the probability of that location receiving more rainfall during the same season (Taylor et al. 2013; Guichard et al. 2012) consistent with local understandings. This results in higher inter-community variability in harvests than would be expected, affecting the nature of labor markets and extra-village ties.

Second, the idea of a trigger is misleading particularly as it relates to food insecurity in the Sahel – a region that has experienced rainfall below the long-term 1900-2013 average for 39 out of the 46 years between 1968-2013⁴ (also see Panthou and Vischel and Lebel 2014). What is the trigger? Instead we are talking about “slow death” (Watts 2013, pg xliii) or “slow violence” (Nixon 2011) – a slow attrition of the economy, health, and society. Farmers in the region consistently point less to particular “droughts” as a problem they face but to the persistent levels of low productivity due not only to aridity but low soil fertility (unpublished survey data in Niger, Mali, and Burkina Faso).

In *Zarmaganda*, sustained periods of low rainfall and low soil fertility (inhibiting harvests when rainfall does occur) have led to a fundamental shift in the relative importance of the productive activities within the agropastoral livelihood triad. Over the past decades, labor emigration and livestock husbandry have constituted a much larger fraction of household income

⁴ Based on regional rainfall index developed by the Joint Institute for the Study of Atmosphere and Ocean, University of Washington, Seattle. <http://jisao.washington.edu/data/sahel/>

than in the past. This in turn has led families to invest less attention, resources, and labor into farming. Land has become much less important as productive capital or wealth store in the area. The prevalence of crop shares gained by land loans and the general ability to control clients by the land wealthy has declined significantly. This form of wealth has historically been held at the level of the lineage with households of common fields – *windi* – forming the basic social unit. In contrast, the major form of individual wealth – livestock – has become relatively more important. Labor emigration and livestock have become increasingly linked as labor emigrants will store the little surplus income in livestock back home. As a result of these changes, the *Djerma*, despite the social identity as farmers, have become less oriented toward farming and more towards labor emigration and livestock husbandry. Yes, most families still plant fields but these fields go largely untended due to the diversion of labor to other pursuits. If rains happen to be sufficient, labor will be recruited in an ad-hoc fashion to perform tardy weeding.

These changes have a number of important social implications. The male patriarch (*windi koy*), whose leverage over women and male juniors in the concession (*windi*) has historically revolved around controlling their access to cropland, has lost leverage with respect to his charges. Cropland which was the material glue that held broader families together has become much less important. As a result, we observe a reinforcement of the trends toward individualization that began during the colonial era. In this case, not because of the deepening of commodity production but because of the reduced relevance of family-controlled land, the material source of power of the *windi koy*. In this way, recurrent crop failure has had an important effect on social relations which in turn plays a role in the ways in which people respond to food insecurity.

Moreover, the relative importance of different forms of capital to rural households has changed. While land sales are rare, the overall value of land relative to that of livestock has declined (both have declined in absolute terms). Cropland produces very little both in terms of millet yield and income through renting, pledging or loaning land. Livestock as a kind of living capital⁵ is different than land with respect to the risk of decapitalization. While “returns” on both is lower during periods of drought, the livestock capital stock can be physically depleted

⁵The relationship of livestock with capital has long been considered. Marx (1964, pg. 119), for example states: "Were the term capital to be applicable to classical antiquity . . . then the nomadic hordes with their flocks on the steppes of Central Asia would be the greatest capitalists, for the original meaning of the word capital is cattle"

through stochastic exposures to hunger and disease with longer delays in post-drought recovery. Therefore, a shift toward greater reliance on livestock as productive capital has an effect on “post-trigger” recovery and productivity.

In the following section, the relative importance of randomness in capital loss and recovery will be explored among the 54 *Djerma* households. The changing distribution of livestock wealth among different categories of households and among individuals will be explored to understand the degree to which changing fortunes are shaped by chance, material wealth (as measured by livestock) or by (social) factors not captured by livestock wealth.

Livestock wealth trajectories in Zarmaganda (1983-1995)

Livestock have historically served as the most important form of personal wealth and productive capital in *Zarmaganda*.⁶ Increasingly, due to the reduced “value” of land as an asset, livestock dominate the assets held by the *Djerma*. Therefore, we can, with some qualification, use livestock wealth as a measure of overall material wealth of an individual to assess the importance of the randomness of loss and gain with respect to wealth and to assess whether the common equating of “material poverty” with vulnerability make sense or if a more relational understanding of vulnerability is necessary. Loss of livestock wealth during the 1984 drought or limited recovery of livestock wealth during the 1985-1995 period will be used as a measure of vulnerability – consistent with its treatment in the human dimensions literature.

Using the average price of livestock species sold by study households during the 1984-1995 period⁷, the value of livestock assets owned by members of the 54 study concessions was determined using the livestock ownership reconstructions for three dates 1/1/84 (prior to the 1984 drought), 11/1/85 (the low point of aggregate livestock ownership in the aftermath of the drought), and 1/1/95 (at the end of the study period when aggregate livestock ownership had

⁶ People do save money with savings clubs or with local merchants. Some may own durable goods with value (a motorcycle, donkey cart, plow). One of the study villages has been the beneficiary of a pump-irrigated garden project resulting in claims to prime garden plots by some representing productive assets. Still, while other forms of wealth may be particularly important for certain individuals and households, livestock represent the major store of wealth across all households. Moreover, given the popularity of livestock as an investment, livestock arguably is a good indicator of overall wealth given that those who have other forms of wealth are most likely to hold livestock assets as well. The exception to this is the small merchant who is more likely to hold their assets in the form of merchandise.

⁷The following prices were used: camels (60,000 FCFA), cattle (40,000 FCFA), horses (10,000 FCFA), donkeys (7,500 FCFA), sheep (6,000 FCFA), and goats (3,600 FCFA).

almost recovered to pre-1984 levels). It is important to note that while 1984 was a drought year of historic proportions, the subsequent period was still a period of below-average rainfall and recurrent subsistence crises.

With these data, we will evaluate the degree to which pre-1984 livestock wealth at the individual and *windi* levels leads to less loss of wealth (e.g. less vulnerability) during the drought (through comparison of livestock wealth in January 1984 compared to that in November 1985). In addition, does remaining wealth in November 1985 lead to a greater ability to recover from drought? In short, did 1983 wealth alone confer lower sensitivity to; or ability to recover from the 1984 drought for individuals or concessions. Finally, who are those decapitalizing less during drought and accumulating more during recovery and does this match a more qualitative assessment of their level of vulnerability?

Figure 1 presents the relationships between the livestock wealth of concessions in 1984, 1985 and 1995. As one would expect there is a relationship between livestock wealth in 1/1/84 and 11/1/85, 22 months later. Regression analyses confirm that this relationship is significant with 66% of the variation of 1985 inter-concession wealth variability “explained” by 1984 concession wealth. This is to be expected given that that only the wealthy could

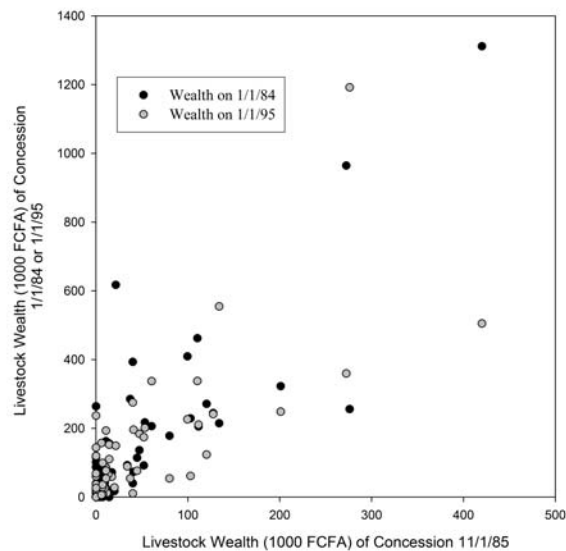


Figure 1. The relationship between the livestock wealth (1000 FCFA) of study concessions (*windi*) on November 1, 1985 with

possibly have significant wealth following the 1984 drought. Still, a review of Figure 1 shows that there are a number of wealthy concessions that lost significant wealth by 11/85 (dark circles). Moreover, the fractional change in the 1984 livestock wealth of concessions between 1/1/84 and 11/1/85 is found not to be related to 1984 livestock wealth. The relationship is less strong during the post-1984 recovery period (Figure 1). 52% of the variation in 1995 concessional wealth variation is explained by 1985 concessional wealth with no significant

relationship found between 1985 wealth and its subsequent fractional change to 1995.

Therefore, wealth is at best, an incomplete measure of vulnerability to wealth loss tied to severe drought (e.g. 1984) or to prolonged hardship (1985-1994) at the level of the *Djerma* concession (*windi*).

To assess the changing distribution of livestock wealth among members of the study concessions, the livestock wealth of all individuals who owned livestock at any point during the 1983-95 period was determined for 1/1/84, 11/1/85, and 1/1/95 (n=292). Of these, those individuals who were present on each of the two dates were included in comparisons between wealth changes during the 1984 drought (1/1/84 to 11/1/85) and during the recovery period (11/1/85 to 1/1/95). Figure 2 plots individuals' livestock wealth between 1985 and 1984 (A) and between 1985 and 1995 (B). Livestock losses are highly variable between individuals during the 1984 drought (A) with regressions of 1985 wealth on 1984 wealth explaining less than 50% of the variation in 1985 individual livestock wealth (Table 2). Similar results are found for the recovery period (Figure 2B) with 1985 wealth explaining only 42% of wealth variability in 1995. Similarly, 1984 and 1985 livestock wealth did not have a significant relationship with fractional changes in that wealth during each subsequent period: 1/1/84 to 11/1/85 and 11/1/85 to 1/1/95 respectively.

Table 2. Results of least-squares regression analysis of individual livestock wealth on previous on livestock wealth and two dummy variables signifying the individual's position within the *windi*: females (woman) and those males who are not the head of household or his father (junior man). The results of two models are presented. The first of 1985 on 1984 wealth and *windi* position variables (Model 1984->1985) was significant with F statistic (3, 263)=87.35 with adjusted R² of 0.49. The second of 1995 on 1985 wealth and *windi* position variables (Model 1985->1995) was significant with F statistic (3, 246)=64.79 with adjusted R² of 0.43. Only those individuals who were present within the *windi* on each of two dates and who were livestock owners at some point during the 1984-95 period were included in regressions.

Variable	Model 1984->1985			Model 1985->1995		
	Coef	β	T	Coef	β	T
Wealth84	0.23	0.70	15.63 ***	--	--	--
Wealth85	--	--	--	1.79	0.66	13.70***
Woman	2705.94	0.05	0.86	28462.22	0.20	2.97**
Junior man	-1489.01	-0.03	-0.45	26287.72	0.17	2.60**
Constant	2009.80	--	0.72	-10422.84	--	-1.24

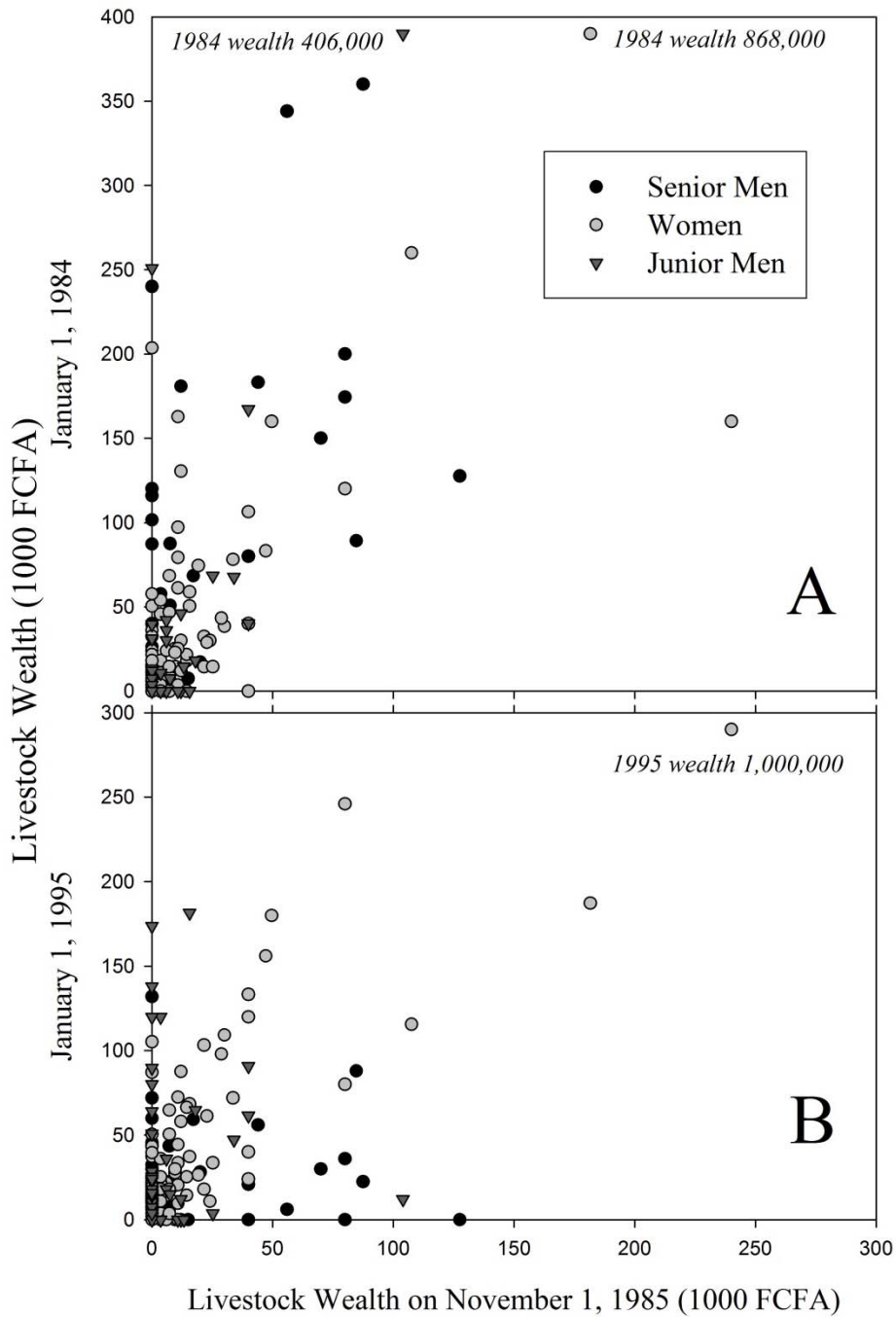


Figure 1. The relationship between the livestock wealth (1000 FCFA) of concession members who have owned livestock sometime during the study period between: A. January 1, 1984 and November 1, 1985; and B. January 1, 1995 and November 1, 1985. Heads of concessions or their fathers (senior men) are distinguished from women and junior men.

In sum, material wealth in hand does not seem to have a dominant influence on a concession's or individual's ability to weather climatic hazard. It is logical that, all else equal, a richer concession or individual is able to liquidate more wealth during times of drought and recover more rapidly with some remaining livestock capital. The problem is that in the real world, "all else" is not equal. There is a social randomness of livestock loss due to death and forced sales during times when the livestock capital stock is in a weakened condition. More importantly, concessions and individuals have different responsibilities, obligations, opportunities, entitlements, and resources which are not captured by a single wealth number – no matter how accurate.

The social relations of vulnerability: Different obligations and opportunities

“I will not sell an animal to support the family until my husband sells his last animal — including working animals [donkeys, oxen, camels]”

Djerma woman,
owner of 20 head of small stock in 1994

A major implicit or explicit premise of those proposing various vulnerability indexes or those who simply equate vulnerability with static measures of “poverty” is that the nature of social relations which underlie vulnerability are captured by static measures of wealth. Certainly in regions such as the Sahel which have experienced recurrent subsistence crises, wouldn't wealth be a sign that the individual or concession has or at least has had the entitlements necessary to maintain his/her wealth over previous periods? Not only do wealth stores have variable entitlements associated with them but they also have different obligations to them as mediated by their owners.

As shown in Table 2, the post-drought livestock wealth trajectory (1985-1995) was different for women and junior males compared to senior men (*windi koy* and their fathers) within *Djerma* concessions. During the period, both women and junior males gained in livestock wealth relative to that of senior men. The aggregate effect of these wealth trajectories is seen in Table 3 which shows the aggregate value of the livestock owned by members of the 54 study concessions. Across this drought and recovery cycle, the fraction of livestock wealth owned by senior men declines from 0.40 to 0.12 while that of women (0.45 to 0.62) and junior men (0.15

to 0.26) rise. Women's gains of wealth relative to that of senior men occurred during both periods with a differential decapitalization of senior men's livestock during the 1984 drought followed by a slower recovery of senior men's wealth. Junior men gained relative to senior men primarily during the recovery phase through their investment of the proceeds of labor migration (11/1/85-1/1/95).

Table 3. Changes in aggregate livestock wealth and the fraction of this wealth owned by senior men, women, and junior men within the 54 concessions on January 1, 1984, November 1, 1985, and January 1, 1995.

	<u>1/1/1984</u>	<u>11/1/1985</u>	<u>1/1/1995</u>
Total livestock wealth (FCFA)	9,180,800	2,692,800	7,910,600
Fraction owned by:			
Senior men	0.40	0.31	0.12
Women	0.45	0.56	0.62
Junior men	0.15	0.14	0.26

These shifts in material wealth reflect not only declines in the productivity of the cropped fields controlled by senior men but also the decline in their leverage over the income of women and junior men as cropland becomes less sought after and valuable.⁸ These changes have come about within the context of the longstanding Islamic tenet that it is the husband's responsibility to feed and clothe the family (Doi 1990) which has been part of the rationale within Sahelian societies to restrict women's access to land and for various forms of wife seclusion or purdah (Cloud 1986; Cooper 1997; Coles and Mack 1991).

Table 4. The mean ranks of the relative responsibility to sell livestock (if owned) to support the family in times of food need within a typical *windi* (having nuclear family of household head (HH) plus brothers, sisters, sons and daughters) as reported by 80 respondents of different ages and gender. Highest responsibility is 1, lowest responsibility among six member categories is 6. In cases where respondent designates level of responsibility is the same for two or more categories, they are given the same rank.

Respondants	Mean Rank (1=highest, 5=lowest)						
	n	Male HH	Wives	Brothers	Sisters	Sons	Daughters
Men							
<=30 years	8	1.00	3.50	4.38	3.63	3.38	4.63
>30 years	28	1.00	3.79	4.00	3.57	3.46	4.43
Women							
<=30 years	22	1.00	2.59	3.86	3.77	4.50	4.18
>30 years	22	1.00	2.38	4.33	3.48	4.52	4.43

⁸As reported in Turner (2000), millet and cowpea farming was the revenue source for only 0.7% of the value of livestock added to *Djerma* herds during the 1984-1995 study period.

While the *Djerma* are known for resisting Islam and animist practices still play an important role in social life, the differential responsibility held by the *windi koy* in selling his livestock to support the family is shown by informants' ranking of the responsibility to sell livestock to provide food among different members of a prototypical *windi* (Table 4). The major difference among of respondents' perception of responsibility is that women generally rank wives in the second position while men rank sons in that position.

As described more fully elsewhere (Turner 2000), decisions about the use of personal wealth (livestock) to support the family are more complex than suggested by these survey results. There are social norms against selling of female livestock or working animals that often would lead those with less responsibility, to sell their livestock first. In addition, there are wider interpretations of responsibility in real-life situations as suggested by these rankings made in abstract. Years of the labor emigration have led to the development of distrust between some husbands and wives. Many husbands would be gone long periods without sending money back. They would say that there was no money to send back while women, who were left in famine zones, would hear rumors otherwise. In polygynous households, some women would be interested in supporting their children over those of a co-wife. The leverage of a wife vis-à-vis her husband is in some ways shaped by her individual wealth in livestock. Threats of divorce are taken more seriously if the woman has the economic means to live independently. Embedded within the livestock ownership data are cases where husbands sold their animals to their own wives in order to meet their obligations to support the family. Marabouts (Islamic priests) recounted to me situations where they counseled husbands to leave the village because their wife or wives were unwilling to sell livestock to support the family with him present and possibly still with livestock himself. The 1984 drought and subsequent period of "recovery" was a time of struggle: recurrent hunger, physical distancing of family members, and conflicts within the household about food needs, assets, and provisioning responsibilities.

Climate change, vulnerability, and adaptation revisited

Whether or not tied to anthropogenic climate change (Panthou and Vischel and Lebel 2014), the sustained dry period experienced in *Zarmaganda* from 1983-1995 provides a useful case to evaluate the prevalent concepts that shape the "human dimensions of climate change" literature. As described earlier in this paper, this literature is dominated by treatments that have promoted a

succession of terms such as vulnerability, adaptation, resilience, coping, deliberate transformation...etc. and a plethora of simple relationships such as those relating poverty and vulnerability, technology and adaptation, or diversification and resilience. The *Zarmaganda* case shows significant social change (response?) associated with 1984 drought and with the subsequent more moderate period of recurrent production failure. Would we call *Zarmaganda* society, the 54 study concessions or their members resilient? By what criteria? Could we call the renegotiations of the conjugal contract, adaptations? If we did choose to use these terms, what would they contribute analytically beyond metaphors for dynamic return (resilience) and responsive change (adaptation)? I would say very little.

Therefore, we can turn quickly to the concept of vulnerability. The antagonistic molding of adaptation and vulnerability perspectives⁹ has resulted in “vulnerability” being treated as being produced socially with outcomes triggered by biophysical events (Wisner et al. 2004). As the *Zarmaganda* case shows, rainfall variability and deficit cannot be viewed as simply a “trigger” – a singular event. Nor can climate change be viewed this way. We also see that recurrent drought as a biophysical phenomenon, through repeated harvest failure, contributed to the changes within *Djerma* families that have in turn shaped the nature of “social response” to the 1984 and subsequent droughts. Clearly, the dichotomization of the social and biophysical has not served us well in understanding how vulnerability is produced in places such as *Zarmaganda*.

The *Zarmaganda* case also questions the equating of measures of poverty with vulnerability in the human dimensions literature. This conceptual move has allowed “vulnerability” to be measured by demographic rather than more dynamic relational characteristics. Measured in this way, the scaling of vulnerability is treated as neutral: the vulnerabilities of households, communities and nations are simply aggregates of their human constituents. We see that livestock wealth trajectories of individuals and concessions are not necessarily correlated. Moreover, our reconstructions of livestock wealth in *Zarmaganda* show that wealth at the beginning of a time period is only weakly predictive of livestock wealth after

⁹ As described above, two dominant approaches have coalesced around vulnerability and adaptation loosely tied to the political economic and hazards traditions respectively (Bassett and Fogelman 2013; Ribot 2014; Ribot 2011; Adger 2006; Wisner et al. 2004). These fields have developed in large part in reaction against each other -- leading to the erection of barriers and a simplification of their positions as each “camp” seeks to clarify and distinguish itself from the other. As a result, much of this literature deviates from the relational frameworks of Sen, Watts or others who grounded these to the historical records and empirical realities of their study areas.

1984 drought and after the subsequent period of wealth recovery. This is due in part to the stochastic nature of livestock loss but also the highly contextualized renegotiations of obligation within and between households to sell livestock to provide food. During these periods, we see a relative increase in women's wealth relative to that of senior men. Does this mean that women are less vulnerable to climate variability? No. In fact, this shift in wealth could be seen as resulting from women's reaction to their differential vulnerability and concern for their children. In this case, livestock wealth alone is a poor inverse measure of vulnerability. In fact, for some study households, an individual's livestock wealth is positively associated with his/her vulnerability.

As a relational concept, vulnerability is necessarily scale dependent. If my study included people outside of these two villages such as grain traders, livestock traders, and the urban-based middlemen who market the labor of *Djerma* migrants, the patterns of vulnerability I would observe, as produced through an expanding set of social relations, would be quite different. Among the 54 *Djerma* households in this study, their vulnerability to recurrent drought (relative to each other) reflects not only wealth in hand but differential access to land, livestock markets, agricultural labor, labor emigration possibilities, and one's children (as fathers and mothers). These access rights reflect changing social relations both between and within *Djerma* concessions. It is the qualitative nature of such relations that should figure more prominently in current approaches to vulnerability.

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