Agricultural Change, Land and Violence:
An Examination of the Region of Darfur, Sudan

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Abdal Monium Khidir Osman

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Dissertation committee:

Helen Young, Ph.D. Chair

Robert F. Houser, Ph.D.

Jennifer C. Coates, Ph.D.

Dedication

To my parents and my wife

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Abstract

Over the past two decades, protracted conflicts have become a prominent feature in many African countries. In Sudan, it is almost nine years since the crisis in Darfur manifested itself to the international community in the form of massive displacement and killings following the brutal counterinsurgency campaign in 2003. Though the violence in Darfur has attracted much attention and analysis, the local dimension of the crisis remains a gap in these analyses. The most important elements that have been accorded little, if any, attention are the agricultural change and the related changes to the land-rights and land-use system. This thesis explores the connection between these issues and violence. It is composed of three analyses that examine (1) the nature of change in agriculture and land use, and how such change affected the resource utilization pattern and the interdependence between pastoral livestock production and shifting crop cultivation; (2) land allocation and acquisition between groups and individuals in a context of changing land use; and (3) the implications of these changes for the local-level traditional institutions that oversee land rights and settle conflicts, and their further implications for violence in the region.

The study area is located in North Darfur State and forms the northeastern extension of Jebel Marra. The study area is a hub of interaction of farming and pastoral livestock production and is characterized by chronic conflicts and social tensions. Qualitative research methods were used to examine the research questions. Data were collected from farmers and transhumant pastoralists in 28 villages in the different agricultural zones in the area, from pastoralists in 8 pastoralists settlements, and from key informants and business groups in the study area. Data collected were transcribed, imported, and analyzed using computer-based qualitative analysis software (QSR NVivo 8).

The thesis investigates changes in land use since the nineteen-sixties. Shifting crop cultivation first changed into continuous land use and since then has evolved into a stabilized

agricultural system of mixed farming. This change in land use has had serious consequences for the cyclic use of land, which allows crop cultivation and pastoralism to take place on the same land. It has also disrupted the multiple and overlapping land-use systems, eroded the mutual interdependencies between cultivation and pastoralism, and broken the traditional twining between these two systems of land use. The interaction between the groups involved in these two systems of production has become competitive. In addition, the customary tenure system has evolved from usufruct rights with reversion to common property on abandonment to an individualized control system. The rise of the individual land control has taken place within a context of conflicting dual land tenure of the customary and state land law. The dual land tenure system, the evolution of a contested individual land control, and the tension ensuing from both have resulted in confusion, lack of access to land and landed resources for large sectors of the population, and insecure access to land and landed resources for others. The implications of these changes in access to agricultural resources are discussed in terms of the disputes, violent conflict, and non-conflict armed violence in the region; the customary land management and conflict resolution authorities; and the ethnic trajectory that the violence has taken. In addition, the structural link between land, ethnicity, and power in Darfur makes access to land liable to political and ethnic mobilization.

The rise of individual land control, the erosion of the customary authorities, and the dual land tenure system present a policy challenge. Individual land registration in general has been an appealing policy strategy. But in a situation such as that in Darfur, where the viability of the different production systems and the groups involved in them are solely based on land use and land claims by several resource users over different times, individual registration would present serious technical as well as social challenges. This dissertation argues for further research on the changing nature of the agricultural system and land system to inform context-specific solutions, policy debates, and peacemaking processes.

I. Introduction

Over the past two decades, protracted conflicts have become a prominent feature in many African countries. In Sudan, it is almost nine years since the crisis in Darfur manifested itself to the international community in the form of massive displacement following the brutal counterinsurgency campaign in 2003. The brewing of the crisis, however, began as early as the 1960s. The recurrent drought, the introduction of (and increasing orientation toward) cash crop production, and the ensuing change in land use in the context of deepening governance gaps have consistently shaped the power relations in the region and the access to resources among and within the different livelihood groups. The change in access to resources has provoked social conflicts and social tensions articulated through violence. The region experienced a total of 35 major tribal conflicts over 25 years between 1975 and 2001, compared with only 3 tribal conflicts over 35 years between 1935 and 1970 (Takana, 2002). These conflicts have become very bloody and eventually led to massacres in the late eighties and into the nineties (Harrir, 1994; News From Africa Watch, 1990).

But violence in Darfur has not always been a simple case of one group of armed actors against others. Rather, it has been a mixture of high generalized violence characterized by attacks on highways, armed banditry, attacks on markets, robbery of banks, burning of villages and pastures, and assassination of individuals. By the end of the nineteen-eighties, such widespread and persistent violence created a new order of permanent crisis in the region. This permanent crisis is characterized by functional violence that has promoted the violent appropriation of assets and limited the options for legitimate livelihoods strategies. Accordingly, livelihoods assets have become life-threatening liabilities (Duffield, 1993; Keen, 1994; News From Africa Watch, 1990). A 90-year-old nomad interviewed during the fieldwork for this study stated that "war has never stopped in Darfur. It just keeps changing its forms and shapes." That means, from the local perspective, that the

contemporary violence in Darfur is interwoven with the long-standing violence and social tensions in the region; it cannot be separated from them. The long-standing inter-communal tension and violence has fed into the insurgency that started in 2003. Since then this drama of violence has brought the region into a protracted political crisis of a multifaceted nature: a new phase of violence in the trajectory of carnage in Darfur.

Violence in Darfur is a complex web of interacting, multifaceted, and evolving situations. Its causes and manifestations are multiple, with local-level elements and wider macro-level elements. Research on the crisis in Darfur has largely addressed the macro-level elements, with inattention to the local-level elements and their links with the wider policy context. The most important element that is lost in a blur of inattention is agricultural change in the region, with its links to the long decades of violent trajectory in Darfur. Agriculture is the backbone of the economy in the region. It provides the basis on which the entire region subsists. Thus, it is important to analyze agricultural change in Darfur and the impact of this change on access to resources, particularly those relevant to the agricultural production of the different groups of people inhabiting the region. This kind of analysis could reveal the social origins of violence and tensions in the region and their relationship with the elements of agriculture change. In addition, bringing the agricultural dimension to the center of attention means bringing into sharper focus the local elements of the conflict that shape the daily relations between individuals, households, and communities. These people and the issues that are of concern to them are often excluded from peace packages offered by the international community.

This research seeks to study the agricultural dimension of the violence in Darfur. Its contention is that violence in Darfur is an outcome of despair underpinned by structural changes in access to resources caused by the process of agricultural change. This process has included changes in the production systems, land use, and common property rights, combined with the failure of

conflict- and land-management institutions. Such despair runs across and within the different livelihood groups and has resulted in widespread social tension and violence. Long-term structural change in access to agricultural resources, in an agrarian society, determines the nature of the relationship between the different resource users. This long-term structural change is particularly critical in places such as Darfur, where land rights are based on an overlapping multi-right system and where the forces of resource allocation and access express themselves in day-to-day living at the micro levels. Therefore, rather than the functioning unit of production at the farm or herd level, or the annual cropping cycle, the central element of the investigation of agricultural change is the long term structural changes in land use and land control regime.

This dissertation examines the nature of agricultural change and its implication for land use and land rights system, its implication for the interdependence between the production systems and violence in the Kebkabiya area of North Darfur in three separate papers:

The first paper investigates the nature of change in land use and how such change affected the resource utilization pattern and the interdependence between pastoralism and cultivation and between the groups that are involved in these modes of production.

The second paper explores land allocation and acquisition between groups and individuals, as practiced on the ground in a context of a changing land use. Have land rights evolved in the direction of increased individualization? Does the land allocation process take place through increasingly private mechanisms?

The third paper builds on the first two papers to examine the ways in which agricultural change and related changes to the land-rights and land-use system in the study area have affected the production symbiosis, the multi-right land system, and the local-level institutions for settling conflicts and disputes; and what the implications of these changes for social polarization and violence.

Chapter 1 explores the literature on agriculture change, investigates the literature on violence with a focus on Darfur, and ends with a brief review of the recent supporting literature on the link between agricultural change and conflicts.

Chapter 2 presents a detailed discussion of the methods that were used to collect and analyze the data for the dissertation.

Chapter 3 examines the research questions in three stand alone articles addressing the research questions in order above. The dissertation closes with a section on the implication of the analysis for research and policy.

Literature Cited

Duffield, M. (1993). NGOs, disaster relief and asset transfer in the Horn: Political survival in a permanent emergency. *Development and Change, 24*, 131–157.

Harir, S. *(*1994*).* "Arab belt" versus "African belt: Ethno-political conflict in Dar Fur and the regional cultural factors. In S. Harir *&* T. Tvedt *(Eds.), Shortcut to decay: The case of the Sudan (pp.* 144–*1*85). Uppsala*:* Nordiska Afrikainstitutet.

Keen, D. (1994). *The benefits of famine: A political economy of famine and relief in southwestern Sudan, 1983–1989*. Princeton, NJ: Princeton University Press.

News From Africa Watch. (1990, April 2). Sudan: The forgotten war in Darfur flares again. *News From Africa Watch, 45,* 1–9.

Takana, Y. (2002). *Resources based conflicts: North Darfur and Upper Nile case.* Khartoum, Sudan: Oxfam GB.

II. Review of the Literature

1. Agricultural Change and Violence: Two Separate Tracks of Debate

In the post-Cold War era, violence and agricultural change in developing countries have each been the subject of extensive research. But generally the research on each of these topics has proceeded on its own separate but related track. Critical links between them remain unexplored. Research on agricultural change has focused on the link between farming and population, founded on the work of Malthus (1798) and Boserup (1965). Research on violent conflict in developing countries in the post-Cold War era has focused on themes such as ethnicity, inequalities, poverty and unemployment, mineral resource endowment, elite bargain (intergroup distribution of access to positions of state power), economic opportunity, and so on. Research and analysis on violent conflicts in the post-Cold War era has not integrated agricultural change in the subject of its analysis. This is probably because agricultural change is articulated in the technical terms of production, technology, and population with inattention to its social dimensions. Recent some scholarship has thought to revive some older analytical approaches and suggest that these approaches could enhance scholarship on the complex crisis of the post-Cold War era. It claimed these older analytical approaches has been neglected and instead research has sought new explanations of the world's turmoils. Cramer and Richard (2011) commented on the shift to search for new causes for these wars: "Seemingly, topics associated with worn-out explanations from the Cold War period are dumped in a rush to find new and ingenious causes of the world's ills" (p. 278). They stressed the need to bring back one of those older and now neglected dimensions: the agrarian roots and dynamics of violent conflicts. This old literature on agrarian change establishes that the processes of agrarian change are themselves inherently conflictual and frequently violent (Bryceson, Cristobal, & Jos, 2000; Scot, 1976).

This recent research in the field of agrarian change and violent conflict research has noted important links between these two fields. Many of these links remain unexplored, and those that have been investigated are often only referred to implicitly, especially in an African context where common land property is believed to prevail and the agrarian society is often described as egalitarian (Noronha, 1985; Yudelman, 1964). The following section explores the literature on agriculture change, followed by the literature on the violence in Darfur in the last two decades. A subsequent section highlights the links between the two subjects. On the basis of these links, the dissertation examines the agricultural dimension of the violence in Darfur in three separate articles as described before.

2. Literature on Agricultural Change

Agricultural change is the movement from forest and bush fallow systems of cultivation to annual and multi-crop systems whereby plots of land are cultivated one or more times per year ((Boserup, 1965). In other words, it is a continuous and permanent use of the land as a form of intensive production. The scholarship on agricultural change is entirely based on two models: The first one is called the Boserup (labor-led or capital-saving) model, and the second one is called the policy-led (capital-led or labor-saving) model (Carswell, 2000).

The Boserup model holds that with increasing population densities, a corresponding shift to greater agricultural production and more intensive use of the land takes place autonomously through the development of market forces (Boserup, 1965). Ester Boserup (1965) has brought an important new perspective on agricultural change that has dismantled Thomas Malthus's assumptions. Malthus (1798) argued for an intrinsic imbalance between rates of population increase and food production. He concluded that it was the fate of human numbers to be checked by "misery or vice" in the form of starvation and war"p.5 . Boserup's model assumes that farmers add labor to the production process on a given unit of land, so that they crop more densely, weed and harvest more assiduously,

and so on (Clay, Reardon, and & Kangasniemi, 1998). Accordingly, the model has come to be known as "labor-led" intensification, as it makes little if any, use of capital (i.e., it is capital saving). However, the sustainability of the labor-led intensification is questionable because it poses an environmental challenge. The reduction of bush fallow, the more intensive use of land without supplementary biological and chemical inputs, and the depletion of forestry resources complicate the transition to intensive agriculture (Lele & Stone 1989).

The second model is policy-led agricultural intensification, involving a shift to crops of high value or to more productive land, as outlined by Pingali and Binswanger (1988). Clay et al. (1998) define the policy-led model from a sustainable agriculture point of view as "'capital-led' intensification, which entails substantial use of capital, broadly defined to include nonlabor variable inputs that enhance soil fertility (such as fertilizer) and quasi-fixed capital that protects the land (such as terraces)" (p. 1). They identified capital farm inputs in Rwanda to include (a) land conservation infrastructure (grass strips, anti-erosion ditches, hedgerows, and radical terraces), (b) organic inputs (composting, manure, green manure, and mulch), and (c) chemical inputs (fertilizer, pesticide, and lime). Clay et al. argued that planting and maintaining cash perennials such as coffee and bananas falls under the capital-led intensification path because the planting of perennials is a long-term capital investment. They added, "In turn, this capital is either acquired through purchase or produced on-farm, often with substantial labor input (e.g., anti-erosion ditches are dug using farm labor and other farm capital, such as hoes)" (p. 1).

In principal, the capital-led and labor-led intensification modes reflect the nature of the agricultural production as a function of capital versus labor (capital saving or labor saving). The path that a household follows is an outcome of all forms of capital that a household has access to. These are not only financial and human resource capital but also include other types of capital such as social, natural, and physical. The household follows a mix of intensification strategies to increase the

value of net output per hectare through increased average inputs of labor or capital per unit of land (either cultivated or a combination of cultivation and grazing). This course of change is in itself a complex one and is influenced by the broader institutional context, which influences access to resources. These institutional factors and their role to influence access to resources raises the issue of differentiated access to the resources necessary to intensify agriculture and the different ways in which the household made intensify their agriculture (Clay etal 1998). The choice made by households or groups of farmers on the intensification path in different institutional contexts has been the focus of much of the conceptual and empirical research in Africa. Turner, Hyden and Kates (1993) suggests that the rules of resource allocation can become a constraints to agricultural growth in situation where change is rapid and the need to promote agriculture growth come into conflict with objectives of allocation rules.

The focus of the research on agricultural change is on inputs-outputs relations and on agricultural productivity. The focus on productivity has limited the debate on the broader context of the policies, institutions, and processes that mediate access to agricultural resources to the role of these factors in promoting agricultural growth. This perspective, however, focuses on the crop rather than the people engaged in the crop production. It overlooks issues of household equity, well-being, and economic development (Brookfield, 2001; Turner and Ali, 1996). Less well understood are the changes in the relationships between people, in their relative power, and in access to and allocation of agricultural resources that occur along side agricultural change. Morrison (1992) pointed out that most of the current debate on intensification leaves no room for the real constraints of unequal power relations. This is because the Boserup model that dominated the debate on agricultural intensification is "necessarily a totalizing perspective on social and economic transformation" (Morrison, 1992, p. 240). Morrison pointed to the fact that intensification "forced some people off the land entirely or into the role of landless laborers" (p. 238). In examining the

paths of intensification in Bangladesh, Turner and Ali (1996) found that the larger holders accounted for the surplus production, while the increasing landless households suffered from chronic production shortfalls and malnutrition. They commented that while "Bangladesh will likely continue its muted path of agricultural intensification—diverting a major famine—it will likely do so under increasing household, even village, polarization" (p. 14991).

The process and consequences of agricultural change in Sub-Saharan Africa are complex and serious. In Sub-Saharan Africa, crop production, horticulture and herding interact on the same steppe under a multi-tenure system of different land uses. The multi tenure system in Sub- Saharn Africa has allowed the serial use of land by different users such as farmers and herders induced the interdependence of the production system and the cooperation of land users in these systems. Agricultural change in multi-tenure and overlapping land uses affects the resource users differently in their access to and utilization of land, with far more serious social and economic implications.

Therefore, in this context the need to examine agricultural change and its impact on the access to and allocation of the productive natural resource base in the central cultivating zone of Darfur could provide insight on the course of change and transformation taking place in the rural societies of the arid and semiarid areas of Sudan and Africa. It could also reveal the dynamics of economic and political change and provide a important perspective on the widespread violence in Darfur in the last four decades. The following section presents a review of the literature on land tenure, the most important aspect on the access to and allocation of the productive base.

2.1 Land Tenure

Land tenure as an institution has attracted much attention and research within the literature of agricultural intensification. Most of the discussion on the institutions of land tenure is centered on the role of land tenure in promoting or constraining agricultural growth. Some scholars have

argued that indigenous land tenure is dynamic and evolves in response to population intensity and technology (Maxwell and Wiebe, 1999). Turner etal (1993) have confirmed the resilience of indigenous land tenure institutions as observed by Downs and Reyna (1988) and they have suggested that many Africans are at a turning point in their relationship to their land. Land, labor, and money have gradually become commodities. Accordingly, the price mechanism and the profit motive have replaced the deliberation and negotiation of diverse social interests and concerns, to become the structuring principle of the society (Polany, 1944). Cuffaro (1997) discussed the economic and institutional change of agriculture change in terms of technical progress, intensification, and definition of property rights. The author concluded that although agricultural intensification makes it possible to meet the growing food needs but the process may not go from balanced management of communal property to a complete definition of individual property rights. Rather, it may result in a breakdown of traditional systems into de facto open access, with the associated environmental degradation. Studies by Harrison (1987) and Dorner (1972) argue that indigenous land tenure provides insufficient security to induce farmers to invest in land.

A large body of research discusses the relative merits of individual and communal land ownership. Communal land tenures are egalitarian, with open and equal access to all individuals on the basis of membership in the group. Many scholars argue that communal land tenures lead to wasteful patterns of land use. In addition, they are not clearly defined or consistently enforced. In other words they are ambiguous and contested, and right in land is subject to ongoing reinterpretation. Consequently, communal land rights are insecure and therefore do not provide incentive to individuals to invest in land improvement (Berry, 1993; Cohen, 1980, Feder and Noronha, 1987; Noronha, 1985).

Individual tenure has all the attributes contrary to those of communal tenure. The right to land is a matter of contract, a power to transfer with the right to use or not to use the land.

Migration does not result in loss of ownership and is not interpreted as abandonment (Noronha, 1985). Accordingly, many of the critics of customary tenure advocate for land reforms to promote agricultural development and to permit governments to allocate land rights in accordance with national priorities (World Bank, 1975).

A good deal of the literature has concentrated on demographic changes and agricultural intensification and their implications for land tenure since the early seventies (Boserup 1965). Demographic growth and agricultural intensification drive a shift from communal to individual and commercial land rights. Accordingly, new types of land transactions such as sales are emerging, with new practices such as use of witnesses and written contracts. These changes confirm the so-called "evolutionary theory of land rights." The fundamental element of this theory is that the increasing population pressure and market integration drive the spontaneous evolvement of land rights toward rising individualization (Boserup, 1965; Chauveau, Colin, Jacob, Lavigne Delville, & Le Meur, 2006; Platteau, 1996). However, such a change is not a linear and uniform one but rather complex, with increasing social and agricultural differentiation (Crowley & Carter, 2000). Those with more resources are able to gain control over valuable lands, while the land claims of more vulnerable members may be weakened. The weaker groups are pushed out, and they are losing access to lands (Platteau, 2002).

Another area of research on land tenure in Africa is the change in land relations within the family, including gender and age relations (Hilhorst, 2000; Quan, 2007). The role of the extended family in land management decisions has been eroding as decisions are increasingly made more at the household or even individual level. In these contexts, land scarcity may lead to redefinition of the land claims of the different groups even within extended family (e.g., along gender lines). Moreover, it could lead to tensions between the older generations' control of land and the younger generation left with limited access to land.

2.3. Livestock production in the semi-arid region of Africa

Livestock production in the form of pastoralism remains a crucial element in the livelihoods and economies of the semi-arid regions of Africa. This is because the physical characteristics, climatic conditions, and associated plant communities are well suited for mobile livestock production (Dong, Wen, Liu, Zhang, Lassoie, Yi, Li & Li, 201;) . These areas are characterized with highly variable rainfall and drought, and as a consequence fodder availability fluctuates widely through time and space (Oba & Lusigi, 1987). This high level of variability encourages and reward more flexible responses and mobility to allow optimal use of available water and pasture. Studies on rain ecology and rangeland management practice have called these non-equilibrium environments because exploiting them requires matching available feed resources with animal numbers and availability of water at a particular site (Behnke, Scoones and Kerven; 1993). According to Brooks (2006), pastoral livelihoods in the Sahel have historically depended on negotiated, nonexclusive access to water and reciprocal land use agreements between pastoralists and agriculturalists. This traditional system, which is flexible and able to respond quickly to changing environmental conditions, is well suitedto the ecological and sociological conditions that characterize the Sahel (Jarvis 1993, Marshall and Hildebrand 2002).

The mobility of pastoralists along different ecological zones to exploit the different animal feed resources represents a flexible response to a dry and increasingly variable environment. It allows pastoral herds to use the drier areas during the wet season and more humid areas during the dry season, thus balancing the variability of the resources as discussed earlier. As a result, pastoral livestock are ensured both high-quality and sufficient grazing. Accordingly, the current literature of pastoralism describes livestock mobility as strategic mobility. Apart from the movement in relation to resource variability, mobility allows pastoralists to mitigate the effect of unforeseen events e.g.

outbreak of disease can be mitigated (Niamir-Fuller, 1999, 1998; Scoones, 1995). These strategies allow pastoralists not only to survival in difficult environments, but also to create economic value. Therefore, constraints on pastoral mobility, such as change in land use, tenure regulations, and border, could undermine the whole pastoral system.

However, many factors such as the unpredictable climate change, increased environmental degradation, and pressures to increase agricultural production to feed a rapidly growing population have undermined the adaptability of pastoralism and its mobility in relation to resource variability. The relative low mean rainfall of the 20th century, compared to the large amount of rainfall of the 1950s and 1960s, combined with the technocratic approaches to development have increasingly marginalized the traditional approaches to resource management and food security (Brooks, 2006; Ahmed, Sanders and Nell, 20000). The expansion of cultivation into marginal areas of the Sahel with the abandonment of the traditional fallow system has lead to deterioration of the land resources (Kandji, Verchot and Mackensen. 2006). As Brooks (2006) states, "Over-extension of agriculture into historically marginal rangeland areas as a result of a failure to appreciate the nature of long-term (i.e., multi-decadal scale) climatic variability in the Sahel, resulted in massive losses of human life and livestock, the destruction of communities and livelihood systems, and massive societal disruption on a regional scale." p 4. The extended droughts of the 1970s and 1980s[1] triggered famines across the Sahel. However, these famines were significantly exacerbated by inappropriate development practices (de Bruijn and van Dijk 1999, Warren 2005). These factors resulted in significant and rapid changes in land use and land control and compression of pastoralists' livelihood space. As a consequence, social conflicts between agriculturalists and pastoralists, and the problems associated

[1] During this period rainfall decreased by 29-49% compared with the 1931-1960 baseline period (IPCC 2001, Claussen et al. 2003

with overgrazing and land resource deterioration, have been accentuated with some ending up living in a "world of insecurity, war, famine and drought" (Baxter 1993). P 143).

As discussed above, the current literature debate on pastoralism argues that it has developed out of the need to adapt constantly to the extreme climatic conditions and marginal landscapes of the dry lands, and it is the most economically productive and environmentally sustainable use of these remote areas. This discourse has gained momentum since the early nineties in the debates concerning land degradation, desertification and pastoral production. In this debate a new understanding of the dry land dynamics has gained importance and led to the so called the new range paradigm (Scoones; 1995, Behnke, Scoones and Kerven; 1993, Niamir-Fuller; 1999). The new paradigm represents a shift in the wider discourse on pastoralism from the earlier debate of the ecologist Garrett Hardin's "tragedy of the commons" (Hardin, 1968). The tragedy of the commons has an inherent bias against pastoralism with a wide misunderstanding of the rationale of pastoralism as a production system. It also blames pastoralists for desertification (Hardins, 1968). The new discourse has inspired many institutions and advocacy programs to promote change in practice and policies with policies to encourage interventions to support pastoralism and pastoral livelihoods in the Horn and East Africa (Mousseau, and Morton, 2010).

The new rangeland paradigm has provided a comprehensive understanding of the dry lands and shown that mobility is an appropriate strategy in the dry lands. However, the model is based on the scientific environmental knowledge. As such it reflects the scientific understanding of the dry lands and not the local knowledge of pastoralists. Accordingly, the perception of African pastoralists regarding mobility and its socioeconomic and political context is not taken into account (Adriansen; 2005, Adriansen; 2008). In protracted violent situations, those elements of the local context play an overriding role in shaping the ability of pastoralists to access natural resources. Mobility in these situations remains strategic, not only as it concerns access to and optimal use of water and grazing

resources driven by climatic variability, but also with regard to saving lives and livelihoods. A situation of protracted conflict involves an intricate web of institutional mix of political, economic, military, and social forces engaged in violence that deliberately targets civilians and their production systems. Accordingly, the assets on which livelihood systems are constructed in peaceful times become the source of vulnerability (Lautze, 2006). Therefore, livestock assets, the foundation of a pastoralist's livelihood, could be transformed into liabilities in a context of asset stripping and violent appropriation of assets (Keen, 1994, Duffield, 1993). In brief, in order to understand pastoral mobility, its rationale, and consequences in protracted political crisis, it is necessary to address not only the ecology and environment but more important the political, military, social, and economic contexts.

3. Darfur and the Violence Debate

The course of violence in Darfur spans the last three decades or so, during which the violence has changed its form and nature as previously mentioned. During this period, violence in Darfur has attracted the scholarship of academics, development agents, and humanitarians who have produced various analyses that illuminate the different aspects of its nature, logic, and implications. This section will briefly review the different analyses of the violence in Darfur and end with a brief review of the recent literature on agrarian change, livelihoods, and violence.

Violence in Sudan has served important political and economic functions for members of the elite and their various ethnic allies. It is associated with parallel economies, and engagement with these economies is often central to the survival of many individuals and groups. Duffield (1993) has pointed out the process of asset transfer in Darfur. He writes that "since subsistence assets are a finite resource, once such an economy is established it demands fresh inputs as the wealth of different groups is exhausted. Asset transfer becomes a 'movable feast' on the ethnic landscape" (p. 137). These asset stripping processes link with a wider regional economy and are controlled by

warlords (Duffield, 1993; Keen, 1998, 2008). One has to point out here that armed banditry has been a constant feature in the region since the early eighties. Analysis and research have perceived this widespread banditry as a criminal act (Rabah, 1998; Mukhtar, 1998). However, Young, Osman, Abusin, Ashar and Egemi (2009) have pointed out the regional dimension of camel rustling and its association with the Chadian government. According to Harrir (1994), this action was regarded by the government as a legitimate operation to recover Chadian national wealth that had been illegally smuggled from Chad into the Sudan. This strategy has in fact been deployed by the Chadian leaders Hussein Habré and Idris Déby to plunder the Arab pastoralists, steal their camels, and deprive them of the foundation of their livelihoods. The Chadian Arabs by then were opposing the Chadian government and moved with their herds into Sudan. Marchal (2007) discussed the trading network in the region associated with the war economy. He noted the set of the commercial networks emerged in the region with supplying markets in the Middle East and the Gulf.

Many scholars have explained some aspect of the violence in Darfur in terms of ethnic difference, usually along a notion of an African/Arab divide (Harrir, 1994; Human Rights Watch, 2003). Along the same line of ethnicity, other scholars maintain that primordial tribal war cultures are the underlying cause of violence (Abdelsalam, 1998). In describing the violent conflict that took place between the Fur and the Arabs (1987–1989), Harrir (1994) argues, "Unlike many other ethnic conflicts which took place in Dar Fur, the destruction that came with this war was total" (p. 144). However, Turton (1997) argues that ethnicity should not be regarded simply as an explanation; it is something which itself needs to be explained. The relationship between ethnicity and war is not a simple matter of cause and effect. Explanations of the violence in Darfur on the basis of ethnic difference gloss over the centuries-long processes of amalgamation, fission, and assimilation that have resulted in the current mosaic of tribal groupings in the region (Hassan, 2003; O'Fahey, 1980). O'Fahey (2008) comments that ethnicity "is a very moveable and slippery concept and nowhere

more so than in Darfur. . . . The most complex kind of slipperiness or (ambiguity) comes with the African/Arab divide" (p. 9). In effect, ethnicity, tribal identity, and culture in Darfur are by no means the rigidly defined concepts portrayed by traditionalists, but have a fluid and permeable nature. Such a permeable nature, argued Haaland (1972), has allowed people to move from one group to another whenever economic and political situations allow.

A large body of literature has focused on the pastoralist/farmer divide to explain the violent conflicts in the semiarid Sahel and East Africa. The pastoralists-versus-farmers debate has emphasized the increasing conflict and competition between the crop farming groups and livestock herding groups, usually over a diminishing natural resource base (Salih, 1999; Hussein, Sumberg, & Seddon, 1999; Takana, 1997; UNDP, 2006). Farmers and herders in Darfur have subsisted on a system of production symbiosis. This system has promoted the cooperation of farmers and herders for their mutual benefit (Haaland 1982; World Bank Group, Independent Evaluation Group, 1994). Many scholars have argued that the separation between the two groups is a relatively recent development in the history of Sudan (UNDP, 2006). In addition, cultivators and other groups are increasingly investing in livestock production. This investment has blurred the distinction between farmers and herders on the basis of livestock rearing (Toulmin, 1983)

The herder-farmer conflict debate is always linked to a diminishing resource base caused by environmental degradation in Sudan. The environmental degradation thesis holds that climatic variation and large scale mechanization for export agriculture lead to scarcity of resources and competition over them. As a consequence, the carrying capacity and ecosystem have reached their limit (Suliman, 1994, 2000). This debate emphasizes ecological degradation, and overlooks the issue of equality in terms of access to resources by the different users. In particular, the environmental degradation debate glosses over the differential impact of the drought on the access to resources by different groups. The debate over the diminishing resources caused by environmental degradation

emphasizes technical fixes such as environmental conservations. It does not put the issue of equity and power at the center of the debate. It therefore does not illustrate the connection between the diminishing resource base and violence. More critically, none of the environmental degradation models pay attention to the transformation of the production systems and its implications for differential access to resources and for the relations between the different actors. Many scholars have argued that the condition of resource scarcity does not have a monopoly on violence. Rather, transformations and instability of natural resources produce a concomitant shifting of the position of resource users (Peluso and Watts, 2001).

Recent research and analysis of violent conflict in developing countries has revived one of the older and now neglected dimensions of the post-Cold-War violent conflicts: the agrarian roots and dynamics of civil wars. Cramer and Richards (2011) argued that recent and ongoing violent conflicts have roots in, and are shaped by, agrarian model structures, relation, and change. In his article "Peasant Wars in Africa: Gone With the Wind," Buijtenhuijs (2000) has also argued for the agrarian dimensions of the violent conflicts of the post-Cold War era. He writes that peasant wars "ceased to be fashionable topics in academic circles" (p.118). Instead, social scientists have tended to see the underlying motivation for wars in developing countries "in terms of ethnic chauvinism or individual pecuniary gain" (Buijtenhuijs, 2000, p. 118). Thomson (2011) has discussed the conflict in Colombia. He argued that a good understanding of the intimate ties between violent conflict and agrarian questions would provide a deep insight into the conflict in Colombia. In short, there is a renewed interest in research on violent conflicts to focus attention on access to land and landed resources, and capital, on mobilizing labor, and on studying changes in the institutional regulation of such access and control. Such a focus means identifying the tensions, techniques of compulsion, and modes of resistance developed around productive relations in, typically, a globalized context. In this respect the roots of the inherent violence in agrarian change are attributed to class struggle and

the structure of political power associated with social differentiation. It follows that the relation of peasant with powerful others amount to various forms of appropriation and oppression (Bernstein and Byres 2001).

The call for incorporating the agrarian dimension in the studies of violent conflict in its essence seeks to present and encourage scholarship and debates that illuminate the process of agrarian change in studies of violent conflicts through the perspective of political economy. Bernstein and Byres (2001), the editors of the *Journal of Agrarian Change,* suggest that agrarian change is agrarian political economy; it is the interdisciplinary study of processes of change in agrarian production, property, social relations, and power. As such, analysts should consider violence from policy, institutional, and process perspectives in their studies. The incorporation of such perspectives is in fact one of the prominent features of the livelihoods model that has been increasingly used to study livelihoods in complex emergencies (Lautze & Raven-Roberts 2006). Livelihoods research, according to Lautze (2008), studies the management of resources, how such resources are used in productive, reproductive, and survival strategies, and the outcomes of such efforts. Access to and control over assets, which are mediated by policies, institutions and processes, shape livelihoods strategies. Violence, according to a livelihood approach, is embedded in the factors that mediate access to resources. Accordingly, assets such as natural assets, social capital, and human financial and physical assets, on which livelihoods systems are constructed in peaceful times, may instead become life- and livelihood-threatening liabilities in periods of conflict. To conclude, agrarian change in violent conflicts in most of its aspects bears similarities to the studies incorporating a livelihood approach in examining agriculture in complex political emergencies.

Literature Cited

Abdelsalam, S. A. (1998). Some aspects of the implications of tribal conflict in Sudan. In A. Elzein & E. I. A. Wadi (Eds.), *Tribal conflicts in Sudan* (pp. 181–194). (In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, Khartoum of University.

Ahmed, M. M., Sanders, J. H. & Nell, W. T. (2000). New sorghum and millet cultivar introduction in Sub-Saharan Africa: impacts and research agenda. *Agricultural Systems* 64:55-65.

Baxter, P. T. W.,(1993). The new" East African pastoralist: an overview. In J. Markahis (Eds). C*onflict and the decline of pastoralism in the Horn of Africa.* London: Macmillan.

Behnke R H, Scoones I and Kerven C eds (1993). *Range ecology at disequilibrium: new models of natural variability and pastoral adaptation in African savannas*. Nottingham: Overseas Development Institute.

Bernstein, H., & Byres, T. J. (2001). From peasant studies to agrarian change. *Journal of Agrarian Change, 1,* 1–56.

Berry, S. (1993). *No condition is permanent: The social dynamics of agrarian change in Sub-Saharan Africa.* Madison: University of Wisconsim Press.

Boserup, E. (1965). *Conditions of agricultural growth.* London: Allen & Unwin.

Brookfield, B. (2001). Intensification and alternative approaches to agricultural change. *Asia Pacific Viewpoint, 42,* 181–192.

Brooks, N. (2006). Climate change, drought and pastoralism in the Sahel. *Discussion note for the World Initiative on Sustainable Pastoralism.* International Union for Conservation of Nature, Gland, Switzerland. [online] URL: http://cmsdata.iucn.org/downloads/e_conference_discussion_note_for_the_world_initiative_on_sustainable_pastoralism_pdf.

Bryceston, D., Kay, C., & Mooij, J. (Eds.). (2000). *Disappearing peasantries? Rural labour in Africa, Asia and Latin America.* London: Intermediate Technology.

Buijtenhuijs, R. (2000). Peasant wars in Africa: Gone with the wind? In D. Bryceson, C. Kay, & J. Mooij (Eds.), *Disappearing peasantries? Rural labour in Africa, Asia and Latin America*. London: Intermediate Technology.

Carswell, G. (2000). *Agricultural Intensification in Ethiopia and Mali*. Research Report 48, Institute of Development Studies at the University of Sussex, England.

Chauveau, J.-P., Colin, J.-P., Jacob, J.-P., Lavigne Delville, P., & Le Meur, P.-Y. (2006). *Changes in land access and governance in West Africa: Markets, social mediations and public policies: Results of the CLAIMS research project*. London: IIED.

Clay, D., Reardon, T., & Kangasniemi, J. (1998). Sustainable intensification in the highland tropics: Rwandan farmers' investments in land conservation and soil fertility. *Economic Development and Cultural Change, 46,* 351–377.

Claussen, M., Brovkin, V., Ganopolski, A., Kubatzki, C., & Petoukhov, V., (2003). Climate change in northern Africa: the past is not the future. *Climatic Change, 57,* 99-118.

Cohen, J. (1980). Land tenure and rural development in Africa. In R. H. Bates & M. F. Lofchie (Eds.), *Agricultural development in Africa: Issues of public policy* (pp. 249–300). New York: Praeger.

Crowley, E. L., & Carter, S. E. (2000). Agrarian change and the changing relationships between toil and soil in Maragoli, Western Kenya (1900–1994). *Human ecology*, 28 (3),383-414

Cramer, C., & Richards, P. (2011). Violence and war in agrarian perspective. *Journal of Agrarian Change, 11,* 277–297.

Cuffaro, N. (1997). Population growth and agriculture in poor countries: A Review of theoretical issues and empirical evidence. *World Development*, 25*, 7*, I I5I-1163.

de Bruijn, M. E., & van Dijk, H. J. W. M. (1999). Insecurity and pastoral development in the Sahel. *Development and Change, 30*, 115-139.

Dong, S., L. Wen, S. Liu, X. Zhang, J. P. Lassoie, S. Yi, X. Li, J. Li, and Y. Li. (2011). Vulnerability of worldwide pastoralism to global changes and interdisciplinary strategies for sustainable pastoralism. *Ecology and Society* **16**(2): 10.

Dorner, P. (1972). *Land reform and economic development.* Harmondsworth, Eng.: Penguin.

Downs, R., & Reyna, S. (Eds.). (1988). *Land and society in contemporary Africa.* Hanover, NH: University Press of New England.

Duffield, M. (1993). NGOs, disaster relief and asset transfer in the Horn: Political survival in a permanent emergency. *Development and Change, 24*, 131–157.

Feder, G., & Noronha, R. (1987). Land rights systems and agricultural development in Sub-Saharan Africa. *World Bank Research Observer, 2,* 143–169.

Glantz, M. (1996). Drought follows the plough: cultivating marginal areas. In J. C. Ribot, A. R. Magalhaes, and S. S. P. Frontmatter, (Eds). *Climate variability, climate change and social vulnerability in the semi-arid tropics* (pp. 125-128).Cambridge: Cambridge University Press.

Haaland, G. (1972). Nomadism as an economic career among the sedentaries in the Sudan Savannah Belt. In I. Cunnison & W. James (Eds.), *Essays in Sudan ethnography* (pp. 149–172). London: C. Hurst.

Hardin, G., (1968). The Tragedy of the Common. *Science* 162, pp. 1243-1248.

Harir, S. *(*1994*).* "Arab belt" versus "African belt: Ethno-political conflict in Dar Fur and the regional cultural factors. In S. Harir *&* T. Tvedt *(Eds.), Shortcut to decay: The case of the Sudan (pp.* 144–*1*85). Uppsala*:* Nordiska Afrikainstitutet.

Harrison, P. (1987). *The greening of Africa.* London: Paladin Grafton.

Hassan, Y. F. (2003). *Studies in Sudanese history.* Khartoum, Sudan: Sudatek.

Hilhorst, T. (2000). Women land rights in Africa: current developments in Sub-saharan Africa. In Toulmin, Camilla, Quan, Julian (eds) evolving land rights, policy and tenure in Africa: London: DFID/IIED/NRI

Human Rights Watch (2004). Darfur Destroyed: Ethnic cleansing by government and militia forces in Western Sudan. *Human Rights Watch, 16*, 1-86.

Hussein, K., Sumberg, J., & Seddon, D. (1999). Increasing violent conflict between herders and farmers in Africa: Claims and evidence. *Development Policy Review, 17,* 397–418.

Intergovernmental Panel on Climate Change (IPCC) (2001). *Climate change 2001: the scientific basis.* Cambridge: Cambridge University Press.

Jarvis, L. S. (1993). Overgrazing and range degradation in Africa: is there need and scope for government control of livestock numbers? *East Africa Economic Review 7* 95-116.

Kandji, S. T., Verchot, L., & Mackensen, J. (2006). *Climate change and variability in the Sahel region: impacts and adaptation strategies in the agricultural sector.* Nairobi: United Nations Environment Programme (UNEP) and World Agroforestry Centre (ICRAF)..

Keen, D. (1994). *The benefits of famine: A political economy of famine and relief in southwestern Sudan, 1983–1989.* Princeton, NJ: Princeton University Press.

Keen, D. (1998). *The economic functions of violence in civil wars.* London: International Institute for Strategic Studies. Adelphi Paper No. 32.

Keen, D. (2008). *Complex emergencies.* Cambridge, Eng.: Polity Press.

Lautze, S. (2008). Social dynamics in militarised livelihood systems: Evidence from a study of Ugandan army soldiers. *Journal of East African Studies, 2,* 415C438.

Lautze, S., & Raven-Roberts, A. (2006). Violence and complex humanitarian emergencies: Implications for livelihoods models. *Disasters, 30,* 383–401.

Lele, U., & Stone, S. W. (1989). *Population pressure, the environment and agricultural intensification: Variations on the Boserup hypothesis.* MADIA Discussion Paper 4. Washington, DC: World Bank.

Malthus, T. (1798). *An essay on the principle of population.* London: J. Johnson.

Marshall, F. & Hildebrand, E. (2002). Cattle before crops: the beginnings of food production in Africa. *Journal of World Prehistory* 16: 99-143.

Marchal, R. (2007). The unseen regional implications of the crisis in Darfur. In de Waal, A. (Ed.), *War in Darfur and the search for peace* (pp. 173–198). London: Justice Africa; Cambridge, US: Global Equity Initiative, Harvard University.

Maxwell, D., & Wiebe, K. (1999). Land tenure and food security: Exploring dynamic linkages. *Development and Change, 30,* 825–849.

Morrison, K. D. (1992). Rethinking intensification: Power relations and scales of analysis in precolonial South India. In T. L. Thurston & C. T. Fisher (Eds.), *Seeking a richer harvest: The archaeology of subsistence intensification, innovation, and change* (pp. 235–247). New York: Springer.

Mousseau, F., and Morton, J., (2010) Addressing Chronic Food Insecurity in the Horn of Africa: Good Practice Identified but Commitment Needed? *REGLAP Discussion Paper.*

Mukhtar, E.A. (1998). On tribal conflicts in Darfur: The causes, and the conferences of conflict resolution and resolution mechanisms. In A. Elzein & E. I A. Wadi (Eds.), *Tribal conflicts in Sudan* (p.p. 257-269). (In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, University of Khartoum.

Noronha, R. (1985). *A review of the literature on land tenure systems in sub-Saharan Africa.* ARU paper 43, Agriculture and Rural Development Research Department, World Bank. Washington, DC: World Bank.

Oba, G. & Lusigi, W. (1987). *An overview of drought strategies and land use in African pastoral systems.* Overseas Development Institute Paper 23a, London.

O'Fahey, R. S. (1980). *State and society in Darfur.* London: Hurst.

O'Fahey, R. S. (2008). *The Darfur Sultanate: A history.* New York: Columbia University Press

Peluso, N. L., & Watts, M. (Eds.). (2001). *Violent environments.* Ithaca, NY: Cornell University Press.

Pingali, P. L., & Binswanger, H. P. (1988). Population density and farming systems: The changing locus of innovations and technical change. In R. D. Lee, W. B. Arthur, A. C. Kelley, G. Rodgers, & T. N. Srinivasan (Eds.), *Population, food, and rural development* (pp. 51–76). Oxford: Clarendon Press.

Platteau, J-P. (1996). The evolutionary theory of land rights as applied to Sub-Saharan Africa: A critical assessment. *Development and Change, 27,* 29–86.

Platteau; J-P. (2002). The gradual erosion of the social security function of customary land tenure arrangement in lineage-based societies. Discussion Paper No. 2002/26, WIDER, United Nations University.

Polanyi, K. (1944). *The great transformation*. New York: The Ferris Printing Company.

Quan, J. (2007). Changes in intra-family land relations. In L. Cotula (Ed.), *Changes in "customary" land tenure systems in Africa* (pp. 51-63). Stevenage, United Kingdom: IIED.

Rabah, N. E. (1998). The causes of the traditional modern tribal conflicts in Sudan. In A. Elzein & E. I A. Wadi (Eds.), *Tribal conflicts in Sudan* (p.p. 139-159).(In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, University of Khartoum.

Salih, E. T. M. M. (1999). *Tribal conflict in Darfur: Its causes, implications and resolutions: A study in sociology and applied anthropology* (p.p. 99-137). (In Arabic). Khartoum, Sudan: Khartoum Limited.

Scott, J. C. 1976. *The moral economy of the peasant rebellion and subsistence in Southeast Asia.* New Haven, CT: Yale University Press.

Suliman, M. (1994). *Civil war in Sudan: The impact of ecological degradation.* ENCOP Occasional Paper No. 4. Bern, Switz.: Swiss Peace Foundation.

Suliman, M. (2000). *Sudan civil wars: New perspectives.* (In Arabic). Cambridge, Eng.: Academic Press.

Takana, Y. (1997). *Report on tribal conflict in Darfur.* Submitted to the Higher Committee for the Promotion of Societal Relations. (In Arabic).

Thébaud, B. & Batterby, S. (2001). Sahel pastoralists: opportunism, struggle, conflict and negotiation: A case study from eastern Niger. *Global Environmental Change* 11:69-78.

Thomson, F. (2011). The agrarian question and violence in Colombia: Conflict and development. *Journal of Agrarian Change*, *11,* 321–56.

Toulmin, C. (1983). *Economic behavior among livestock-keeping peoples: A review of the literature on the economics of pastoral production in the semi-arid zones of Africa.* Norwich, England: School of Development Studies, University of East Anglia.

Turner II, B.L., Hyden, G. and Kates. R. (1993) *Population Growth and Agriculturrd Change in Africa.* University Press of Florida, Gainesville.

Turner, B., & Ali, A. M. (1996). Induced intensification: Agricultural change in Bangladesh with implications for Malthus and Boserup. *Proceedings of the National Academy of Sciences, 93,* 14984–14991.

Turton, D. (1997). Introduction. In D. Turton (Ed.), *War and ethnicity: Global connections and local violence* (pp. 1–45XXX). New York: University of Rochester Press.

United Nations Development Program in Sudan (UNDP Sudan). (2006). *Share the land or part the nation: The pastoral land tenure system in Sudan, Study 3.* Khartoum, Sudan: UNDP Sudan.

Young, H., Osman, A. M., Abusin, A. M, Asher, M., & Egemi, O. (2009). *Livelihoods, power and choice: The vulnerability of the Northern Rizaygat, Darfur, Sudan.* Medford, MA: Feinstein International Famine Center, Tufts University.

Yudelman, M. (1964). Africans *on the Land.* Cambridge: Harvard University Press.

Warren, A. (2005). The policy implications of Sahelian change. *Journal of Arid Environments* 63:660-670.

World Bank. (1975). *The assault on world poverty: Problems of rural development, education, and health.* Baltimore and London, Johns Hopkins University Press.

World Bank Group, Independent Evaluation Group. (1994). *Livestock in Africa: Support for pastoralists.* Retrieved from http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/E2A9FEFDF86DBF77852567F5005D871E

III. Methods

1. Settings

The analyses presented here used data derived from a comprehensive field survey undertaken in the Kebkabyia area of North Darfur State, the Sudan, during the period between December 22, 2009, and February 22, 2010. OXFAM America (OA) provided the financial support for the data field work of this research through its local partner in the study area Kebkabiya Charitable Society (KSCS). A detailed background of the study area is provided in chapter IV of this study as a part of the first paper. The study area is characterized by a high degree of social, economic and ecological diversity. The population of the study area is composed of different tribal groups that include Fur, Arabs, Tama, Gimir, Zaghawa, Berti and Tunjur (Young, Osman, Aklilu, Dale, Badri, and Fuddle, 2005). These groups are broadly involved in a pattern of economic activities centered on farming and nomadic pastoralism. These activities are practiced in a landscape that ranges from the rocky, gravel and volcanically derived soil to sandy soil with numerous seasonal rivers running through it. The populations of the area are distributed in villages and pastoralists' settlements (*fariqs)* in the rural areas and in the town of Kebkabyia.

The study area represents one of the epicenters of the conflicts in Darfur. For the last three decades the area is characterized by protracted insecurity caused by social polarization, tribal conflicts and armed banditry. In 2003 the area was directly affected by the government counterinsurgency, driving more than 45,000 internally displaced persons in the town of Kebkabiya. Since then, insecurity has restricted the mobility of the population in the area, and travel from the town to the rural areas is very limited. The security situation during the field work was volatile. The United Nation demarcated the area as a no-go area for international personnel with no humanitarian access as illustrated in the map of the area, Fig. 1.

Tufts University Institutional Review Board in the United States of America granted the ethical approval to conduct this study prior to the field work. Informed consent was obtained from all interviewees. The study was carried out in collaboration with the Kebkabiya Charitable Society and was funded by OXFAM America through its local partners. At the field level, KCS secured permission to undertake the study from the relevant governmental and traditional authorities.

2. Study Design

This study utilized qualitative research methods to collect data from participants in 28 villages, inhabited by farmers and transhumant pastoralists, participants in 8 pastoralists settlements, inhabited by pastoralists, and from urban participants in the town of Kebkabyia. Appendixes 1, and appendix 2, provide a list of the villages and pastoralists settlements where data were collected. Data collection in the villages and pastoralists settlements was undertaken during January/February of 2010 while interviews in the town took place in the different periods of the field research from December 2009 to February 2010.

2.1. Research Instruments. The research instruments (See appendix 3, 4, 5 and 6) were developed through a detailed literature review and consultation with relevant experts. Table 1 presents these research instruments and the number of the different types of interviews undertaken in this study. These instruments included (a) open-ended, semi structured interviews guides of three different forms used with members of different community groups; (b) semi structured focus group discussion guides used with separate groups of male and female participants; (c) unstructured, in-depth interviews with key informants, including tribal leaders and governmental staff; and (d) unstructured group interviews with business groups in Kebkabiya. In addition observations were recorded throughout the field study.

Table 1: Research tools and the numbers of different types of interviews carried out

	Research tools	Number of interviews
1.	Open ended interviews with: a) village chiefs b) conflict resolution experts in the village c) individual men and women of the village community	 36 36 228
2.	Semi-structured focus group discussion for separate groups of males and females participants	64
3.	unstructured, in-depth interviews with key informants	13
4.	unstructured group interviews with business groups	7

2.2. Recruitments of participants and selection of villages and pastoralists' camps

Participants agreed to voluntarily participate in the study on the date and time the study team visited the village or pastoralists settlements'. These dates were agreed on with the village sheikh before the date of the visit. In each selected village the study team recruited the people who attended the meeting for the different methods of data collection. The number of the people who attended the meeting in each village was large enough for the recruitments of participants for the different research methods.

The selection of the villages where farmers and transhumant pastoralists were settled was made on a basis of a participatory agricultural mapping exercise. This exercise was carried out with the key informants, community leaders, and technical experts from the governmental departments in the area. This exercise mapped the different areas of agricultural production, land-use zones, ethnic and livelihood groups, and agricultural profile and setup of the area. This approach was meant to ensure that the perspectives of the farmers and transhumant pastoralists in the different zones and from the different tribal backgrounds were captured. Appendix 1, illustrates the different zones and villages selected and the criteria of selection of the villages.

Nomadic pastoralists are settled in mobile hamlets in the study area, and therefore different criteria were set for their recruitment in the study. Nomadic pastoralists in the study area were

traditionally divided into the camel herding groups and the cattle herding groups. Each of these groups was classified, on the basis of its seasonal movement, into two subgroups. The first group was involved in a short seasonal movement between the study area and other areas within North Darfur State. The second one was involved in a long seasonal movement, crossing the study area on the way between North Darfur State and South or West Darfur State. Accordingly, four groups from each of the camel and cattle herding groups were selected. As illustrated in Table 2, two of each group were of short seasonal movement and the other two of long seasonal movement. Appendix 2, illustrates the site of the pastoralists' fariqs selected for this study.

Table 2: Selection of the pastoralists group

Type of seasonal movement	Pastoralists group		Total
	Camel herder "*Abbala*"	Cattle herders "*Baggara*"	
Long	2	2	4
Short	2	2	4
Total	4	4	8

2.3. Recruitments of participants for the different research instruments. In the villages and pastoralists settlements the study recruited participants for the different types of research instruments.

2.3.1. Open-ended, semi-structured interviews with members of community groups. The study employed three different forms for interviews with community groups in the villages and pastoralist hamlets enrolled in this research.

The first form of open-ended, semi-structured interview was designed for interviews with the chiefs of the villages and pastoralist hamlets. The total number of chiefs interviewed was 36, one chief for each village or pastoralist hamlet.

The second form was designed for interviews with the community leaders who are experts in conflict resolution in their respective village communities. An expert in conflict resolution in each of

the 36 villages and hamlets was interviewed. These experts are identified by the village/hamlets community as the people mostly involved in conflict resolution within the village and with other communities in other villages.

The third form was intended for individual male and female farmers and transhumant pastoralists of three different age groups: 20–30 years, 40–50 years, and above 60 years. Table 3 illustrates the number and age groups of the males and females interviewed. In each village, a minimum of three male and three female participants were interviewed, with at least one male and one female of each age group.

Table 3: Age groups and number of the males and females participants

Gender	**Age group in years**			**Total**
	20 – 30	40 -50	Above 60	
Female	41	40	39	120
Male	37	37	34	108
Total	78	77	73	228

2.3.2. Semi-structured focus group discussion tailored for separate male and female participants. In each village a male and a female focus group discussion were carried out, while in the pastoralist hamlet only male focus group discussions were organized. Table 4, presents the type and number of focus group discussions. In total, 64 focus group discussions were carried out, with the male focus groups constituted 36 and the female focus groups constituted 28. The numbers of the participants in each focus group varied, with an average of 10 to 15 participants per focus group.

Table 4: Type and number of focus group discussions

Focus group	**Numbers of focus groups**	**Remarks**
Female focus group	28	The average number of participants in the each group was 10-15
Male focus groups	36	
Total	64	

2.3.3. ***Unstructured, in-depth interviews of some individuals.*** These key informant and experts interviews were carried out with the *shartaya* (hakura chiefdom) and the *omdas* (different tribal leaders based in the town), and the governmental staff of the departments of agriculture and

veterinary services, the Agricultural Bank, and the Humanitarian Assistance Commissioner in Kebkabiya town.

2.3.4. Unstructured group interviews. These interviews were conducted in Kebkabiya with the different business groups in the town. These groups included the truck transport, the blacksmiths, the farmer unions, the agribusiness and veterinary centers in the market, and the agricultural crops traders. Also, direct observations were employed in this research in the villages, the pastoralists' hamlets, and the town of Kebkabiya.

3. Data Collection

The study team for this research was composed of twelve individuals who played different roles in the study, ranging from administration to data collection. Because the situation in the study area was tense and highly politicized, the study team members were carefully selected. They were experienced in research management and data collection. Many of them were trained by Tufts University and participated in previous training and research conducted in the area by Tufts University Feinstein International Center, USA. They also constituted a mix of the different tribal backgrounds from the study area.

Four days of training for the members of the study team were organized before the start of the data collection. The first two days of training covered the research itself, qualitative methods of data collection, individual interviews, focus group discussion, and participatory rural appraisal techniques such as participatory mapping and proportional piling to investigate livelihood strategies and means of land tenure and conflict mapping. The last two days covered piloting of the research checklists for the structured interviews and focus groups, and training of the team members on these tools.

Individual interviews were conducted in person at a convenient place that allowed privacy. On average, interviews with individual male and female participants lasted for one hour and a half,

interviews with the conflict resolution expert in the village lasted for one hour, and the interviews with the village chief lasted for three hours. Before the beginning of the interview process, the interviewer explained the procedure and clearly assured each participant of confidentiality, and then requested the oral consent of the participant before the interview continued. Focus group discussions were organized publically, and people could join or leave during the discussion. On average, the focus group consisted of 10 to 15 participants and continued for approximately two and a half hours.

The study team members met at the end of each day of data collection to ensure interview consistency and data quality. They reviewed and assessed the data collected from each set of instruments and group of respondents. They discussed their field observations and interviews they made and any emerging issues. Responses to the interview questions were recorded in Arabic during the interview on the same checklist sheet. The data collected covered a wide range of topics and varied in their depth and breadth, from the large amount of detail-rich information from the focus groups to the in-depth personal experiences of individual interviewees. Themes and topics explored included demographic information, village history and administration, irrigated agriculture, rain-fed agriculture, land ownership and control, types of land, land allocation and administration, land transactions and investments, land fertility, water sources, groups, conflicts and their resolution, perception of change in cooperation, land tenure before the conflict, cropping systems and use of crop residues, range and pasture, livestock, and gender roles. In addition, the focus group discussions with the pastoralists covered the annual movement and livestock routes of the groups and the changes that have taken place over the last five decades.

4. Data Analysis

The principal investigator, who led the data collection, transcribed, imported, and analyzed the data by himself to ensure consistency in interpretation. A data record made of transcribed

interviews, focus group discussions, and field notes that recorded observations and thoughts about the data (document memos) was prepared in Microsoft Word. Each document was imported into computer-based qualitative analysis software (QSR NVivo 8). Structured interviews and focus group discussion questions were labeled using a heading style to facilitate auto-coding and query tools in NVivo.

Several techniques prescribed by Bazeley (2009) were systematically used to analyze the imported interviews. The data were extensively reviewed, and accordingly a coding tree containing parent (concepts) and child nodes (sub-concepts) was developed and used to code the imported transcripts. The data were coded using two techniques: first, assigning specific passages of text, comments, and answers to specific questions in the imported transcript to a specific code; and second, topic auto-coding by heading level (consistently applying the heading style level to the structured interviews). Auto-coding allowed responses to each question to be coded at a node with a name based on the question. Accordingly, the resulting codes gave immediate access to, for example, Question 3 in the individual interviews of interviewees of the age group above 60.

Attribute information such as age group, ethnicity, gender, and village was linked to the cases and was used to make comparisons across data (e.g., comparing male with female responses or comparing the response of females of specific age groups to specific questions). The codes were then recorded and explained in memos. This memo recording took the analysis from the empirical data to a conceptual level, refining and explaining the nodes further and showing their relationship to building a more integrated understanding.

5. Triangulation

To get more detailed and balanced findings, triangulation was built into the research design, and triangulation strategies were employed in the different stages of the research process. Methodological triangulation of different data gathering techniques, such as focus group discussion,

semi-structured and unstructured interviews, and observations, was used. These methods were used by different investigators in the study team, as mentioned above. Moreover, they were used to collect data from participants drawn from very diverse backgrounds. Selection of the participants entailed several strata of selection, which allowed the collection of data from a diverse group of people of people, place, time, and social situation. Selection of participants took place between and within populations (people of different tribal background, age group, and gender), between and within different geographical areas and villages, between and within production systems, and between and within the different social positions such as farmers, community leaders, tribal administrators, staff of government and nongovernment organizations, traders, and truck drivers.

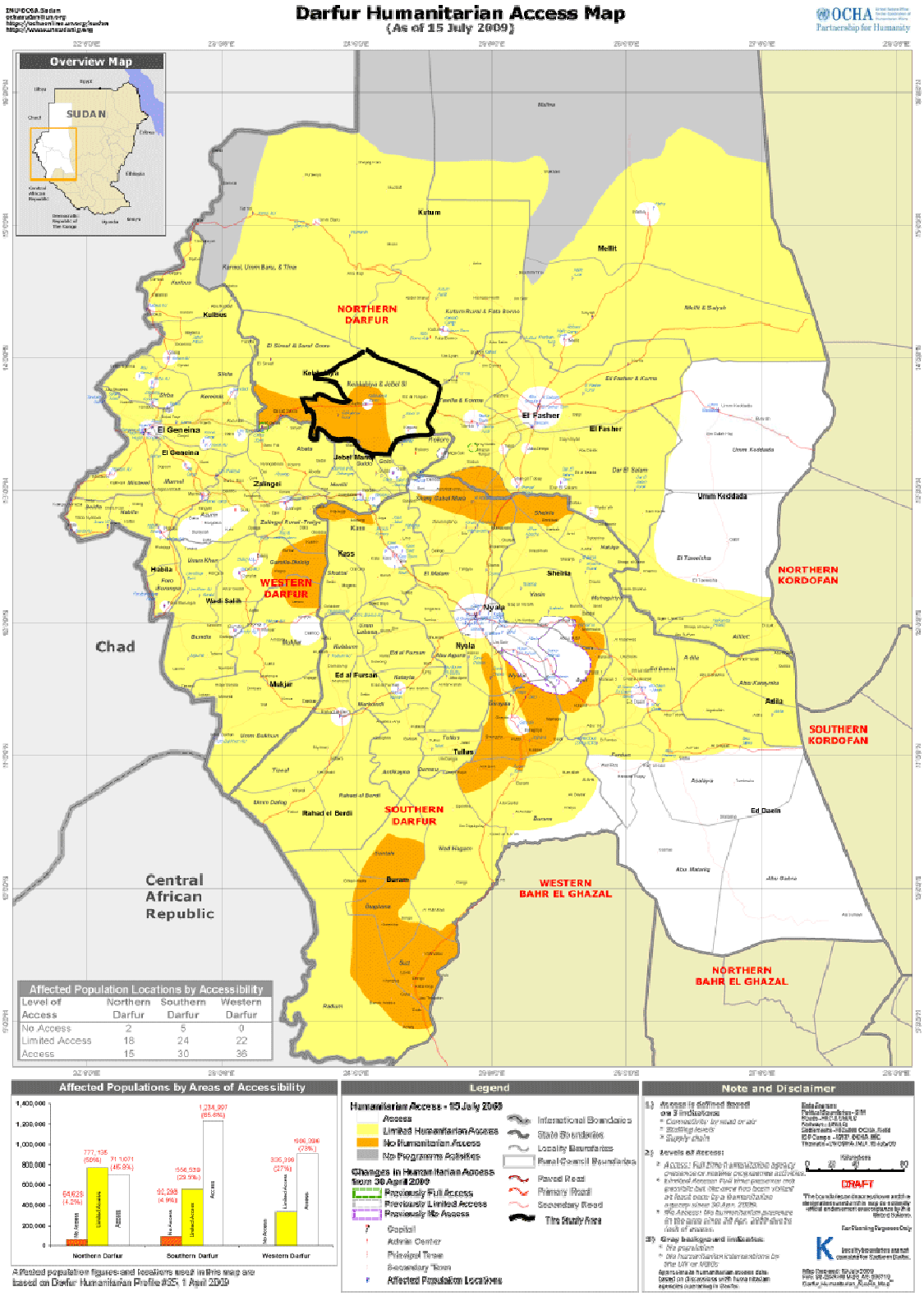
Triangulation not only included different methods of data collection used by multiple members of the study team but also included the checking and rechecking of data as they were collected in the field. The study team met regularly during the fieldwork to discuss the data collected and the feedback from the different team members. In addition, the research question was tackled using a series of different mini-hypotheses and propositions to build the conclusions of the research. All these triangulation strategies were further enhanced by the use of the NVivo software. The software provided the capability to present, check, compare, and contrast the contents of nodes and cases based on the attribute values assigned to them (e.g., Do male [or female] interviewees under the age of 30 have different perceptions of land rights from male [or female] interviewees of the age group above 60. Similarly, I compared the answers to the different questions in one village or zone to the answers of the same questions in another village or zone. For example, the answers of the sheikhs of the different villages and zones to the questions about the introduction of water pumps in the village or water shifting technology were compared. But there was no equivalent of statistic with a p-value in these comparisons. The text that satisfied the criteria of the query was found, read and interpreted. Such comparisons enhanced the understanding of the data, the categories, and concepts

emerging from them. When working with coding stripes in a source or a node, one could choose to display the stripe for a selected attribute: For example, a stripe for *female* would show all content-coded cases involving female participants.

6. Limitations

Despite the comprehensiveness of the research, there still remain some limitations with the study. The study tracked change in land use over time and its implications for the interaction of major livelihood groups through design of interviews with different age groups to capture the change in land use in the different time periods. One obvious problem is that the data collected are based on recall, which is subject to memory lapse and recall bias. To address this challenge, an intensive literature review was carried out and incorporated along with the findings to present a narrative that captures change across scale of time and space. Moreover, the research was carried out in a situation of insecurity and social tensions in the study area. All these factors have the potential to affect the data. Given the previous lack of research on agricultural change, land, and violence in Darfur, it is difficult to assess the impact of these factors on the overall findings and conclusion of this study. The need to replicate this research in other parts in Darfur remains of utmost importance to confirm the findings from this study and to inform and enhance evidence-based policy.

Figure 1: Darfur Humanitarian Access in 2009



Source: OCHA (2009)

Literature Cited

Bazeley, P. (2009). *Qualitative data analysis with NVivo.* London: Sage.

Young, H., Osman, A. M., Aklilu, Y., Dale, R., Badri, B., & Fuddle, A. J. A. (2005). *Darfur—livelihoods under siege.* Medford, MA: Feinstein International Famine Center, Tufts University.

IV. Articles

1. Cultivation and Pastoralism in Darfur: From Symbiosis to Competition[2]

Abdal Monium K. Osman*, Helen Young*, Robert F. Houser*, Jennifer C. Coates*

* Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy

Tufts University

150 Harrison Avenue

Boston, MA 02111

Corresponding Author

Abdal Monium Osman

Abdal.osman@tufts.edu (phone)

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Abstract

Crop cultivation and pastoral production are the basis of the economy of Darfur, Sudan. Land is essential to both crop cultivation and pastoral activities, and therefore the way the land is used and controlled is important for the production processes in these systems and for the interaction of the groups that sustain themselves on these production activities.

This paper examines change in land use in the Kebkabiya area of Darfur, Sudan, its implications for the interdependent relationship between crop cultivation and pastoral livestock production, and for the interaction and cooperation of resource users for their mutual benefit and peaceful coexistence. Qualitative research methods employing focus group discussion, open-ended semi-structured interviews, and unstructured interviews with key informants and business groups in the study area were employed to collect data from a diverse community of farmers and agro-pastoralists in 28 villages and pastoralists in 8 pastoralists camping sites. Shifting crop cultivation in the study area has changed to continuous land use as part of an evolution of stabilized form of agriculture. The stabilized form of agriculture is based on mixed farming that combines long-term cash crops, livestock production, and staple food production. Consequently, the cyclic use of land, which allows crop cultivation and pastoralism to take place, is disrupted; their mutual interdependencies have eroded; and the traditional twining between cultivation and pastoralism is lost. The interaction between these two systems of production has become competitive and has brought an end to the long-lived traditional cooperation between them. These findings have implication for agricultural land use policy development and promotion of social harmony and peace in the Darfur. Further research to understand the changes in land use and land control in the region, and their impact on access to land and landed resources, is critical for policy making on the future of pastoralism and cultivation, and on social harmony and stability in Darfur.

1. Introduction

Crop cultivation and pastoral production are the basis of the economy of Darfur, Sudan. Land is essential to both crop cultivation and pastoral activities, and therefore the way the land is used and controlled is important for the production processes in these systems and for the interaction of the groups that sustain themselves on these production activities. Cultivation and pastoral production have traditionally coexisted in Darfur, based on a system of extensive land use and communal land ownership. Pioneer studies on land use in Darfur were undertaken by Paterson (1948), Hunting Technical Services (1958, 78), Lebon and Roberston (1961), Lebon (1965), Hale (1966) and FAO (1968). Up to the early eighties, this system of land use and land control allowed cultivation and pastoral systems to take place on the same land at different times of the year, facilitated interdependence between them, and enhanced the cooperation and interaction of the groups involved in these activities for their mutual benefit.

As a result, cultivators such as the Fur and pastoralists such as the different Arab tribes were able to shift emphasis from one mode of production to another. There is a substantial body of evidence indicating that groups and individuals changed their mode of livelihood whenever the opportunity for herding or the necessity for cultivating presented itself (Barth, 1981; Haaland, 1972; Symanski et al., 1975; Toulmin, 1983). This means that successful farmers in the semiarid regions invested surplus in livestock, and that unsuccessful pastoralists resorted to farming. This change in emphasis involved crossing political, ethnic, and spatial boundaries wherever the two modes of production corresponded with different political, tribal, and ethnic identities. The course of crossing over boundaries might involve processes of amalgamation, assimilation, and fission into other cultural and ethnic identities (Haaland, 1972; Hassan, 2003; O'Fahey, 2008). The change in emphasis on these livelihoods combined with the processes of amalgamation, assimilation, and fission could explain Spaulding's (1979) argument that people of the steppe and the sown represent "a single

society of herdsmen and cultivators, a society in perpetual metamorphosis within a framework of possibilities limited by ecology and custom" (p. 347). As a result, the interrelation and the interaction between groups in these two modes of production were characterized by peaceful cooperation and exchange.

The interdependence between cultivation and pastoral production has been a recurrent theme in the literature. It has emphasized a symbiotic rather than a competitive dimension. The long-established cooperative relationship between the Arab pastoralists and the Fur cultivators of Darfur, similar to the nomadic pastoralists and farming groups of Swat, North Pakistan, for example, has been called symbiosis (Barth, 1956, 1964; Haaland, 1972, 1991). Scott (1984), who studied the mutual interaction between the Habe and the Fulbe of northern Nigeria, has suggested treating them as a single analytical unit. Morgan and Pugh (1969) studied the relations between the farmers of the Bambara and Diawar, around Lake Debo in Niger, and pastoral groups of the Tuareg and Maures who migrate with their herds to the area of the lake on annual basis. They have stressed the interdependence of the production systems of these groups. In northern Uganda a similar relationship existed between the Boran and the settled agriculturists (Dahl, 1979). Koster and Koster (1976) discuss the relationship between pastoralism and cultivation in the Southern Argolid, Greece. They argue "animal husbandry and agriculture form interdependent elements in the Greece economy. Competition must be demonstrated, not simply assumed" (p. 275). Such interdependence has played a critical role in the settlement of the Darfur region, the wider Sahel, and the savanna region where both modes of production lived side by side.

However, during the last four decades the region has been hard hit by climatic variability, economic stress, political instability, and demographic changes. The combined effects of these factors have caused changes that have involved alteration to land allocation, land use, technology, and production systems. Morton (1994) has noted that in Darfur there are signs of shifts to more

intensive strategies of production. Osman (2012) has discussed the changes in land tenure, pointing out the evolution of individual land control of a contested nature in the study area. These changes have had detrimental effects on the interdependence of cultivation and pastoral production in Darfur. At the same time, internal conflicts and competition between these modes of production have intensified since the mid-1980s. The nature of this change and its implication for the well-established cooperative and peaceful relation between the cultivators and pastoralists remains a gap in the discussion around the local tensions and conflicts in the region.

This article is part of a broader study of agricultural change, land, and violence in Darfur. It seeks to fill that gap in the literature and inform policy-making development, future research, and peace and reconciliation debate in Darfur. The article's objective is to examine the nature of change in land use in the central zone of Darfur, as exemplified in the Kebkabiya area, North Darfur, and to explore how such change has affected the resource utilization patterns and interdependence between pastoralism and cultivation and between the groups that are involved in these modes of production.

Section 2 provides background on the different types of land use and the production systems associated with them in the study area. This includes a description of the different components of these systems, their integration in a symbiotic production process through arrangements of exchange of the production inputs, and the system of multiple and overlapping land claims that provided the foundation of the production symbiosis and the interaction of the different groups involved in this process for their mutual benefit up to the early eighties.

Section 3 presents the research methodology, which is based on qualitative methods that combine focus group discussion with individual and key informant interviews involved in the different types of the agricultural system.

Section 4 tracks land-use changes over time in rangeland and the different types of arable land, where rain-fed cultivation, irrigated agriculture, and terrace cultivation are practiced. The

section brings together the findings of the study and the literature review in a narrative that allows the study of the landscape from a spatial perspective and over the time scale of the decades of the pre-1960s.

Section 5 discusses and analyses the impact of changes in land use on the production process and the implications of these changes for the interaction of the cultivators and pastoralists and their access to land and landed resources. The last section draws on the results of the analysis undertaken in the different sections to conclude the paper and provide some suggestion for further research and policy implications.

2. Background

The traditional agricultural system of Darfur is composed of two primary types of subsistence production. The first component is farming, which is practiced in the form of traditional rain-fed farming and small-scale irrigation. The second component is animal husbandry in the form of pastoral livestock production. Each of these components is traditionally associated with an ethnic group. In the study area, for example, the Fur tribe specializes in cultivation, while the different Arab tribes specialize in livestock herding with seasonal migration between the dry-season and the wet-season grazing areas. Until the beginning of this century, these components operated under an extensive land-use system in the form of shifting or bush-fallow cultivation and pastoral livestock production (Food and Agriculture Organization of the United Nations [FAO], 1984; Haaland, 1991).The extensive land-use system is one of seasonal succession with overlapping rights over land by multiple resource users. This system of land use and land control integrates the different types of the agricultural system in a process of production symbiosis in which the agricultural production inputs are exchanged between the agricultural systems. This process of exchange necessitates the interaction of the different resource users in an interdependent fashion that requires their cooperation for their mutual benefit. This subsection of the paper provides an overview of the

traditional land use and agricultural system in the study area, its different components, and how these components connect and interact.

2.1. Land Use and Production Systems

2.1.1. Rain-fed farming. Traditional rain-fed farming is the dominant form of agriculture. It is practiced in the sandy soil and in the alluvial soil along the seasonal rivers, which are locally known as *wadis*. In addition to being practiced in alluvial and sandy soil areas, rain-fed cultivation is practiced in the mountain areas of Jebel Si, the northeastern parts of the massif of Mara Mountains. In these areas of Jebel Si, terraced cultivation is practiced on the slope of the mountains.

The main form of land use in rain-fed cultivation is shifting cultivation. Land in shifting cultivation systems is cultivated and fallowed in a systematic rotational pattern. The rotational average varies from three to seven years depending on soil fertility, population pressures, and cultivation techniques (Paterson,1948; Hale, 1966; FAO, 1968, 84; Barth, 1988, Halaand 1991). When the soil is exhausted, fields are not cultivated continuously but are left fallow. Right to fallow land reverts to the village community, and the sheikh (the village head man) allocates a new plot to the cultivator. That means under this system of land use, land is circulated through reallocation, and not through purchase or inheritance (Barth, 1988). Apart from the allocation of land by the sheikh, the other means of land allocation is self-allocation by clearance of land, that is, bush clearance to claim fresh land (FAO, 1984; Haaland, 1991).

Millet and sorghum cultivation are practiced in the rainy season. Millet and sorghum are the main staple food crops, and they form the basis of the subsistence economy. Almost all households grow at least a portion of their annual need of staple crop, and this takes priority over other crops and activities in agriculture. The whole operation—preparing the fields, sowing, weeding several times, harvesting, threshing, and winnowing—extends over roughly a six-month period, from June

until December. Millet is intercropped with melon, cow pea, *karkadei* (roselle), cucumber, sesame, okra, tomato, and peppers.

Under the traditional system, each individual adult in the village, male or female, forms an independent economic unit for the purpose of agriculture. Husband and wife operate as separate economic units; they cultivate separate fields and have independent decision making and control over the harvest and its utilization. Such an individual unit has a usufruct right (temporary right of utilization of land) in different plots of land, to grow enough food and earn cash according to his or her need and capacity to work (Barth, 1988).

Traditional technology is the only form of agricultural production technology used in the different agricultural operations. Modern agricultural technology was introduced in recent decades, with the first tractor and animal plough introduced in the study area in the early 1980s. All the agricultural operations are carried out manually. Farmers plant the seed in heavy and light soils using the stake (*hafara*) and long-handled hoe (*touriya*), respectively. Weeding is carried out using a short-handled hoe (*boeng*). Labor is intensive in the rainy season, when cultivation entails a great demand of labor. Studies on labor demand in the Jebel Marra area indicate that millet and sorghum production during the rainy season takes about half of a man's labor and most of a woman's labor. At this period of peak labor demand, labor is mobilized through the communal work groups or beer parties locally known as *nafir*. The reciprocity of labor is the essential social link of the nafir system. Hired labor is not available and the individual person uses his or her own resources to work for the satisfaction of his or her need. The absence of hired labor and the reliance of the individual person on his labor limits the area worked and the number of livestock owned by the individual (Barth, 1988; Manger, 1987).

The raising of livestock plays a limited role in Fur agriculture except as a source of manure, but it is critically important to the nomadic pastoral livelihood. Livestock holding for a well-off Fur

family in North Darfur in the 1940s was two cows (Paterson, 1948) and for a family in the middle of the socio-economic spectrum in West Darfur at the end of the 1970s was one cow (Haaland, 1972). If the capital value of the herd for a Fur cultivator increased to a minimum of seven to ten cows, the cultivator would start to shift to a pastoralists life. That means the cultivator would entirely desert the village cultivating livelihood and cross tribal, cultural, and geographic boundaries to become part of a nomadic pastoral livelihood as the number of his livestock increase. Haaland (1969) has studied the rate at which Fur cultivators shift to pastoralist's livelihoods. He found the rate at which a Fur farmer accumulated a herd and moved into pastoralists life to be 1% per annum of the population in the village of Amballa in West Darfur. This means that despite the apparent division of the production patterns between the tribal groups of the Fur and Arabs that division is fairly fluid, and ethnic boundaries are porous and allow the movement of individuals and groups through them.

2.1.2. Horticulture. Horticulture is traditionally practiced in the area in the form of manually irrigated gardening. It is mostly practiced by women, with emphasis on self-provisioning to supplement the rain-grown crops. The gardeners grow short-term and medium-term crops such as okra, scallion, tomato, pepper, and rocket. These crops have a short harvesting cycle and are traditionally consumed by the farmers.

Horticulture is mainly practiced in the alluvium soil in a strip along the banks of the wadis. The alluvium soil locally known as *teen* or *tartur,* or heavy or light clay soil respectively, retains its moisture for many months after the floods cease, and this extends the effective growing season in these valleys. The gardeners practice horticulture in the summertime in the same plots used for the rain-fed staple food crop, after the crop is harvested. The gardening plots rarely exceed a square chain (20 meters) in size (Lebon & Robertson, 1961).

As in rain-fed cultivation, traditional gardening is based on traditional technology utilizing locally available materials. The methods of irrigation are by the *delu* and *shadouf,* devices for drawing

water from wells or streams in buckets with ropes and pouring it on the land. The delu and shadouf are used where the water table is high. Gardening relies on household labor and locally made equipment. Wells are constructed by the gardeners with some assistance from relatives. Wells are lined with wood of *Acacia* species such as *Acacia mellifera* and *Acacia arabica,* locally known as *kitir* and *garad* respectively, and other species such as *Albizia anthelmintica* and *Commiphora africana,* or *gafal* and *gurfa dud*. The buckets are made of goatskin. The basic technology employed and the fact that gardening serves as a supplementary activity to rain-fed cultivation combine to make the area of the gardening plot small.

2.1.3. Livestock production. Livestock production in the study area, traditionally practiced by the Arab ethnic group, is based on extensive land use. It includes two distinctive systems of extensive land use: agropastoralism and nomadic pastoralism. The former combines traditional rain-fed farming with livestock rearing. It is mainly practiced by pastoralists who have settled in the area since the droughts at the end of the 1960s. They are involved in short livestock migrations between their dry- and wet-season grazing areas within North Darfur. The latter involves raising livestock as the main means of subsistence, with migration after livestock as a way of life. The pastoralists' migration covers large distances, and they go as far as South and West Darfur and may cross the national borders to East Africa. They follow three main livestock migration routes that come through the study area (Figure 1). Two of these routes take them from the northern parts of North Darfur to the border with East Africa. The third route takes them to South Darfur.

The seasonal pastoral migration allows the pastoralists to feed their herds in different grazing resources at different times of the year. In the rainy season they move to the dry grazing areas; some groups, such as the camel herders, move to the far north to graze the Gizzu, a distinctive natural grazing source comprised of succulent plants (Wilson, 1978). As the rainy season slips away, they migrate southward into the farming belt in the central zone of Darfur. In the farming belt, the

pastoralists feed their livestock on the stubble of the harvested fields. After they have grazed the harvested fields, they move to stay among the wadis (seasonal rivers in the area) for the rest of the dry season. These wadis are the main source of water, from the shallow wells in their beds. Additionally, the acacia stands along their banks are a main source of shade and fodder (Hale, 1966; Hunting Technical Services, 1977; Lebon, 1965; Lebon & Robertson, 1961; Paterson, 1948). The different groups spend the dry summer in the different wadis along their livestock routes, with many of them moving far south into South Darfur and the national borders as mentioned above.

The movement of pastoralists along these ecological zones represents a flexible response that allows the use of harsh environment and balance the variability of the resource. It allows pastoral herds to use the drier areas during the wet season and more humid areas during the dry season. As a result, pastoral livestock are ensured both high-quality and sufficient grazing. Apart from the movement in relation to resource variability, pastoral mobility also means that the effect of unforeseen events e.g. outbreak of disease can be mitigated (Niamir-Fuller, 1999, 1998; Scoones, 1995). Therefore, constraints on pastoral mobility, such as tenure regulations, cultivated areas, border, could undermine the whole pastoral system.

2.2. The Interaction Between Cultivation and Livestock Production

The traditional association of farming and pastoral livestock subsistence patterns with different tribal groups in the study area and in the wider Darfur region has resulted in a division of labor between these groups. Yet these production patterns are integrated in a symbiotic process of production through a system of exchange of the productive inputs. The exchange of the productive inputs is achieved through different supporting linkages such as fodder, manure, and labor. Other linkages involve food, draft, and investment (McCown, Haaland, & de Haan, 1979; Scott, 1984). The herders are the main source of manures for the crop farming. Fur cultivators welcome the pastoralists and open their fields for them to graze on the crop residues after the harvest, in a

practice locally named *talaag*. Apart from the talaag, the cultivators get the manures through an arrangement locally known as *diyara*, in which the cultivators invite the pastoralists to camp for several days on their farms just prior to cultivation. The cultivators benefit from the manure, the trampling in of residues, and the breaking up of ridges (Van Raay, 1975). Equally, the pastoralists benefit by using their own labor and that of their pack animals in transport of the harvested crops of the farmers (Haaland, 1984; McCown et al., 1979; Paterson, 1948). Up to the 1980s the interdependence of cultivation and pastoral livestock production fostered a cooperative and peaceful coexistence between these groups.

2.3. Multiple and Overlapping Land Rights: The Foundation of Production Symbiosis

The production symbiosis benefits both the cultivators and the pastoralists. The extensive land use and the communal land ownership form the basis of the interaction of this production system and the mutual cooperation of the groups that practice it. Land is communally owned, and the individual right to cultivation is based on usufruct rights and reversion to common property on abandonment. That means the conditions under which the land is held by the cultivator are determined by his or her social status in the community, rather than by virtue of any contractual arrangement (Barth, 1988; Liversage, 1945). In other words, membership in the community implies right to cultivate. When the soil is exhausted of nutrients after three to five years of cultivation, the land is left fallow. Accordingly, right to this fallow land reverts to the community, and the cultivator is allocated usufruct rights to new fields. It also means that land rights lapse if plots are left uncultivated for more than two years. Land is thus not transacted, and the shifting agriculture prevents this allocation from having permanent effects on its communal control. In other words, the temporary nature of the allocation remains unchanged (Barth, 1981; Haaland, 1969; Hussein, 1957). The right to cultivation is based on community membership and need. It does not confer exclusive

possession of land or ignore the multiple and overlapping claims over the land by multiple resource users.

The multiple and overlapping claims over land by different resource users have become possible under the extensive land use of shifting cultivation in the study area. The different resource users follow each other in a system of serial use of the land in different times. That means the tenure rights vary within the year (Noronha, 1985; Platteau, 1992), and each of the resource users is a part-time owner. For example, pastoralist groups or other farmers, including the cultivator him/herself, can feed their animals on the remaining stubble. The cyclic use of land is practiced in other parts of the world. For example, in medieval England private rights within the area ceased after the harvest. The land could then be grazed over by any livestock of the settled and migratory groups (Liversage, 1945). This means that the successive use of the land is not limited to common property rights open to different livelihoods, as in the case of the pastoralists pointed out before, but also extends to individuals within groups. Women in the study area, for example, could gain access to land after the harvest of the rainy season to practice traditional smallholder irrigated agriculture. The system of multiple and overlapping land use has provided the anchor for the production symbiosis and the peaceful interaction of the different groups for their mutual benefit. To put it more broadly, the system of multiple and overlapping land claims provided the economic and the social basis of the traditional system of production in the study area and the region as a whole. Within this framework of overlapping right land system, disputes and conflict arose and were resolved as a normal state of affairs up to the early eighties. However, the system of land use and land control has since experienced changes as discussed above. This article investigates the change in land use over time in the study area, and its implication for symbiotic interaction between the resource users.

3. Method

3.1. Site

This paper presents the first part of a three-part study on agricultural change, land, and violence in Darfur. The study was undertaken in the Kebkabiya area of North Darfur State, Sudan during the period between December 22, 2009, and February 22, 2010. The study area is located in North Darfur State and represents the northeastern extension of Jebel Marra. It is composed of the mountainous area of Jebel Si and the low plains of the Kebkabiya area, and is characterized by a high degree of social, economic, and ecological diversity. The population of the study area is composed of different tribal groups that include Fur, Arabs, Tama, Gimir, Zaghawa, Berti and Tunjur (Young, Osman, Aklilu, Dale, Badri, and Fuddle, 2005). These groups are broadly involved in a pattern of economic activities centered on farming and nomadic pastoralism. These activities are practiced in a landscape that ranges from rocky, gravel, and volcanically derived soil to sandy soil with numerous seasonal rivers running through it. The populations of the area are distributed in the pastoralist settlements (*fariqs*) and villages in the rural area, and in the town of Kebkabiya.

The study area is characterized by chronic conflicts and social tensions. For the last three decades, the area has experienced protracted insecurity caused by social tensions, tribal conflicts, and armed banditry. In 2003 the area was directly affected by the government counterinsurgency, driving more than 45,000 people of the farming communities into the town of Kebkabiya. Since then, insecurity has restricted the mobility of the population in the area, with travel from the town to the rural areas being very limited. The security situation in the study during the fieldwork was volatile. The United Nations demarcated the area as a no-go area for international personnel.

Tufts University Institutional Review Board, USA granted the ethical approval to conduct this study prior to the field work. Informed consent was obtained from all interviewees. The study was carried out in collaboration with the Kebkabiya Charitable Society (KCS) and was funded by

Oxfam America through its local partner. At the field level, KCS secured permission to undertake the study from the relevant governmental and traditional authorities.

3.2. Design

In this study qualitative research methods were used. Data were collected from farmers and transhumant pastoralists in 28 villages, from pastoralists in 8 pastoralist settlement fariqs, and from participants in the town of Kebkabiya. Data collection in the villages and pastoralist fariqs was undertaken during January/February of 2010 while interviews in the town took place in the different periods of the field research from December 2009 to February 2010.

3.2.1. Research Instruments. The research instruments were developed through a detailed literature review and consultation with relevant experts. Table 1 presents these research instruments and the number of the different types of interviews undertaken in this study. These instruments included (a) open-ended, semi-structured interviews guides of three different forms, each form used with members of different community groups as illustrated in Table 1; (b) semi-structured focus group discussion guides with separate groups of male and female participants; (c) unstructured, in-depth interviews with key informants, including tribal leaders and governmental staff; and (d) unstructured group interviews with business groups in Kebkabiya. In addition observation has been recorded throughout the field study.

Table 1: Research tools and numbers of different types of interviews carried out

	Research tool	**Number of interviews**
1.	Open ended interviews with: d) village chiefs e) conflict resolution experts in the village f) individual men and women of the village community	 36 36 228
2.	Semi-structured focus group discussion for separate groups of males and females participants	64
3.	unstructured, in-depth interviews with key informants	13
4.	unstructured group interviews with business groups	7

3.2.2. Recruitments of participants and selection of villages and fariqs groups.

Participants agreed to voluntarily participate in the study on the date and time the study team visited the village or fariq. These dates were agreed on with the village sheikh before the date of the visit. In each selected village the study team recruited the people who attended the meeting for the different methods of data collection. The number of the people who attended the meeting with the study in each village was large enough for the recruitments of participants for the different research methods.

The selection of the villages where farmers and transhumant pastoralists were settled was made on a basis of a participatory agricultural mapping exercise. This exercise was carried out with the key informants, community leaders, and technical experts from the governmental departments in the area. This exercise mapped the different areas of agricultural production, land-use zones, ethnic and livelihood groups, and agricultural profile and setup of the area. This approach was meant to ensure that the perspectives of the farmers and transhumant pastoralists in the different zones and from the different tribal backgrounds were captured.

Nomadic pastoralists are settled in mobile fariqs in the study area, and therefore different criteria were set for their recruitment in the study. Pastoralists in the study area were traditionally divided into the camel herding groups and the cattle herding groups. Each of these groups was classified, on the basis of its seasonal movement, into two subgroups. The first group was involved in a short seasonal movement between the study area and other areas within North Darfur State. The second one was involved in a long seasonal movement, crossing the study area on the way between North Darfur State and South or West Darfur State. Accordingly, four groups from each of the camel and cattle herding groups were selected. As illustrated in Table 2, two of each group were of short seasonal movement and the other two of long seasonal movement.

Table 2: Selection of the pastoralists group

Type of seasonal movement	Pastoralists group		Total
	Camel herder "*Abbala*"	Cattle herders "*Baggara*"	
Long	2	2	4
Short	2	2	4
Total	4	4	8

3.2.3. Recruitments of participants for the different research instruments.

In the villages and pastoralists settlements the study recruited participants for the different types of research instruments.

3.2.3.1. Open-ended, semi-structured interviews with members of community groups. The study employed three different forms for interviews with community groups in the villages and pastoralist hamlets enrolled in this research.

The first form of open-ended, semi-structured interview was designed for interviews with the chiefs of the villages and pastoralist hamlets. The total number of chiefs interviewed was 36, one chief for each village or pastoralist settlement.

The second form was designed for interviews with the community leaders who are experts in conflict resolution in their respective village communities. An expert in conflict resolution in each of the 36 villages and hamlets was interviewed. These experts were identified by the village and fariq community as the people mostly involved in conflict resolution within the village and with other communities in other villages.

The third form was intended for individual male and female farmers and transhumant pastoralists of three different age groups: 20–30 years, 40–50 years, and above 60 years. In each village, a minimum of three males and three females were interviewed, with at least one male and one female of each age group. Table 3 illustrates the number and age groups of the males and females participants.

Table 3: Age groups and number of the males and females participants

Gender	Age group in years			Total
	20 – 30	40 -50	Above 60	
Female	41	40	39	120
Male	37	37	34	108
Total	78	77	73	228

3.2.3.2. Semi-structured focus group discussion tailored for separate male and female participants. In each village a male and a female focus group discussion were carried out, while in the pastoralist fariqs only male focus group discussions were organized. Table 4 presents the type and number of focus group discussions. In total, 64 focus group discussions were carried out, with the male focus groups constituted 36 and the female focus groups constituted 28. The numbers of the participants in each focus group varied, with an average of 10 to 15 participants per focus group.

Table 4: Type and number of focus group discussions

Focus group	**Numbers of focus groups**	**Remarks**
Female focus group	28	The average number of participants in the age group is 10 to 15 participants
Male focus groups	36	
Total	64	

3.2.3.3. Unstructured, in-depth interviews of some individuals. These key informants and experts interviews were carried out with the *shartaya* (hakura chiefdom) and the *omdas* (different tribal leaders based in the town), and the governmental staff of the departments of agriculture and veterinary services, the Agricultural Bank, and the Humanitarian Assistance Commissioner in Kebkabiya town.

3.2.3.4. Unstructured group interviews. These interviews were conducted in Kebkabiya with the different business groups in the town. These groups included the truck transport, the blacksmiths, the farmer unions, the agribusiness and veterinary centers in the market, and the agricultural crops traders. Also, direct observations were employed in this research in the villages, the pastoralist settlements, and the town of Kebkabiya.

3.3. Data Collection

The study team for this research was composed of twelve individuals who played different roles in the study, ranging from administration to data collection. Because the situation in the study area was tense and highly politicized, the study team members were carefully selected. They were experienced in research management and data collection. Many of them were trained by Tufts University and participated in previous training and research conducted in the area by Tufts University Feinstein International Center, USA. They also constituted a mix of the different tribal backgrounds from the study area.

Four days of training for the members of the study team were organized before the start of the data collection. The first two days of training covered the research itself, qualitative methods of data collection, individual interviews, focus group discussion, and participatory rural appraisal techniques such as participatory mapping and proportional piling to investigate livelihood strategies and means of land tenure and conflict mapping. The last two days covered piloting of the research checklists for the structured interviews and focus groups, and training of the team members on these tools.

Individual interviews were conducted in person at a convenient place that allowed privacy. On average, interviews with individual male and female participants lasted for one hour and a half, interviews with the conflict resolution expert in the village lasted for one hour, and the interviews with the village chief lasted for three hours. Before the beginning of the interview process, the interviewer explained the procedure and clearly assured each participant of confidentiality, and then requested the oral consent of the participant before the interview continued. Focus group discussions were organized publically, and people could join or leave during the discussion. On average, the focus group consisted of 10 to 15 participants and continued for approximately two and a half hours.

The study team members met at the end of each day of data collection to ensure interview consistency and data quality. They reviewed and assessed the data collected from each set of instruments and group of respondents. They discussed their field observations and interviews they made and any emerging issues. Responses to the interview questions were recorded in Arabic during the interview on the same checklist sheet. The data collected covered a wide range of topics and varied in their depth and breadth, from the large amount of detail-rich information from the focus groups to the in-depth personal experiences of individual interviewees. Themes and topics explored included demographic information, village history and administration, irrigated agriculture, rain-fed agriculture, land ownership and control, types of land, land allocation and administration, land transactions and investments, land fertility, water sources, groups, conflicts and their resolution, perception of change in cooperation, land tenure before the conflict, cropping systems and use of crop residues, range and pasture, livestock, and gender roles. In addition, the focus group discussions with the pastoralists covered the annual movement and livestock routes of the groups and the changes that have taken place over the last five decades.

3.4. Data Analysis

The principal investigator, who led the data collection, transcribed, imported, and analyzed the data by to ensure consistency in interpretation. A data record made of transcribed interviews, focus group discussions, and field notes that recorded observations and thoughts about the data (document memos) was prepared in Microsoft Word. Each document was imported into computer-based qualitative analysis software (QSR NVivo 8). Structured interviews and focus group discussion questions were labeled using a heading style to facilitate auto-coding and query tools in NVivo.

Several techniques prescribed by Bazeley (2009) were systematically used to analyze the imported interviews. The data were extensively reviewed, and accordingly a coding tree containing parent (concepts) and child nodes (sub-concepts) was developed and used to code the imported

transcripts. The data were coded using two techniques: first, assigning specific passages of text, comments, and answers to specific questions in the imported transcript to specific code; and second, topic auto-coding by heading level (consistently applying the heading style level to the structured interviews). Auto-coding allowed responses to each question to be coded at a node with a name based on the question. Accordingly, the resulting codes gave immediate access to, for example, Question 3 in the individual interviews of interviewees of the age group above 60.

Attribute information such as age group, ethnicity, gender, and village was linked to the cases and was used to make comparisons across data (e.g., comparing male with female responses or comparing the response of females of specific age groups to specific questions). The codes were then recorded and explained in memos. This memo recording took the analysis from the empirical data to a conceptual level, refining and explaining the nodes further and showing their relationship to building a more integrated understanding.

3.5. Triangulation

To get more detailed and balanced findings, triangulation was built into the research design, and triangulation strategies were employed in the different stages of the research process. Methodological triangulation of different data gathering techniques, such as focus group discussion, semi-structured and unstructured interviews, and observations, was used. These methods were used by different investigators in the study team, as mentioned above. Moreover, they were used to collect data from participants drawn from very diverse backgrounds. Selection of the participants entailed several strata of selection, which allowed the collection of data from a diverse group of people, place, time, and social situation. Selection of participants took place between and within populations (people of different tribal background, age group, and gender), between and within different geographical areas and villages, between and within production systems, and between and

within the different social positions such as farmers, community leaders, tribal administrators, staff of government and nongovernment organizations, traders, and truck drivers.

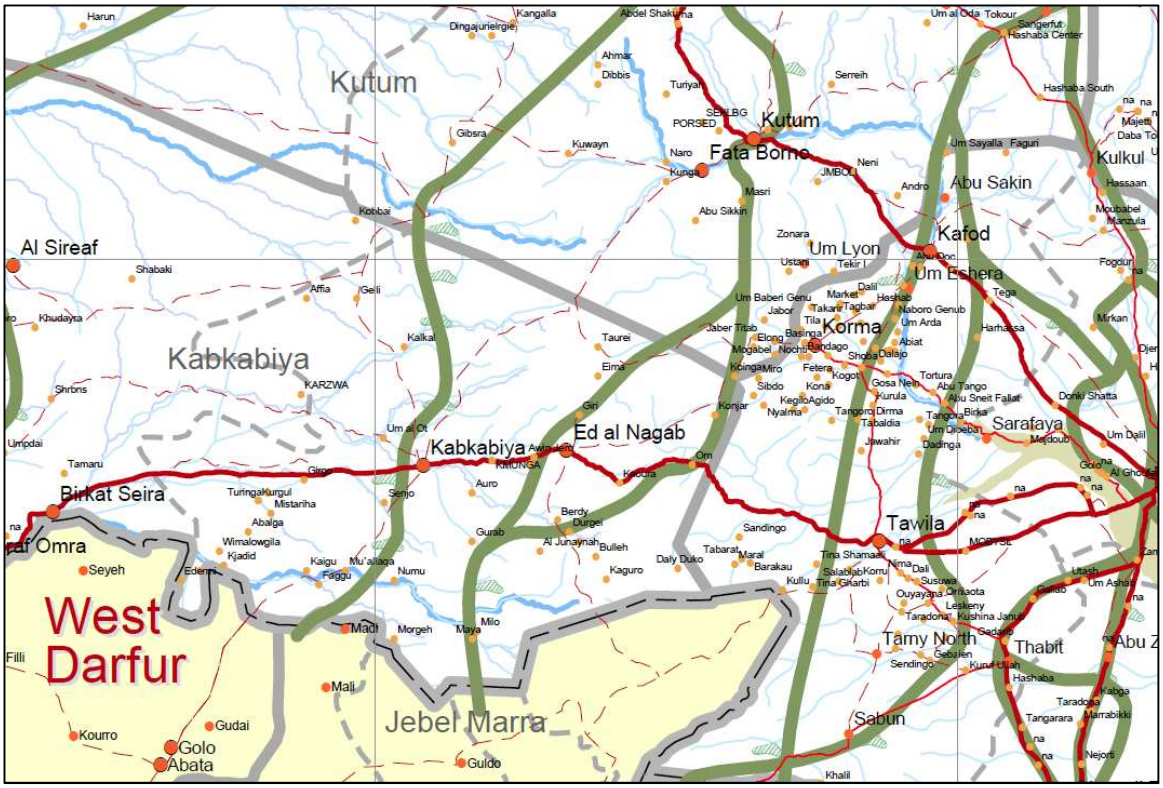
Triangulation not only included different methods of data collection used by multiple members of the study team but also included the checking and rechecking of data as they were collected in the field. The study team met regularly during the fieldwork to discuss the data collected and the feedback from the different team members. In addition, the research question was tackled using a series of different mini-hypotheses and propositions to build the conclusions of the research. All these triangulation strategies were further enhanced by the use of the NVivo software. The software provided the capability to present, check, compare, and contrast the contents of nodes and cases based on the attribute values assigned to them (e.g., Do male [or female] interviewees under the age of 30 have different perceptions of land rights from male [or female] interviewees of the age group above 60. Such comparisons enhanced the understanding of the data, the categories, and concepts emerging from them. When working with coding stripes in a source or a node, one could choose to display the stripe for a selected attribute: For example, a stripe for *female* would show all content-coded cases involving female participants.

3.6. Limitations

Despite the comprehensiveness of the research, there still remain some limitations with the study. The study tracked change in land use over time and its implications for the interaction of major livelihood groups through design of interviews with different age groups to capture the change in land use in the different time periods. One obvious problem is that the data collected are based on recall, which is subject to memory lapse and recall bias. To address this challenge, an intensive literature review was carried out and incorporated along with the findings to present a narrative that captures change across scale of time and space. Moreover, the research was carried out in a situation of insecurity and social tensions in the study area. All these factors have the potential

to affect the data. Given the previous lack of research on agricultural change, land, and violence in Darfur, it is difficult to assess the impact of these factors on the overall findings and conclusion of this study. The need to replicate this research in other parts in Darfur remains of utmost importance to confirm the findings from this study and to inform and enhance evidence-based policy.

Figure 1: Pastoralists Livestock Migration Routes in the Study Area (Kebkabiya)



Source: HIC Darfur (2004) North Darfur Livestock Migration Routes

4. Changes in Land Use and the Evolution of a Stabilized form of Agriculture

Land use in arable areas, where rain-fed and gardening were practiced, in the study area has undergone fundamental changes. Since the end of the sixties extensive land use in the form of shift crop cultivation in the rain-fed arable lands has been abandoned over time to continuous cultivation with no fallow periods. Irrigated agriculture practiced in the alluvial lands bordering the wadis has expanded and grown into intensive cash cropping with heavy external inputs. It is practiced immediately after the end of the rainy season. Both the winter-irrigated agriculture and the rain-fed

cultivation in the alluvial land have transformed the land-use system in these plains into a permanent one that involves no fallow periods. The permanent use of land means that shifting crop cultivation has evolved into a stabilized form of agriculture in which crop production and livestock integrate at the farm level. The following sections present the changes in land use in the study area.

4.1. Land-Use Changes in the Alluvial Plains

The alluvial plains situated along the wadis constitute the most fertile lands in the study area as well as Darfur in general. They are formed of the riverine alluvium soils locally known as *teen* and *tartur*, or heavy and light clay soil, respectively. According to the participants of the farming communities the soil along these plains retains its moisture for many months after the floods cease, and this extends the effective growing season in these valleys. Its availability is an important factor in shaping the land use in these plains. The communities in the study area believe that the water table depth in the different villages along wadis has risen since 1980. This rise in the water table has had significant consequences in the subsequent changes in land use, development, and expansion of irrigated agriculture in these plains, as will be discussed later. In most of the villages situated along the seasonal rivers that participated in this study, the water table varies from 2 meters to 5 meters. In one of the villages (Margoba), interviewees reported that the water table was about 50 meters before the 1980s, compared to the current water table of 4 to 6 meters in the same village. In contrast to the Kebkabiya area, the northeastern parts of Jebel Marra, Hunting Technical Services (1995) provided a different perspective, reporting that there has been a decline in the water level around the western side of Jebel Marra. This might be due to earthquake movement and rock shifts in Jebel Marra in the 1970s (Hunting Technical Services, 1995). However, there has never been a report of a major-scale earthquake in West Darfur of a magnitude that could effect a change to aquifers. Therefore, according to the report, the changes in water levels could be attributed to changes in runoff and rainfall type (Hunting Technical Services, 1995).

The focus group discussions revealed that the plains support stands of acacia species that provide an abundance of protein-rich fodder in the dry season, when animal feed is normally in short supply. This provides dry-season grazing for the livestock. Research has established that the livestock dung and the nitrogen-fixing property of the acacia stand enrich the soil (Brockwell, Searle, Jeavons, & Waayers, 2005; Hirai, 2005; Miehe, 1986).

The fertile soil, the acacia cover, and the good moisture together impart a distinctive importance to these plains in sustaining the livelihoods of the different groups. Participants explained that cultivation is generally good in these plains compared with other rain lands where cultivation generally yields a precarious livelihood. They added that under rain-fed farming, cropping of the alluvial land is mainly dedicated to millet and sorghum, the subsistence crops, and a variety of other crops to a lesser extent. In addition, winter gardening in the alluvial plains is practiced using the shallow groundwater. Pastoralists participants pointed out that the crop residues of the staple crops, along with the leaves and pods of the acacia trees, provide an important source of animal feed for the livestock in the dry season. They also serve as a significant hub for the exchange of the production inputs that support the mutual interaction and interdependence between these groups.

Changes of land use in these plains are examined below for four successive time periods. The first period is from 1916 (the year when the British annexed Darfur to the Anglo-Egyptian Sudan) – to the early 1960s, the second from the 1960s to the early 1980s; the third from the mid-1980s to 2003, when the current conflict erupted; and the fourth from 2003 to the present. Table 5 summarizes the political, economic and environmental factors that influence land use during each of these periods. These factors have resulted in continuous population movement in form of migration and displacement in the region.

Table 5: The main political, economic and environmental factors influencing land use change in Darfur

The Anglo-Egyptian rule	The post independence era		
1916-1960	**1960s – 1980s**	**1980s – 2003**	**2003 present**
- Political stability -Monetization of the economy - Limited drought spell in 1948 - Down slope population movement from the massif of Jebel Marra	- The collapse of the gum Arabic trade - Decline in rain fall - Food deficit - Population movements into the central cultivation zone of Darfur	- Political instability -Violent conflicts - Social tensions - Drought - International humanitarian and development programs	- Protracted political crisis. - Massive population displacement - High presence of the international community - International humanitarian and peace interventions

4.1.1. The pre-1960s: An increased access to land. Land use in these alluvial plains before the 1960s was shaped by increased security and economic opportunities associated with political stabilities in the region during the colonial rule in Darfur from 1916 to 1956. A 75-year old man reported that increased security resulted in wider access to land and encouraged down slope movement of the population from the refuge of Jebel Marra massif, to which people resorted for reasons of defense from wars and epidemics. Of the 28 villages that participated in this research, 4 villages (14%) were established in the 1920s. Lebon (1965) and Babikir (1988) have pointed out the intensive land use in Jebel Marra caused by the concentration of the population during the pre-1960s. The down slope population movement allowed a change from an intensive agriculture in Jebel Marra to hoe shifting cultivation of the alluvial plains. Autumn vegetable cultivation was limited, and these vegetables were grown on residual moisture, rather than irrigated (FAO, 1968). At the same time, the fallow lands and the acacia trees provided graze for the pastoralists' livestock.

4.1.2. 1960's-1980's: The expansion of vegetable and fruit gardening. In comparison to the pre-1960s, land use in the alluvial plains (1960s to early 1980s) was influenced by a decline in

rainfall, a food deficit, and the collapse of the gum Arabic trade, for which Darfur produced 20% of Sudan's total export (Beshai, 1976; Eldredge, Khalil, Nicholds, Abdalla, & Rydjeski, 1988; Hulme, 1990).[3] Eleven villages (39%) that participated in the study were established in 1960s. Five of these villages were established by the Arabs and the Zaghawa, who were highly affected by the drought. To cope with these changes, explained the participants, people expanded in cash cropping and rain-fed agriculture in the alluvial plains. In addition, they accelerated labor migration to central Sudan and to the newly rich OPEC states of the Gulf (Beshai, 1976; ILO/UNDP Employment Mission, 1975). The latter, pointed interviewees of the farming communities played a pioneering role in introduction of new agricultural technology in the decades that followed, including the 1970s and 1980s. Irrigation pumps in six (21%) of the villages that participated in this study were introduced for the first time during these eras by immigrants of these villages to the Gulf or eastern Sudan.

During this period, cash cropping and rain-fed cultivation expanded into the alluvial plains. The expansion in cash cropping took place in both rain-fed cash crops and irrigated ones. Farmer participants pointed out that rain-fed cash crops were intercropped with millet and sorghum in the rain-fed agriculture practiced from June to December. This was then followed by small-scale gardening from October to June. Farmers' interest in fruit orchards using manual irrigation started to increase. Morton (1993) illustrates this trend, noting that there were just 17 hectares of citrus in all Darfur in 1943. By 1977, there were 913 hectares of citrus in west Jebel Marra alone. Interviewees from the Agricultural Services Department in the study area explained that the expansion of the winter gardening and fruit orchards could also be an indirect effect of the growing emphasis on

[3] Annual rainfall totals were consistently low for the period 1966 to 1986, while the annual rainfall totals for the pre-1960s were abnormally high in North Darfur (Eldredge et al, 1988).

irrigated agriculture in Jebel Marra. At that time, development and tapping of the water resources, primarily for irrigation, was taking place in Jebel Marra (Ahmed & Hassan, 1983).

However, the change in land use took place at a slow pace because the scale of production was of limited size and was quite enough to meet the local needs, with cultivators involved in vegetable gardening to supplement the household consumption. In addition, cultivators were employing low-level technology. Therefore, they were growing the short-maturing vegetables such as scallion, rocket, white radish, and tomato. There was a consensus among farming women focus groups that these crops could provide steady cash flow and at the same time could be used for the household's own consumption. Interviewees reported that the part that was sold was transported to local markets using the donkey or camel, the latter of which historically played a central role in local and regional trade and transport (Paterson, 1948). It, therefore, cemented the relation between the farming groups and the herders. Long-term maturing crops such as fruit trees were limited to small areas. Interviews in the villages along Wadi Barie revealed that sugarcanes were introduced for the first time during the 1970s and grown in the flooded plains of the main wadis such as Wadi Barie.

Another factor contributing to the slow pace of the evolving changes in land use in the alluvial plains was that cultivators were employing a low level of technology. Interviewees explained that there was no use of chemical fertilizers such as urea. Farmers maintained the fertility of the land using animal manures "*desi"* applied directly on the irrigated fields or by livestock grazing the fallow ones. Similarly, continued the interviewees, there was no use of chemical pesticides for pest control. Instead, farmers utilized wood ashes, or *ramad,* as a pesticide. Research has shown these practices to be effective, as the area was free from plant disease and pests (Lebon, 1965). According to Abate, van Huis, and Ampofo (2000), this traditional pest management practice was successful because it was a built-in process in the overall crop production system rather than a separate well-defined activity. Further, according to the interviewees, irrigation took place manually from manually

constructed wells lined with wood and re-dug annually after the flooding season. From these wells, water was lifted using the delu and shadouf. Moreover, irrigated agriculture in Darfur was further limited by lack of labor, and its practice was limited to women. Under the traditional system women were normally fully occupied in the millet and sorghum cultivation in the rainy season. For this reason, they were not involved in the production of the rain-fed cash crops (Barth, 1981; Umbadda & Abdul-Jalil, 1985).

In short, many factors at micro and macro levels stimulated change in the landscape in these alluvial plains in the late 1960s with the expansion of rain-fed staple food crops and irrigated gardening into these plains. This change, however, was of a limited nature because of the low technologies used; the scale of production was to meet local needs, and labor was limited to the household. Generally, the agricultural landscape of the alluvial plains remained unchanged as an extensive land-use system for crop production and pastoral livestock production.

4.1.3. Mid-1980s to 2003: The expansion of pump irrigation and intensification of irrigated agriculture. Land use from the mid-1980s to 2003 was mostly influenced by the increased intensity of stress caused by more frequent climatic shocks, and by the increased insecurity caused by political instability in the whole region (Burr & Collins, 1999; de Waal, 1989; Harir, 1994; Ibrahim, 1984). There was a consensus among the participants that the cumulative effect of these factors precipitated population migration to the fertile areas in the region around the Jebel Marra area, including the study area, and to south Darfur. To these processes the international community responded by implementing large-scale rural community development programs to increase food security as a long-term response to famine. Key informants in the town of Kebkabiya mentioned that these programs represented a shift in the focus of the work of the international organizations in the area in the post-famine era of the mid-eighties. According to Strachan & Peters (1997), the activities of these programs included agricultural extension work, animal traction, animal health, and

pest control. In fact, these interventions were not limited to the study area but also included the neighboring area of Zalengei and Saraf Omra, where the European Commission supported large-scale agricultural programs (Hunting Technical Services, 1977, 1995).

The increased pressure on the alluvial plains, combined with the implementation of large-scale programs, initiated a change in the agricultural technology in the area. This change progressed to a situation where external agricultural inputs have become the norm in agricultural practice. Group discussion with the blacksmiths (*hadahid*) noted that animal traction was introduced into the area, and successive trials eventually resulted in the development of the Kebkabiya plough. This plough has the capacity to increase the area cultivated by 100%, and according to the International agency Practical Action who promoted this technology, it cut the labor involved by 50%. Along with the development of animal traction is the work on agricultural transport that led to the development of animal carts. Water harvesting techniques that included dams, terraces, and reservoirs were also developed. Pump irrigation continued to replace the traditional methods with the development of permanent wells lined with brick. In addition, skilled local workers were trained and well developed to maintain and manufacture these products. Discussion with the staff of the Agricultural Services Department in the study area mentioned that by the end of the nineties, tractors for soil plowing were introduced in the area by the department. Participants involved in agro-business in the study area explained that in 1985 there were no agro-veterinary shops in the area. By 1990, Oxfam UK&I (currently Oxfam GB) established a drug revolving fund and established the first ever pharmacy in Kebkabiya. Currently there are more than 15 private agro-veterinary shops that provide the different types of agricultural inputs and veterinary services, such as veterinary medicines, commercial fertilizers, improved seeds, pesticides, and fuels.

Group discussion with truck transport and agricultural crop traders showed that with the growing communication, the export of horticultural products started to grow, and new varieties

were introduced and became some of the main horticultural crops. Of the fruit trees, mangoes became the most important crop, followed by citrus fruits, guava, and banana**.** Long-term maturing vegetables such as onion, broad beans, and potato also became important. This is probably because the transport of fresh short-maturing vegetables over long distances was too expensive and because other vegetables were more perishable than onions, broad beans, and potato. The latter could also be marketed at a season when local supplies from Nile Valley are unavailable. In addition to the fruits mentioned above, onions have also become the major crop under the small-scale pump irrigation. Participants explained that these crops are grown in the winter from January to June on the same land that is used for rain-fed cultivation. Sugarcane farming in the Wadi Barie area, on the other hand, has expanded, and the production has grown to the extent that the government implemented a pilot sugar project in Wadi Barie. Though the factory/refinery is still in place, the operation has been halted since 2003 when the war erupted.

As a result of all these factors, permanent land use in the alluvial plains has taken place. The traditional role of the pastoral livestock herding and acacia trees in maintaining soil fertility in these plains has weakened in some areas and has come to an end in other areas due to the use of commercial fertilizers such as urea. In addition, the introduction of animal carts has replaced the pack animal and the labor of pastoralist services traditionally used in the transport of the agricultural products and input. Finally, by the end of the 1990s, the fencing movement that had taken place in the rangeland had also extended to the alluvial plains, denoting the evolution of communal ownership of the alluvial lands into private ownership (Osman, 2012).

4.1.4. 2003 to the present: The rise of small-scale horticultural enterprise. The expansion and diffusion of irrigated agriculture in the alluvial plains have intensified in the last decade and have completely transformed the cyclical use of land into permanent land use. Participants described the change in land use in the alluvial plains during this period. Rain-fed

agriculture is practiced from June to December, followed by irrigated agriculture from January to June. Consequently, the commercial irrigated agriculture of the late 1990s has now turned into small-scale, complex multi-cropping private enterprises that involve the production of three to four crops a year. The intensification of the agriculture in the alluvial plains during the current crisis in the study area echoes some historical aspects of land use in Darfur. The drastic population movements associated with the slave trade, famine, and epidemics of the eighteenth century, for example, shaped the land use and vegetation cover in Jebel Marra massif, as mentioned before (Hale, 1966; Lebon, 1965).

Farmers have responded innovatively to the high market demands, availability of cheap labor, and provision of agricultural inputs by the international organizations and the Agricultural Bank of Sudan in the study area. They have achieved a cropping intensity (number of crops harvested per year multiplied by 100) in excess of 100%. Participants pointed out that the primary factors that have influenced the current intensification process are the displacement of more than 45,000 internally displaced persons (IDPs) in the Kebkabiya area and the presence of a large international community in Darfur. These factors have created high demands for irrigated crops and put more pressure on the land. In addition to the IDPs, the international community in the urban centers in the region has created a large demand to which the farmers responded by further intensifying the land they grow. Displaced women, on the other hand, have provided cheap labor for these farms at rate of less than two US dollars a day in 2009.

Another factor that drives the permanent use of the alluvial land in the last ten years is the availability of inputs and technologies. FAO introduced a new technique for the development of permanent irrigation wells with cement lining in 2009. While FAO and other international organizations have established more than 150 wells for agricultural irrigation in the area, the farmers have quickly adapted the technique, which has become commercially available. On the other hand,

the Agricultural Bank of Sudan in Kebkabiyia, according to interviews with the staff in bank, has provided about 1,500 diesel pumps, 2 tractors, and 8,000 sacks of urea, in addition to pesticides, sprayers, and potato seed tubers, during 2005–2010. The bank provides these inputs on a loan basis to the farmers in the area.

Farmers responded innovatively to both factors, high demands for irrigated crops in the region and the availability of agricultural inputs, by increasingly intensifying land uses. The first area of innovation is the efficiency with which the irrigation operation is carried out by the farmer. Water is pumped within the farm and between farms through a piped supply instead of the former open-channel systems. Farmers' resourcefulness is illustrated by the use of the pipes sewn locally from the plastic sheets distributed by the relief organizations.

The other area of innovation, to make the maximum use of land, is the development of an agricultural technique that would allow farmers to have two harvests of onions a year. Interviewees explained that for the first harvest, the seeds are sown in beds about one meter square immediately after the harvest of the staple crops. These seedlings are then transplanted in March, and the plant is mature and harvested in June. The second harvest starts with sowing of the seeds in March to get the seedlings in June. The seedlings (the small bulbs) are then replanted in August, after 3-month storage, for early production of big bulbs in January, when supplies of onions are low and their prices high. In contrast to old farms, in the recently established farms and leased ones, fruits trees are entirely absent. Leasers concentrate on onions and broad beans, locally known as *ful*. The area per farm is on average about 3 to 5 feddans (about 1.5 to 2.5 hectares) compared to an average of 2 feddans (about 1 hectare) in the 1990s, while the area of orchards grown remained the same. Of this area, there is an average area of 0.125 to 0.15 mokhamas (less than a hectare) of the farm-grown forage plants alfalfa *(Medicago sativa)* locally known as *"Berseem"* and sorghum *(Sorghum vulgare)* locally

known as *"Abu 70"*. Interviewees revealed that the growth of irrigated fodder such as alfalfa and Abu 70 represents another new development in livestock production in the study area.

The commercial scale of production, explained the agricultural crops traders and truck drivers discussion groups, has shifted the marketing of the produce from local markets in the study areas to the main urban markets in Nyala, Elfashir, El Geneina, and to Tina at the border between Chad and Sudan. This shift in marketing has also led to the use of commercial trucks replacing the pack animals that have a long history in trade in Darfur. Both the trucks and the cart animals have taken in all aspects of transporting the agricultural produce locally and regionally. They have entirely replaced the pack animals that existed up to the eighties as the main means for the transport of the agricultural products in the region. Men have taken over the whole business, with women serving as hired labor in the land they once used for traditional gardens. This shift in the control of irrigated agriculture is captured by a village chief interviewed in this research: "We the men have taken over irrigated agriculture and left the rain-fed farming for our women."

In short, alluvial plains represent an important natural asset that is of vital importance for the sustenance of the livelihoods of the farming and pastoralists groups. In the past they provided the space where these groups could exchange production inputs, enhancing the interdependence of these groups and allowing the sustainable use of the plains. The ongoing changes in the land use of the plains have undermined the elements of its sustainable use and the mutual interaction it provides for the different groups.

4.2. Land-Use Changes in the Rain-Fed Arable Lands

The rain-fed arable lands are areas where farming is limited to rain-fed cultivation and there is no practice of irrigated agriculture of any kind. As mentioned earlier, they include the terraced slopes of the Jebel Si mountains in the northern reaches of the Jebel Marra ranges and the rain-fed sandy soil of the low land. In these terraces, a fairly long cycle of cropping followed by rotation and

regeneration of woodland is practiced. Terraced agriculture in the Jebel Marra massif is linked to the pre-colonial history (Babikir, 1988; Hale, 1964). Participants explained that they are able to adopt a long cycle of cropping by the application of manures, the burning of crop residues on the plots, the intercropping with beans, and the effect of acacia species. The beans and acacia species have a nitrogen-fixing effect that contributes to the fertility of the soil. The second form of rain-fed cultivation is practiced in the sandy areas where farming is limited to rain-fed agriculture. The soil of the rain-fed lands varies from light sand to more fertile mixed sandy loam. They are primarily dominated by the subsistence crops of millet and sorghum. In these areas, significant interactions between pastoral livestock production and cultivation take place after the harvest season, when crop residues and agricultural products are available. For these reasons, rain-fed arable lands and changes in their use are the focus of this section.

4.2.1. 1980s to the present: the continuous use of land. Land use in these areas has undergone fundamental changes whereby extensive shifting hoe cultivation has been abandoned since the early 1980s. It has changed to continuous land use with the absence of fallow or rotation between or within plots. One village chief noted that there is no reserve land to be left fallow because of the increasing pressures on land. Cultivators cannot afford to leave part of their land fallow. At the same time, the pressure to emphasize cash cropping tends to intensify the use of the land. Farmers have intensively used land by intercropping cash crops with millet and by investment in livestock, discussed below.

Farmers' focus on cash cropping has largely contributed to the continuous use of rain-fed arable land. Participants described their farming practices. Cash crops, such as *kerkadei* (hibiscus), sesame, cucumber, and watermelon, are intercropped with millet, one of the chief crops. Millet is planted in May/June before the rains; the harvesting season of the millet continues up to December. These echoes the findings of El Sammani (1987) who found that millet intercropping with cash

crops has been increasing since the end of the 1980s, especially in areas with less alluvial land that therefore rely on rain-fed cash crops. The growing emphasis on cash cropping extends the rain-fed agricultural season into the dry season up to the end of February. At this time, cucumber and watermelon are still producing and growing on the residual moisture of the soil. According to interviewees, the extension of the rain-fed agricultural season means that the opening of the farms for grazing the crop residues by all livestock owners in the study area has to take place at the end of February/early March. By then, the pastoralists' herds have already moved into the study area to graze the crop residues, and the livestock herds find their way into the farms.

4.2.2. Crop residue management and sustainable land use. Another change in the rain-fed arable land use is the management of the crop residues. Crop residues are traditionally open to common use by all livestock herders in accordance with the customary practice. Participants mentioned that this takes place immediately after the harvest of the crop, according to the tradition called *talaag*. Consequently, the migratory herd of the pastoralists and the herds of the farming communities graze crop residues as standing hay without any charges. Crop residues, however, have increased in value in the last three decades. Cultivators, therefore, are increasingly collecting the crop residues after the harvest. Focus groups explained that they sort these crop residues by quality into three categories: The first category, from mature plants, is the hard and rigid stalk and is used for building purposes. The second category of the stalk is not suitable for building and is used as animal fodder for the cultivator's own livestock and is either transported to the village where it is stored or kept in fences in the farm. The third category of the residues is sold as a source of income. Its sale is becoming an expanding business. Many interviewees and focus groups reported that crop stalk and residues in irrigated farms are increasingly used as windbreaks. This new use of crop stalk further diminishes its availability as a livestock feed. In fact, as many interviewees pointed out, after the collection and sorting, little, if any, of the crop residue remains on the farm. This leftover is grazed

by both the farmers and pastoralists livestock. Cultivators have their own herd, as discussed above. They continue to graze their herds on their farm after the harvest. That means they continue to use the land up to April. By then they start preparing their field for planting in May before the rains start in June.

Pressures on land appear to have pushed cultivars to use their land continuously, year after year, without fallows. At the same time, their emphasis on cash crops (through intercropping) combined with livestock production has extended their use of the land for most of the year. In the rain-fed arable land, in contrast to the alluvial land, the use of the technology has played very limited role in the land use. Technology in rain-fed arable land is limited to the introduction of the animal plough in the early 1980s. The use of the plough increased the area cultivated by the household and improved the productivity of land by increasing the infiltration of water, as discussed above.

4.3. Rangelands and Livestock Management

Rangelands in Sudan are all lands that produce native plants for livestock grazing and are not put under crop production or any other form of land use (Darrag, 1998; Suleiman, 1985). Rangelands, along with the crop residues and acacia browse discussed above, form the main sources of animal feed resources in Darfur.

The use of these resources takes place in succession. Pastoral livestock move from the rainy-season natural grazing areas into the farming areas to graze on the stubble of the harvested fields. In focus group discussions, both pastoralists and farmers agreed that up to the early eighties, this movement into the harvested fields was welcomed by the farmers in recognition of the manures that the livestock provides while grazing the harvested fields. Then, for the rest of the dry season, livestock remained in the plains and the valleys of the seasonal rivers, where they fed on the fodder and use the shade from acacia stands in these valleys. That meant any loss in any of these resources could result in serious consequences on the livelihoods and the interaction of the different groups

that use the resource. The growing pressure on these resources, which were under collective ownership, set in motion processes that have affected their use and property rights.

A major change in rangeland use, as pointed out by the interviewees, is the development of range enclosures. Range enclosures are fenced territories in the rangelands. According to the interviewees, they are safeguarded as a source of fodder and forestry products for direct individual use and/or for sale at times of scarcity of these products. Range enclosures in Darfur started for the first time in the early eighties in South Darfur, in the homeland of the pastoralist groups of the Beni Helba (El Sammani, 1987). Participants pointed out that range enclosures have expanded over large areas as different groups and individuals have tried to safeguard their interest. They are in fact part of a general fencing movement in the different kinds of lands in the study area (Osman, 2012).

In the Jebel Si area, the northern parts of the study area, range enclosures are widespread. Participants in the different villages of the farming community in Jebel Si explained that they are on average about 1 to 3 mokhamas (about 0.7 to 2.0 hectares). In contrast participants of the farming community of the low land of Kebkabiya area reported that the size of the enclosures ranges from 4 to 6 mokhamas (about 3.0 to 4.5 hectares). The difference in size of these enclosures could probably be attributed to their use. According to the participants enclosure in Jebel Si is largely to provide fodder for livestock of the farming community, while in Kebkabiya the fodder could also be sold. There is a high demand for fodder in Kebkabiya and Saraf Omra, where there is a large livestock market for local supply and for export. Moreover, enclosures in the Kebkabiya area are established around the margin of the cultivated area. As such, the enclosure is managed as part of the arable land and allows claim to harvest residues. In these aspects, enclosures in the Kebkabiya area are similar to those of South Darfur described by Behnke (1985).

Range enclosures as such represent two patterns of change in the management of rangelands. The first change is in rangeland property rights, whereby parts of rangeland are taken out of

communal access and brought under private or individual use (Osman, 2012). The second change is in rangeland use, whereby parts of the rangelands have been taken from an open system of livestock production and put in use as a part of mixed crop livestock production system. When the extensive livestock production of pastoralism is the dominant form of animal husbandry, a system of seasonal grazing according to the availability and quality of the pasture is practiced (IIED and SOS Sahel, 2010). With the development and growth of a livestock production as an integral part of the stabilized form of crop production, the strategic grazing is no longer the case. The members of the settled population keep their herds permanently around the village to raise these herds on the crop residues of the arable lands and the grasses and browse of the enclosures; a high pressure on pasture is thus maintained all year round. In other words, one could describe the fencing of the rangeland as a process setting the stage for the private use of the rangelands; this process excludes other range users. Yet the customary system accommodates neither the enclosed system of rangeland nor its private use.

4.4. The Growth of a Livestock Sub-system as part of an Arable Farming

The fact that cultivators have raised livestock on local pasture resources (crop residues, farm by products, grass from the farm and enclosures) within the study area as part of the a sedentary system of agriculture, this marks the development of an evolution a mixed farming system in place of the older shifting crop cultivation. Cultivators who accumulate surplus and invest in livestock manage their livestock as part of arable farming. There is a consensus among all participants from the farming groups that livestock is the main venue in which they invest their surplus. This process of investment is similar to that one under the traditional system described before. The interviewed cultivators pointed out that they manage their livestock as part of their crop production and not as part of the long seasonal migration outside the study area. Under this system they tend to integrate livestock production with their arable farming in a pattern of a mixed farming. This represents a

radical shift from the open livestock system and nomadic careers these cultivators used to pursue when they invested surplus in livestock and became part of the pastoral production system. This nomadization process, which involves both economic and cultural transformation, had characterized the region for so long (Haaland, 1972). In other words, from the cultivators' perspective, nomadization and pastoral livestock production are no longer a trustworthy and viable system of production that successful cultivators could pursue. Accordingly, they have sought more innovative and more lucrative systems that combine livestock and crop production under arable farming. In addition, they have declined the herding arrangements to leave their livestock as part of the long rainy season migration where they entrust it with the pastoralist. They have increasingly relied on wage labor or village group arrangements in the husbandry of their herd within the study area.

The processes that drive this shift are not implicit in the dichotomy of pastoralists versus farmers, or nomadic groups versus sedentary ones, but rather are driven by the pressure on land resources in general, with the consequence of mounting pressures on the grazing resources. This is evident in the growing use of crop residues, the change of use of the different categories of land discussed in this document, the increase in livestock population, and the type of labor involved in livestock management. For example, the cultivators' herd has grown significantly from what it was in the 1940s (estimated to be 1 to 2 cows for a better-off family, as mentioned before). Animal husbandry is no longer restricted to traditional pastoral societies, and that means a high proportion of animals remain continuously in the study area as part of the arable farming system. A Tufts University Feinstein International Center survey of a randomly selected sample of 414 internally displaced people of the farming community in Kebkabiya reveals that 96% percent of the IDPs owned livestock before their displacement in 2003. Of the respondents, 95% owned shoats, 77% owned cattle, and 14% owned camels. Almost none of the respondent left his animal with the pastoralists groups (Young, Jacobsen & Osman, 2009). In addition, low-level aerial surveys in Sudan

and other countries of the Sahel in the early 1990s indicate that overall livestock distribution is with cultivation and rural settlements. Accordingly, Bourn & Wint (1993) conclude that livestock biomass increases with rising levels of human population and increasing intensity of land use.

Participants explained that there is an increasing trend toward sheep husbandry and cattle husbandry since the early 1990s. The high demand for sheep in the local and export market has probably shaped these trends toward sheep husbandry. The increasing trend in sheep husbandry is accompanied by a remarkable change in the breed of sheep raised. Participants described these trends. The *garaj* sheep (small in size with white or black color) of the eighties has been replaced with the *abrag/ashgar* breed. Participants noted that this breed is a crossbreed between the *hamari* of Kordofan and the white local sheep. This crossbred sheep came into existence in the late nineteen-nineties, when the demand for it in the market became high. It is still preferred by all the herders and farmers because there is a high demand for it in the local and export market, and it grows to market size quickly. According to the participants, before the ashgar, a white local breed of small size and white color was predominant in the study area. In addition, reported the staff of the Agriculture Service Department in Kebkabiya, there has been a growing milk market in the urban centers. In response to the growing milk demand in the urban centers, farmers have started to seek ways to improve the milk production of the local breeds through crossbreeding with other dairy breeds from other parts of Sudan. In recent years this has gone further by establishing dairy farms composed of a herd of Friesian cattle in Kebkabiya and Saraf Omra.

5. Implications for the interdependence between the different livelihood groups

5.1. Development of Stable Agricultural Systems and End of Production Symbiosis

Land use in the study area, as illustrated above, was based on the traditional system of multiple and overlapping rights that enable the successive use of the land and landed resources by

the different resource users. Such a system provided the base of shifting cultivation and pastoral livestock production that are taking place on the same terrain. It enabled these production patterns to interact ecologically, economically, socially, and politically, though they tended to take place in different management units, typically belonging to different ethnic groups.

Land use has, however, changed over time. Shifting cultivation has changed into continuous land use as part of the evolution of stable agricultural systems caused by the increasing pressure on land and by the introduction and expansion of cash crops. The stabilized form of agriculture is based on the development of valuable long-term cash crops combined with livestock production and staple food crop production. The pastoral livestock production, on the other hand, has remained as a distinct pure grazing system of extensive land use that involves the utilization of the different feed resources in the same cyclic pattern at the different seasons of the year. However, the components of its animal production have experienced some other changes, such as the composition and breed of the herd, to cope with the multiple stresses of the intensifying climatic variability and economic, political, and social changes.

The dramatic changes in land use in the study area with the evolution of shifting crop cultivation into a stabilized form of agriculture that combine crop and livestock production have implications for the symbiotic relation of cultivation and pastoralism, and the mutual interaction of the groups that are involved in these patterns of production.

5.2. Ecological Linkages

The ecological exchange linkages in the study area developed in the alluvial plains and the arable rain-fed farmlands in the dry season when livestock move into those areas, as discussed above. In these areas pastoral herds graze on the crop residues as standing hay, which is of little value to the cultivators, and on the acacia stands in the dry season after the harvest. While these herds are grazing, they improve the fertility of the soil through the dropping of manure on the fields. These

ecological linkages are of long standing and form an integral part of both pastoral livestock production and cultivation. The ecological linkages have been disrupted in different ways, as described below.

5.2.1. The erosion of the manuring link. The manuring linkage exists in two forms. The most common form takes place when farms are open to communal use whereby the general herds are allowed to graze crop residues as part of the tradition named the *talaag*. According to this tradition, pastoral herds have free access to the crop residues in the plots as soon as the harvest is completed. The second form of the manuring linkage requires different arrangements for another local tradition called *diyara*. The cultivators welcome the pastoralists and may pay them to camp for several days on their farms just prior to the cultivation season. Van Raay (1975) has noted a similar arrangement in northern Nigeria, where there is a ready market for manure gathered from pastoralist camps.

The linkage between crop residues and manuring, as discussed earlier, provides a base for a symbiotic relationship between the cultivation and pastoral production patterns. Such a symbiotic relation results in a mutual relationship between farmers and pastoralists. The pastoralists benefit by having access to animal feed of a good nutritional quality at a critical time of the season when the natural pasture has already been exhausted. The farmers, on the other hand, gain by having their fields fertilized by the animal manure. Manure supplies organic matter to improve the soil's physical and chemical properties, besides adding valuable macro- and micronutrients to the soil. It also increases infiltration of water, enhances retention of nutrients, reduces wind and water erosion, and promotes growth of beneficial organisms (Hailin, 2009; Hoffmann & Mohammed, 2004). The positive impacts of the manure on the physical and chemical properties of the soil improve the land productivity and enable the farmers to cultivate their land under shift cultivation for longer periods than they normally do. Farmers in the alluvial plains of West Darfur could grow millet continuously

for 15 to 20 years, rather than the usual 3 to 5 years (McCown et al., 1979). Similarly Haaland (1980, 1984) found out that a herd of 30 cows produced enough manure to keep 1 mokhamas (1.04 feddans, or 0.73 hectare) of the rain-fed arable land permanently fertile if they were kept for 18 nights on the fields, three days on the same campsite, six campsites on 1 mokhamas.

This manuring linkage, however, started to erode in the early 1980s. It was completely cut and lost its influence in enhancing a complementary relationship between the farmers and the pastoralists by the end of the 1990s. Farmers, with the permanent use of land for commercial irrigated agriculture, have increasingly become dependent on agrochemical and modern technologies. Chemical fertilizers have been heavily used to maintain agricultural productivity in the alluvial plains. As a result, the use of the manures to improve soil in the alluvial plains has been weakened and abandoned. The tradition of the diyara has been deserted since the early eighties, though it is still vibrant in the living memory of both farmers and pastoralists in the study area.

Equally, the role of the migratory herd of the pastoralists in manuring the soil during the talaag in lands where only rain-fed cultivation is practiced has diminished. The manure has become available to the farmer from his herd and the village based herd. Farmers have increasingly used the crop residues for their own herd and for other uses. The diminishing role of the migratory herd as a source of manure and the increasing alternative uses of the crop residues have weakened the role of the crop residues in the production symbiosis and as an element of mutual interaction between the farmers and the pastoralists.

5.2.2. The diminishing role of the acacia. The permanent use of the alluvial lands has further undermined two important aspects in the interaction of pastoral livestock production and cultivation. First, it has undermined the ecological linkage between pastoral livestock production and cultivation. Second, it has restricted the access of the pastoral herds to the acacia stands in the wadis, the main source of animal feed in the hunger season. The permanent use of land has increasingly

restricted the access of livestock to the hunger-season fodder of the acacia since the 1960s. At that time, the cultivators started to expand their winter gardening of short-term maturing vegetables and fruit orchards in the alluvial plain at the expense of the acacia stand. As discussed earlier, cultivators have expanded their winter gardening and rain-fed cultivation into the alluvial plain in response to the drought and food deficits of the 1960s/1970s. The use of the alluvial land has intensified over time with the increased introduction of irrigation technologies and increased dependence on external agricultural inputs. This process of intensive land use and expansion in the acreages under irrigated agriculture involves the removal of the acacia cover along the wadi. The acacia species' role in enhancing the fertility of the soil through the nitrogen-fixing property of the tree is well established. The green foliage during the dry season, when green fodder is in short supply, is a valuable source of animal feed. Moreover, the pods of the tree are very rich in protein. The Jebel Marra Rural Development Project has estimated that the supply of pods from twelve trees of *Acacia albida*, for example, has a crude protein equivalent to that of a hectare of ground nuts (Hunting Technical Services, 1995). In addition, the acacia stands along the wadi are an important source of shade for the livestock in the dry season when the temperature is high. The growth of commercially oriented agriculture has taken over the small-scale-irrigation and brought the land under an intensive use. Consequently, the manure of the livestock that feed on these trees and the nitrogen-fixing property of the tree itself are replaced by industrial fertilizers. Therefore, removal of the tree itself has become a necessity for efficient horticultural production.

In short, the transformation of the agriculture in the plains along the valley has resulted in the development of an intensive form of irrigated agriculture owned by male cultivators. It has also removed and excluded the role of the acacia tree and livestock in maintaining and enriching the soil fertility. As a result of these changes, other resource users such as women are excluded, and their

role has increasingly been limited to providing paid agricultural labor. At the same time, the access of livestock to large tracts of the acacia stands in the valleys has diminished, if not cut off completely.

5.2.3. Crop residues: From an element of cooperation to an element of violence. Another element that further eroded the linkages between pastoral livestock and crop production is the growth of a village based herd as part of mixed farming. Farmers and settled groups in the area have increasingly invested in livestock as an integral part of their continuous land use. Farmers raise their livestock in the rangelands in the high areas around the villages and the farms during the wet season. By the time the pastoralists' herd arrives for dry-season grazing, the cultivators' herd, which reside in the study area for all year, may have already depleted the local pasture and have turned to the leftover from the crop residues of the rain-fed arable land. Stalks, by then, may already have been collected and stored as a fodder, for building houses, or as a source of income, as mentioned earlier. In addition to the cultivators' herd, there a high demand for crop residues for the commercial herd in the market. As mentioned earlier the area has two primary markets for the export of livestock to other parts of Sudan and outside Sudan to North Africa. The cultivators' herd and commercial herds have taken a great share of the crop residues. In fact, the cultivators' herd is supported on crop residues in the dry season.

In the alluvial land of the valley where irrigated agriculture is practiced, crop residues have become limited to the farmer or village herd. These herds graze the crop residues of the alluvial agriculture as part of the closed grazing system. These herds are very well attended and guarded when they graze crop residues of irrigated farms to avoid any damage to irrigated crops. In some cases they are fed on a cut-and-carry feeding system. In addition, crop stalk and residues are used as windbreaks to improve yield, protect irrigated crops from damage caused by strong wind, and enable the plant to maintain moisture. In addition, they help reduce topsoil erosion.

Many have argued that the expansion of rain-fed cropping at the expense of grazing land has resulted in the rising conflicts between farmers and herders (Shazali & Abdel Ghaffar, 1999; United Nations Development Program in Sudan, 2006). In the situation where multiple and overlapping land claim systems exist, one would expect the loss of range forage to be compensated to some extent by fodder contributed by crop residues, such as sorghum, ground nut, cowpea, and millet. The compensation, however, is not open to other livestock owners because of the disruption of the cyclic use of land, the transformation of shifting crop cultivation into mixed farming, the ensuing change in property rights, and the expulsion of other users.

The diminishing role of the crop residues has made the talaag into a nominal tradition that does not exist in reality. In fact, the "talaag" has become a period of tensions and competition for crop residues between farmers and pastoralists. The formal and informal debate around the talaag has branded it as "*el-talaag el-jaeir*" the forcible talaag.[4] The role of talaag as an element of cooperation between pastoral and cultivation groups has turned it into an element of competition and conflict that involves bloodshed.

5.3. Exchange Linkages

Land-use changes in Darfur have eroded not only the ecological linkages discussed above but also the exchange linkages that have traditionally connected herders, farmers, and others in the area. Such linkages include the herding contract and the role of the camel in transport and trade.

5.3.1. The Evolution of Mixed Farming and the demise of the herding contract. In addition to the ecological linkage established around the talaag, diyara, and the acacias, pastoralists and cultivators under the extensive land use are also involved in herding arrangements as part of an exchange relationship. These herding arrangements have cemented the interactions and relationship

[4] The civil forum to limit the forcible Talaag was organized in Saraf Omra, North Darfur from October 25 to October 26, 2008.

between the two groups. Cultivators invest the surplus of the production they accumulate in livestock. They leave their livestock with the pastoralist groups as part of the arrangement of a herding contract. According to this herding contract, the pastoralists combine the farmers' animals with their migratory herd.[5] The herders keep the milk, while the farmers devote their own labor solely to cultivation. The farmers' livestock under this arrangement has a high potential to grow because it is placed under a competent management system that combines the herding expertise of the pastoralists and extensive use of the land. The extensive uses of the land through the migratory movements provide a good pasture during the different seasons of the year and also keep the herd away from the unfavorable environment of the wet season in the wadi areas. Farmers who succeed in accumulating large herds change their career and set themselves into a nomadization process. Haaland (1969) studied the nomadization process among the Fur in West Darfur. He pointed out that "A successful economic career among the Fur ends up with the long rainy season migration to the Baggara area". He added "through the nomadization process individual are sloughed off from Fur local communities and eventually incorporated into Baggara community" P 65.

The herding arrangement has come to an end since the end of the 1980s with the shift to continuous land use. Continuous land use has led to stabilized form of cultivation that over time has combined crop and livestock in a form of mixed farming production. This emergence of mixed farming has encouraged the growth of the farmers' herds that reside in the study, as discussed above. This means that the cultivators have withdrawn their animals from the long rainy season migratory herd of the pastoralists and manage them on the farm and the range enclosure as part of the stable agriculture. The integration of the farmers' livestock in their stabilized form of agriculture has two

[5] The term "herding contract" is widely used in the literature. See Toulmin's (1992) article "Herding Contracts: For Better or Worse?" and Finkelstein's (1968) "An Old Babylonian Herding Contract and Genesis 31:38."

implications: First, it means that a pastoral livelihood has no longer become the strategic choice for cultivators who accumulate livestock as discussed earlier. The denial of this option is part of a change in the production system in the area associated with the change in land use. Second, it means that the withdrawal of the cultivators' herd from the pastoralists is not a result of lack of trust of pastoralists as guarantor of the cultivators' livestock. Rather, one could say that cultivators no longer have faith in keeping their livestock under a migratory system as an investment option that ensures their long-term welfare. The permanent land use provided the cultivators with other opportunities that allow them to integrate livestock into the farming activities. Such integration allows them to minimize risks, recycle resources and to maximize the use of the available resources (Food and Agricultural Organization of the United Nation, 2001). These advantages are lost if the cultivators leave their herd to pastoralists or herdsmen to take them in long seasonal migration. However, such integration has replaced and developed at the expense of the earlier interactions between the pure grazing systems of the pastoralists with pure cultivation system of the cultivators.

In fact, the development of wage labor and investment opportunity in livestock and agriculture in the traditional economy in the area has facilitated the withdrawal of farmers' herds from migratory herds and the growth of livestock production as part of arable farming. Accordingly, cultivators have replaced the herding contract they had with pastoralists with individual or group arrangements that involve cooperation with other farmers in the village. The use of wage labor in the herd management is, however, not limited to the farmers, as the pastoralists have increasingly resorted to hired herders in the last 10 years. They have hired cattle herders from South Darfur and sheep and camel herders from North Darfur, where the professional expertise of cattle herding and of sheep and camel herding respectively reside. This change in labor exchange has meant that this investment interaction through the herding contract linkage has also been abandoned. Consequently, it has further weakened the mutual relationship between these livelihood groups.

5.3.2. The vanishing role of the camel in transport and trade. The change in the herding labor arrangement is also combined with changes in labor arrangements associated with the transportation of the agricultural produce within and outside Darfur, including the study area. Pack animals, mainly camels, are widely used for the transport of agricultural produce associated with the traditional systems of land use where the scale of production and technology used is limited. In addition, contracts are annually arranged for pack camels to carry produce and trade goods over the different parts in northern Sudan and within the province (Paterson, 1948). This long tradition has provided an investment link whereby pastoralists rent their camels to transport the agricultural products to the different weekly markets that are distributed over the area. The change in the agricultural system and land use is combined with shifts in marketing to the regional markets, as mentioned before. This shift in marketing has also led to the use of commercial trucks replacing the pack animals that have a long history in trade in Darfur. In fact, the introduction of the trucks in the early 1970s has gradually replaced the camel in the long-distance transportation of agricultural products. Morton (1994) has commented on the impact of the introduction of the motor trucks. He writes, "The arrival of motor vehicles undermined one of the great strengths of the North [North Darfur], its fast camel herds for transport" (Morton, 1994, p. 70). By the early 1990s, with the introduction of animal traction technology, cart animals had completely eroded the pack animal linkage. Animal-drawn carts, or *karu,* have become the main vehicle that the farmers use for the transportation of their farms' produce and for agricultural inputs in the village. Both the trucks and the cart animals have taken over all aspects of transporting the agricultural produce for long-distance trade and local transport, respectively. They have entirely replaced the pack animals that existed up to the end of the seventies as the main means for the transport of the agricultural products in the region.

To summarize, extensive land use has provided the basis for the interaction of the different resource users. This interaction has emphasized a symbiotic relationship involving the cooperation of the resource users in their production process. The change in land use into a permanent and continuous one has undermined the symbiotic relationship between the different resource users. As a result, the relationship between the resource users has turned from a symbiotic one into a competitive one blended with tensions and grievances (Osman, 2012). As a result, confrontation rather than cooperation has become the norm, with an increasing likelihood of conflict between the resource users.

6. Conclusion

This article examined change in land use in the Kebkabiya area of North Darfur and its implications for the interdependent relationship between the farming and pastoral livestock production systems and the interaction of the groups involved in these production systems. Under the traditional land-use system, extensive shifting cultivation and pastoralism took place in a cyclic manner that allowed these production patterns to succeed each other on the same soil. This system of land use supported a production symbiosis that fostered the interaction and cooperation of the resource users for their mutual benefit and peaceful coexistence.

Land use has, however, changed over time. Shifting crop cultivation has changed to continuous land use as part of an evolution of stabilized form of agricultural systems driven by the increasing pressure on land, and the introduction and expansion of cash crops. The stabilized form of agriculture is based on the development of valuable long-term cash crops combined with livestock production and staple food crop production. To maintain its productivity, this system of stable agriculture has largely become dependent on agricultural inputs of a technological nature in the alluvial plains. And in its rain-fed cultivation it maintains the productivity by intercropping and by the manure of its own livestock as they graze the leftover from the harvest. The stabilization of

shifting cultivation and its evolution into a mixed farming has implication for the pastoral livestock production. The pastoral livestock production is based on the utilization of the different feed resources in the same cyclic pattern at the different seasons of the year.

The outcome of the change in land use is that the cyclic use of land is disrupted, the production symbiosis has eroded, and traditional twining between cultivation and pastoralism is lost. Consequently, the mutual interaction between them has become competitive and has brought an end to the long-lived traditional cooperation between these two enterprises and the groups living on them.

The continuous land use, the evolution of a stabilized agriculture, and the erosion of the traditional linkages between cultivation and pastoralism in the study area raise two issues that merit investigation. The first one is the extent to which the change in land use has stimulated changes in the principles of communal control of land to an individual one. The second one is the wide impact of the change in land use on the access of the different resource users to land and landed resources, and on the social relations and interactions in the study area. Understanding the changes in land use and land control, and their impact on access to land and landed resources, in Darfur is critical for policy making and discussion on the future of the interaction of pastoralism and cultivation, as well as for the peaceful coexistence of groups involved in these production systems.

Literature Cited

Abate, T., van Huis, A., & Ampofo, J. K. O. (2000). Pest management strategies in traditional agriculture: An African perspective. *Annual Review of Entomology, 45,* 631–659.

Ahmed, M. K., & Hassan, M. S. (1983). *Horticultural production and research in Darfur region.* Eighth African Symposium on Horticultural Crops, 1983; Wad Medani, Sudan, 20–24 March 1983.

Babikir, A. A. A. (1988). Vegetation, soil and land-use changes in Jebel Marra and other mountains in the Republic of the Sudan. *Mountain Research and Development, 8*, 2/3, 235–241.

Barth, F. (1956). Ecologic relationships of ethnic groups in Swat, North Pakistan. *American Anthropologist, 58*(6), 1079–1089.

Barth, F. (1964.) Competition and symbiosis in north-east Baluchistan. *Folk, 6,* 15–22.

Barth, F. (1981). Economic spheres in Darfur. In F. Barth (Ed.), *Process and form in social life: Selected essays of Fredrik Barth.* Vol. 1 (pp. 157–178). London: Routledge & Kegan Paul.

Barth, F. (1988). *Human resources: Social and cultural features of the Jebel Marra Project Area. Bergen studies in social anthropology, 42*. Bergen, Norway: Department of Social Anthropology, University of Bergen.

Bazeley, P. (2009). *Qualitative data analysis with NVivo.* London: Sage.

Behnke, R. H. (1985). *Open-range management and property rights in pastoral Africa: A case of spontaneous range enclosure in South Darfur, Sudan.* ODI paper no. 20f. N.p.: Overseas Development Unit.

Beshai, A. A. (1976). *Export performance and economic development in Sudan, 1900–1967*. London: Ithaca Press.

Bourn, D., & Wint, W. (1993). *Livestock, land use and agricultural intensification in sub-Saharan Africa.* Retrieved from http://www.odi.org.uk/work/projects/pdn/papers/37a.pdf

Brockwell, J., Searle, S. D., Jeavons, A. C., & Waayers, M. (2005). *Nitrogen fixation in acacias: An untapped resource for sustainable plantations, farm forestry and land reclamation.* N.p.: Australian Centre for International Agricultural Research.

Burr, J. M., & Collins, R. O. (1999). *Africa's Thirty Years' War: Chad, Libya, and the Sudan, 1963–1993.* Boulder, CO: Westview.

Dahl, G. (1979). Ecology and equality: The Boran case. In C. Lefébure (Ed.), *Pastoral production and society* (pp. 261–281). Cambridge: Cambridge University Press.

Darrag, A. (1998). *Range rehabilitation in Sudan.* 8th Arab Veterinary Conference, Khartoum, Sudan.

de Waal, A. (1989). Famine mortality: A case study of Darfur, Sudan 1984–5. *Population Studies, 43*(1), 5–24.

El Sammani, M. O. (Ed.). (1987). *Baseline survey for Darfur region.* Khartoum, Sudan: Republic of Sudan Ministry of Finance and Economic Planning, UNDP–Khartoum, Institute of Environmental Studies (IES), University of Khartoum, and Government of Darfur Region.

Eldredge, E., Khalil, S. E. S., Nicholds, N., Abdalla, A. A., & Rydjeski, D. (1988). Changing rainfall patterns in western Sudan. *Journal of Climatology, 8*, 45–53.

Finkelstein, J. J. (1968). An old Babylonian herding contract and Genesis 31:38. *Journal of the American Oriental Society, 88*(1), 30–36.

Food and Agriculture Organization of the United Nations (FAO). (1968). *Land and water resources survey in the Jebel Marra area: The Sudan: Final report* (Report No. LA-FAO/SF: 48/SUD). Rome: FAO..

Food and Agriculture Organization of the United Nations (FAO). (1984). *Institutional aspects of shifting cultivation in Africa.* Rome: FAO, Human Resources, Institution and Agrarian Reform Division.

Haaland, G. (1969). Economic determinants in ethnic processes. In F. Barth (Ed.), *Ethnic groups and boundaries* (pp. 58–74). Boston, MA: Little, Brown.

Haaland, G. (1972). Nomadism as an economic career among the sedentaries in the Sudan Savannah Belt. In I. Cunnison & W. James (Eds.), *Essays in Sudan ethnography* (pp. 149–172). London: C. Hurst.

Haaland, G. (1980). Social organization and ecological pressure in Southern Darfur. In G. Haaland (Ed), *Problems of savannah development: The Sudan case. Occasional papers in social anthropology, 19* (pp. 55–106). Bergen, Norway: University of Bergen.

Haaland, G. (1984). The Fur. In R. V. Weekes (Ed), *Muslim peoples: A world ethnographic survey* (pp. 264–269). Westport, CT: Greenwood Press.

Haaland, G. (1991). Systems of agriculture in Western Sudan. In G. M. Craig (Ed.), *The agriculture of the Sudan, 230–251*. Oxford: Oxford University Press.

Hailin, Z. (2009). *Fertilizer nutrients in animal manure*. Oklahoma State University Department of Plant and Soil Science. Retrieved from http://www.poultrywaste.okstate.edu/files/f-2228web.pdf

Hale, G. A. (1964). Land rotation and cultivation terracing in Jebel Marra, Darfur, Sudan. Abstracts of papers presented at the 60th annual meeting of the Association of American Geographers, Syracuse, New York, March 29–April 1, 1964. *Annals of the Association of American Geographers, 54*(3), 412–443.

Hale, G. A. (1966). *Cultivation terraces in Western Darfur, Sudan: A study in an agricultural form and practice.* (Doctoral dissertation). University of California, Los Angeles.

Harir, S. (1994). "Arab belt" versus "African belt: Ethno-political conflict in Dar Fur and the regional cultural factors. In S. Harir & T. Tvedt *(Eds.), Shortcut to decay: The case of the Sudan (pp.* 144–185). Uppsala: Nordiska Afrikainstitutet.

Hassan, Y. F. (2003). *Studies in Sudanese history*. Khartoum, Sudan: Sudatek.

Hirai, M. (2005). A vegetation-maintaining system as a livelihood strategy among the Sereer, west-central Senegal. *African Study Monographs, 30*, 183–193.

Hoffmann, I., & Mohammed, I. (2004). The role of nomadic camels for manuring farmers' fields in the Sokoto Close Settled Zone, Northwest Nigeria. *Nomadic Peoples, 8*(1), 99–112.

Hulme, M. (1990). The changing rainfall resources of Sudan. *Transactions of the Institute of British Geographers, 15*(1), 21–34.

Hunting Technical Services, Ltd. (1958) *Jebel Marra Investigations Report on Phase 1 Studies*. London: Sudan Ministry of Irrigation and Hydro-Electric Power.

Hunting Technical Services, Ltd. (1977). *Agricultural development in the Jebel Marra area. Annex 1, land resources.* Borehanwood, England: Hunting Technical Services.

Hunting Technical Services, Ltd. (1978). *Agricultural development in the Jebel Marra area. Final report.* Borehanwood, England: Hunting Technical Services.

Hunting Technical Services, Ltd. (1995). *Jebel Marra Rural Development Project: Land use planning studies. Final report.* Hemel Hempstead, England: Hunting Technical Services.

Hussein, O. M. (1957). Land policy in northern Kordofan. In Thompson, C. F. (1965), *Land law of the Sudan: Cases and materials.* Vol. 2 (pp. 860–863). Khartoum, Sudan: Faculty of Law, University of Khartoum.

Ibrahim, F. N. (1984). *Ecological imbalance in the Republic of the Sudan: With reference to desertification in Darfur.* Bayreuth, Germany: Druckhaus Bayreuth Verlagsgesellschaft.

ILO/UNDP Employment Mission. (1975). *Growth, employment and equity: A comprehensive strategy for Sudan.* Report of the ILO/UNDP Employment Mission 1975, A United Nations interagency team organized by the International Labor Office, Geneva. Geneva: Imprimeries Populaire.

Koster, H. A. and Koster, J. B. (1976) Competition or symbiosis?: Pastoral Adaptive Strategies in the Southern Argolid, Greece. *Annals of the New York Academy of Sciences, 268* (1), 275–285.

Lebon, J. H. G. (1965). *Land use in the Sudan. The world land use survey, monograph 4*. Bude, England: Geographical Publications.

Lebon, J. H. G., & Robertson, V. C. (1961). The Jebel Marra, Darfur, and its region. *Geographical Journal, 127,* 30–49.

Liversage, V. (1945). *Land tenure in the colonies.* London: Cambridge University Press.

Manger, L. O. (1987). Introduction. In L. O. Manger (Ed.), *Communal labour in the Sudan* (pp. 1–7). Bergen, Norway: University of Bergen.

McCown, R. L., Haaland, G., & de Haan, C. (1979). The interaction between cultivation and livestock production in semiarid Africa. In A. E. Hall, G. H. Cannell, & H. W. Lawton (Eds.), *Agriculture in semi-arid environments* (pp. 297–332). Berlin: Springer.

Miehe, S. (1986). *Acacia albida* and other multipurpose trees on the Fur farmlands in the Jebel Marra highlands, Western Darfur, Sudan. *Agroforestry Systems, 4*, 89–119.

Morgan, W. B., & Pugh, J. C. (1969). *West Africa.* London: Methuen.

Morton, J. F. (1993). *Agricultural development in Darfur Region, Sudan, with special reference to innovation, technical change and open access resources.* (Doctoral dissertation). London University, London.

Morton, J. F. (1994). *The poverty of nations: The aid dilemma at the heart of Africa.* London: British Academic Press.

Niamir-Fuller, M. (1998). The resilience of pastoral herding in Sahelian Africa in Berkes F, Folke C and Colding J eds *Linking social and ecological systems: management practices and social mechanisms for building resilience (*pp. 250–84). Cambridge: Cambridge University Press.

Niamir-Fuller, M. (1999). *Managing mobility in African rangelands: the legitimization of transhumance.* Exter: Intermediate Technology Publications.

Noronha, R. (1985). A review of the literature on land tenure systems in sub-Saharan Africa. ARU paper 43, Agriculture and Rural Development Research Department, World Bank. Washington, DC: World Bank.

O'Fahey, R. S. (2008). *The Darfur Sultanate: A history*. New York: Columbia University Press.

Osman, A. M. K. (2012). *Agricultural change, land and violence: An examination of Darfur.* (Unpublished manuscript doctoral dissertation). Tufts University, Medford, MA.

Paterson, R. T. (1948). Darfur Province. In J. D. Tonhill (Ed.), *Agriculture in the Sudan: Being a handbook of agriculture as practised in the Anglo-Egyptian Sudan* (pp. 851–874). Oxford: Oxford University Press.

Platteau, J.-P. (1992). *Land reform and structural adjustment in Sub-Saharan Africa: Controversies and guidelines.* FAO Economic and Social Development Paper No. 107. Rome: FAO.

Practical Action. (2010). *Food production in western Sudan*. Retrieved from http://practicalaction.org/food-production-4

Scoones I ed (1995). *Living with uncertainty: new directions in pastoral development in Africa.* Exeter: Intermediate Technology Publications.

Scott, E. P. (1984). Life before drought: A human ecological perspective. In E. P. Scott (Ed.), *Life before the drought*. London: George Allen & Unwin.

Shazali, S., & Abdel Ghaffar, M. A. (1999). Pastoral land tenure and agricultural expansion: Sudan and the Horn of Africa. Issue paper no. 85. London: International Institute for Environment and Development.

Spaulding, J. (1979). Farmers, herdsmen and the state in rainland Sinnar. *Journal of African History, 20,* 329–347.

Strachan, P., & Peters, C. (1997). *Empowering communities: A casebook from Western Sudan.* Oxford: Oxfam.

Suleiman, M. M. (1985). *Baseline survey for Kordofan and Darfur*. Khartoum, Sudan: Range and Pastured Administration.

Symanski,R., Manners, I., & Bromley,R. (1975). The mobile- sedentary continuum. Annals of the association of American geographers, *65,* 461 – 471.

Toulmin, C. (1983). *Economic behavior among livestock-keeping peoples: A review of the literature on the economics of pastoral production in the semi-arid zones of Africa*. Norwich, England: School of Development Studies, University of East Anglia.

Toulmin, C. (1992). Herding contracts: For better or worse? *ILEIA Magazine, 8*(3), 8–9.

Umbadda, S., & Abdul-Jalil, M. A. (1985). Women in small-scale irrigated agriculture: The case of Wadi Kutum (Sudan). *Africa Spectrum, 20*(3), 339–335.

UN Office for the Coordination of Humanitarian Affair (2009). Darfur humanitarian access map. IMU OCHA Sudan http://ochaonline.un.org/sudan.

United Nations Development Program in Sudan (UNDP Sudan). (2006). *Share the land or part the nation: The pastoral land tenure system in Sudan, Study 3*. Khartoum, Sudan: UNDP Sudan.

Van Raay, H. G. T. (1975). *Rural planning in a savanna region*. Rotterdam: Rotterdam University Press.

Wilson, R. T. (1978). The "gizu": Winter grazing in the south Libyan Desert. *Journal of Arid Environments, 1*(4), 327–344.

Young, H., Jacobsen, K., & Osman, A. (2009). *Livelihoods, migration and conflict: Cases studies from west and noth Darfur 2006 – 2007*. Medford: Feinstein International Center, Tufts University.

Young, H., Osman, A.M., Aklilu, Y., Dale, R., Badri, B. and Fuddle, A.J.A. (2005). *Darfur: Livelihoods under siege*. Medford: Feinstein International Famine Center, Tufts University.

2. Land Tenure in Darfur: Dualism, Uncertainty, and the Evolution of a Contested Exclusive Individual Possession

Abdal Monium K. Osman*, Helen Young*, Robert F. Houser*, Jennifer C. Coates*

* Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy

Tufts University

150 Harrison Avenue

Boston, MA 02111

Corresponding Author

Abdal Monium Osman

Abdal.osman@tufts.edu (phone)

Abstract

This article is part of a study to examine the connection between agricultural change, land, and violence in the Kebkabiya area of Darfur, Sudan. This study uses qualitative research methods to investigate land allocation and acquisition in the context of changing land use and a dualistic land tenure system. This system involves both the statutory land law and the customary land tenure, the latter based on a multiple and overlapping land claims system. The customary tenure system, which has traditionally organized land acquisition and transfer in the study area, has gone through a transition from communal tenure (usufruct rights and reversion to common property on abandonment) to an individualized control system of an exclusionary nature. Inheritance-based land acquisition and contractual arrangements such as rent and purchase have been rising as means of permanent transfer of land. The exclusionary individual ownership has taken place in a context of institutional tension created by the coexistence of both the statutory and the customary tenure. Given the insecure and contested nature of the exclusionary individual land ownership, land fencing has emerged as a signpost for the exclusionary land control and boundary making. These processes of the dual land tenure system, the evolution of a contested individual land control, and the tension ensuing from both have resulted in confusion, lack of access to land for large sectors of the population, and insecure access to land and landed resources for others. Accordingly, the use of violence to claim rights and secure access to land and landed resources has emerged as a serious problem. The current academic and policy debate on land tenure in Darfur is insufficiently grounded in empirical evidences and sound theoretical frameworks and therefore, it is distant from the reality on the ground. The importance of properly grounding policy debates in the wider body of knowledge cannot be overemphasized. Research is needed to investigate the effect of the exclusionary ownership on the social security in the area, and on the traditional structure of land management and conflict resolution.

1. Introduction

Land in Darfur remains the most important asset because it provides the basis of livelihood for most of the population. Therefore, the systems of right and institutions that regulate how land is accessed, used, allocated, and transferred play a vital role in shaping social relations and promoting livelihoods opportunities, food security, and agricultural and economic development.

In addition to the central role of land as a livelihood resource for people in Darfur, rights to land and the ways in which land is exploited incorporate fundamental features of the society and economy. In fact, rights to land involve the intersection and overlapping of the worlds of society and politics (Sikor & Lund, 2009). As such, they are issues of major competing interests involving diverse social forces, individuals, and institutions at the local and international level. Struggles over land in Africa, as Berry (2002) writes, are "as much about power and the legitimacy of competing claims to authority, as about control of property per se" (p. 639). It is, therefore, not surprising that land reform is often a central issue in political debate and that these debates are often couched in terms of redistributing political power as well as wealth (World Bank, 1975).

The central role of land to the economic, social, and political life becomes more complex in Darfur. Land is subject to multiple and overlapping claims by different groups. Consequently, land becomes the place and space of interaction of users from different livelihoods and tribal backgrounds. Disputes over land in Darfur have acted as a major source of permanent social tensions. As a result, disputes over land and the definition of the customary rights have moved from the courts to the space of political conflict since the mid-eighties (Osman, 2012). By the early days of the new millennium, these disputes over land have evolved to become the central part of a permanent political crisis. In this context, one has to step very gently in any debate that addresses the question of land and take into account at every junction the complex political and tribal nature of the issue.

The complexity of the land question and natural resources in the Sudan in general and Darfur in particular has created an intense debate. This debate, however, is based on few, if any, evidence-based studies. As a result, the literature on the Sudanese land tenure is built on inadequate knowledge and is therefore, argued Babiker (n.d.),

> flawed with too many empirically unfounded and history-distorting generalizations or packed with too many contradictory accounts that reflect a symptomatic confusion of the *de jure* (the legal provisions in law) with the *de facto* (the practice in the real world) aspects of land tenure as well as a lack of thematic, geographic and historical focus. (p. 1)

These limitations shed serious doubts on the potential role of the current literature to inform a land policy and legislation that could secure equitable and sustainable land use based on the recognition and reconciliation of the multiple and overlapping claims on the land by the different groups in the society. Therefore, there is an urgent need for empirical research to inform the debate on land in Darfur.

Most of the literature on land tenure in the Sudan addresses the customary resource tenure, state legislation, and policies with an emphasis on the legal codification and on aspects of the history of their evolvement. In other words, the main focus of the literature has so far been on the legal aspects of the property rights (the "de jure"), while the practice on the ground (the "de facto") has attracted little attention. The de jure, however, is not necessarily congruent with the real practice. During the last 30 years there have been many changes in the social, economic, and political sphere that challenge these rights. Monetization of the traditional economy, coupled with labor migration and cash cropping, has taken place since the seventies; population densities have ratcheted up, and rapid technological change has occurred (Barth, 1981; Central Bureau of Statistics & Southern the Sudan Commission for Census, Statistics and Evaluation, 2009; El Sammani, 1987; ILO/UNDP

Employment Mission, 1975). All these factors have combined to influence changes in land use and the production system in the area (Osman, 2012), with a potential detrimental effect on land tenure. The nature of the change and its impact remain a gap in the current research on land tenure in the Sudan.

The vast body of literature on land tenure in other parts of Africa could shed some light on the question of land relations in the Sudan. A large body of research discusses the relative merits of individual and communal land ownership. Communal land tenures are egalitarian, with open and equal access to all individuals on the basis of membership in the group. Many scholars argue that communal land tenures lead to wasteful patterns of land use. In addition, they are not clearly defined or consistently enforced. In other words, they are ambiguous and contested, and right in land is subject to ongoing reinterpretation. Consequently, communal land rights are insecure and therefore do not provide incentive to individuals to invest in land improvement (Berry, 1993; Cohen, 1980, Feder and Noronha, 1987; Noronha, 1985).

Individual tenure has all the attributes contrary to those of communal tenure. The right to land is a matter of contract, a power to transfer with the right to use or not to use the land. Migration does not result in loss of ownership and is not interpreted as abandonment (Noronha, 1985). Accordingly, many of the critics of customary tenure advocate for land reforms to promote agricultural development and to permit governments to allocate land rights in accordance with national priorities (World Bank, 1975).

A good deal of the literature has concentrated on demographic changes and agricultural intensification and their implications for land tenure since the early seventies (Boserup 1965). Demographic growth and agricultural intensification drive a shift from communal to individual and commercial land rights. Accordingly, new types of land transactions such as sales are emerging, with new practices such as use of witnesses and written contracts. These changes confirm the so-called

"evolutionary theory of land rights." The fundamental element of this theory is that the increasing population pressure and market integration drive the spontaneous evolvement of land rights toward rising individualization (Boserup, 1965; Chauveau, Colin, Jacob, Lavigne Delville, & Le Meur, 2006; Platteau, 1996). However, such a change is not a linear and uniform one but rather complex, with increasing social and agricultural differentiation (Crowley & Carter, 2000). Those with more resources are able to gain control over valuable lands, while the land claims of more vulnerable members may be weakened. The weaker groups are pushed out, and they are losing access to lands (Platteau, 2002).

Another area of research on land tenure in Africa is the change in land relations within the family, including gender and age relations (Hilhorst, 2000; Quan, 2007). The role of the extended family in land management decisions has been eroding as decisions are increasingly made more at the household or even individual level. In these contexts, land scarcity may lead to redefinition of the land claims of the different groups even within extended family (e.g., along gender lines). Moreover, it could lead to tensions between the older generations' control of land and the younger generation left with limited access to land.

In the light of the growing body of literature on land allocation and transfer, the objective of this article is to study the land allocation and acquisition between groups and individuals, as practiced on the ground in a context of a changing land use. The contention of the article is that land rights, as practiced and exemplified in the Kebkabiya area of the central cultivation zone of Darfur, have evolved in the direction of increased individualization, and the allocation process takes place through increasingly private mechanisms. These private mechanisms exclude common right and use of land resources by other livelihood groups and individuals. This shift has been driven by the move from shifting cultivation to a stable agricultural system. This research is critically needed to

inform policy making, shape future research, and inform the current political debate on land in Darfur.

Section 1 presents the research methodology, which is based on qualitative methods that combine focus group discussion with individual and key informant interviews in different villages that practice agriculture in form of rain-fed cultivation (in the low lands and terraced slopes of the mountains), and irrigated agriculture (in the alluvial lands along the seasonal rivers), and the rangelands. Section 2 discusses the norms and principles that regulate access to land and the changes that have transpired in the last five decades. These principles include the customary communal law and the statutory legislation. Section 3 summarizes the main findings of the research and presents the different types of land transfer and acquisition and other non-customary changes in land relations. Section 4 discusses and analyzes the nature of the changes in ownership of and access to land and the implications for the different groups and individuals. Section 5 examines the emergence of land fencing in the study area as an element in the change in land property rights and as an element that emphasizes individual ownership of land. The last section draws on the results of the analysis undertaken in the different sections to conclude the paper and provide some suggestion for further research.

2. Method

2.1. Context

The analysis presented here on land tenure is a part of study on agricultural change, land and violence undertaken in the Kebkabiya area of North Darfur State, the Sudan during the period between December 22nd, 2009 and February 22nd, 2010. The study area represents the North eastern extension of Jebel Marra. It is composed of the mountainous area of Jebel Si and the low plains of the Kebkabiya area. It is characterized by a high degree of social, economic, and ecological diversity. The population of the study area is composed of different tribal groups that include Fur, Arabs,

Tama, Gimir, Zaghawa, Berti and Tunjur (Young, Osman, Aklilu, Dale, Badri, and Fuddle, 2005). These groups are broadly involved in a pattern of economic activities centered on farming and nomadic pastoralism. These activities are practiced in a landscape that ranges from the rocky, gravel and volcanically derived soil to sandy soil with numerous seasonal rivers running it. The populations of the area are distributed in the villages and nomadic settlements "*farigs*" in the rural area and in the town of Kebkabiya.

The study area (Figure 1) is characterized by chronic conflicts and social tensions. For the last three decades the area has been characterized by protracted insecurity caused by social tensions, tribal conflicts, and armed banditry. In 2003 the area was directly affected by the government counter insurgency driving more than 45,000 people of farming communities into the town of the Kebkabiya. Since then, insecurity has restricted the mobility of the population in the area, and travel from the town to the rural areas is very limited. The security situation in the study area during the field work was volatile. The United Nation demarcated the area as a no-go area for international personnel with no humanitarian access.

Tufts University Institutional Review Board, USA granted the ethical approval to conduct this study prior to the field work. Informed consent was obtained from all interviewees. The study was carried out in collaboration with the Kebkabiya Smallholder Charitable Society (KSCS) and was funded by OXFAM AMERICA through their local partner. At the field level KCS secured the permission to undertake the study from the relevant governmental and traditional authorities.

2.2. Design

In this study qualitative research methods were used. Data were collected from farmers and transhumant pastoralists in 28 villages, from pastoralists in 8 nomadic fariqs, and from participants in the town of Kebkabiya. Data collection in the villages and nomadic fariqs was undertaken during

January/February of 2010 while interviews in the town took place in the different periods of the field research from December 2009 to February 2010.

2. 2.1. Research Instruments. The research instruments were developed through a detailed literature review and consultation with relevant experts. Table 1 presents these research instruments and the number of the different types of interviews undertaken in this study. They included (a) open-ended, semi-structured interviews guides used with members of different community; (b) semi-structured focus group discussion guides with separate groups of male and female participants; (c) unstructured, in-depth interviews with key informants, including tribal leaders and governmental staff; and (d) unstructured group interviews with business groups in Kebkabiya. In addition, observation has been recorded throughout the field study.

Table 1: Research tools and the number of the different types of interviews carried out

	Research tool	**Number of interviews**
1.	Open ended interviews with: a) village chiefs b) conflict resolution experts in the village c) individual men and women of the village community	 36 36 228
2.	Semi-structured focus group discussion for separate groups of males and females participants	64
3.	unstructured, in-depth interviews with key informants	13
4.	unstructured group interviews with business groups	7

2.2.2. Recruitments of participants and selection of villages and pastoralists camps

Participants agreed to voluntarily participate in the study on the date and time the study team visited the village or pastoralists camping sites. These dates were agreed on with the village sheikh before the date of the visit. In each selected village the study team recruited the people who attended the meeting for the different methods of data collection. The number of the people who attended the meeting in each village was large enough for the recruitments of participants for the different research methods.

The selection of the villages where farmers and transhumant pastoralists were settled was made on a basis of a participatory agricultural mapping exercise. This exercise was carried out with the key informants, community leaders, and technical experts from the governmental departments in the area. This exercise mapped the different areas of agricultural production, land-use zones, ethnic and livelihood groups, and agricultural profile and setup of the area. This approach was meant to ensure that the perspectives of the farmers and transhumant pastoralists in the different zones and from the different tribal backgrounds were captured.

Nomadic pastoralists are settled in mobile hamlets in the study area, and therefore different criteria were set for their recruitment in the study. Pastoralists in the study area were traditionally divided into the camel herding groups and the cattle herding groups. Each of these groups was classified, on the basis of its seasonal movement, into two subgroups. The first group was involved in a short seasonal movement between the study area and other areas within North Darfur State. The second one was involved in a long seasonal movement, crossing the study area on the way between North Darfur State and South or West Darfur State. Accordingly, four groups from each of the camel and cattle herding groups were selected. As illustrated in Table 2, two of each group were of short seasonal movement and the other two of long seasonal movement.

Table 2: Selection of the pastoralists group

Type of seasonal movement	**Pastoralists group**		**Total**
	Camel herder "*Abbala*"	**Cattle herders "*Baggara*"**	
Long	2	2	4
Short	2	2	4
Total	4	4	8

2.2.3. Recruitments of participants for the different research instruments.

In the villages and pastoralists settlements the study recruited participants for the different types of research instruments.

2.2.3.1. Open-ended, semi-structured interviews with members of community groups. The study employed three different forms for interviews with community groups in the villages and pastoralist hamlets enrolled in this research.

The first form of open-ended, semi-structured interview was designed for interviews with the chiefs of the villages and pastoralist hamlets. The total number of chiefs interviewed was 36, one chief for each village or pastoralist hamlet.

The second form was designed for interviews with the community leaders who are experts in conflict resolution in their respective village communities. An expert in conflict resolution in each of the 36 villages and hamlets was interviewed. These experts were identified by the village/hamlet community as the people mostly involved in conflict resolution within the village and with other communities in other villages.

The third form was intended for individual male and female farmers and transhumant pastoralists of three different age groups: 20–30 years, 40–50 years, and above 60 years. In each village, a minimum of three males and three females were interviewed, with at least one male and one female of each age group. Table 3 illustrates the number and age groups of the males and females interviewed.

Table 3: Age groups and number of the males and females participants

Gender	Age group in years			Total
	20 – 30	40 -50	Above 60	
Female	41	40	39	120
Male	37	37	34	108
Total	78	77	73	228

2.2.3.2. Semi-structured focus group discussion tailored for separate male and female participants. In each village a male and a female focus group discussion were carried out, while in the pastoralist hamlet only male focus group discussions were organized. Table 4 presents the type and number of focus group discussions. In total, 64 focus group discussions were carried out, with the male focus groups constituted 36 and the female focus groups constituted 28. The numbers of the participants in each focus group varied, with an average of 10 to 15 participants per focus group.

Table 4: Type and number of focus group discussions

Focus group	Number of focus groups	Remarks
Female focus group	28	The average number of participants in the age group is 10 to 15 participants
Male focus groups	36	
Total	64	

2.2.3.3. Unstructured, in-depth interviews of some individuals. These key informants and experts interviews were carried out with the *shartaya* (hakura chiefdom) and the *omdas* (different tribal leaders based in the town), and the governmental staff of the departments of agriculture and veterinary services, the Agricultural Bank, and the Humanitarian Assistance Commissioner in Kebkabiya town.

2.2.3.4. Unstructured group interviews. These interviews were conducted in Kebkabiya with the different business groups in the town. These groups included the truck transport, the blacksmiths, the farmer unions, the agribusiness and veterinary centers in the market, and the agricultural crops traders. Also, direct observations were employed in this research in the villages, the pastoralists' hamlets, and the town of Kebkabiya.

2.3. Data Collection

The study team for this research was composed of twelve individuals who played different roles in the study, ranging from administration to data collection. Because the situation in the study area was tense and highly politicized, the study team members were carefully selected. They were

experienced in research management and data collection. Many of them were trained by Tufts University and participated in previous training and research conducted in the area by Tufts University Feinstein International Center, USA. They also constituted a mix of the different tribal backgrounds from the study area.

Four days of training for the members of the study team were organized before the start of the data collection. The first two days of training covered the research itself, qualitative methods of data collection, individual interviews, focus group discussion, and participatory rural appraisal techniques such as participatory mapping and proportional piling to investigate livelihood strategies and means of land tenure and conflict mapping. The last two days covered piloting of the research checklists for the structured interviews and focus groups, and training of the team members on these tools.

Individual interviews were conducted in person at a convenient place that allowed privacy. On average, interviews with individual male and female participants lasted for one hour and a half, interviews with the conflict resolution expert in the village lasted for one hour, and the interviews with the village chief lasted for three hours. Before the beginning of the interview process, the interviewer explained the procedure and clearly assured each participant of confidentiality, and then requested the oral consent of the participant before the interview continued. Focus group discussions were organized publically, and people could join or leave during the discussion. On average, the focus group consisted of 10 to 15 participants and continued for approximately two and a half hours.

The study team members met at the end of each day of data collection to ensure interview consistency and data quality. They reviewed and assessed the data collected from each set of instruments and group of respondents. They discussed their field observations and interviews they made and any emerging issues. Responses to the interview questions were recorded in Arabic during

the interview on the same checklist sheet. The data collected covered a wide range of topics and varied in their depth and breadth, from the large amount of detail-rich information from the focus groups to the in-depth personal experiences of individual interviewees. Themes and topics explored included demographic information, village history and administration, irrigated agriculture, rain-fed agriculture, land ownership and control, types of land, land allocation and administration, land transactions and investments, land fertility, water sources, groups, conflicts and their resolution, perception of change in cooperation, land tenure before the conflict, cropping systems and use of crop residues, range and pasture, livestock, and gender roles. In addition, the focus group discussions with the pastoralists covered the annual movement and livestock routes of the groups and the changes that have taken place over the last five decades.

2.4. Data Analysis

The principal investigator, who led the data collection, transcribed, imported, and analyzed the data by himself to ensure consistency in interpretation. A data record made of transcribed interviews, focus group discussions, and field notes that recorded observations and thoughts about the data (document memos) was prepared in Microsoft Word. Each document was imported into computer-based qualitative analysis software (QSR NVivo 8). Structured interviews and focus group discussion questions were labeled using a heading style to facilitate auto-coding and query tools in NVivo.

Several techniques prescribed by Bazeley (2009) were systematically used to analyze the imported interviews. The data were extensively reviewed, and accordingly a coding tree containing parent (concepts) and child nodes (sub-concepts) was developed and used to code the imported transcripts. The data were coded using two techniques: first, assigning specific passages of text, comments, and answers to specific questions in the imported transcript to specific code; and second, topic auto-coding by heading level (consistently applying the heading style level to the structured

interviews). Auto-coding allowed responses to each question to be coded at a node with a name based on the question. Accordingly, the resulting codes gave immediate access to, for example, Question 3 in the individual interviews of interviewees of the age group above 60.

Attribute information such as age group, ethnicity, gender, and village was linked to the cases and was used to make comparisons across data (e.g., comparing male with female responses or comparing the response of females of specific age groups to specific questions). The codes were then recorded and explained in memos. This memo recording took the analysis from the empirical data to a conceptual level, refining and explaining the nodes further and showing their relationship to building a more integrated understanding.

2.5. Triangulation

To get more detailed and balanced findings, triangulation was built into the research design, and triangulation strategies were employed in the different stages of the research process. Methodological triangulation of different data gathering techniques, such as focus group discussion, semi-structured and unstructured interviews, and observations, was used. These methods were used by different investigators in the study team, as mentioned above. Moreover, they were used to collect data from participants drawn from very diverse backgrounds. Selection of the participants entailed several strata of selection, which allowed the collection of data from a diverse group of people, place, time, and social situation. Selection of participants took place between and within populations (people of different tribal background, age group, and gender), between and within different geographical areas and villages, between and within production systems, and between and within the different social positions such as farmers, community leaders, tribal administrators, staff of government and nongovernment organizations, traders, and truck drivers.

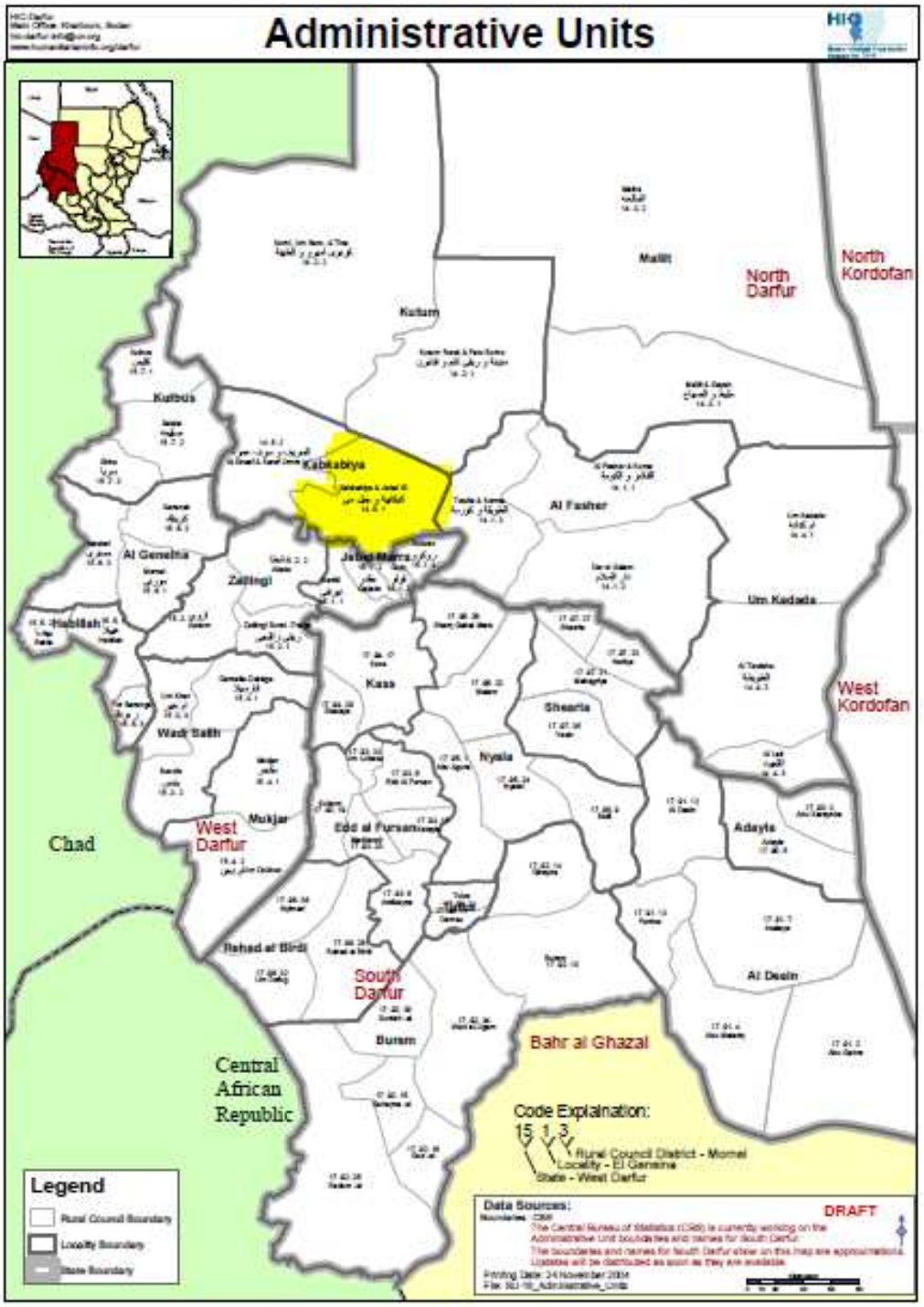
Triangulation not only included different methods of data collection used by multiple members of the study team but also included the checking and rechecking of data as they were

collected in the field. The study team met regularly during the fieldwork to discuss the data collected and the feedback from the different team members. All these triangulation strategies were further enhanced by the use of the NVivo software. The software provided the capability to present, check, compare, and contrast the contents of nodes and cases based on the attribute values assigned to them (e.g., Do male [or female] interviewees under the age of 30 have different perceptions of land rights from male [or female] interviewees of the age group above 60. Such comparisons enhanced the understanding of the data, the categories, and concepts emerging from them. When working with coding stripes in a source or a node, one could choose to display the stripe for a selected attribute: For example, a stripe for *female* would show all content-coded cases involving female participants.

2.6. Limitations

Despite the comprehensiveness of the research, there still remain some limitations with the study. The study tracked change in land use over time and its implications for the interaction of major livelihood groups through design of interviews with different age groups to capture the change in land use in the different time periods. One obvious problem is that the data collected are based on recall, which is subject to memory lapse and recall bias. To address this challenge, an intensive literature review was carried out and incorporated along with the findings to present a narrative that captures change across scale of time and space. Moreover, the research was carried out in a situation of insecurity and social tensions in the study area. All these factors have the potential to affect the data. Given the previous lack of research on agricultural change, land, and violence in Darfur, it is difficult to assess the impact of these factors on the overall findings and conclusion of this study. The need to replicate this research in other parts in Darfur remains of utmost importance to confirm the findings from this study and to inform and enhance evidence-based policy.

Figure 1: Map of North Darfur and The Study Area



Source: Humanitarian Information Center for Darfur (2005)

3. Land Tenure in Darfur

The principles that govern the tenurial practices in Darfur are formed of the statutory laws and the customary tenure, both of which coexisted in a state of tenure dualism dating back to the colonial advent in 1899 and persisting throughout the post-independence era. The government has legislated on some aspects of administration of land and title to land. However, the customary law title to land has not been well defined in relation to government ownership. This has resulted in an ambiguous legal situation, with insecure and uncertain tenure that has become evident with the increasing pressure on land.

3.1. Statutory Land Tenure in Darfur

The common legal fabric of the governmental regulations of land in the Sudan is an outcome of a long history of lawmaking. This lawmaking process is based on various sources of the Sudanese and non-the Sudanese origin. These sources have been brought together, during the different political eras of the country, with varying degrees of modification to form a unique and complex product (Gordon, 1986; Thompson, 1966; Tier, 1990).

The land law of the Sudan has undergone a series of changes during both the colonial and the postcolonial eras since its enactment in 1899. These changes are influenced by the different political and social institutions that have dominated the country. These changes were also inspired by the technocrats who have supervised the legislation process and the practice of the law on the ground (Thompson, 1965). All these elements of change have put their stamp on the different laws of land in the different eras of the modern history of the country. Despite the variation in the political and social institutions that have shaped the formulation of the land laws in the Sudan, the legislation in the different areas of the country bear a remarkable resemblance to each other in some basic features. These features have implications for the security of tenure in Darfur in general and the study area in particular.

3.1.1. Land registration. The registration of rights and interest in land in the Sudan represents the main form of secure land ownership in the land law of the country. Land registration facilitates proof of title and makes transfer of land simple, quick, and certain (Simpson, 1976).[6] In the Sudan, as early as the 1950s, Miskin (1953) writes, "If real security is to be given, it is essential that all transactions be registered" (p. 74). He added that "No claim in respect of an unregistered will be upheld in the courts" (p.73). Registration in Darfur has, however, taken place only in the major towns of the region and in the mechanized agriculture in South Darfur (El Sammani, 1987; Land Tenure Task Force, 1986). In the study area, there are elites who have managed to register their farms, though no governmental registration or cadastral plan[7] has taken place in that area.

The principle of land registration retained high priority in the agenda of the colonial administration. It was established in the first two acts issued two months after the colonial administration conquered the country in 1899. Since then, the principle of registration has been confirmed in all the laws that followed these first colonial acts. The first two laws proclaimed in theSudan—the Khartoum, Donglola, and Berber Town Ordinances (1899) and the Title to Land Ordinance (1899)—provided for the registration of the traditional smallholdings along the Nile in

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[6] Registration represents the process by which a government agency keeps a record of title to land. Accordingly, no dealing in respect of any parcel of land in that record is valid unless it is registered.

[7] According to the Inter-governmental Committee on Surveying and Mapping (ICSM) the cadastral plan is a survey plan produced by a registered/licensed surveyor who accurately measures and records the boundaries of each property. This occurs whenever a new land parcel is created and each new survey produces a new survey plan. Because of this, each plan is static in time (i.e., it represents the shape and status of the cadastre at the time of survey).

the northern the Sudan. The institution of individual private land ownership had already existed in these areas, as freehold before the advent of the colonial rule (Awad, 1971).[8] In later development, the colonial administration, as a part of a legal consolidation process, enacted a series of laws: the Land Settlement and Registration Ordinance (1925), the Prescription and Limitation Ordinance (1928) and the Land Acquisition Ordinance (1930).[9]

The Land Settlement and Registration Ordinance (1925) consolidated the laws of land settlement and introduced a system of registration of title (Elbashir & Elmudawi, 2009, Runger, 1987). It confirmed that without registration no person could acquire land in the Sudan with any degree of safety. The Prescription and Limitation Ordinance (1928) was the first law in the Sudan that provided for the acquisition of a right to property by uninterrupted possession for a prescribed period. However, some provisions had been included in previous laws such as the title of Land Ordinance (1899) and the Land Settlement and Registration Ordinance (1925) (Omer, 2000; Simpson, 1955). Here one has to point out the position of the native courts in relation to this legislation and their role in land cases.[10] These courts are only authorized to consider disputes related to registered land. The Native Courts Ordinance (1932) provides that "no native court shall have power to hear any case concerning the ownership of land except a claim for partition of land

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[8] Freehold gives the owner of that interest the exclusive right to the land for an indefinite period of time.

[9]In the Land Acquisition Ordinance, 1930 (which replaced the 1903 Ordinance), "material benefit to the public generally or to persons residing or owning land in the neighborhood" was substituted for "likely to prove advantageous to the Government" (Simpson, 1955,p. 13).

[10] Native courts administer native law and custom prevailing in the area or in the tribe over which the court exercises the jurisdiction, provided that such native law and custom is not contrary to justice, morality, and order.

registered under the Land Settlement and Registration Ordinance, 1925 and owned in undivided share by co-heirs" (Abushouk & Bjørkelo, 2004, p. 241).

Land registration as a government policy under the national flag has not differed widely from that of the colonial period. The Land Settlement and Registration Ordinance of 1925 has remained effective. The state has amended the legislation in an attempt to apply the Islamic Sharia law in 1984. In accordance with this legal change, the government enacted the Civil Transaction Act (1984), which regulates the possession, ownership and rights regarding land in the Sudan, including contracts with respect to the Sudanese land (Gordon, 1986; Omer, 1997). Accordingly, right to land is upheld on the basis of usufruct. The Act maintains that land registered on or after April 6th, 1970, in the name of an owner shall be deemed merely the ownership of the usufruct.[11] However, the usufruct right is secured through registration. Accordingly, "registered" usufruct rights are equal to registered ownership. It seems that there is nothing that distinguishes usufruct from freehold. As a result, the usufruct right as defined by the Civil Transaction Act could be acquired through deed, inheritance, will, or exercise of possession. This formulation of the usufruct as an exclusive possession and control under the Civil Transaction Act, however, seems to conflict with that of the customary usufruct right. The latter implies that usufruct right is temporary and is allocated administratively on basis of need and group membership, as will be explained later. Moreover, usufruct right is not registered, and legally it is not recognized because there is no legislation for the registration of the title in Darfur, where the rain-fed land, like other rain-fed land in the Sudan, is owned by the state.

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[11] According to Simpson (1954), "Usufruct means the right to enjoy the use and fruits of land, the ownership of which belongs to another. It is not an expression which is used in English land law and perhaps it is a pity that it is used in colonial territories, particularly where such expressions of English law as 'fee simple' have already caused some confusion" (p. 52).

3.1.2. State ownership of unregistered land. The twin principle of the government policy of land registration in the Sudan is the government possession of all land other than the registered ones. This makes the government, as one commentator says, the largest land broker in the country. This principle has been maintained in the different legislation that has been enacted during both the colonial administration and the national rule.

The Land Settlement Ordinance (1905) enacted by the colonial rule has provided for the government ownership of land in which no private ownership has been proved. The ordinance is enacted "for the settlement of rights over waste, forest and unoccupied lands and to provide for the expropriation of such rights" (Simpson, 1955, p. 13).[12] In contrast to the colonial policy in the Nile, where individual ownership was established, the colonial policy in the rain-fed areas, forest, and waste land did not recognize private individual land ownership. Access to land in these areas established on the basis of usufruct communal rights based on need and community membership. In these areas, where access is upheld on the basis of usufruct, the colonial rule delegated its power to manage and control access to land to the Native Administration, the local governmental body, under the indirect rule model of the colonial administration. The West African Land Committee (1966) has succinctly expressed the link between the land and the native rule as "together they stand or fall" (as cited in Chanock, 1991, p. 64). Meek (1946) has stressed that land tenure is the foundation of native rule. He pointed out that the authority of chiefs, sub-chiefs, and heads of clans and families is bound

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[12] Unoccupied land was defined as including "uncultivated land and all land which shall not have been in the uninterrupted occupation of some person or persons for a period exceeding five years next before the settlement and also all lands which, owing to their height above the river, the infrequency of rains and other circumstances have been cultivated at irregular intervals only" (Simpson, 1955, p. 13).

up with the land. The sale of tribal land by chiefs or grant of absolute rights of ownership would, therefore, tend to disrupt the native policy.

Many scholars, however, have argued that the legal status of the rain-fed agricultural areas during colonial rule was uncertain in connection with the ownership of waste, forest, and occupied or unoccupied unregistered land. The Land Tenure Task Force (1986) points out that the legal position of these lands is ambiguous. In practice, the government allowed customary and Islamic land tenure too, and it entrusted those forms of land tenure with the Native Administration (Land Tenure Task Force, 1986). This ambiguity is probably inherent in the customary law as well as its relation to the statutory law, as will be discussed later.

The different national governments have maintained government possession of the unregistered land, though these governments held different political ideologies. The first land act in the post-independence era, the Unregistered Land Act (1970), expressly considers all lands that were not registered before the commencement of the act to be the property of the government and deemed to be registered in its name (El-mahdi, 1976). The government has, however, removed links between the land control and the local government of the Native Administration, maintained by the colonial rule. The government abolished the Native Administration in 1971 when it issued the 1971 People's Local Government Act.

These acts have far-reaching impact on the security of tenure and on right of land of the rural communities in Darfur. At one level, land in Darfur is not registered, as mentioned above. That means the government can seize land from any landholder for any public use or interest, as is provided for in the legislation. Such land seizure has taken place under the expansion of mechanized agriculture in some areas (Shazali & Abdel Ghaffar, 1999). At the legislative level, these acts challenge the communal land ownership. At the same time, the bodies that replaced the local government of Native Administration are barely operating at the local level due to lack of funds and

personnel. This has resulted in a tenure vacuum. Consequently, the old system at the village level continued under the command of the village sheik, though he "lacked a clear basis in administrative law since 1971" (Land Tenure Task Force, 1986, p. 5). The customary land tenure has continued on the ground to organize land tenure in the region, though it is no longer enforceable in court (Runger, 1987). The result is the creation of an uncertain land tenure situation caused by the gap between the practice on ground and the state legal situation and by the absence of an active administrative body capable to oversee land management and use on the ground.

The institution of individual ownership along the Nile, combined with communal ownership in the rain-fed area under state ownership of the land, is maintained in the post-independence era. In contrast to many countries in North, East, and Central Africa, the Sudan is the only country where the declaration of independence in 1956 has not produced any changes in the system of land tenure (Awad, 1971). After the country's independence in 1956, the two main acts of legislation are the Unregistered Land Act (1970) and the Civil Transaction Act (1984). Both acts emphasize that the government has the absolute ownership of land and that the government can expropriate land without proper processes or payment of compensation. The government has further reinforced its unlimited possession of the land in an amendment of the Civil Transaction Act in 1991. The amendment excludes any consideration of a legal or other suit or procedure in respect of any subject to do with proprietorship of land owned by the state (Babiker, n.d.).

Land laws in the Sudan create an insecure and a confused tenure situation in Darfur. This insecure situation affects the different livelihood groups, those who cultivate the land and those who use the land for grazing on a cyclical manner. For the former it creates an ambiguous and uncertain tenure situation, and for the latter the legislation remains mute on their right. The 1944 Soil Conservation Committee, quoted by El-Tayeb (1985), recommended that "where nomadic pastoralists were in direct competition for land with settled cultivators, it should be the policy that

the rights of the cultivator be considered as paramount, because his crop yields a bigger return per unit area" (p. 35).

3.4. The Customary Land Tenure in Darfur

Another aspect of the ambiguous situation of land rights in Darfur is that the statutory law conflicts and overlaps with the customary tenure. The customary land tenure system has developed over centuries as an indigenous land tenure system on the basis of which the different resource users gain access to land. It formed the basis of land management and administration in Darfur during the Fur sultanate, which ruled the region for almost four centuries, from 1641 to 1916. For this reason its evolution in Darfur dates back to the Fur sultanate. Customary land tenure is in fact, argued Awad (1971), a politically negotiated product between the local kingdoms and the Arab Bedouins who migrated to the Sudan to escape the harsh discipline imposed upon them by the Fatimi, Ayyuibl, and Mamliuk rulers of Egypt after they had been involved in a number of abortive revolts. Chanock (1985) claimed that the making of the customary law is the outcome of a process of dialogue between the colonial state and its African subjects. Therefore, it tends to benefit whatever interest group holds power.

The impact of land management and administration of the Fur sultanate has persisted up to the present time. It involved elements of societal control over use and methods of disposal. Accordingly, all the land in the sultanate belonged to the sultan. He divided it into *howekir* (estates or concessions, plural hakura), which he granted to nobles to maintain control over the land and to encourage newcomers to the sparsely populated kingdom. However, these nobles were only granted the right of use, and therefore hakura were not inherited or disposed in any manner without the sultan's consent (O'Fahey, 1980).

Though land in Darfur, as in the rain-fed areas in other parts of the Sudan, has come under the possession and ownership of the state, the customary land tenure has continued to regulate

access to and control over land at the community level. The colonial government endorsed the customary system under the supervision of the Native Administration of the indirect rule system. In other words, the state devolved its power to the local government to control and manage the land in the region, within the framework of the customary law (Abushouk & Bjørkelo, 2004). The customary law has also continued under the national rule.

The continuity of the customary law in Darfur has significant implications on the study area. It has meant that the agricultural land in the study area, which is predominantly a Fur tribe land hakura, is communally owned. This means that the conditions under which the land is held by the cultivator are determined by his or her social status in the community, rather than by virtue of any contractual arrangement entered into by him/her (Liversage, 1945). In other words, membership in the community implies right to cultivate. When the soil is exhausted of nutrients after three to five years of cultivation, the land is left fallow. Accordingly, right to this fallow land reverts to the community, and the cultivator is allocated usufruct rights to new fields. It also means that land rights lapse if plots are left uncultivated for more than two years. Land is thus not transacted, and shifting agriculture prevents this allocation from having permanent consequences or changes to its temporary nature (Barth, 1981; Haaland, 1969; Hussein, 1957).

The principle that has been widely accepted is that a *need* for land among members of the community implies a *right* to usufruct of land. At the same time, the individual capacity and the individual's range of needs, in the absence of means to obtain the hired labor of others has put limits on the size of holdings to what a person can cultivate by his or her own efforts (El Sammani, 1987; Haaland, 1969). As such, land is kept under a redistribution system as a part of a collective, not an individual, system of ownership. It is reallocated administratively on the basis of usufruct to tribal and village members, and not on the basis of purchase or inheritance. The traditional system thus does not accommodate permanent private rights to land. The only recognized individual right is the

right to usufruct use of the land under the supervision of the tribal authority. The current policy debate on land ownership in Darfur is shaped by the Darfur Peace agreement signed between the government and the rebels group in 2004. The agreement asserts the traditional rights of land ownership and establishes the Darfur's state Land Commission to oversee all the land tenure questions such as arbitrating disputes over land tenure, establishing and maintaining records of existing and historical land use, the application and reforms of land laws and recommending measures for land use planning (de Waal, 2006)

Based on the premises above, the implementation of the customary tenure in Darfur depends largely on the redistribution of the land. The relative poverty of the soil and the low input of technology have induced an extensive system of land use that allowed the redistributive mechanism of the land tenure to work well. But this redistributive system could be effective only when there was a relative abundance of land and the population density was low. These two elements, however, have changed in recent decades. The increasing pressure on land, due to population growth, has transformed land use into permanent and continuous use. At the same time, the land is being utilized to its full capacity, and cultivation has expanded on range areas that are of low quality (Fadul, 2004; UNEP, 2007; Osman, 2012). That means the redistributive mechanism of the customary system itself has become strained and fixed, and its effectiveness in land allocation to community members could be increasingly weakened and eroded. At the same time, government interventions have created a situation of conflict of laws. Though the customary land tenure systems control access to and use of land at the community level, they in fact have no legal force under the Civil Transaction Act of 1984 (Land Tenure Task Force, 1986). The result is that there are unclear property rights and tenure security, and deficient legal frameworks for private property. Moreover, there is overlap and friction between the customary and statutory law over authority in land dispute cases.

4. Results

4.1. Land Transfer and Acquisition

Within this environment of uncertain land tenure security and unclear property rights, new means of land acquisition and transfer have evolved in the study area. Tables 5, 6, and 7 illustrate the changes in land acquisition means in the study area. These tables are compiled from interviews with village chiefs and from male and female focus groups discussions using proportional piling exercises. Table 8 provides a comparative data from the Western the Sudan Development Project (WSDP) and Jebel Marra Development Project (JMRDP) in Darfur [WSDP], 1986). In the absence of data from the study area from previous years, the comparison could shed some light on the change that has taken place in the whole region.

Two major changes in the allocation of land have taken place across the different types of land in the study area. The first change is that land allocation by the village chief (sheikh) and allocation to oneself by clearance of land (bush clearance to claim fresh areas) do not exist as means for land acquisition. In contrast to the study area, Table 8 illustrates that in South Darfur in 1986, land allocation by the sheikh and acquisition by land clearance and loans constituted 18%, 46% and 5% of land acquisition, respectively. In Jebel Marra in West Darfur, on the other hand, cleared land constituted 34% of land acquisition (Table 8). At the same time, allocation of land by an existing landowner from his or her holdings in the form of temporary land loans is limited to the side hill of the terrace cultivation areas. In fact, this form of land allocation is found in only one village out of the 28 villages selected for this study. In that village it amounts to 10% of land acquisition. In contrast to the study area, land cultivated on the basis of loan in Jebel Marra of West Darfur amounted to 30%.

Table 5: Types and Range of Percentages of the different Methods of Land Acquisition in the Different Rain-Fed Cultivated Zones in the Study Area

Zone	Time	Status of the population	Inherited	Allocated by sheikh	Gift (*hiba*)	Cleared	Bought (*shira*)	Loan	Rented
K. North West	2003[a]	IDPs	70–75	0	5–10	0	5–20	0	15
K. North West	2010	Resident	50–75	0	25	0	25	0	25
K. South	2010	Coerced[13]	75–100	0		0		0	25
K. South	2010	Resident	50	0	25–35	0	15	0	10–15
K. West	2010	Resident	40–80	0	10–40	0	10–50	0	10–20
K. Middle	2010	Resident	50–98	0	10	0	8–30	0	2–10

K= Kebkabiya Area. [a] Date of conflict and displacement in the area.

The disappearance of land acquisition by allocation of the sheikh and by clearance of fresh land could be attributed to the increasing pressure on land and the lack of reserve land that could be acquired through these two means. One of the interviewed village chiefs in the study area has well captured the scarcity of land and the disappearance of land acquisition on the basis of clearance: "Since the end of the seventies all the land has been taken to its full limit. Therefore, there is no surplus land to allow us to break up fresh patches for cultivation or allocate land to needy people." These types of allocation, as discussed above, are made on the basis of need to group members, including new residents who are accepted in the community. The land allocated is usually of a size sufficient to provide for the livelihood of the allottee. The disappearance of these means of land allocation in the study area raises critical questions about the effect of this change on needy and vulnerable groups in the study area.

[13] These are some of the resident farming groups in villages along Wadi Barie that have not been displaced, but are living under highly exploitative regimes (Buchanan-Smith and Jaspars, 2007).

While the traditional means of land allocation by the sheikh, by land clearing, and by loans are disappearing, new nontraditional means of acquiring land are rising. These include inheritance, land sale, and land renting.

Inheritance-based acquisition of land has invariably become the main means of land acquisition and transfer in the different agricultural zones and among the different tribal groups that inhabit these zones. In the study area, the proportion of land acquired through inheritance varied widely between tribal groups and between the different agricultural zones. Inheritance-based acquisition amounted to 60%–100% in the areas of terrace cultivation of the massif of Si Mountains to a range of 40%–100% in the rain-fed cultivated land and irrigated lands. On the other hand, inheritance-based acquisition constitutes 13% in South Darfur and 27% in West Darfur, as illustrated in Table 8. This change could be attributed to the rise in individual land ownership.

Inheritance of land is made according to Sharia law prescribed in the Qur'an, with sons inheriting equally and receiving shares double those of their sisters. If there are no sons and only one daughter, her share is one-half, and if there are no sons but two or more daughters, the daughters' combined share is two-thirds of the inheritance.[14] The dominance of inheritance-based acquisition on the basis of the Sharia law and the disappearance of need-based allocation rooted in the traditional allocation have implications for women's shares. Rather than a fixed proportion of share (sisters receiving half the share of inheritance available to their brothers) prescribed in the Sharia law, the need-based allocation according the traditional system allocates land to women on the same basis as allocation to men: need and membership of the community.

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[14] Surat An-Nisa, Ayat 4, in the Qu'ran (Al-madina Al-Munawarah, Saudi Arabia: King Fahd Complex for the Printing of the Holy Qu'ran, 1410 H, p. 209).

Table 6: Types and Range of Percentages of the Different Methods of Land Acquisition in Irrigated Land in the Zones in the Study Area

Zone	Time	Status of the population	Inherited	Allocated by sheikh	Gift *(hiba)*	Cleared	Bought (*shira*)	Loan	Rent
K. North West	2003[a]	IDPs	70	0	10	0	20	0	0
K. North West	2010	Resident	70	0		0	10	0	30
K. South	2010	Coerced	100–75	0		0		0	25
K. South	2010	Resident	50	0	25–35	0	15	0	10–15
K. West	2010	Resident	40–80	0	10–40	0	10–20	0	10–40
K. Middle	2010	Resident	50	0	10	0	30	0	10

K= Kebkabiya Area. The means of land acquisition for the IDPs is in their original area before the displacement.

[a] Date of conflict and displacement in the area.

Table 7: Types and Range of Percentages of the Different Methods of Land Acquisition in Terrace Cultivation Areas

Area	Time	Status of the population of the area	Inherited	Allocated by sheikh	Gift *(hiba)*	Cleared	Bought *(shira)*	Loan	Rent
Jebel Si	2003	Internally displaced	60–100		5–30			10	5–10

In addition to inheritance-based acquisition, land sale, or *shira,* has become an important means of land acquisition in all types of land except the mountainous zone. The proportion of the rain fed cultivated land acquired through sale ranges from 5% to 50% in the different villages (Table 5). Land sale in irrigated land ranges from 10% to 30% in the different villages (Table 6). In some villages where irrigated agriculture is growing rapidly, land sale constitutes about 50% of land acquisition. Land sale, on the other hand, constituted only 3% and 2% in 1986 in South and West Darfur respectively, as illustrated in Table 8.

Table 8: Land Acquisition; Percentage of Fields by Means of Acquisition

Area	Cleared at will	Allocated by sheikh	Bought	Rented	Gift	Loan	Inherited
Western Sudan Development Project	46	18	3	4	11	5	13
Jebel Marra Rural Development Project	34	–	2	7	–	30	27

Source: WSDP (1986).

Land renting, on the other hand, varies from between 2% and 25% in the rain-fed cultivated lands to between 10% and 40% in irrigated land. In the terrace cultivation, land rent is limited to two villages and it accounts for 5% and 10%, respectively, in each of these villages. In 1986, rent accounted for only 4% in South Darfur and only 7% in West Darfur.

In the absence of fresh reserve land to be allocated, land rental and shira have become one possible means for landless people and non-community members such as internally displaced people or refugees to get access to land. Under the customary law, rights to usufruct are not paid for by money but are simply allocated on the basis of need. From the standpoint of statutory law, the land is the property of the government, which means that its sale and rent pose serious tenure security problems.

In addition to inheritance, sale, and rent, acquisition of land through gift varied from 0% to 10% in both rain-fed cultivated land and irrigated land. It does not exist in villages where irrigated agriculture is dominant.

Departures from customary tenure arrangements are not limited to land acquisition in the form of inheritance, sale, and rent; they also include the rights of migrants or cultivators absent from the villages. Participants explained that these groups of absentees make temporary arrangements to loan and trust their lands with relatives and they involve the chief of the village and other people as witnesses in these arrangements. The land remains the absentee's, with no changes in the ownership of the land. However, under the customary tenure arrangement, the right to land for the migrants

and cultivators absent from the village for more than three years lapses, and the land could be relocated by the village sheikh (Haaland, 1969).

4.2. Land Fencing

The evolution of non-customary arrangements in land allocation in arable land is coupled with the rise of non-customary practices of land fencing. Range enclosures are prevalent throughout the study area. Accordingly, individuals mark off large portions of the grazing by means of thorn branches, indicating that other people cannot graze their livestock in these areas. Participants estimated the size of these areas varied from 2 to 10 mokhmas.[15]

But land fencing is not new in Darfur. Range enclosure has taken place in the region since the late eighties (Behnke, 1985; El Sammani, 1987; Rabah, 1998). Osman (2012) has pointed out the implications of range enclosure for range land use. Range enclosures have taken large parts of the rangelands from the open system of seasonal grazing and limits its use to an agricultural system that combine crop and livestock production. In addition, these lands are safeguarded as a source of fodder and forestry products for direct individual use and/or for sale at times when these products are scarce. Therefore, they represent a private ownership of rangelands that are communally owned, and as such they eliminate other range users.

In addition to rangelands, land fencing has also spread in rain-fed and irrigated areas. The two-inch long thorns of the bush used for fencing are as sharp as barbed wire. Participants described the different types of fencing. In the older irrigated farms, fences are made of a combination of a thorn bush and a live stand of *kitir* trees. On the other hand, a combination of barbed wire and live tree stands is found in many of the farms that were established in or before the nineteen-nineties.

[15] 1 mokhmas = 0.5 hectare.

5. Discussion

5.1. The Nature of the Evolving Individualized Land Tenure Rights

Land acquisition and transfer in the study area have taken place on the basis of customary systems, despite the fact that the government owns the land. The customary system has, however, gone through a transition from communal tenure (usufruct rights and reversion to common property on abandonment) to a system where ownership and control of land are retained by individuals even throughout long fallow periods. Contractual arrangement such as rent and purchase has been rising as a means of permanent transfer of land.

The existence or development of individual ownership of land within a communal system of land ownership has been an area of controversy in the literature. There are two threads of debate. First, many scholars have argued that individual ownership of land does not exist under a system of communal tenure. Howell (1954), discussing property rights among the Nuer of southern Sudan, writes that "there is no concept of the ownership of land by an individual, ownership of land, both for cultivation and of grazing is expressed in term of kinship" (p. 178). Hussein[16] (1957) has explained the land policy in Northern Kordofan: "No individual, whether a chief or otherwise, may sell land under any conditions whatever"; he added, "There is no right of inheritance in land other than registered" (p. 860). Barth (1988), discussing communal tenure in Darfur, stresses that the traditional system "lacks a clear institutionalization of permanent private rights to land" (p. 70). Accordingly, he noted "Land has thus circulated through relocation and not by purchase or inheritance" (p.70).

Other scholars argue differently. They claim that individual tenures do exist under communal systems of land tenure. Further, they argue that critics of the communal system ignore or

[16] O. M. Hussein, District Commissioner of North Kordofan, Bara, The Sudan.

downplay the dynamic potential of the indigenous African land systems, failing to see that individual tenure can exist under a general system of corporate ownership and that the right to specific plots of land is held by individuals or households (Demsetz, 1967; Noronha, 1985). This argument that individual ownership exists within the communal ownership of land is, probably, maintained because under the customary arrangement the right of the individual to cultivate land continues undisturbed as long as the land is being cultivated (allowing as well for a fallow cycle). As such, the continuous cultivation of a plot carries with it the potential of permanent occupation. This occupation, however, does not confer exclusive possession of land. And it does not ignore the multiple and overlapping claims over the land by multiple resource users within the prevailing traditional land use and agriculture technology.

The extensive land use of traditional agriculture in the study area reconciled the multiple and overlapping claims over land by different resource users through the serial use of land whereby different users succeed one another over different seasons and times. The serial use of the land enables other land users to access the land and its resources at the end of the cultivation season after the harvest. Such cyclic and serial use of land implies that tenure rights vary within the year (Noronha, 1985; Platteau, 1992). For example, pastoralist groups or other farmers, including the cultivator him/herself, can feed their animals on the remaining stubble. This practice of serial use of land is much more akin to the land use system in medieval England, where private rights within the area ceased after the harvest. The land could then be grazed over by any livestock of the settled and migratory groups (Liversage, 1945). The serial use of land is not limited to common property rights open to different livelihoods, as in the case of the pastoralist pointed out before, but also extends to individuals within groups. Women in the study area, for example, could gain access to land after the harvest of the rainy season to practice traditional smallholder irrigated agriculture. However, the

shifting cultivation system in the study area has evolved into a stabilized form of agriculture, with a detrimental impact on the serial use of land.

The change in the agricultural system in the study area has resulted in the development of an individual claim of land of an exclusionary nature. This exclusionary element undermines the multiple claims on land maintained under the traditional agriculture system, as discussed above. Shifting crop cultivation in the study area has evolved over time into a stabilized form of agriculture. The stabilized form of agriculture is based on the permanent and continuous use of land, use of new technology (irrigation technology and other inputs), and the development of valuable and long-term cash crops combined with a village based livestock and staple crop production in form of mixed farming (Osman, 2012). Such a shift has blocked the cyclical use of land and resulted in the emergence of individual ownership and development of exclusionary practices. These practices deprive other resource users of their right to access land resources, which they are entitled to under the traditional cultivation. Women, for example, can no longer access land to practice their smallholding traditional irrigated agriculture. As well put by one of the farmers, "we have taken over irrigated agriculture of cash crop production and left the rain-fed cultivation of staple crops to our women." Studies on property in forests in Kenya have confirmed the existence of exclusionary practices affecting women (Rocheleau and Edmunds, 1995). Similarly, *talaag,* the access of pastoralists to graze agricultural residues, is no longer guaranteed as the cultivators reserve the residues for private use for their livestock or sale as a source of income. To recap, the evolution of individual land possession in the study area is of an exclusive nature that undermines the right to land by other resource users.

In addition to its exclusive nature, the individual land ownership has an inherent contested nature. As discussed above, individual ownership of the land has resulted in exclusionary practices that undermine the multiple and overlapping system of land rights. It has deprived other resource

users of their traditional right to access the land and its resources. Consequently, these groups have continuously challenged and contested the rise of exclusive possession of the land in the area. This contested nature of exclusive possession of land is manifested in the frequent disputes and conflicts between and within the different livelihood groups in the study area. Some of these disputes are over land boundaries and ownership; others represent conflicts over pastures and grazing of the stubbles and agricultural residues (Osman, 2012).

To conclude, the evolving exclusive possession does not provide security or certainty to any of the land users. It is contested and disputed by land users other than the cultivators. Moreover, it is established on a state land, it is not registered, and therefore it is not recognized by the statutory law. In addition, it has evolved on the basis of the customary law. The customary law, however, does not provide for individual ownership of land. More importantly, as The Land Tenure Task Force (1986), puts it, the customary law has "no legal force" (p. 15). All these elements together drive cultivators to seek ways to emphasize their individual ownership and accentuate the boundaries of their plots. Land fencing, in this context, has become the signpost to the exclusive possession of land and a means to delimit its boundary.

5.2. Land Fencing: The Signpost for Boundary Making and Exclusionary Possession of Land

With the insecure and contested nature of the exclusionary individual ownership comes the need to protect the title together with all the rights that accompany it. Accordingly, land fencing has spread in the study area as a signpost for exclusive land ownership and boundary making. The fence works as a physical feature that marks the limit of a property to identify each parcel without ambiguity. It has also become a necessity to keep intruders out. The intruders in this case could be other resource users who have claim to the land under the traditional system of land tenure (e.g., the herders who seek to graze the stubble).

In contrast to range enclosures, land fencing in the irrigated and rain-fed arable lands has attracted no attention. This is probably because thorn-bush fences are traditionally used as "*a fence of convenience.*" The fence of convenience forms a physical barrier along some parts or side of the farmed fields *"Zarrie"* to keep intruders, mainly livestock, out from damaging the fields. As such, the fence does not correspond with the boundaries of the land the farmer is traditionally entitled to cultivate but instead is intended to protect the actually farmed area or the cultivation itself (zarrie). Farmers, in areas where grazing pressures or the risk of intruders are low, may fence the exposed side of their zarrie only.

The fence of convenience does not modify the communal conditions under which individuals cultivate the land, as it is customarily put up to protect the farmed field from the ravages of livestock before the harvest. In other words, the fence of convenience is not intended to mark the boundaries of a privately owned land. Consequently, these fences stake no future claim of ownership of the land. Under the circumstance of traditional systems, land was abundant, and access to it was based on an assessment of need and ability to satisfy those needs. A right to land was collective, and it was not in constant emphasis, nor was there any demarcation of boundaries. Boundaries ultimately corresponded to regions occupied by people closely bound by ties of kinship and by the need for close cooperation in the economic sphere. Therefore, there were no disputes over land boundaries. The only form of disputes common in the courts concerned animal terracing when straying animals damaged the crops (Thompson, 1965). When disputes over land boundaries arose and people failed to come to an agreement over them, the most satisfactory method to resolve these disputes, explained Hussein (1957), was "to get parties to agree on some old man or men, unrelated to either, to carry the Quran and show the limits of the rights to each" (p. 480). This procedure of "shigging the had*"* (Arabic: splitting the boundary) is also maintained in the study area (Al-Amin, 2003).

Rather than a fence of convenience, land fencing in the study area is a manifestation of the evolving exclusionary individual land right as it emphasizes land boundary and right to land. These fences demarcate boundaries and define holdings owned by individuals, so they indicate and entail elements that alter the conditions under which individuals manage and use the land. They clearly divide up the area into parcels of land, indicating that they are subject to separate propriety rights. These propriety rights are not recorded on the registrar of titles but are well known and defined by the sheikh and the community, so they are seldom in dispute among the members of the village community. As such, they represent a traditional cadastral plan or map and a traditional registrar of title, though not recognized in the government system.

6. Conclusion

The intent of this article was to investigate land allocation and acquisition as practiced on the ground in a context of changing land use in Darfur. The analysis has pointed out that in the recent decades, the traditional pattern of communal ownership and communal rights to land in the study area has undergone a dramatic transformation towards more individual ownership and control. Change in land use into continuous one in a context of a stabilized agricultural system and increased pressure on land have driven the evolution of individual land control. The evolution of individual land control undermines the multiple claim system over land, leading into exclusionary forms of possession. The exclusionary individual ownership deprives other resource users of their traditional claims rights to access land resources. This traditional claim to access land under the multiple claim system over land is reconciled by the cyclic use of land by different users of the traditional system of extensive land use. Consequently, the evolution of the individual land control is of a contested nature that could lead to social tensions and polarizations.

Moreover, the evolution of the individual land control has taken place in a context of an institutional tension in the dual land tenure system in which both the statutory and the customary

tenure operate simultaneously. The result of these processes of dual land tenure system, the evolution of a contested individual land control, and the tension ensuing of both of them is confusion, lack of access to large sectors of the population, and insecure access to land for others. Under such a situation, the use of violence to claim rights and secure access to land would not be an unlikely development.

The current academic and policy debate on land tenure in Darfur is insufficiently grounded in empirical field based information and does not employ sound theoretical frameworks; consequently, it is distant from the reality on the ground. For these reasons, it cannot capture the social and economic impact of the change in land tenure on the different resource users in the region. It is constructed and perceived on the basis of land rights of the farmers versus herders. It is, therefore, unable to cross over these boundaries to provide a sound analysis and inform both the research agenda and the policy debate on the question of land in Darfur.

The temporary granting of rights of use has been the main way of preserving flexibility in land use and maintaining the values of providing land for those who need it. The erosion of such system in favor of exclusionary possession of land flags the immediate need for research to investigate the implication of the exclusionary process on the social security in the area. Specifically, further studies are needed to investigate the effect of change on land rights on the access to land of the vulnerable groups of the society. In addition, research on the role of the rising individual ownership of land in the chronic social tension and violence in the region should be afforded high priority. Further research into the effects of changes in land tenure patterns on the traditional structures of land management and conflict resolution is of important policy implications.

Literature Cited

Abushouk, A. I., & Bjørkelo, A. (2004). *The principles of Native Administration in the Anglo Egyptian Sudan: 1898–1956*. Omdurman, Sudan: Abdel-Karim Mirghani Cultural Centre.

Al-Amin, M. A. (2003). *Between two eras: Memories of a Sudanese administrator: February 15, to January 11, 1973*. Vol. 1. Khartoum, Sudan: Elshariff Academic Bookshop.

Awad, M. H. (1971). The evolution of landownership in the Sudan. *Middle East Journal, 25*, 212–228.

Babiker, M. (n.d.). *Land tenure in the Sudan: An overview*. Khartoum, Sudan: University of Khartoum.

Barth, F. (1981). Economic spheres in Darfur. In F. Barth (Ed.), *Process and form in social life: Selected essays of Fredrik Barth*. Vol. 1 (pp.157–178). London: Routledge & Kegan Paul.

Barth, F. (1988). Human resources: social and cultural features of the Jebel Marra Project Area. *Bergen Studies in social anthropology, 42*. Bergen: Department of Social Anthropology, University of Bergen.

Bazeley, P. (2009). *Qualitative data analysis with NVivo*. London: Sage

Behnke, R.H. (1985). Open range- management and property rights in pastoral Africa- A case of spontaneous range enclosure in South Darfur, Sudan. ODI 20f

Berry, S. (1993). *No condition is permanent: The social dynamics of agrarian change in Sub-Saharan Africa*. Madison: University of Wisconsim Press.

Berry, S. (2002). Debating the land question in Africa. *Comparative Studies in Society and History, 44* (4), 638–668.

Boserup, E. (1965). *Conditions of agricultural growth*. London: Allen & Unwin.

Buchanan-Smith and Jaspars, S. (2007). Conflict, camps and coercion: the ongoing livelihoods crisis in Darfur. *Disasters 31(s1):* s57−s76.

Central Bureau of Statistics and Southern Sudan Commission for Census, Statistics and Evaluation. (2009). *Fifth Sudan population and housing census 2008: Priority results submitted to the Population Census Council by the Technical Workshop Group 08 April 2009*. Khartoum, Sudan

Chanock, M. (1985). *Law, customs and social order*. Cambridge: Cambridge University Press

Chanock, M. (1991). Paradigms, policy and property: A review of the customary law of land tenure. In K. Mann & R. Roberts (Eds.), *Law in colonial Africa* (pp. 61-85). Portsmouth, NH and London: Heinemann and James Curry.

Chauveau, J.-P., Colin, J.-P., Jacob, J.-P., Lavigne Delville, P., & Le Meur, P.-Y. (2006). *Changes in land access and governance in West Africa: Markets, social mediations and public policies: Results of the CLAIMS research project*. London: IIED.

Cohen, J. (1980). Land tenure and rural development in Africa. In R. H. Bates & M. F. Lofchie (Eds.), *Agricultural development in Africa: Issues of public policy* (pp. 249–300). New York: Praeger.

Crowley, E. L., & Carter, S. E. (2000). Agrarian change and the changing relationships between toil and soil in Maragoli, Western Kenya (1900–1994). *Human ecology*, 28 (3),383-414

Demsetz, H. (1967). Toward a theory of property rights. *American Economic Review, 57,* 347–359.

De Waal, A. (2006). *The Darfur Peace Agreement: Part 10 Land*. London: Justice Africa.

El Sammani, M. O. (Ed.). (1987). *Baseline survey for Darfur region*. Khartoum, Sudan: Republic of Sudan Ministry of Finance and Economic Planning and UNDP–Khartoum, Institute of Environmental Studies (IES), University of Khartoum, and Government of Darfur Region.

Elbashir, A. E., & Elmudawi, M. S. (2009). *The practice of land settlement and registration in Sudan*. [In Arabic.] Khartoum, Sudan:Sudan Press.

El-Mahdi, S. M. A. (1976). *A guide to land settlement and registration*. Khartoum, Sudan: Khartoum University Press.

El-Tayeb, G. E. D. (Ed.). (1985). *Gedaref District study area.* Khartoum, Sudan: Institute of Environmental Studies.

Fadul, A. (2004). The problems of water, agriculture, range and livestock routes in Darfur. [In Arabic.] Presented in the workshop organized by the University of Khartoum, Fashir University, Khartoum Center for Human Rights, and the Sudanese Interreligious Center. November 28– 30, 2004, Friendship Hall, Khartoum, Sudan.

Feder, G., & Noronha, R. (1987). Land rights systems and agricultural development in Sub-Saharan Africa. *World Bank Research Observer, 2,* 143–169.

Gordon, C. N. (1986). Recent developments in the land law of the Sudan: A legislative analysis. *Journal of African Law, 30* (2), 143–174.

Haaland, G. (1969). Economic determinants in ethnic processes. In F. Barth (Ed.), *Ethnic groups and boundaries* (58–74). Boston, MA: Little, Brown.

Hilhorst, T. (2000). Women land rights in Africa: current developments in Sub-saharan Africa. In Toulmin, Camilla, Quan, Julian (eds) evolving land rights, policy and tenure in Africa: London: DFID/IIED/NRI

Howell, P.P. (1954). *A manual of Nuer law: being an account of customary law, its evolution and development in the courts established by the Sudan Government*. London, Oxford University Press.

Hussein, O. M. (1957). Land policy in northern Kordofan. In Thompson, C. F. (1965), *Land law of the Sudan: Cases and materials* (Vol. 2), p. 860] Khartoum, Sudan: Faculty of Law, University of Khartoum.

ILO/UNDP Employment Mission. (1975). *Growth, employment and equity: A comprehensive strategy for Sudan*. Report of the ILO/UNDP Employment Mission 1975, A United Nations Interagency Team organized by the International Labor Office, Geneva. Geneva, Swizerland: Imprimeries Populaire,

Inter-governmental Committee on Surveying and Mapping (2011). Fundamentals of Mapping: Types of Maps- Cadastral plans and Maps. http://www.icsm.gov.au/mapping/maps_cadastral.html

Land Tenure Task Force. (1986). *Land tenure in the rain-fed agriculture: Strategy, policy and development of rain-fed agriculture: A report prepared for the Ministry of Finance and Economic Planning, Khartoum, Sudan.* Main Report. Vol. 1. Khartoum, Sudan

Liversage, B. (1945). *Land tenure in the colonies.* London: Cambridge University Press.

Meek, C. (1946). *Land law and custom in the colonies.* Oxford: Oxford University Press.

Miskin, A. B. (1953). Land registration. *Journal of African Administration*. 72-80

Noronha, R. (1985). A review of the literature on land tenure systems in sub-Saharan Africa. ARU paper 43, Agriculture and Rural Development Research Department, World Bank. Washington, DC: World Bank.

O'Fahey, R. S. (1980). *State and society in Darfur.* London: Hurst.

Omer, M. (1997). Civil Transaction Act 1984: Pros and cons. *Sudan Journal of Law,* 1997. Retrieved from http://sjsudan.org/details.php?id=18&lang=ar&target=r&title

Omer, M. (2000). Property rights in Sudan. Khartoum. [In Arabic]

Osman, A. M. K. (2012). Agricultural change, land and violence: An Examination of Darfur. Unpublished manuscript Ph.D. thesis, Tufts University, Medford

Platteau, J.-P. (1992). *Land reform and structural adjustment in SubSaharan Africa: Controversies and guidelines.* FAO Economic and Social Development Paper No. 107. Rome: FAO.

Platteau, J-P. (1996). The evolutionary theory of land rights as applied to Sub-Saharan Africa: A critical assessment. *Development and Change, 27,* 29–86.

Platteau; J-P. (2002). The gradual erosion of the social security function of customary land tenure arrangement in lineage-based societies. Discussion Paper No. 2002/26, WIDER, United Nations University.

Quan, J. (2007). Changes in intra-family land relations. In L. Cotula (Ed.), *Changes in "customary" land tenure systems in Africa* (pp. 51-63). Stevenage, United Kingdom: IIED.

Rabah, N. E. (1998). The causes of the traditional modern tribal conflicts in Sudan. In A. Elzein & E. I. A. Wadi (Eds.), *Tribal conflicts in Sudan.* Khartoum (Sudan): Institute of Afro Asian Studies, University of Khartoum. [In Arabic.]

Rocheleau, D., & Edmunds, D. (1995). Women, men and trees: Gender, power and property in forest and agrarian landscapes. *World Development*, *25* (8), 1351–1371.

Runger, M. (1987). *Land law and land use control in western Sudan: The case of southern Darfur.* London and Atlantic Highlands, NJ: Ithaca Press, 1987. Sudan Studies Series, no. 12.

Shazali, S., & Abdel Ghaffar, M. A. (1999). Pastoral land tenure and agricultural expansion: Sudan and the Horn of Africa. Issue paper no. 85. London: International Institute for Environment and Development.

Sikor, T., & Lund, C. (2009). Access and property: A question of power and authority. In T. Sikor & C. Lund (Eds.), *The politics of possession: Property, authority, and access to natural resources* (pp. 1–22). Chichester U.K.: Wiley-Blackwell.

Simpson, S. R. (1954). Land tenure, some explanation and definitions. *Journal of African Administration,* 50–64.

Simpson, S. R. (1955). Land law and registration in the Sudan. *Journal of African Administration,* 11–17.

Simpson, S. R. (1976). *Land law and registration.* Cambridge, : Cambridge University Press.

Thompson, C. F. (1965). *The land law of the Sudan: Cases and materials.* Vol. 1. Khartoum, Sudan: Faculty of Law, University of Khartoum.

Thompson, C. F. (1966). The sources of law in the nations of Africa: A case study from the Republic of the Sudan. *Wisconsin Law Review, 4,* 1146–1187.

Tier, A. M. (1990). Conflict of laws and legal pluralism in the Sudan. *International and Comparative Law Quarterly, 39* (3), 611–640.

UN Office for the Coordination of Humanitarian Affair (2009). Darfur humanitarian access map. IMU OCHA Sudan http://ochaonline.un.org/sudan.

UNEP. (2007). *Sudan post-conflict environmental assessment.* Retrieved from http://postconflict.unep.ch/publications/UNEP_Sudan.pdf

Western Sudan Development Project. (1986). *Western Sudan Development Project Annual Report* . Khartoum, Sudan

World Bank. (1975). *The assault on world poverty: Problems of rural development, education, and health.* Baltimore and London, Johns Hopkins University Press.

Young, H., Osman, A. M., Aklilu, Y., Dale, R., Badri, B., & Fuddle, A. J. A. (2005). *Darfur—livelihoods under siege.* Medford, MA: Feinstein International Famine Center, Tufts University.

3. Violence, Ethnicity and the Land Right System in a protracted political crisis: An Examination of Darfur

Abdal Monium K. Osman*, Jennifer C. Coates*, Robert F. Houser*, Helen Young*

* Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy

Tufts University

150 Harrison Avenue

Boston, MA 02111

Corresponding Author

Abdal Monium Osman

Abdal.osman@tufts.edu (phone)

Abstract

Agriculture provides the foundation of economic, political, and social life in Darfur. Analysis and commentary on violence and social tensions in Darfur over the last three decades have neglected the dynamic of agriculture change and its implication for the violence in the area. This article presents the last of a three-part study on agricultural change, land, and violence in the Kebkabiya area of North Darfur, Sudan. It examines the collective community violence in the study area within the context of agricultural change and the related land use and land control system.

Focus groups, open-ended semi-structured interviews, and unstructured interviews were used to collect data from a diverse community of farmers and agro-pastoralists in 28 villages, pastoralists in 8 nomadic settlements, and key informants and business groups. Data were transcribed, imported, and analyzed using qualitative analysis software (QSR NVivo 8).

Three major forms of violence were identified: violent conflicts, disputes and conflicts, and non-conflict armed violence. Though these different types of conflicts and violence are not officially war related, they share common characteristics. These similarities, the nature, and the logic of these forms of violence are discussed and explained in relation to agricultural change in the study area. The traditional agricultural system has become characterized by competition and exclusion in a context of limited off-farming income opportunities, climatic variability, and marginalization of the region. Given the structural link between land, power, and ethnicity in Darfur, such agricultural change has an inherent capacity to undermine the local authorities of conflict resolution and settlement and generate violence along ethnic lines. The agricultural dilemma in this context is not technical in nature, so technical fixes are inadequate for resolution. Peace processes and political solutions sponsored by the international community need to address local-level issues. Further research on key strategic areas of land use and land control in Darfur to inform policymaking and peace efforts is critically needed.

1. Introduction

Over the past two decades, protracted conflicts have become a prominent feature in many African countries. In Sudan, while the civil war in the South was winding down, massive displacement and mass killings escalated in the western territory of Darfur following a brutal counterinsurgency campaign in 2003. The brewing of this crisis, however, began as early as the 1960s. The recurrent drought, the introduction of (and increasing orientation toward) cash crop production, and the ensuing change in land use in the context of deepening governance gaps have consistently shaped the power relations in the region and the access to resources among and within the different livelihood groups. The change in access to resources has provoked social conflicts and social tensions articulated through violence. From 1975 to 2001, the region experienced a total of 35 major tribal conflicts, compared with only 3 tribal conflicts between 1935 and 1970 (Takana, 2002). These conflicts became very bloody and eventually led to massacres in the late eighties and into the nineties (Harrir, 1994; News From Africa Watch, 1990).

But violence in Darfur is not always a simple case of one group of armed actors against others. Rather, it is a mix of high generalized violence characterized by attacks on highways, armed banditry, attacks on markets, banks robbery, rape, burning of villages and pastures, and assassination of individuals. By the end of the eighties, such widespread and persistent violence created a new order of permanent crisis in the region characterized by violent appropriation of assets and limited the options for legitimate livelihoods strategies. Accordingly, livelihoods assets became life-threatening liabilities (Duffield, 1993; Keen, 1994; News From Africa Watch, 1990). These social divisions and tensions deepened over the nineties and have since given the way to more and more overt expressions of disharmony and violence. This social disharmony and violence has provided the background for exploitation by political elites to drive the region into the complex humanitarian emergency and mass killing that have loomed over the region since 2003.

Violence in Darfur is a complex web of interacting, multifaceted, and evolving situations. Its causes and manifestations are multiple, with local-level elements and wider macro-level elements. Though the violence in Darfur has attracted much attention and analysis, the local dimension of the crisis has remained absent from these analyses. Most studies limit their scope to the macro-level structures at the national and regional level and their interplay with economic neglect, climatic variability, and the political marginalization of Darfur. The local dynamics of the violence that have underlain the deepening social polarization and disharmony in Darfur for decades have drawn less attention. The most important elements that have been accorded little, if any, attention are the agricultural change and the related changes to the land-rights and land-use system.

Agricultural change is the movement from forest and bush fallow systems of cultivation to short fallow and then to annual and multi-crop systems whereby plots of land are cultivated one or more times per year (Boserup, 1965). In other words, it is a continuous and permanent use of the land as a form of intensive production. Changes in the frequency of cropping mean change in land use, agricultural technology, land tenure systems, and settlement forms. The scholarship on agricultural change is based entirely on two models: First one the Boserup (labor-led or capital-saving) model, and second thepolicy-led (capital-led or labor-saving) model (Carswell, 2000). In principal, the capital-led and labor-led intensification models reflect the nature of the agricultural production as a function of capital versus labor (capital saving or labor saving).

This course of change is complex, influenced by the broader institutional context that influences access to resources. These institutional factors and their impact on access to resources raise the issue of differentiated access to the resources necessary to intensify agriculture and the different ways the household may intensify their agriculture (Clay etal 1998). The choice made by households or groups of farmers on the intensification path in different institutional contexts has been the focus of much of the conceptual and empirical research in Africa. Turner, Hyden and

Kates (1993) suggest that the rules of resource allocation can become constraints to agricultural growth in situations where change is rapid and the need to promote agriculture growth come into conflicts with objectives of allocation rules.

The focus of the research on agricultural change is on inputs-outputs relations and on agricultural productivity. The focus on productivity has limited the debate on the broader context of the policies, institutions, and processes that mediate access to agricultural resources to the role of these factors in promoting agricultural growth. This perspective, however, focuses on the crop rather than the people engaged in the crop production. It overlooks issues of household equity, well-being, and economic development (Brookfield, 2001; Turner and Ali, 1996). Less well understood are the changes in the relationships between people, in their relative power, and in access to and allocation of agricultural resources that occur along side agricultural change. Morrison (1992) notes that most of the current debate on intensification leaves no room for the real constraints of unequal power relations because the Boserup model that dominated the debate on agricultural intensification is "necessarily a totalizing perspective on social and economic transformation" (Morrison, 1992, p. 240). Morrison points to the fact that intensification "forced some people off the land entirely or into the role of landless laborers" (p. 238). In examining the paths of intensification in Bangladesh, Turner and Ali (1996) found that the larger holders accounted for the surplus production, while the increasing landless households suffered from chronic production shortfalls and malnutrition. They commented that while "Bangladesh will likely continue its muted path of agricultural intensification—diverting a major famine—it will likely do so under increasing household, even village, polarization" (p. 14991).

The process and consequences of agricultural change in Sub-Saharan Africa are complex and serious. In Sub-Saharan Africa, crop production, horticulture and herding interact on the same steppe under a multi-tenure system of different land uses. The multi tenure system in Sub-Saharan

Africa has allowed the serial use of land by different users such as farmers and herders induced the interdependence of the production system and the cooperation of land users in these systems. Agricultural change in multi-tenure and overlapping land uses affects the resource users differently in their access to and utilization of land, with far more serious social and economic implications. The process of agricultural change has already taken place in Darfur. Morton (1994) has noted that in Darfur there are signs of shifts to more intensive strategies of production. Osman (2012) has studied changes in land use and land tenure system since the 1960s in the Kebkabiya area of North Darfur. He argues that shifting crop cultivation has changed into stabilized form of agriculture with land use becoming continuous and land ownership evolving from a multi-right land right system into individual control.

Therefore, in this context, examining agricultural change and its impact on the access to and allocation of the productive natural resource base in Darfur could provide insight on the course of change taking place in the rural societies of the arid and semiarid areas of Sudan and Africa. It could also reveal the dynamics of economic and political change and provide an important perspective on the widespread violence in Darfur in the last four decades. This article is the third article of a three-paper research project on agricultural change and violence in Darfur. The article builds on the first two papers to examine the implications of agricultural change and related changes to the land-rights and land-use system for social polarization and violence and for the local-level institutions of settling conflicts and disputes.

Section 2 provides background on the different types of land use and the production systems associated with them in the study area and the integration of these systems within a framework of a symbiotic production process and multi-right land system.

Section 3 presents a detailed discussion of the methods that were used to collect and analyze the data for the research.

Section 4 explores the various forms of violence in the study area, traces its evolution from the 1980s to the present, investigates the magnitude and the logic behind it and explores the effectiveness of traditional means of conflict resolution in addressing these conflicts.

Section 5 discusses and analyses the ethnic nature of tensions and violence and the eroded capacity of the traditional institutions of conflict resolution to address the violence within the framework of the agricultural change in the study area. The article closes with a section on the implications of the analysis for research and policy.

2. Background

Traditional agriculture in the study area and in the larger Darfur region constitutes the backbone of the economy and the principal source of livelihood for the population, and represents the social and political foundation of the society. It is composed of two primary types of subsistence production: farming, practiced as traditional rain-fed farming and small-scale irrigation, and animal husbandry, in the form of pastoral livestock production. These components of subsistence agriculture are practiced as specialized activities by different communities of different tribal backgrounds. In the study area, for example, the Fur tribe specializes in cultivation, while the different Arab tribes specialize in livestock herding with seasonal migration between the dry-season and the wet-season grazing areas. Until the beginning of this century, these components operated under an extensive land-use system in the form of shifting or bush-fallow cultivation and pastoral livestock production (Food and Agriculture Organization of the United Nations [FAO], 1984; Haaland, 1991).The extensive land-use system is one of seasonal succession with overlapping rights over land by multiple resource users. This system of extensive land use and corporate land control integrates the different types of the agricultural system in a process of production symbiosis in which the agricultural production inputs are exchanged between the agricultural systems. This

process of exchange necessitates the interaction of the different resource users in an interdependent fashion that requires cooperation for their mutual benefit.

This subsection of the paper provides an overview of the agricultural system in the study area with emphasis on two principles, (1) corporate ownership of land tenure, involving a multiple and overlapping land claim system, and (2) the production symbiosis which involves mutual interdependencies between production activities. These two principles provided the basis of the agricultural system and the framework that support the economic, political, and social integration of the society.

2.1. Land Use and Production Systems

2.1.1. Rain-fed farming. Traditional rain-fed farming is the dominant form of agriculture. The main form of land use in rain-fed cultivation is shifting cultivation. Millet and sorghum are the main staple crops. Their cultivation extends over roughly a six-month period from June until December using the traditional technologies. Land in shifting cultivation systems is cultivated and fallowed in a systematic rotational pattern. The rotational average varies from three to seven years depending on soil fertility, population pressures, and cultivation techniques (Paterson, 1948; Hale, 1966; FAO, 1968, 84; Barth, 1988, Halaand 1991). When the soil is exhausted, fields are not cultivated continuously but are left fallow. Right to fallow land reverts to the village community, and the sheikh (the village head man) allocates a new plot to the cultivator. That means under this system of land use, land is circulated through reallocation, and not through purchase or inheritance (Barth, 1988). Apart from the allocation of land by the sheikh, the other means of land allocation is self-allocation by clearance of land, that is, bush clearance to claim fresh land (FAO, 1984; Haaland, 1991).

2.1.2. Horticulture. Horticulture is traditionally practiced in the area in the form of manually irrigated gardening. It is practiced mostly by women, with an emphasis on self-provisioning

to supplement the rain-grown crops. The gardeners grow short-term and medium-term crops such as okra, scallion, tomato, pepper, and rocket. These crops have a short harvesting cycle and are traditionally consumed by the farmers. They are grown in the alluvium soil in a strip along the banks of the wadis using traditional technology from locally available materials. The alluvium soil retains its moisture for many months after the floods cease, and this extends the effective growing season in these valleys. The gardeners practice horticulture in the summertime on the same plots used for the rain-fed staple food crop, after the crop is harvested. The gardening plots rarely exceed a square chain (20 meters) in size (Lebon & Robertson, 1961).

2.1.3. Livestock production..

Livestock production in the study area, traditionally practiced by the Arab ethnic group, is based on extensive land use. It includes two distinctive systems of extensive land use: agropastoralism and nomadism. The former combines traditional rain-fed farming with livestock rearing. It is mainly practiced by pastoralists who have settled in the area since the droughts at the end of the 1960s. They are involved in short livestock migrations between their dry- and wet-season grazing areas within North Darfur. The latter involves raising livestock as the main means of subsistence, with migration after livestock as a way of life. The pastoralists' migration covers large distances; they go as far as South and West Darfur and may cross the national borders to East Africa. They follow three main livestock migration routes that come through the study area. Two of these routes take them from the northern parts of North Darfur to the border with East Africa. The third route takes them to South Darfur.

The raising of livestock plays a limited role in Fur agriculture except as a source of manure, but it is critically important to the nomadic pastoral livelihood. The livestock holding for a well-off Fur family in North Darfur in the 1940s was two cows (Paterson, 1948); for a family in the middle of the socio-economic spectrum in West Darfur at the end of the 1970s,one cow (Haaland, 1972). If

the capital value of the herd for a Fur cultivator increased to a minimum of seven to ten cows, the cultivator would start to shift to a pastoralists life. That means the cultivator would entirely desert the village cultivating livelihood and cross tribal, cultural, and geographic boundaries to become part of a pastoral livelihood as the number of his livestock increase. Haaland (1969) has studied the rate at which Fur cultivators shift to pastoralist livelihoods. He found the rate at which a Fur farmer accumulated a herd and moved into pastoralists life to be 1% per annum of the population in the village. This means that despite the apparent division of production patterns between the Fur and Arab tribal groups, ethnic boundaries are in fact fairly porous and allow the movement of individuals and groups through them.

2.2. The Interaction between Cultivation and Livestock Production

The traditional association of farming and pastoral livestock subsistence patterns with different tribal groups in the study area and in the wider Darfur region resulted in a division of labor between these groups within the overall subsistence production system. Yet these production patterns were integrated in a symbiotic process of production through a system of exchange of the productive inputs. The exchange of the productive inputs was achieved through different supporting linkages such as fodder, manure, and labor. Other linkages involved food, draft, and investment (McCown, Haaland, & de Haan, 1979; Scott, 1984). The herders were the main source of manures for the crop farming. Fur cultivators used to welcome the pastoralists and open their fields for them to graze on the crop residues after the harvest, in a practice locally named *talaag*. Apart from the talaag, the cultivators got the manures through an arrangement locally known as *diyara*, in which the cultivators used to invite the pastoralists to camp for several days on their farms just prior to cultivation. The cultivators benefited from the manure, the trampling in of residues, and the breaking up of ridges (Van Raay, 1975). Equally, the pastoralists benefited by using their own labor and that of their pack animals in transport of the harvested crops of the farmers (Haaland, 1984;

McCown et al., 1979; Paterson, 1948). Up to the 1980s the interdependence of cultivation and pastoral livestock production fostered a cooperative and peaceful coexistence between these groups.

2.3. Multiple and Overlapping Land Rights: The Foundation of Production Symbiosis

The production symbiosis benefits both the cultivators and the pastoralists. The extensive land use and the communal land ownership form the basis of the interaction of this production system and the mutual cooperation of the groups that practice it. Land is communally owned, and the individual right to cultivation is based on usufruct rights and reversion to common property on abandonment. The conditions under which the land is held by the cultivator are thus determined by his or her social status in the community, rather than by virtue of any contractual arrangement (Barth, 1988; Liversage, 1945). In other words, membership in the community implies right to cultivate. When the soil is exhausted of nutrients after three to five years of cultivation, the land is left fallow. Accordingly, right to this fallow land reverts to the community, and the cultivator is allocated usufruct rights to new fields. It also means that land rights lapse if plots are left uncultivated for more than two years. Land is thus not transacted, and the shifting agriculture prevents this allocation from having permanent effects on its communal control. In other words, the temporary nature of the allocation remains unchanged (Barth, 1981; Haaland, 1969; Hussein, 1957). The right to cultivation is based on community membership and need. It does not confer exclusive possession of land or ignore the multiple and overlapping claims over the land by multiple resource users.

The multiple and overlapping claims over land by different resource users have become possible under the extensive land use of shifting cultivation in the study area. The different resource users follow each other in a system of serial use of the land in different times. That means the tenure rights vary within the year (Noronha, 1985; Platteau, 1992), and each of the resource users is a part-time user. For example, pastoralist groups or other farmers, including the cultivator him/herself, can

feed their animals on the remaining stubble. The cyclic use of land is practiced in other parts of the world. For example, in medieval England private rights within the area ceased after the harvest. The land could then be grazed over by any livestock of the settled and migratory groups (Liversage, 1945). The successive use of the land is thus not limited to common property rights open to different livelihoods, as in the case of the pastoralists pointed out before, but also extends to individuals within groups. Women in the study area, for example, could gain access to land after the harvest of the rainy season to practice traditional smallholder irrigated agriculture. The system of multiple and overlapping land use has provided the anchor for the production symbiosis and the peaceful interaction of the different groups for their mutual benefit. To put it more broadly, the system of multiple and overlapping land claims has provided the economic and social bases of the traditional system of production in the study area and the region as a whole. Within this framework of overlapping right land system, until the early 1980s disputes and conflict arose and were resolved as a normal state of affairs.

2.4. The Multiple land Rights System and Production Symbiosis: The Framework for Social Stability and Peaceful Coexistence

While the production symbiosis and multiple land system form the basis of the traditional agriculture as a livelihood activity, they also form the framework within which the social system and social relations are established. This framework enhances the integration of people in the society and the social fabric of community. As such, rights to secured access to land within this framework amount to more than their material significance; they are intertwined with ideas of spiritual life and community membership. The complexity of the right to land is succinctly captured by Moore (1998): "to say that someone has a right to land is to summarize in one word a complex and highly conditional state of affairs which depends on the social, political and economic context. The place, the setting, the history, and the moment, all matter" (p. 33). In this framework, disputes and

conflicts arise and are resolved as a normal state of affairs, and controls are embedded in the local norms and institutional arrangements. As such, disputes and conflicts are themselves a means of integration and provide opportunities for mutual interaction to set spatial and temporal boundaries that organize access to land and landed resources (Elwert, 2001). In fact, disputes were of low intensity and were limited to crop destruction, trespassing, and animal theft of an individual nature. Their resolution cemented the social harmony rather than undermining it. In short, the production symbiosis and the multiple-right land system have traditionally provided for a land use system in which the right to access land and landed resources secures material benefits and inspires peaceful relations between groups and individuals.

3. Method

3.1. Site

This paper presents the last part of a three-part study on agricultural change, land, and violence in Darfur. The study was undertaken in the Kebkabiya area of North Darfur State, Sudan during the period between December 22, 2009, and February 22, 2010. The study area is located in North Darfur State and represents the northeastern extension of Jebel Marra. It is composed of the mountainous area of Jebel Si and the low plains of the Kebkabiya area, and is characterized by a high degree of social, economic, and ecological diversity. The population of the study area is composed of different tribal groups that include Fur, Arabs, Tama, Gimir, Zaghawa, Berti and Tunjur (Young, Osman, Aklilu, Dale, Badri, and Fuddle, 2005). These groups are broadly involved in a pattern of economic activities centered on farming and nomadic pastoralism. These activities are practiced in a landscape that ranges from rocky, gravel, and volcanically derived soil to sandy soil with numerous seasonal rivers running through it. The populations of the area are distributed in the nomadic settlements (*fariqs*) and villages in the rural area, and in the town of Kebkabiya.

For the last three decades, the study area has been characterized by chronic conflicts and social tensions. During these decades the area has experienced protracted insecurity caused by social tensions, tribal conflicts, and armed banditry. In 2003, the area was directly affected by the government counterinsurgency, driving more than 45,000 people of the farming communities into the town of Kebkabiya. Since then, insecurity has restricted the mobility of the population in the area, with travel from the town to the rural areas being very limited. As a result, the humanitarian access to the area has become very limited, as illustrated in Figure 1, with the United Nations demarcated the area as a no-go area for international personnel.

Tufts University Institutional Review Board, USA granted the ethical approval to conduct this study prior to the field work. Informed consent was obtained from all interviewees. The study was carried out in collaboration with the Kebkabiya Charitable Society (KCS) and was funded by Oxfam America through its local partner. At the field level, KCS secured permission to undertake the study from the relevant governmental and traditional authorities.

3.2. Design

In this study qualitative research methods were used. Data were collected from farmers and transhumant pastoralists in 28 villages, from pastoralists in 8 nomadic fariqs, and from participants in the town of Kebkabiya. Data collection in the villages and nomadic fariqs was undertaken during January/February of 2010 while interviews in the town took place in the different periods of the field research from December 2009 to February 2010.

3.2.1. Research Instruments. The research instruments were developed through a detailed literature review and consultation with relevant experts. Table 1 presents these research instruments and the number of the different types of interviews undertaken in this study. These instruments included (a) open-ended, semi-structured interviews guides of three different forms, each form used with members of different community groups; (b) semi-structured focus group discussion guides

with separate groups of male and female participants; (c) unstructured, in-depth interviews with key informants, including tribal leaders and governmental staff; and (d) unstructured group interviews with business groups in Kebkabiya. In addition observation has been recorded throughout the field study.

Table 1: Research tools and numbers of different types of interviews carried out

	Research tool	**Number of interviews**
1.	Open ended interviews with: a) village chiefs b) conflict resolution experts in the village c) individual men and women of the village community	 36 36 228
2.	Semi-structured focus group discussion for separate groups of males and females participants	64
3.	unstructured, in-depth interviews with key informants	13
4.	unstructured group interviews with business groups	7

3.2.2. Recruitments of participants and selection of villages and Pastoralists camps

Participants agreed to voluntarily participate in the study on the date and time the study team visited the village or pastoralists camping sites hamlet. These dates were agreed on with the village sheikh before the date of the visit. In each selected village the study team recruited the people who attended the meeting for the different methods of data collection. The number of the people who attended the meeting with the study in each village was large enough for the recruitments of participants for the different research methods.

The selection of the villages where farmers and transhumant pastoralists were settled was made on a basis of a participatory agricultural mapping exercise. This exercise was carried out with the key informants, community leaders, and technical experts from the governmental departments in the area. This exercise mapped the different areas of agricultural production, land-use zones, ethnic and livelihood groups, and agricultural profile and setup of the area. This approach was meant to

ensure that the perspectives of the farmers and transhumant pastoralists in the different zones and from the different tribal backgrounds were captured.

Nomadic pastoralists are settled in mobile hamlets in the study area, and therefore different criteria were set for their recruitment in the study. Pastoralists in the study area were traditionally divided into the camel herding groups and the cattle herding groups. Each of these groups was classified, on the basis of its seasonal movement, into two subgroups. The first group was involved in a short seasonal movement between the study area and other areas within North Darfur State. The second one was involved in a long seasonal movement, crossing the study area on the way between North Darfur State and South or West Darfur State. Accordingly, four groups from each of the camel and cattle herding groups were selected. As illustrated in Table 2, two of each group were of short seasonal movement and the other two of long seasonal movement.

Table 2: Selection of the pastoralists group

Type of seasonal movement	**Pastoralists group**		**Total**
	Camel herder "*Abbala*"	**Cattle herders "*Baggara*"**	
Long	2	2	4
Short	2	2	4
Total	4	4	8

3.2.3. Recruitments of participants for the different research instruments.

In the villages and pastoralists settlements the study recruited participants for the different types of research instruments.

3.2.3.1. Open-ended, semi-structured interviews with members of community groups. The study employed three different forms for interviews with community groups in the villages and pastoralist hamlets enrolled in this research.

The first form of open-ended, semi-structured interview was designed for interviews with the chiefs of the villages and pastoralist hamlets. The total number of chiefs interviewed was 36, one chief for each village or pastoralist hamlet.

The second form was designed for interviews with the community leaders who are experts in conflict resolution in their respective village communities. An expert in conflict resolution in each of the 36 villages and hamlets was interviewed. These experts were identified by the village and hamlet fariq community as the people mostly involved in conflict resolution within the village and with other communities in other villages.

The third form was intended for individual male and female farmers and transhumant pastoralists of three different age groups: 20–30 years, 40–50 years, and above 60 years. In each village, a minimum of three males and three females were interviewed, with at least one male and one female of each age group. Table 3 illustrates the number and age groups of the males and females participants.

Table 3: Age groups and number of the males and females participants

Gender	Age group in years			Total
	20 – 30	40 -50	Above 60	
Female	41	40	39	120
Male	37	37	34	108
Total	78	77	73	228

3.2.3.2. Semi-structured focus group discussion tailored for separate male and female participants. In each village a male and a female focus group discussion were carried out, while in the pastoralist hamlet only male focus group discussions were organized. Table 4 presents the type and number of focus group discussions. In total, 64 focus group discussions were carried out, with the male focus groups constituted 36 and the female focus groups constituted 28. The numbers of the participants in each focus group varied, with an average of 10 to 15 participants per focus group.

Table 4: Type and number of focus group discussions

Focus group	Numbers of focus groups	Remarks
Female focus group	28	The average number of participants in the age group is 10 to 15 participants
Male focus groups	36	
Total	64	

3.2.3.3. Unstructured, in-depth interviews of some individuals. These key informants and experts interviews were carried out with the *shartaya* (hakura chiefdom) and the *omdas* (different tribal leaders based in the town), and the governmental staff of the departments of agriculture and veterinary services, the Agricultural Bank, and the Humanitarian Assistance Commissioner in Kebkabiya town.

3.2.3.4. Unstructured group interviews. These interviews were conducted in Kebkabiya with the different business groups in the town. These groups included the truck transport, the blacksmiths, the farmer unions, the agribusiness and veterinary centers in the market, and the agricultural crops traders. Also, direct observations were employed in this research in the villages, the pastoralists' hamlets, and the town of Kebkabiya.

3.3. Data Collection

The study team for this research was composed of twelve individuals who played different roles in the study, ranging from administration to data collection. Because the situation in the study area was tense and highly politicized, the study team members were carefully selected. They were experienced in research management and data collection. Many of them were trained by Tufts University and participated in previous training and research conducted in the area by Tufts University Feinstein International Center, USA. They also constituted a mix of the different tribal backgrounds from the study area.

Four days of training for the members of the study team were organized before the start of the data collection. The first two days of training covered the research itself, qualitative methods of

data collection, individual interviews, focus group discussion, and participatory rural appraisal techniques such as participatory mapping and proportional piling to investigate livelihood strategies and means of land tenure and conflict mapping. The last two days covered piloting of the research checklists for the structured interviews and focus groups, and training of the team members on these tools.

Individual interviews were conducted in person at a convenient place that allowed privacy. On average, interviews with individual male and female participants lasted for one hour and a half, interviews with the conflict resolution expert in the village lasted for one hour, and the interviews with the village chief lasted for three hours. Before the beginning of the interview process, the interviewer explained the procedure and clearly assured each participant of confidentiality, and then requested the oral consent of the participant before the interview continued. Focus group discussions were organized publically, and people could join or leave during the discussion. On average, the focus group consisted of 10 to 15 participants and continued for approximately two and a half hours.

The study team members met at the end of each day of data collection to ensure interview consistency and data quality. They reviewed and assessed the data collected from each set of instruments and group of respondents. They discussed their field observations and interviews they made and any emerging issues. Responses to the interview questions were recorded in Arabic during the interview on the same checklist sheet. The data collected covered a wide range of topics and varied in their depth and breadth, from the large amount of detail-rich information from the focus groups to the in-depth personal experiences of individual interviewees. Themes and topics explored included demographic information, village history and administration, irrigated agriculture, rain-fed agriculture, land ownership and control, types of land, land allocation and administration, land transactions and investments, land fertility, water sources, groups, conflicts and their resolution,

perception of change in cooperation, land tenure before the conflict, cropping systems and use of crop residues, range and pasture, livestock, and gender roles. In addition, the focus group discussions with the pastoralists covered the annual movement and livestock routes of the groups and the changes that have taken place over the last five decades.

3.4. Data Analysis

The principal investigator, who led the data collection, transcribed, imported, and analyzed the data by to ensure consistency in interpretation. A data record made of transcribed interviews, focus group discussions, and field notes that recorded observations and thoughts about the data (document memos) was prepared in Microsoft Word. Each document was imported into computer-based qualitative analysis software (QSR NVivo 8). Structured interviews and focus group discussion questions were labeled using a heading style to facilitate auto-coding and query tools in NVivo.

Several techniques prescribed by Bazeley (2009) were systematically used to analyze the imported interviews. The data were extensively reviewed, and accordingly a coding tree containing parent (concepts) and child nodes (sub-concepts) was developed and used to code the imported transcripts. The data were coded using two techniques: first, assigning specific passages of text, comments, and answers to specific questions in the imported transcript to specific code; and second, topic auto-coding by heading level (consistently applying the heading style level to the structured interviews). Auto-coding allowed responses to each question to be coded at a node with a name based on the question. Accordingly, the resulting codes gave immediate access to, for example, Question 3 in the individual interviews of interviewees of the age group above 60.

Attribute information such as age group, ethnicity, gender, and village was linked to the cases and was used to make comparisons across data (e.g., comparing male with female responses or comparing the response of females of specific age groups to specific questions). The codes were then recorded and explained in memos. This memo recording took the analysis from the empirical

data to a conceptual level, refining and explaining the nodes further and showing their relationship to building a more integrated understanding.

3.5. Triangulation

To get more detailed and balanced findings, triangulation was built into the research design, and triangulation strategies were employed in the different stages of the research process. Methodological triangulation of different data gathering techniques, such as focus group discussion, semi-structured and unstructured interviews, and observations, was used. These methods were used by different investigators in the study team, as mentioned above. Moreover, they were used to collect data from participants drawn from very diverse backgrounds. Selection of the participants entailed several strata of selection, which allowed the collection of data from a diverse group of people, place, time, and social situation. Selection of participants took place between and within populations (people of different tribal background, age group, and gender), between and within different geographical areas and villages, between and within production systems, and between and within the different social positions such as farmers, community leaders, tribal administrators, staff of government and nongovernment organizations, traders, and truck drivers.

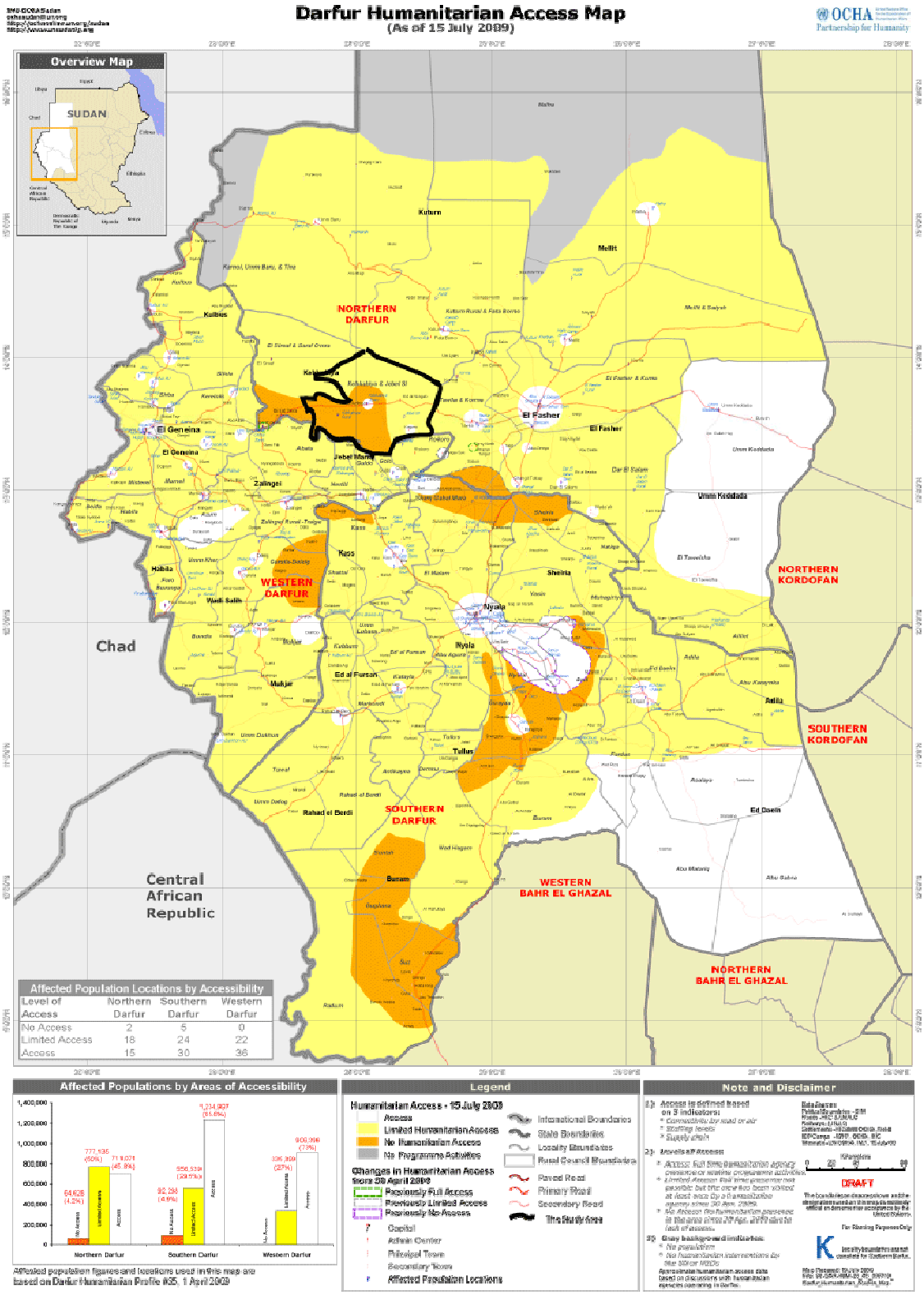
Triangulation not only included different methods of data collection used by multiple members of the study team but also included the checking and rechecking of data as they were collected in the field. The study team met regularly during the fieldwork to discuss the data collected and the feedback from the different team members. In addition, the research question was tackled using a series of different mini-hypotheses and propositions to build the conclusions of the research. All these triangulation strategies were further enhanced by the use of the NVivo software. The software provided the capability to present, check, compare, and contrast the contents of nodes and cases based on the attribute values assigned to them (e.g., Do male [or female] interviewees under the age of 30 have different perceptions of land rights from male [or female] interviewees of the age

group above 60. Such comparisons enhanced the understanding of the data, the categories, and concepts emerging from them. When working with coding stripes in a source or a node, one could choose to display the stripe for a selected attribute: For example, a stripe for *female* would show all content-coded cases involving female participants.

3.6. Limitations

Despite the comprehensiveness of the research, there still remain some limitations with the study. The study tracked change in land use over time and its implications for the interaction of major livelihood groups through design of interviews with different age groups to capture the change in land use in the different time periods. One obvious problem is that the data collected are based on recall, which is subject to memory lapse and recall bias. To address this challenge, an intensive literature review was carried out and incorporated along with the findings to present a narrative that captures change across scale of time and space. Moreover, the research was carried out in a situation of insecurity and social tensions in the study area. All these factors have the potential to affect the data. Given the previous lack of research on agricultural change, land, and violence in Darfur, it is difficult to assess the impact of these factors on the overall findings and conclusion of this study. The need to replicate this research in other parts in Darfur remains of utmost importance to confirm the findings from this study and to inform and enhance evidence-based policy.

Figure 1: Humanitarian Access in the study area during the Survey Period



Source: UN Office of Coordination of Humanitarian Affair (2009)

4. Results

In the last four decades violence has become a permanent feature of the day to day living in the study area. This section first explores the various forms of violence in the study area and traces its evolution from the 1980s to the present. The second part investigates the magnitude and the logic behind it. Lastly, the section explores the effectiveness of traditional means of conflict resolution.

Violence in the study area has taken different forms, such as tribal wars, theft, armed robbery and raiding, rape, animal trespassing onto crops, destruction of crops, and burning of pasture grass. A 90-year-old nomad interviewed for this study described the situation. He stated that "war has never stopped in Darfur. It just keeps changing its forms and shapes in the different decades." Elder participants stated that the years of the drought and famine of the mid eighties mark a sharp change toward violence in the study area. According to a 60- year old woman interviewee, "the era of the drought and famine in the mid-eighties has set the pattern to the current raids and violence".

Participants explained that one aspect of the different forms of violence that erupted in the mid eighties was the tribal conflicts fought over access to the natural productive resource. Since then these tribal conflicts have fed into the evolving violence, bloodshed, and destruction of the study area. Many pastoralists from the Arabs and Zaghawa of North Darfur were severely affected by the drought and driven to the study area in search of grazing and lands to farm. An interviewee, who is a member in the local tribal courts, mentioned that the massive movements created tensions and an eruption in land disputes between those moved into the area and the Fur groups. These disputes fed into the devastating war between the Arabs and Fur, the Fur and Zaghawa, Zaghawa and Arabs, and the other tribal conflicts that ensued. A common feature of these conflicts is livestock raiding, destruction of crops, uprooting of fruit trees and burning of the pastures and killings practiced by the different groups in the conflict. Participants from the farming groups, the majority of whom

were Fur, noted that the different forms of violence, though they seem to be unrelated, are aimed at plundering the Fur, destroying their agriculture, and taking their land, thus depriving them of the foundation of their livelihood. A participant from the pastoralist groups pointed out that "the pastoralists are not interested in government offices (*humkum)*. We live in uninhabited lands (*Elkhala*) looking for pasture for our livestock. They [farming tribes] are enclosing the range and burning the pasture."

These tribal conflicts and wars have increased in intensity and frequency during the nineties and into 2000. Many participants pointed out that situation has been further inflamed and intensified by the availability of and easy access to modern weapons from the different neighboring areas. Several authors have also noted this intensification both between and within groups. *News From Africa Watch* (1990) describes the tribal war between the Fur and Arabs in the early 1990s as "a full-scale civil war without rebels" (p. 3). Flint (2010) describes the conflicts among pastoralist Arabs from 2005 to 2010 as the largest single cause of violent death in Darfur. She attributes the fighting to conflicts over "use of, and access across, the land from which government-backed militias, or 'janjaweed', drove farming tribes perceived to be aligned with the armed movements" (p. 5).

As violence has intensified, the different communities and groups have organized themselves in military forms. One participant mentioned that with the increased killings due to disputes between the different groups during the nineties and into 2000s, the different communities organized themselves in military structures. Village protection groups were formed and evolved into militarized group such as Bashmerga (in reference to the Kurdish peshmerga militias of northern Iraq) and Torabora (in reference to the Afghan militia of Tora Bora Mountains). These military forms of organization have formed the basis for both the rebel groups and the para-government militia

respectively. By the time of the rise of the contemporary rebellion in Darfur, widespread intercommunity violence for access to land and landed resources had already taken place in Darfur.

But these tribal wars are not only between tribal groups from different livelihood backgrounds such as farming and pastoralists groups. They have also taken place within these livelihood groups. Tensions within the farming groups such as the Tama and Fur is cited as one example. Among pastoralists groups, devastating conflicts erupted in the study area and resulted in assassination of tribal leaders and displacement of groups such as the Hotiya in West Darfur. In South Darfur, tensions and conflicts among the Arab pastoralists took place (Flint, 2010).

Coupled with increases in disputes and violent tribal killings, there has been an increase in armed raiding "*Nahb Musalah*". Participants mentioned that armed raiding took place in the area for the first time in the mid-eighties in the village of Awl. Over time, it became well organized around the market days and at the time when people were returning back to their villages at the end of the market day. In addition, travelers in buses and lorries were continuously targeted. As a 25-year old female participant put it, "people in this area were looted and looted". Another participant added: "they looted our land and belongings, and they raided our livestock". Dinnar (2005) reports that the number of incidents of armed banditry filed with the police in Darfur from 1983 to 1987 is estimated at 1053 cases. Between 1990 and 1992, there were 30 armed robberies per day. Like tribal conflicts, Nahb Musalah is identified as having ethnic origins. El Mahdi (2007)[17] points out that Nahb Musalah is mainly carried out by the youth of Zaghawa and Arab background, two groups that have been displaced and impoverished by the droughts. *News From Africa Watch* (1990) argues along the same lines as El Mahdi: "They [young Arab and Zaghawa youth] saw banditry as a quick way of regaining them [their herd]" (p. 3).

[17] El Mahdi was the prime minister of Sudan (1986–1989). He was removed from power in June 1989 by a military coup led by Brigade Omer Elbashir.

Apart from tribal wars and *Nahb Musalah,* conflicts over land within villages have become frequent. Community leaders interviewed explained that these conflicts include disputes over parcel boundaries, ownership of land, and crop damage. Disputes over farm boundaries and ownership have taken place among the traditional cultivators in the villages. Participants involved in conflict resolutions in the different villages noted that these conflicts arise when the right to use a parcel of land passes from one person to another, such as inheritance or when one cultivator agree to another one to use his or her parcel. The dispute comes up when the first cultivator wants the land back for his or her use. This raises the question of whether the first user maintains the right to take it back, especially if the agreement involved any kind of payments. These problems echoes the findings of Osman (2012) who noted the evolution of new means of individual land acquisition and transfer within a context of uncertain land tenure and unclear property rights. Haaland (1980) notes similar problems in South Darfur and he attributes these problems to inconsistencies in the customary law.

Conflicts over crop damage occur when animals trespass on crop fields. Cultivators in the different villages reported that crop damages take place often. Crop damage occurs most frequently from November to January, the end of the rainy season when pastoralists herds start to move towards the dry season grazing area, and from March to June, the end of the dry season when herds move to the seasonal rivers for grazing and watering. Cultivators differentiated between crop damage by straying animals from intentional crop damage caused by entire herds which trample and graze their way through the fields. These latter conflicts are usually between cultivators and nomads. A participant cultivator described his own experience with the trampling of his fields and the damage of his crop. He stated that *"Crop damage generates frustration which turns into anger when the cultivators see their crop losses turned into gain for the pastoralists herds"*. Participants from the pastoralist

groups attributed the increased frequency of crop damage to the expansion of both rain-fed farming and irrigated agriculture with limited passage and routes for the herds movements.

These conflicts are usually addressed by the sheikhs, a mediation group locally known as *ajaweed,* or by local courts. But this mechanism has increasingly failed to solve these disputes to the satisfaction of the different parties involved especially when they are from different livelihood groups. Participants from the pastoralists groups noted that the fines for trespassing on crop fields have become exorbitant and include various forms. In addition to the compensation paid for the destroyed crop, the fines include "*Hag elzariba*" to cover the cost of the barns where the animal are kept during the disputes and "*Hag elnaal*" to cover various administrative costs. A pastoralist expressed his personal experience in a dispute of crop trespassing. He pointed out that in early 2003 he had 10 cows that encroached onto a farm in one of the villages. He made a total payment of two million Sudanese pounds. The exorbitant fines for the damaged crops echo the findings of Behnke (1985), who examined the rulings of local courts in South Darfur. These courts are dominated by and represent the interests of the local farmers and livestock keepers. They have routinely enforced fines against nomadic livestock owners whose stock grazed the crops. The high fines and the increased intensity and frequency of the disputes have generated grievances that often cause these disputes to involve bloodshed and develop into violent conflicts.

The traditional mechanism of addressing disputes and conflicts in the study area are increasingly ineffective. A 65-year old pastoralist sheikh stated that the native administration of sheikh, the omda and Nazir, whom he described as "*shubak Agul*" [Literally meaning the window to the wisdom] are no longer respected and their capacity to address these disputes and conflicts has weakened. He blamed the government for not providing the support to the native administration system. Similarly, other participants mentioned that the reconciliation conferences are no longer

effective for resolving tribal conflicts as neither the parties to the conflict nor the government stands by their obligations to the outcome of these conferences. The reconciliation conferences represent the main government policy that plays an essential part to resolve the major tribal conflicts in Darfur ( ). Participants noted that for the last 20 years, these conferences have failed to resolve the seemingly never ending inter-tribal conflicts in Darfur. They pointed out that these conflicts are beyond the capacity of the native administration and that members of the native administration have themselves become a target to the violence. In 1987, for example, the head chief of the Native Administration *"Shartia"* in the study area Shartia Adam Ahmediya, his wife, and his son were killed at their home in Kebkabyia, and since then many of the sheikh have been killed or injured in targeted attacks in the study area.

Key informants from the different backgrounds and tribal groups noted that access to natural resources has become a risky endeavor. It requires the payment of fees at check points set by pro-government militia groups. Displaced female participants mentioned that women are subject to a different kind of violence when they go out to collect fire wood, wild fruits and grasses. Similarly, many of the pastoralist groups that participated in the study have abandoned their seasonal migration to the gizu, an ephemeral type of succulent winter grazing in the far North of Darfur. They attributed their abandonment of the trip to the gizu due to insecurity and armed raiding. An Arab pastoralist participant stated that the last time he drove his herd to gizu was in 1995. He said the Zaghawa are organized in armed raiding that targets the Arabs and their livestock in the gizu. He believed one of the positive outcomes of the current war is the availability and access to pasture. He added, however, that the expansion of irrigated agriculture along the banks of the different Wadis has limited their access to the pasture there.

5. Discussion

Three patterns of social conflict and violence can be identified in the study area: first, violent conflicts such as tribal wars; second, disputes and conflicts over parcel boundaries, ownership of land, and crop damage; and third, non-conflict armed violence in the form of organized gang violence and armed raiding. Though these different types of conflicts and violence are not officially war related, they share common characteristics. They are related to access to and control of the productive resources, especially land and landed resources. In addition, they are beyond the control of the native administration, the traditional governance system, to resolve and address. Moreover, they are ethnically expressed and seen by others to have ethnic origins. Ethnicity/tribalism and power struggle in Darfur, as in other parts of Africa, are intimately linked to land rights. This tight link between ethnicity/tribalism, land, and power is in fact a colonial construction that has been maintained by the Sudanese state to date. Mamdani (1996) addresses this link. He states that "[i]ndirect rule reinforced ethnically bound institutions of control" (Mamdani, 1996, p. 147). Therefore, change in land use and land control could explain the nature and logic of the different forms of violence, its ethnic dimension, and the implication of these changes for the capacity of the native administration to manage land, people, and conflicts in the study area.

5.1. Agricultural Changes in the Study Area: Competition, Exclusion and Violence

Land use and land rights in the study area have undergone fundamental changes as part of an agricultural change in the area. Osman (2012) discusses the agricultural change and related land use and land control in the study area. Since the 1960s, shifting crop cultivation has evolved into a stabilized form of agriculture composed of staple crop production; small-scale, irrigated commercial agriculture; and livestock production. Rights over land and land resources, under this agricultural system, are exclusive, meaning that land use is permanent and land ownership is individually controlled. Land transfer and acquisition are determined by the market transaction and inheritance guided by the Sharia Islamic law. The exclusionary processes are not limited to the individual parcel

of land but also include the commons such as natural grazing, browsing, and crop residues. The agricultural inputs are no longer exchanged between the production systems, the production symbiosis is disrupted, and the interdependence of the groups under these production systems has eroded. The succession of the different producers on land and land resources has become competitive; the relationship between the resource users has broken down and has become violent. The polarization between livelihood groups/systems, such as the pastoral livestock production and the agriculture system, is also characterized by the polarization of the ethnic/tribal affiliation of the farmers and pastoralists. Confrontation rather than cooperation between the different groups of producers has become the norm.

The evolution of the traditional agricultural system into one characterized by competition, exclusion, and ethnic/tribal polarization has taken place in a context of limited off-farming income opportunities, climatic variability, and a general marginalization of the region. Young et al (2005) have discussed the wider political economic and environmental context of the conflict in Darfur. There have been 16 drought years since 1972. Those that stand out include 1983–1985, 1987–1988, 1990–1991, and 2000–2001. The famine of the mid-eighties caused the largest loss of life. De Waal (1989) estimated that death rates were three times higher than normal (a total of 176,900 actual deaths, including 95,000 excess deaths). In addition, the region has suffered economic neglect since the colonial era of pre-1956. An example of this economic neglect is the limited development that has taken place in the region. The only two development projects in Darfur to be financed by international organizations, the Western Savannah Development Project and the Jebel Mara Rural Development Project, came to a complete halt when their administration was transferred from the central government to state governments in the late 1980s. Between 1958 and 2003, the international community provided a total fund of US$13.4 billion for development projects in Sudan. Darfur accounted for only ten projects, which constituted a share of 2% (Young et al., 2005). As a result,

the exclusion and deprivation from land, the principal source of livelihoods around which the social and political life is anchored, could lead to destitution as it has taken place in a context of lack of other opportunities. Accordingly, it has resulted in tensions and in a deepening sense of grievance and despair. The growing sense of tensions, grievance, and despair has expressed itself in different forms of violence and conflicts.

5.2. Agricultural Change: Conflicts and Violence

Conflicts (both violent and non-violent) and non conflict violence have increased in frequency and intensity with the agricultural change that set into motion in 1960s but has accelerated in the study area since the early eighties. The change in land tenure, the permanent use of land, and land fencing as a means to mark land boundaries and indicate the individual private ownership of the farm have started to take place since that time. These changes have created a local context of increasing competition, exclusion, and grievances over access to land and common property resources (Osman, 2012). The literature on conflicts in Darfur conceals the dramatic changes that have taken place in the rules of the game that organized access to land and common property resources the last four decades. The limitation of the literature in exposing the changes in land tenure in Darfur is largely attributed to the theoretical models that have dominated the investigations of conflicts in Darfur. One such dominant model is the herder-versus-farmer theoretical model, which tends to describe these conflicts as farmer–herder conflicts or tribal conflicts over a diminishing natural resource base (Salih, 1999; Hussein, Sumberg, & Seddon, 1999; Takana, 1997; UNDP, 2006). Such description implies that these conflicts are inherent in the coexistence of farmers and herders and the coexistence of the different tribes in Darfur. Moreover, it implies that they could be resolved through the traditional mechanism of tribal reconciliation conferences. Other models explained violence in Darfur in term of environmental crisis (University of Peace, 2006; Bromich, 2008), ethnicity (Harrir, 1994; Human right Watch, 2004), criminal act (Rabah, 1998;

Mukhtar, 1998) or state of anarchy embedded in primordial tribal wars cultures (Abdelsalam, 1998). In addition to the problem of the research models employed is the lack of data and empirical research. These limitations in the conceptual models and empirical research on the conflict in Darfur limit the role of such research in enhancing evidence-informed policy making.

Moreover, the current models and research distract attention from and fail to account for other large-scale violence in the form of non-conflict armed violence. Gang violence, locally known as armed banditry, has become more common in the study area since the early 1980s. International organizations and donors operating in the region since the early eighties have paid no attention to non-conflict armed violence in Darfur. This is probably because the policy responses to armed banditry lie within the criminal justice system, where elements of prevention and reduction of criminal activities are addressed. As such, non-conflict armed violence does not fit within the humanitarian and development mandate of the international organizations working in Darfur. Consequently, the immediate and underlying social origin of armed banditry in the study area in particular and Darfur in general has not been well researched. The role of social origin of gang violence in the exclusion, competition, and struggle around access rights to resources, and of the ensuing grievances, has remained unexplored (Osman, 2012). The exclusionary natures of the agricultural system and the limited opportunities for livelihood have pushed many to join gang violence as a survival strategy. El Mahdi (2007) argues that gang violence in Darfur is bred from the completion and conflict over the diminishing resource base. In Congo, many smallholders are forced out of farming due to lack of land. For these groups, Boas (2008) writes that "militia formation, or joining an existing one, becomes an alternative survival strategy" (p. 60).

5.3. Agricultural Change and Ethnic/Tribal Polarization

The land system in Darfur is based on the tribal land in which the hakura or *dar* represents the administrative unit. This administrative unit represents an ethno-geographical tribal territory and

is managed by a hierarchal political system, the native administration. Within such a system of ethnically bound control, the native administration of the tribal hakura/dar administratively allocates land to individuals on the basis of a usufruct right. This allocation of the usufruct right to members of the community (tribe members) is bound to political allegiance to local authorities (Meek, 1946). Such a structural link between land, power, and ethnic/tribal affiliation makes people prone to severe ethnic tensions when conflicts over land or power rise. At the same time, this structural link makes people susceptible to ethnic manipulation for political support and brings about divisive ethnic appeals to mobilize supports in political struggles over land.

But land availability, more than need or the production symbiosis, has facilitated a consistent contact and mutual relation between the different ethnic/tribal groups. This interdependence has created an environment in which ethnic/tribal identities are accommodated and expressed without being a source of major instability. While power struggles between the elites of tribes and sub-tribes were there before 1960s, they had not translated to violent conflicts. For example, the colonial and postcolonial governments were unable to organize the different camel herding groups of the Northern Rizaygat under one native administration because of the struggle over power among the elites of these groups. But until recently, this power struggle among the Northern Rizaygat had not resulted in violent conflicts between sub-tribes of this group (Young et al., 2009). In the last four decades, agricultural change associated with social exclusion and competition over land has disrupted the production symbiosis and the interdependence among the different groups, as elaborated earlier.

Simultaneously, there has been a growing struggle over local power linked with claims of tribal autonomy by many tribal groups. The claim to tribal autonomy is often associated with a claim to a tribal land. The struggle over land and power has triggered and intensified ethnic/tribal tensions and conflicts over access to land and landed resources. Grievances related to land competition,

disputes, and exclusion have transferred into ethnic/tribal conflicts through discourse utilizing tribal affiliation between and within tribal groups, but particularly between groups such as Fur versus Arab, Fur versus Zaghawa, and Zaghawa versus Arab. In this respect, Haaland (1980) argues that the population's attachment to ethnic, tribal, or kinship groups always constitutes a potential basis for mobilization of political support. Moreover, changes to administrative units for political interests and manipulation of ethnic tensions have contributed to the micro-level conflicts and have led to the affirmation of ethnic/tribal division at the local level. In brief, land is structurally linked to power and ethnicity/tribalism. This link between ethnicity, land, and power has facilitated micro-level conflicts when land scarcity has become a pressing issue. These micro-level conflicts could easily transfer into ethnic/tribal polarization. Equally, conflicts over power or land at the political level could be used for mobilization of ethnic/tribal groups and could turn into ethnic/tribal conflicts.

5.4. Agricultural Change: Implications for Traditional Structures, Security, and Stability

The agricultural system, land use, and control have been managed by the political and judicial systems of indirect rule and its executive authority in the form of the native administration. The indirect rule system was established by the British colonial administration (1916–1956). It is based on the *hakura* system of the Fur Sultanate, which ruled Darfur for almost four centuries (1650–1916) (Abu Salim, 1974; La Rue, 1989). The native administration system of indirect rule adopted and formalized the traditional tribal governing structures. Each tribal head is assisted by *omdas,* executives who conduct local courts and act as spokesmen and negotiators with other groups over matters of land, grazing, and water rights. Sheikhs are executives at more local or village levels, with a variety of duties including land allocation, tax collection, and responsibilities for the poor. Accordingly, the native administration manages both the territory itself and the people living within it. The native administration, as the customary authority, makes the rules and enforces them, allocates rights and administers them, and arbitrates conflicts. In other words, the native administration within its

respective ethnic/tribal geographical territory has provided a system of local governance that governed the use of land and landed resources and allowed various groups to live in relative peace and stability.

However, the relevance of the native administration to the governance system is highly disputed in the postcolonial literature. It is often argued that government policies and interventions have transformed and eroded the capacity of the native administration. These policies have stripped chiefs of their authorities, abolished the native administration altogether in 1971 and reinstituted it in 1984, and even co-opted it (World Bank, 1985). Despite these changes, the native administration has continued to operate as the custodian of customary law and communal assets, especially land. Yet it operates largely in an informal setting, without clear definition of its authorities, and at times it functions with a politicized mandate.

But change in land tenure and its impact on the capacity of the native administration to manage land have received no attention in the literature. The evolution of exclusive land tenure is likely to undermine the authority and the role of the native rule to manage land and maintain security and stability. The communal tenure systems and the administrative reallocation of land to members of the community on the basis of status and need is the foundation of the native rule. For this reason, the system does not accommodate permanent private rights to land. The only recognized individual right is the right to usufruct use of the land under the supervision of the tribal authority (Osman, 2012). Accordingly, the authority of the native administration is bound up with the land. The link between the land and the native rule is succinctly expressed by the commissioner of land in Southern Nigeria. He, quoted in Berry (1993), has stressed the political importance of upholding pure native tenure. "If individual Africans acquired freehold rights to land," he warned, "this would weaken the authority of chiefs and undermine indirect rule" (as cited in Berry, 1993, p. 106). The link between the land and the native administration is also stressed by the West African

Land Committee (1966), quoted in Chanock (1991): "together they stand or fall" (p. 64). Similarly, Meek (1946) has confirmed that in many parts of Africa the right to the use of land is dependent on allegiance to a chief or chiefs. He has pointed out that the sale of tribal land by chiefs or grant of absolute rights of ownership would therefore tend to disrupt the native rule, and so, too, would the indiscriminate sale of tribal lands by chiefs. He added, "The control of alienation of land has in consequence been one of the main planks of the British system of 'Indirect Rule'" (p. 10). To conclude, change in land tenure to individual control undermines the authority and the role of the traditional structures of the native administration, from the sheikh at the village level to the shartaya at the upper level.

The roles of the native administration are to manage and maintain both social and political security through the native tenure system. First, it organizes and manages access to land for all members of the community according to their need. This access to land is managed on the basis of the usufruct right through the redistributive communal tenure system. While this redistributive mechanism does not necessarily alleviate poverty or ensure social equality, it remains a vital mechanism for reducing rural unemployment, poverty, and inequality, and for safeguarding food security and accordingly social security. Second, it does not change the native means of land acquisition and as such ensures the people's sense of identity and belonging (Sikor and Lund, 2009). Land is associated with identity, and this native tenure maintains the social security and political stability as it ensures that people maintain their identity. This is why the British rule maintained it. Third, the native administration organizes the multiple and overlapping land right system in which different users succeed one another in the different seasons. This multiple land right system requires extensive coordination within groups and between different groups (e.g., the seasonal movement of the pastoralists and the resolution of any disputes). The evolution of exclusionary individual control of land and landed resources has removed from the village and tribal chiefs the authority over land

allocation. In turn, these changes to the land right system have diminished the ability of the native administration to settle inter-communal and intra-communal disputes. In short, the changes in land tenure undermine the authority and role of the native administration and, accordingly, the stability and security in the area. It is therefore no surprise that resource conflicts, as illustrated above, have ravaged the communities in the study area in the face of the development of individual land ownership, the continuous use of land, and the diminishing capabilities of the traditional structure of native administration in the mitigation of resource-based conflicts.

6. Conclusion

Violence on access to land and landed resources has been a permanents feature of the daily life in the study area for the last four decades. The manipulation of identity, the political formation along these identities over access to the productive natural resource have eroded the capacity the traditional institution of conflict resolution and have made mass violence in the study area possible At the heart of this crisis in the study area and in Darfur is the transformation of the agriculture and the related land use and land rights. The agricultural dimension of the crisis has been in the making since the end of the 1960s. For centuries the traditional agricultural system in Darfur formed the economic, political, and social basis of the society in Darfur. It is composed of shifting cultivation and pastoral livestock production, both of which are practiced as specialized activities by different communities of different ethnic backgrounds. Traditional agriculture in Darfur is based on two principles: first, the corporate ownership of land tenure based the multiple and overlapping land claim system; second, the production symbiosis. These two principles have provided the peaceful coexistence and inspired the interaction of the different ethnic groups involved in agriculture to their mutual advantage.

The rapid economic and demographic changes and climatic variability in Darfur, within a context of a deepening national governance gap in Sudan, have shaken the foundations of the

traditional agricultural system, the multiple land right system, and the production symbiosis. Shifting crop cultivation has evolved into stabilized agriculture that integrates cash crop, livestock, and staple crop production. Accordingly, land use has become continuous, and access to land and landed resources is becoming exclusionary. This change in land use and land control has led to the erosion of the multiple land right and production symbiosis and has dismantled the political and social relations and institutions that have prevailed for centuries. As a consequence, the unwritten social constitution that organized these social relations and institutions is torn apart. At the same time, change in land use and land control has generated competition, exclusion, and contest and has broken the traditional twinning of farming and pastoral livestock production. All these changes together have driven the collective violence that has raged over Darfur, undermined its social fabric, and provided the background for the current protracted political crisis.

The agricultural dilemma in Darfur cannot be isolated from the protracted political crisis in the area. It has become enfolded within, and has contributed to, a nexus of collective violence and civil war in Darfur. The spontaneous change in land use; the individualization of land, landed resources, and common property rights; and the ensuing disputes and violence have challenged the traditional authority structures. As a result, these structures can no longer deal with land disputes and conflicts. This means that the agricultural dilemma in this context is not of a technical nature for which technical fixes would provide an adequate basis for resolution. Peace processes and political solutions sponsored by the international community need to address local-level issues. Instead, these local-level issues are usually left to be unraveled by the power holders in the post-conflict era.

Agricultural interventions are major components of international aid organizations. These interventions run the risk of actually doing harm because they are founded on little knowledge of the agricultural systems. The limited knowledge of the agricultural system and the changes that it has undergone is due in large part to the fact that the agricultural roots of the crisis so far have not

attracted the attention of academic and policy research. Therefore, there is an urgent need for empirical and field research studies on the agricultural dimension of the crisis to inform the political and policy debates in Darfur. Specific areas of research are changes on customary land tenures with focus on intra-family land relations, changes in land management institutions and the future role of the traditional authorities in land management and changes in land transfer in the different parts of Darfur.

Literature Cited

Abdelsalam, S. A. (1998). Some aspects of the implications of tribal conflict in Sudan. In A. Elzein & E. I. A. Wadi (Eds.), *Tribal conflicts in Sudan* (pp. 181–194). (In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, Khartoum of University.

Abu Salim, M. I. (1974). *The Fur and the land: Documents of ownership*. Paper no. 10. (In Arabic). Khartoum, Sudan: Afro Asian Studies, University of Khartoum.

Barth, F. (1981). Economic spheres in Darfur. In F. Barth (Ed.), *Process and form in social life: Selected essays of Fredrik Barth*. Vol. 1 (pp. 157–178). London: Routledge & Kegan Paul.

Barth, F. (1988). Human resources: social and cultural features of the Jebel Marra Project Area. *Bergen Studies in social anthropology, 42*. Bergen: Department of Social Anthropology, University of Bergen.

Bazeley, P. (2009). *Qualitative data analysis with NVivo*. London: Sage.

Behnke, R. H. (1985). *Open-range management and property rights in pastoral Africa: A case of spontaneous range enclosure in South Darfur, Sudan*. ODI paper no. 20f. N.p.: Overseas Development Unit.

Berry, S. S. (1993). *No condition is permanent: The social dynamics of agrarian change in Sub-Saharan Africa*. Madison: University of Wisconsin Press.

Boas, M. (2008). "Just another day": The North Kivu security predicament after the 2006 Congolese elections. *African Security, 1,* 53–56.

Bromwich, B. (2008). Environmental degradation and conflict in Darfur: implications for peace and recovery. *Humanitarian Exchange Magazine,* 39*,* 22–29.

Boserup, E. (1965). *Conditions of agricultural growth*. London: Allen & Unwin.

Brookfield, B. (2001). Intensification and alternative approaches to agricultural change. *Asia Pacific Viewpoint, 42,* 181–192.

Bryceston, D., Kay, C., & Mooij, J. (Eds.). (2000). *Disappearing peasantries? Rural labour in Africa, Asia and Latin America.* London: Intermediate Technology.

Carswell, G. (2000). *Agricultural Intensification in Ethiopia and Mali.* Research Report 48, Institute of Development Studies at the University of Sussex, England.

Chanock, M. (1991). Paradigms, policy and property: A review of the customary law of land tenure. In K. Mann & R. Roberts (Eds.), *Law in colonial Africa* (pp. 61–85). Portsmouth, NH and London: Heinemann and James Curry.

Clay, D., Reardon, T., & Kangasniemi, J. (1998). Sustainable intensification in the highland tropics: Rwandan farmers' investments in land conservation and soil fertility. *Economic Development and Cultural Change, 46,* 351–377.

Cramer, C., & Richards, P. (2011). Violence and war in agrarian perspective. *Journal of Agrarian Change, 11,* 277–297.

De Waal, A. (1989). Famine mortality: A case study of Darfur, Sudan 1984–5. *Population Studies, 43*(1), 5–24.

Dinnar, H. I. A. (2005). *Darfur blaze: A story of civil and political conflict.* (In Arabic). Khartoum, Sudan: New Khartoum Corporation Press.

Duffield, M. (1993). NGOs, disaster relief and asset transfer in the Horn: Political survival in a permanent emergency. *Development and Change, 24*, 131–157.

El Mahdi, E. (2007). *Towards establishing rules of justice, peace and equity in Darfur.* (In Arabic). Cairo: Egypt: Cairo Center for Human Rights Studies.

Elwert, G. (2001). Conflict, anthropological perspective. In N. Smelser & P. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 2542–2547). Amsterdam: Elsevier.

Flint, J. (2010). *The other war: Inter-Arab conflict in Darfur.* Small Arms Survey HSBA Working Paper 22. Geneva: Small Arms Survey.

Food and Agriculture Organization of the United Nations (FAO). (1968). *Land and water resources survey in the Jebel Marra area: The Sudan: Final report* (Report No. LA-FAO/SF: 48/SUD). Rome: FAO..

Food and Agriculture Organization of the United Nations (FAO). (1984). *Institutional aspects of shifting cultivation in Africa.* Rome: FAO, Human Resources, Institution and Agrarian Reform Division.

Haaland, G. (1969). Economic determinants in ethnic processes. In F. Barth (Ed.), *Ethnic groups and boundaries* (58–74). Boston, MA: Little, Brown.

Haaland, G. (1972). Nomadism as an economic career among the sedentaries in the Sudan Savannah Belt. In I. Cunnison & W. James (Eds.), *Essays in Sudan ethnography* (pp. 149–172). London: C. Hurst.

Haaland, G. (1980). Social organization and ecological pressure in Southern Darfur. In G. Haaland (Ed.), *Problems of savannah development: The Sudan case. Occasional papers in social anthropology, 19* (pp. 55–106). Bergen, Norway: University of Bergen.

Haaland, G. (1984). The Fur. In R. V. Weekes (Ed.), *Muslim peoples: A world ethnographic survey* (pp. 264–269). Westport, CT: Greenwood Press.

Haaland, G. (1991). Systems of agriculture in Western Sudan. In G. M. Craig (Ed.), *The agriculture of the Sudan, 230–251.* Oxford: Oxford University Press.

Hale, G. A. (1966). *Cultivation terraces in Western Darfur, Sudan: A study in an agricultural form and practice.* (Doctoral dissertation). University of California, Los Angeles.

Harir, S. *(*1994*).* "Arab belt" versus "African belt": Ethno-political conflict in Dar Fur and the regional cultural factors. In S. Harir *&* T. Tvedt *(Eds.), Shortcut to decay: The case of the Sudan (pp.* 144–*1*85). Uppsala*:* Nordiska Afrikainstitutet.

Human Rights Watch (2004). Darfur Destroyed: Ethnic cleansing by government and militia forces in Western Sudan. *Human Rights Watch, 16*, 1-86.

Hunting Technical Services. (1977). *Agricultural development in the Jebel Marra area. Annex 1, land resources.* Borehanwood, England: Hunting Technical Services.

Hussein, O. M. (1957). Land policy in northern Kordofan. In Thompson, C. F. (1965), *Land law of the Sudan: Cases and materials* (Vol. 2), p. 860] Khartoum, Sudan: Faculty of Law, University of Khartoum.

Keen, D. (1994). *The benefits of famine: A political economy of famine and relief in southwestern Sudan, 1983–1989*. Princeton, NJ: Princeton University Press.

La Rue, G. M. (1989). *The Hakura system: Land and social stratification in the social and economic history of the Sultanate of Dar Fur (Sudan), ca. 1785–1875*. (Doctoral dissertation). Boston University, Boston, MA.

Lebon, J. H. G. (1965). *Land use in the Sudan. The world land use survey, monograph 4*. Bude, England: Geographical Publications.

Lebon, J. H. G., & Robertson, V. C. (1961). The Jebel Marra, Darfur, and its region. *Geographical Journal, 127,* 30–49.

Liversage, B. (1945). *Land tenure in the colonies*. London: Cambridge University Press.

Malthus, T. (1798). *An essay on the principle of population*. London: J. Johnson.

Mamdani, M. (1996). Indirect rule, civil society, and ethnicity: The African dilemma. *Social Justice, 23*(1/2), 145–150.

Manger, L. O. (1987). Introduction. In L. O. Manger (Ed.), *Communal labour in the Sudan* (pp. 1–7). Bergen, Norway: University of Bergen.

McCown, R. L., Haaland, G., & de Haan, C. (1979). The interaction between cultivation and livestock production in semiarid Africa. In A. E. Hall, G. H. Cannell, & H. W. Lawton (Eds.), *Agriculture in semi-arid environments* (pp. 297–332). Berlin: Springer.

Meek, C. (1946). *Land law and custom in the colonies.* Oxford: Oxford University Press.

Moore, S. F. (1998). Changing African land tenure: Reflections on the incapacities of the state. *European Journal of Development Research, 10*(2), 33–49.

Morrison, K. D. (1992). Rethinking intensification: Power relations and scales of analysis in precolonial South India. In T. L. Thurston & C. T. Fisher (Eds.), *Seeking a richer harvest: The archaeology of subsistence intensification, innovation, and change* (pp. 235–247). New York: Springer.

Morton, J. F. (1994). *The poverty of nations: The aid dilemma at the heart of Africa.* London: British Academic Press.

Mukhtar, E.A. (1998). On tribal conflicts in Darfur: The causes, and the conferences of conflict resolution and resolution mechanisms. In A. Elzein & E. I A. Wadi (Eds.), *Tribal conflicts in Sudan* (p.p. 257-269). (In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, University of Khartoum.

News From Africa Watch. (1990, April 2). Sudan: The forgotten war in Darfur flares again. *News From Africa Watch, 45,* 1–9.

Niamir-Fuller, M. (1998). The resilience of pastoral herding in Sahelian Africa in Berkes F, Folke C and Colding J eds *Linking social and ecological systems: management practices and social mechanisms for building resilience (*pp. 250–84). Cambridge: Cambridge University Press.

Niamir-Fuller, M. (1999). *Managing mobility in African rangelands: the legitimization of transhumance.* Exter: Intermediate Technology Publications.

Noronha, R. (1985). *A review of the literature on land tenure systems in sub-Saharan Africa.* ARU paper 43, Agriculture and Rural Development Research Department, World Bank. Washington, DC: World Bank.

Osman, A. M. K. (2012). *Agricultural change, land and violence: An examination of Darfur.* (Unpublished manuscript doctoral dissertation). Tufts University, Medford, MA.

Paterson, R. T. (1948). Darfur Province. In J. D. Tonhill (Ed.), *Agriculture in the Sudan: Being a handbook of agriculture as practised in the Anglo-Egyptian Sudan* (pp. 851–874). Oxford: Oxford University Press.

Platteau, J.-P. (1992). *Land reform and structural adjustment in Sub-Saharan Africa: Controversies and guidelines.* FAO Economic and Social Development Paper No. 107. Rome: FAO.

Rabah, N. E. (1998). The causes of the traditional modern tribal conflicts in Sudan. In A. Elzein & E. I A. Wadi (Eds.), *Tribal conflicts in Sudan* (p.p. 139-159).(In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, University of Khartoum.

Scoones I ed. (1995). *Living with uncertainty: new directions in pastoral development in Africa.* Exeter: Intermediate Technology Publications.

Scott, E. P. (1984). Life before drought: A human ecological perspective. In E. P. Scott (Ed.), *Life before the drought*. London: George Allen & Unwin.

Scott, J. C. 1976. *The moral economy of the peasant rebellion and subsistence in Southeast Asia.* New Haven, CT: Yale University Press.

Sikor, T., & Lund, C. (2009). Access and property: A question of power and authority. In T. Sikor & C. Lund (Eds.), *The politics of possession: Property, authority, and access to natural resources* (pp. 1–22). Chichester, Eng.: Wiley-Blackwell.

Takana, Y. (2002). *Resources based conflicts: North Darfur and Upper Nile case.* Khartoum, Sudan: Oxfam GB.

Turner II, B.L., Hyden, G. and Kates. R. (1993) *Population Growth and Agriculturrd Change in Africa.* University Press of Florida, Gainesville.

Turner, B., & Ali, A. M. (1996). Induced intensification: Agricultural change in Bangladesh with implications for Malthus and Boserup. *Proceedings of the National Academy of Sciences, 93,* 14984–14991.

UN Office for the Coordination of Humanitarian Affair (2009). Darfur humanitarian access map. IMU OCHA Sudan http://ochaonline.un.org/sudan.

Van Raay, H. G. T. (1975). *Rural planning in a savanna region.* Rotterdam: Rotterdam University Press.

Wilson, R. T. (1978). The "gizu": Winter grazing in the south Libyan Desert. *Journal of Arid Environments, 1*(4), 327–344.

World Bank. (1985). *Staff appraisal report, Sudan, Western Savannah Project—Phase II.* Report No. 5814-SU.

Young, H., Jacobsen, K., & Osman, A. (2009). *Livelihoods, migration and conflict: Cases studies from west and north Darfur 2006–2007.* Medford, MA: Feinstein International Center, Tufts University.

Young, H., Osman, A. M., Aklilu, Y., Dale, R., Badri, B., & Fuddle, A. J. A. (2005). *Darfur—livelihoods under siege.* Medford, MA: Feinstein International Famine Center, Tufts University.

V. Conclusion

Traditional agriculture in Darfur has formed the foundation of the economic, political, and social life of the society for centuries. This thesis has examined the connection between agricultural change, with the related land-use and land-control regime, and violence in the Kebkabiya area of North Darfur. The customary land tenure system of multiple and overlapping land rights has evolved over the last four decades into continuous land use with more individualized control and monetized access to land. These changes represent structural shifts that have shaken the foundation of the livelihood system in the study area.

Individual land control undermines the traditional rights of other resource users and disrupts the interdependence pattern among the agricultural production systems. This interdependence has provided great social advantages through peaceful coexistence and interaction among the groups and individuals involved in the production systems of traditional agriculture. Consequently, its disruption has resulted in inter-communal strife, social polarization, and rural rebellion and has weakened the customary institutions and authorities built around the traditional agriculture. This shift has evolved in the context of a governance gap in Sudan and has become intertwined enfolded in the current political emergency and the mass killings that erupted in Darfur in 2003. These many forms of violence in Darfur, which are not all officially dubbed war related, are not isolated; they are interconnected in complex ways.

The traditional system of property rights represents the de facto system that has long organized land rights on the ground. It is based on usufruct rights and reversion to common property on abandonment. However, the state land law—the de jure system—stipulates that the state owns the land and that registration provides the only form of secure land rights. This dual land tenure system, in which both the statutory and the customary tenure coexist, presents an

institutional tension. This institutional tension has become more evident with the evolution of the multiple land right systems in the study area toward more individual control, though the individual control is not registered and accordingly is not recognized by the state land law. This institutional tension does not provide secure land tenure to any of the resource users under the multiple land rights system. It also makes land liable to manipulation by the state and its political elite for their political interests. Accordingly, land could be exchanged for political loyalty and power support. Moreover, the fact that there is a structural link between land, ethnicity, and power in Darfur has made these mobilizations and conflicts over land and landed resources take place along ethnic lines.

The rise of individual land control, the erosion of the customary authorities, and the dual land tenure system present a policy challenge. Individual land registration in general has been an appealing policy strategy. But in a situation such as that in Darfur, where the viability of the different production systems and the groups involved in them are based solely on land use and land claims by several resource users over different periods of time, individual registration would present serious technical as well as social challenges. These challenges have become more complicated given the fact that there is no conventional solution to the problem of how to secure local resource rights.

The contextual issues shaping access to, control of, and utilization of land and landed resource as outlined above include the erosion of the multi-land right system, the development of exclusionary practice, the dualistic land tenure and land administration system, processes of social organization and mobilization based on ethnicity, the erosion of the local institutions and structures of land management and conflict resolution. The combination of these processes results in a complex basis of claims and conflicts that drives the whole region into different forms of violence and displacement. This context calls for land policies which support a wide range of economic, social, and political objectives including the prevention of conflicts and their prompt and effective resolution through mutually acceptable solutions. The formulation of such policy requires popular

participation to promote consensus for shared principles as the basis for securing access to land for all users, enhancing agricultural productivity, and sustaining livelihoods. The popular participation and the agreed principles of access by a broad base of stakeholder bring about a high degree of trust in the land governance structures and institutions among the various groups competing for land resources.

The lack of a conventional solution necessitates the need for a context-specific approach and the need for a land policy with broad social, economic, and political objectives as discussed above. The design of such policy presents an immediate need to understand and research the changing dynamics of agriculture in Darfur. Yet agriculture and the economic, political, and social relations established around it have attracted no attention in the analysis of the violence that has raged over Darfur for the last three decades. Studies to explore nature of the agricultural change, the changes in the institutional regulation of access and control, customary land tenure and its overlapping nature, the evolving land market and in the different parts of Darfur and the environmental implications of change in land use and land control should be afforded high priority to inform policy debates and peace processes in the region.

These research issues, however, should be considered part of other land research issues both in Darfur and at national level. This necessitates the need for research agendas on land relations at both of these levels. These research agenda could be formulated through land research workshops that take place at the regional levels which finally feed into a national land research agenda workshop. The organization of these workshops to establishing the most critical land-related policy research priorities could provide the basis for the international community to support a Sudanese-led research on these priorities. In addition, it could enable local institutions to collaborate with

international partners to produce top-level policy research related to land and advocate effectively for continuous adaptation of policy in the interest of ordinary Sudanese citizens.

Literature Cited

Abate, T., van Huis, A., & Ampofo, J. K. O. (2000). Pest management strategies in traditional agriculture: An African perspective. *Annual Review of Entomology, 45,* 631–659.

Abdelsalam, S. A. (1998). Some aspects of the implications of tribal conflict in Sudan. In A. Elzein & E. I. A. Wadi (Eds.), *Tribal conflicts in Sudan* (pp. 181–194). (In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, Khartoum of University.

Abu Salim, M. I. (1974). *The Fur and the land: Documents of ownership*. Paper no. 10. (In Arabic). Khartoum, Sudan: Afro Asian Studies, University of Khartoum.

Abushouk, A. I., & Bjørkelo, A. (2004). *The principles of Native Administration in the Anglo Egyptian Sudan: 1898–1956*. Omdurman, Sudan: Abdel-Karim Mirghani Cultural Centre.

Ahmed, M. M., Sanders, J. H. & Nell, W. T. (2000). New sorghum and millet cultivar introduction in Sub-Saharan Africa: impacts and research agenda. *Agricultural Systems* 64:55-65.

Ahmed, M. K., & Hassan, M. S. (1983). *Horticultural production and research in Darfur region*. Eighth African Symposium on Horticultural Crops, 1983; Wad Medani, Sudan, 20–24 March 1983.

Al-Amin, M. A. (2003). *Between two eras: Memories of a Sudanese administrator: February 15, to January 11, 1973*. Vol. 1. Khartoum, Sudan: Elshariff Academic Bookshop.

Awad, M. H. (1971). The evolution of landownership in the Sudan. *Middle East Journal, 25*, 212–228.

Babiker, M. (n.d.). *Land tenure in the Sudan: An overview*. Khartoum, Sudan: University of Khartoum.

Babikir, A. A. A. (1988). Vegetation, soil and land-use changes in Jebel Marra and other mountains in the Republic of the Sudan. *Mountain Research and Development, 8*, 2/3, 235–241.

Barth, F. (1956). Ecologic relationships of ethnic groups in Swat, North Pakistan. *American Anthropologist, 58*(6), 1079–1089.

Barth, F. (1964.) Competition and symbiosis in north-east Baluchistan. *Folk, 6,* 15–22.

Barth, F. (1981). Economic spheres in Darfur. In F. Barth (Ed.), *Process and form in social life: Selected essays of Fredrik Barth*. Vol. 1 (pp. 157–178). London: Routledge & Kegan Paul.

Barth, F. (1988). *Human resources: Social and cultural features of the Jebel Marra Project Area. Bergen studies in social anthropology, 42*. Bergen, Norway: Department of Social Anthropology, University of Bergen.

Baxter, P. T. W.,(1993). The new" East African pastoralist: an overview. In J. Markahis (Eds).

Bazeley, P. (2009). *Qualitative data analysis with NVivo*. London: Sage.

Behnke R H, Scoones I and Kerven C eds (1993). *Range ecology at disequilibrium: new models of natural variability and pastoral adaptation in African savannas*. Nottingham: Overseas Development Institute.

Behnke, R. H. (1985). *Open-range management and property rights in pastoral Africa: A case of spontaneous range enclosure in South Darfur, Sudan.* ODI paper no. 20f. N.p.: Overseas Development Unit.

Bernstein, H., & Byres, T. J. (2001). From peasant studies to agrarian change. *Journal of Agrarian Change, 1,* 1–56.

Berry, S. (1993). *No condition is permanent: The social dynamics of agrarian change in Sub-Saharan Africa.* Madison: University of Wisconsin Press.

Berry, S. (2002). Debating the land question in Africa. *Comparative Studies in Society and History, 44* (4), 638–668.

Beshai, A. A. (1976). *Export performance and economic development in Sudan, 1900–1967*. London: Ithaca Press.

Boas, M. (2008). "Just another day": The North Kivu security predicament after the 2006 Congolese elections. *African Security, 1,* 53–56.

Boserup, E. (1965). *Conditions of agricultural growth*. London: Allen & Unwin.

Bourn, D., & Wint, W. (1993). *Livestock, land use and agricultural intensification in sub-Saharan Africa.* Retrieved from http://www.odi.org.uk/work/projects/pdn/papers/37a.pdf

Brockwell, J., Searle, S. D., Jeavons, A. C., & Waayers, M. (2005). *Nitrogen fixation in acacias: An untapped resource for sustainable plantations, farm forestry and land reclamation.* N.p.: Australian Centre for International Agricultural Research.

Bromwich, B. (2008). Environmental degradation and conflict in Darfur: implications for peace and recovery. *Humanitarian Exchange Magazine,* 39*,* 22–29.

Brookfield, B. (2001). Intensification and alternative approaches to agricultural change. *Asia Pacific Viewpoint, 42,* 181–192.

Brooks, N. (2006). Climate change, drought and pastoralism in the Sahel. *Discussion note for the World Initiative on Sustainable Pastoralism.* International Union for Conservation of Nature, Gland, Switzerland. [online] URL: http://cmsdata.iucn.org/downloads/e_conference_discussion_note_for_the_world_initiative_on_sustainable_pastoralism_pdf.

Bryceston, D., Kay, C., & Mooij, J. (Eds.). (2000). *Disappearing peasantries? Rural labour in Africa, Asia and Latin America.* London: Intermediate Technology.

Buchanan-Smith and Jaspars, S. (2007). Conflict, camps and coercion: the ongoing livelihoods crisis in Darfur. *Disasters 31(s1):* s57−s76.

Buijtenhuijs, R. (2000). Peasant wars in Africa: Gone with the wind? In D. Bryceson, C. Kay, & J. Mooij (Eds.), *Disappearing peasantries? Rural labour in Africa, Asia and Latin America*. London: Intermediate Technology.

Burr, J. M., & Collins, R. O. (1999). *Africa's Thirty Years' War: Chad, Libya, and the Sudan, 1963–1993.* Boulder, CO: Westview.

Carswell, G. (2000). *Agricultural Intensification in Ethiopia and Mali.* Research Report 48, Institute of Development Studies at the University of Sussex, England.

Central Bureau of Statistics and Southern Sudan Commission for Census, Statistics and Evaluation. (2009). *Fifth Sudan population and housing census 2008: Priority results submitted to the Population Census Council by the Technical Workshop Group 08 April 2009*. Khartoum, Sudan

Chanock, M. (1985). *Law, customs and social order*. Cambridge: Cambridge University Press

Chanock, M. (1991). Paradigms, policy and property: A review of the customary law of land tenure. In K. Mann & R. Roberts (Eds.), *Law in colonial Africa* (pp. 61–85). Portsmouth, NH and London: Heinemann and James Curry.

Chauveau, J.-P., Colin, J.-P., Jacob, J.-P., Lavigne Delville, P., & Le Meur, P.-Y. (2006). *Changes in land access and governance in West Africa: Markets, social mediations and public policies: Results of the CLAIMS research project*. London: IIED.

Claussen, M., Brovkin, V., Ganopolski, A., Kubatzki, C., & Petoukhov, V., (2003). Climate change in northern Africa: the past is not the future. *Climatic Change, 57,* 99-118.

Clay, D., Reardon, T., & Kangasniemi, J. (1998). Sustainable intensification in the highland tropics: Rwandan farmers' investments in land conservation and soil fertility. *Economic Development and Cultural Change, 46,* 351–377.

Cohen, J. (1980). Land tenure and rural development in Africa. In R. H. Bates & M. F. Lofchie (Eds.), *Agricultural development in Africa: Issues of public policy* (pp. 249–300). New York: Praeger. C*onflict and the decline of pastoralism in the Horn of Africa*. London: Macmillan.

Cramer, C., & Richards, P. (2011). Violence and war in agrarian perspective. *Journal of Agrarian Change, 11,* 277–297.

Crowley, E. L., & Carter, S. E. (2000). Agrarian change and the changing relationships between toil and soil in Maragoli, Western Kenya (1900–1994). *Human ecology*, 28 (3),383-414

Cuffaro, N. (1997). Population growth and agriculture in poor countries: A Review of theoretical issues and empirical evidence. *World Development*, 25*, 7*, I I5I-1163.

Dahl, G. (1979). Ecology and equality: The Boran case. In C. Lefébure (Ed.), *Pastoral production and society* (pp. 261–281). Cambridge: Cambridge University Press.

Darrag, A. (1998). *Range rehabilitation in Sudan.* 8th Arab Veterinary Conference, Khartoum, Sudan.

de Bruijn, M. E., & van Dijk, H. J. W. M. (1999). Insecurity and pastoral development in the Sahel. *Development and Change, 30*, 115-139.

de Waal, A. (1989). Famine mortality: A case study of Darfur, Sudan 1984–5. *Population Studies, 43*(1), 5–24.

De Waal, A. (2006). *The Darfur Peace Agreement: Part 10 Land.* London: Justice Africa.

Demsetz, H. (1967). Toward a theory of property rights. *American Economic Review, 57,* 347–359.

Dinnar, H. I. A. (2005). *Darfur blaze: A story of civil and political conflict.* (In Arabic). Khartoum, Sudan: New Khartoum Corporation Press.

Dong, S., L. Wen, S. Liu, X. Zhang, J. P. Lassoie, S. Yi, X. Li, J. Li, and Y. Li. (2011). Vulnerability of worldwide pastoralism to global changes and interdisciplinary strategies for sustainable pastoralism. *Ecology and Society* **16**(2): 10.

Dorner, P. (1972). *Land reform and economic development.* Harmondsworth, Eng.: Penguin.

Downs, R., & Reyna, S. (Eds.). (1988). *Land and society in contemporary Africa.* Hanover, NH: University Press of New England.

Duffield, M. (1993). NGOs, disaster relief and asset transfer in the Horn: Political survival in a permanent emergency. *Development and Change, 24*, 131–157.

El Mahdi, E. (2007). *Towards establishing rules of justice, peace and equity in Darfur.* (In Arabic). Cairo: Egypt: Cairo Center for Human Rights Studies.

El Sammani, M. O. (Ed.). (1987). *Baseline survey for Darfur region.* Khartoum, Sudan: Republic of Sudan Ministry of Finance and Economic Planning, UNDP–Khartoum, Institute of Environmental Studies (IES), University of Khartoum, and Government of Darfur Region.

Elbashir, A. E., & Elmudawi, M. S. (2009). *The practice of land settlement and registration in Sudan.* [In Arabic.] Khartoum, Sudan:Sudan Press.

Eldredge, E., Khalil, S. E. S., Nicholds, N., Abdalla, A. A., & Rydjeski, D. (1988). Changing rainfall patterns in western Sudan. *Journal of Climatology, 8*, 45–53.

El-Mahdi, S. M. A. (1976). *A guide to land settlement and registration.* Khartoum, Sudan: Khartoum University Press.

El-Tayeb, G. E. D. (Ed.). (1985). *Gedaref District study area.* Khartoum, Sudan: Institute of Environmental Studies.

Elwert, G. (2001). Conflict, anthropological perspective. In N. Smelser & P. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 2542–2547). Amsterdam: Elsevier.

Fadul, A. (2004). The problems of water, agriculture, range and livestock routes in Darfur. [In Arabic.] Presented in the workshop organized by the University of Khartoum, Fashir University, Khartoum Center for Human Rights, and the Sudanese Interreligious Center. November 28– 30, 2004, Friendship Hall, Khartoum, Sudan.

Feder, G., & Noronha, R. (1987). Land rights systems and agricultural development in Sub-Saharan Africa. *World Bank Research Observer, 2,* 143–169.

Finkelstein, J. J. (1968). An old Babylonian herding contract and Genesis 31:38. *Journal of the American Oriental Society, 88*(1), 30–36.

Flint, J. (2010). *The other war: Inter-Arab conflict in Darfur.* Small Arms Survey HSBA Working Paper 22. Geneva: Small Arms Survey.

Food and Agriculture Organization of the United Nations (FAO). (1968). *Land and water resources survey in the Jebel Marra area: The Sudan: Final report* (Report No. LA-FAO/SF: 48/SUD). Rome: FAO..

Food and Agriculture Organization of the United Nations (FAO). (1984). *Institutional aspects of shifting cultivation in Africa.* Rome: FAO, Human Resources, Institution and Agrarian Reform Division.

Glantz, M. (1996). Drought follows the plough: cultivating marginal areas. In J. C. Ribot, A. R. Magalhaes, and S. S. P. Frontmatter, (Eds). *Climate variability, climate change and social vulnerability in the semi-arid tropics* (pp. 125-128).Cambridge: Cambridge University Press.

Gordon, C. N. (1986). Recent developments in the land law of the Sudan: A legislative analysis. *Journal of African Law, 30* (2), 143–174.

Haaland, G. (1969). Economic determinants in ethnic processes. In F. Barth (Ed.), *Ethnic groups and boundaries* (pp. 58–74). Boston, MA: Little, Brown.

Haaland, G. (1972). Nomadism as an economic career among the sedentaries in the Sudan Savannah Belt. In I. Cunnison & W. James (Eds.), *Essays in Sudan ethnography* (pp. 149–172). London: C. Hurst.

Haaland, G. (1980). Social organization and ecological pressure in Southern Darfur. In G. Haaland (Ed), *Problems of savannah development: The Sudan case. Occasional papers in social anthropology, 19* (pp. 55–106). Bergen, Norway: University of Bergen.

Haaland, G. (1984). The Fur. In R. V. Weekes (Ed.), *Muslim peoples: A world ethnographic survey* (pp. 264–269). Westport, CT: Greenwood Press.

Haaland, G. (1991). Systems of agriculture in Western Sudan. In G. M. Craig (Ed.), *The agriculture of the Sudan, 230–251.* Oxford: Oxford University Press.

Hailin, Z. (2009). *Fertilizer nutrients in animal manure.* Oklahoma State University Department of Plant and Soil Science. Retrieved from http://www.poultrywaste.okstate.edu/files/f-2228web.pdf

Hale, G. A. (1964). Land rotation and cultivation terracing in Jebel Marra, Darfur, Sudan. Abstracts of papers presented at the 60th annual meeting of the Association of American Geographers,

Syracuse, New York, March 29–April 1, 1964. *Annals of the Association of American Geographers, 54*(3), 412–443.

Hale, G. A. (1966). *Cultivation terraces in Western Darfur, Sudan: A study in an agricultural form and practice.* (Doctoral dissertation). University of California, Los Angeles.

Hardin, G., (1968). The Tragedy of the Common. *Science* 162, pp. 1243-1248.

Harir, S. *(*1994*).* "Arab belt" versus "African belt": Ethno-political conflict in Dar Fur and the regional cultural factors. In S. Harir *&* T. Tvedt *(Eds.), Shortcut to decay: The case of the Sudan (pp.* 144–*1*85). Uppsala*:* Nordiska Afrikainstitutet.

Harrison, P. (1987). *The greening of Africa.* London: Paladin Grafton.

Hassan, Y. F. (2003). *Studies in Sudanese history.* Khartoum, Sudan: Sudatek.

Hilhorst, T. (2000). Women land rights in Africa: current developments in Sub-saharan Africa. In Toulmin, Camilla, Quan, Julian (eds) evolving land rights, policy and tenure in Africa: London: DFID/IIED/NRI

Hirai, M. (2005). A vegetation-maintaining system as a livelihood strategy among the Sereer, west-central Senegal. *African Study Monographs, 30*, 183–193.

Hoffmann, I., & Mohammed, I. (2004). The role of nomadic camels for manuring farmers' fields in the Sokoto Close Settled Zone, Northwest Nigeria. *Nomadic Peoples, 8*(1), 99–112.

Howell, P.P. (1954). *A manual of Nuer law: being an account of customary law, its evolution and development in the courts established by the Sudan Government*. London, Oxford University Press.

Hulme, M. (1990). The changing rainfall resources of Sudan. *Transactions of the Institute of British Geographers, 15*(1), 21–34.

Human Rights Watch (2004). Darfur Destroyed: Ethnic cleansing by government and militia forces in Western Sudan. *Human Rights Watch, 16*, 1-86.

Hunting Technical Services, Ltd. (1958) *Jebel Marra Investigations Report on Phase 1 Studies*. London: Sudan Ministry of Irrigation and Hydro-Electric Power.

Hunting Technical Services, Ltd. (1977). *Agricultural development in the Jebel Marra area. Annex 1, land resources.* Borehanwood, England: Hunting Technical Services.

Hunting Technical Services, Ltd. (1978). *Agricultural development in the Jebel Marra area. Final report.* Borehanwood, England: Hunting Technical Services.

Hunting Technical Services, Ltd. (1995). *Jebel Marra Rural Development Project: Land use planning studies. Final report.* Hemel Hempstead, England: Hunting Technical Services.

Hussein, K., Sumberg, J., & Seddon, D. (1999). Increasing violent conflict between herders and farmers in Africa: Claims and evidence. *Development Policy Review, 17,* 397–418.

Hussein, O. M. (1957). Land policy in northern Kordofan. In Thompson, C. F. (1965), *Land law of the Sudan: Cases and materials.* Vol. 2 (pp. 860–863). Khartoum, Sudan: Faculty of Law, University of Khartoum.

Ibrahim, F. N. (1984). *Ecological imbalance in the Republic of the Sudan: With reference to desertification in Darfur.* Bayreuth, Germany: Druckhaus Bayreuth Verlagsgesellschaft.

ILO/UNDP Employment Mission. (1975). *Growth, employment and equity: A comprehensive strategy for Sudan.* Report of the ILO/UNDP Employment Mission 1975, A United Nations interagency team organized by the International Labor Office, Geneva. Geneva: Imprimeries Populaire.

Inter-governmental Committee on Surveying and Mapping (2011). Fundamentals of Mapping: Types of Maps- Cadastral plans and Maps. http://www.icsm.gov.au/mapping/maps_cadastral.html

Intergovernmental Panel on Climate Change (IPCC) (2001). *Climate change 2001: the scientific basis.* Cambridge: Cambridge University Press.

Jarvis, L. S. (1993). Overgrazing and range degradation in Africa: is there need and scope for government control of livestock numbers? *East Africa Economic Review 7* 95-116.

Kandji, S. T., Verchot, L., & Mackensen, J. (2006). *Climate change and variability in the Sahel region: impacts and adaptation strategies in the agricultural sector.* Nairobi: United Nations Environment Programme (UNEP) and World Agroforestry Centre (ICRAF)..

Keen, D. (1994). *The benefits of famine: A political economy of famine and relief in southwestern Sudan, 1983–1989.* Princeton, NJ: Princeton University Press.

Keen, D. (1998). *The economic functions of violence in civil wars.* London: International Institute for Strategic Studies. Adelphi Paper No. 32.

Keen, D. (2008). *Complex emergencies.* Cambridge, Eng.: Polity Press.

Koster, H. A. and Koster, J. B. (1976) Competition or symbiosis?: Pastoral Adaptive Strategies in the Southern Argolid, Greece. *Annals of the New York Academy of Sciences, 268* (1), 275–285.

La Rue, G. M. (1989). *The Hakura system: Land and social stratification in the social and economic history of the Sultanate of Dar Fur (Sudan), ca. 1785–1875.* (Doctoral dissertation). Boston University, Boston, MA.

Land Tenure Task Force. (1986). *Land tenure in the rain-fed agriculture: Strategy, policy and development of rain-fed agriculture: A report prepared for the Ministry of Finance and Economic Planning, Khartoum, Sudan.* Main Report. Vol. 1. Khartoum, Sudan

Lautze, S. (2008). Social dynamics in militarised livelihood systems: Evidence from a study of Ugandan army soldiers. *Journal of East African Studies, 2,* 415C438.

Lautze, S., & Raven-Roberts, A. (2006). Violence and complex humanitarian emergencies: Implications for livelihoods models. *Disasters, 30,* 383–401.

Lebon, J. H. G. (1965). *Land use in the Sudan. The world land use survey, monograph 4*. Bude, England: Geographical Publications.

Lebon, J. H. G. (1965). *Land use in the Sudan. The world land use survey, monograph 4*. Bude, England: Geographical Publications.

Lebon, J. H. G., & Robertson, V. C. (1961). The Jebel Marra, Darfur, and its region. *Geographical Journal, 127,* 30–49.

Lele, U., & Stone, S. W. (1989). *Population pressure, the environment and agricultural intensification: Variations on the Boserup hypothesis.* MADIA Discussion Paper 4. Washington, DC: World Bank.

Liversage, B. (1945). *Land tenure in the colonies.* London: Cambridge University Press.

Malthus, T. (1798). *An essay on the principle of population.* London: J. Johnson.

Mamdani, M. (1996). Indirect rule, civil society, and ethnicity: The African dilemma. *Social Justice, 23*(1/2), 145–150.

Manger, L. O. (1987). Introduction. In L. O. Manger (Ed.), *Communal labour in the Sudan* (pp. 1–7). Bergen, Norway: University of Bergen.

Marchal, R. (2007). The unseen regional implications of the crisis in Darfur. In de Waal, A. (Ed.), *War in Darfur and the search for peace* (pp. 173–198). London: Justice Africa; Cambridge, US: Global Equity Initiative, Harvard University.

Marshall, F. & Hildebrand, E. (2002). Cattle before crops: the beginnings of food production in Africa. *Journal of World Prehistory* 16: 99-143.

Maxwell, D., & Wiebe, K. (1999). Land tenure and food security: Exploring dynamic linkages. *Development and Change, 30,* 825–849.

McCown, R. L., Haaland, G., & de Haan, C. (1979). The interaction between cultivation and livestock production in semiarid Africa. In A. E. Hall, G. H. Cannell, & H. W. Lawton (Eds.), *Agriculture in semi-arid environments* (pp. 297–332). Berlin: Springer.

Meek, C. (1946). *Land law and custom in the colonies.* Oxford: Oxford University Press.

Miehe, S. (1986). *Acacia albida* and other multipurpose trees on the Fur farmlands in the Jebel Marra highlands, Western Darfur, Sudan. *Agroforestry Systems, 4*, 89–119.

Miskin, A. B. (1953). Land registration. *Journal of African Administration*. 72-80

Moore, S. F. (1998). Changing African land tenure: Reflections on the incapacities of the state. *European Journal of Development Research, 10*(2), 33–49.

Morgan, W. B., & Pugh, J. C. (1969). *West Africa.* London: Methuen.

Morrison, K. D. (1992). Rethinking intensification: Power relations and scales of analysis in precolonial South India. In T. L. Thurston & C. T. Fisher (Eds.), *Seeking a richer harvest: The archaeology of subsistence intensification, innovation, and change* (pp. 235–247). New York: Springer.

Morton, J. F. (1993). *Agricultural development in Darfur Region, Sudan, with special reference to innovation, technical change and open access resources.* (Doctoral dissertation). London University, London.

Morton, J. F. (1994). *The poverty of nations: The aid dilemma at the heart of Africa.* London: British Academic Press.

Mousseau, F., and Morton, J., (2010) Addressing Chronic Food Insecurity in the Horn of Africa: Good Practice Identified but Commitment Needed? *REGLAP Discussion Paper.*

Mukhtar, E.A. (1998). On tribal conflicts in Darfur: The causes, and the conferences of conflict resolution and resolution mechanisms. In A. Elzein & E. I A. Wadi (Eds.), *Tribal conflicts in Sudan* (p.p. 257-269). (In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, University of Khartoum.

News From Africa Watch. (1990, April 2). Sudan: The forgotten war in Darfur flares again. *News From Africa Watch, 45,* 1–9.

Niamir-Fuller, M. (1998). The resilience of pastoral herding in Sahelian Africa in Berkes F, Folke C and Colding J eds *Linking social and ecological systems: management practices and social mechanisms for building resilience (*pp. 250–84). Cambridge: Cambridge University Press.

Niamir-Fuller, M. (1999). *Managing mobility in African rangelands: the legitimization of transhumance.* Exter: Intermediate Technology Publications.

Noronha, R. (1985). *A review of the literature on land tenure systems in sub-Saharan Africa.* ARU paper 43, Agriculture and Rural Development Research Department, World Bank. Washington, DC: World Bank.

O'Fahey, R. S. (1980). *State and society in Darfur.* London: Hurst.

O'Fahey, R. S. (2008). *The Darfur Sultanate: A history.* New York: Columbia University Press.

Oba, G. & Lusigi, W. (1987). ***An overview of drought strategies*** *and land use in African pastoral systems.* Overseas Development Institute Paper 23a, London.

Omer, M. (1997). Civil Transaction Act 1984: Pros and cons. *Sudan Journal of Law,* 1997. Retrieved from http://sjsudan.org/details.php?id=18&lang=ar&target=r&title

Omer, M. (2000). Property rights in Sudan. Khartoum. [In Arabic]

Osman, A. M. K. (2012). *Agricultural change, land and violence: An examination of Darfur.* (Unpublished manuscript doctoral dissertation). Tufts University, Medford, MA.

Paterson, R. T. (1948). Darfur Province. In J. D. Tonhill (Ed.), *Agriculture in the Sudan: Being a handbook of agriculture as practised in the Anglo-Egyptian Sudan* (pp. 851–874). Oxford: Oxford University Press.

Peluso, N. L., & Watts, M. (Eds.). (2001). *Violent environments.* Ithaca, NY: Cornell University Press.

Pingali, P. L., & Binswanger, H. P. (1988). Population density and farming systems: The changing locus of innovations and technical change. In R. D. Lee, W. B. Arthur, A. C. Kelley, G. Rodgers, & T. N. Srinivasan (Eds.), *Population, food, and rural development* (pp. 51–76). Oxford: Clarendon Press.

Platteau, J.-P. (1992). *Land reform and structural adjustment in Sub-Saharan Africa: Controversies and guidelines.* FAO Economic and Social Development Paper No. 107. Rome: FAO.

Platteau, J-P. (1996). The evolutionary theory of land rights as applied to Sub-Saharan Africa: A critical assessment. *Development and Change, 27,* 29–86.

Platteau; J-P. (2002). The gradual erosion of the social security function of customary land tenure arrangement in lineage-based societies. Discussion Paper No. 2002/26, WIDER, United Nations University.

Polanyi, K. (1944). *The great transformation*. New York: The Ferris Printing Company.

Practical Action. (2010). *Food production in western Sudan*. Retrieved from http://practicalaction.org/food-production-4

Quan, J. (2007). Changes in intra-family land relations. In L. Cotula (Ed.), *Changes in "customary" land tenure systems in Africa* (pp. 51-63). Stevenage, United Kingdom: IIED.

Rabah, N. E. (1998). The causes of the traditional modern tribal conflicts in Sudan. In A. Elzein & E. I A. Wadi (Eds.), *Tribal conflicts in Sudan* (p.p. 139-159).(In Arabic). Khartoum, Sudan: Institute of Afro Asian Studies, University of Khartoum.

Rocheleau, D., & Edmunds, D. (1995). Women, men and trees: Gender, power and property in forest and agrarian landscapes. *World Development*, *25* (8), 1351–1371.

Runger, M. (1987). *Land law and land use control in western Sudan: The case of southern Darfur*. London and Atlantic Highlands, NJ: Ithaca Press, 1987. Sudan Studies Series, no. 12.

Salih, E. T. M. M. (1999). *Tribal conflict in Darfur: Its causes, implications and resolutions: A study in sociology and applied anthropology* (p.p. 99-137). (In Arabic). Khartoum, Sudan: Khartoum Limited.

Scoones I ed. (1995). *Living with uncertainty: new directions in pastoral development in Africa*. Exeter: Intermediate Technology Publications.

Scott, E. P. (1984). Life before drought: A human ecological perspective. In E. P. Scott (Ed.), *Life before the drought*. London: George Allen & Unwin.

Scott, J. C. 1976. *The moral economy of the peasant rebellion and subsistence in Southeast Asia*. New Haven, CT: Yale University Press.

Shazali, S., & Abdel Ghaffar, M. A. (1999). Pastoral land tenure and agricultural expansion: Sudan and the Horn of Africa. Issue paper no. 85. London: International Institute for Environment and Development.

Sikor, T., & Lund, C. (2009). Access and property: A question of power and authority. In T. Sikor & C. Lund (Eds.), *The politics of possession: Property, authority, and access to natural resources* (pp. 1–22). Chichester, Eng.: Wiley-Blackwell.

Simpson, S. R. (1954). Land tenure, some explanation and definitions. *Journal of African Administration,* 50–64.

Simpson, S. R. (1955). Land law and registration in the Sudan. *Journal of African Administration,* 11–17.

Simpson, S. R. (1976). *Land law and registration.* Cambridge, : Cambridge University Press.

Spaulding, J. (1979). Farmers, herdsmen and the state in rainland Sinnar. *Journal of African History, 20,* 329–347.

Strachan, P., & Peters, C. (1997). *Empowering communities: A casebook from Western Sudan.* Oxford: Oxfam.

Suleiman, M. M. (1985). *Baseline survey for Kordofan and Darfur.* Khartoum, Sudan: Range and Pastured Administration.

Suliman, M. (1994). *Civil war in Sudan: The impact of ecological degradation.* ENCOP Occasional Paper No. 4. Bern, Switz.: Swiss Peace Foundation.

Suliman, M. (2000). *Sudan civil wars: New perspectives.* (In Arabic). Cambridge, Eng.: Academic Press.

Symanski,R., Manners, I., & Bromley,R. (1975). The mobile- sedentary continuum. Annals of the association of American geographers, *65,* 461 – 471.

Takana, Y. (1997). *Report on tribal conflict in Darfur.* Submitted to the Higher Committee for the Promotion of Societal Relations. (In Arabic).

Takana, Y. (2002). *Resources based conflicts: North Darfur and Upper Nile case.* Khartoum, Sudan: Oxfam GB.

Thébaud, B. & Batterby, S. (2001). Sahel pastoralists: opportunism, struggle, conflict and negotiation: A case study from eastern Niger. *Global Environmental Change* 11:69-78.

Thompson, C. F. (1965). *The land law of the Sudan: Cases and materials.* Vol. 1. Khartoum, Sudan: Faculty of Law, University of Khartoum.

Thompson, C. F. (1966). The sources of law in the nations of Africa: A case study from the Republic of the Sudan. *Wisconsin Law Review, 4,* 1146–1187.

Thomson, F. (2011). The agrarian question and violence in Colombia: Conflict and development. *Journal of Agrarian Change*, *11,* 321–56.

Tier, A. M. (1990). Conflict of laws and legal pluralism in the Sudan. *International and Comparative Law Quarterly, 39* (3), 611–640.

Toulmin, C. (1983). *Economic behavior among livestock-keeping peoples: A review of the literature on the economics of pastoral production in the semi-arid zones of Africa.* Norwich, England: School of Development Studies, University of East Anglia.

Toulmin, C. (1992). Herding contracts: For better or worse? *ILEIA Magazine, 8*(3), 8–9.

Turner II, B.L., Hyden, G. and Kates. R. (1993) *Population Growth and Agriculturrd Change in Africa.* University Press of Florida, Gainesville.

Turner, B., & Ali, A. M. (1996). Induced intensification: Agricultural change in Bangladesh with implications for Malthus and Boserup. *Proceedings of the National Academy of Sciences, 93,* 14984–14991.

Turton, D. (1997). Introduction. In D. Turton (Ed.), *War and ethnicity: Global connections and local violence* (pp. 1–45XXX). New York: University of Rochester Press.

Umbadda, S., & Abdul-Jalil, M. A. (1985). Women in small-scale irrigated agriculture: The case of Wadi Kutum (Sudan). *Africa Spectrum, 20*(3), 339–335.

UN Office for the Coordination of Humanitarian Affair (2009). Darfur humanitarian access map. IMU OCHA Sudan http://ochaonline.un.org/sudan.

UNEP. (2007). *Sudan post-conflict environmental assessment.* Retrieved from http://postconflict.unep.ch/publications/UNEP_Sudan.pdf

United Nations Development Program in Sudan (UNDP Sudan). (2006). *Share the land or part the nation: The pastoral land tenure system in Sudan, Study 3*. Khartoum, Sudan: UNDP Sudan.

Van Raay, H. G. T. (1975). *Rural planning in a savanna region.* Rotterdam: Rotterdam University Press.

Warren, A. (2005). The policy implications of Sahelian change. *Journal of Arid Environments* 63:660-670.

Western Sudan Development Project. (1986). *Western Sudan Development Project Annual Report* . Khartoum, Sudan

Wilson, R. T. (1978). The "gizu": Winter grazing in the south Libyan Desert. *Journal of Arid Environments, 1*(4), 327–344.

World Bank Group, Independent Evaluation Group. (1994). *Livestock in Africa: Support for pastoralists.* Retrieved from http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/E2A9FEFDF86DBF77852567F5005D871E

World Bank. (1975). *The assault on world poverty: Problems of rural development, education, and health.* Baltimore and London, Johns Hopkins University Press.

World Bank. (1985). *Staff appraisal report, Sudan, Western Savannah Project—Phase II.* Report No. 5814-SU.

Young, H., Jacobsen, K., & Osman, A. (2009). *Livelihoods, migration and conflict: Cases studies from west and noth Darfur 2006 – 2007*. Medford: Feinstein International Center, Tufts University.

Young, H., Osman, A. M., Abusin, A. M, Asher, M., & Egemi, O. (2009). *Livelihoods, power and choice: The vulnerability of the Northern Rizaygat, Darfur, Sudan.* Medford, MA: Feinstein International Famine Center, Tufts University.

Young, H., Osman, A. M., Aklilu, Y., Dale, R., Badri, B., & Fuddle, A. J. A. (2005). *Darfur—livelihoods under siege.* Medford, MA: Feinstein International Famine Center, Tufts University.

Yudelman, M. (1964). Africans *on the Land*. Cambridge: Harvard University Press.

VI. Appendices

1. Villages Selected

1.a. Some Key Characteristics of the selected villages

2. Location of the pastoralists fariqs

3. Interviews with the Sheikh guide

4. Interview with Conflict resolution expert guide

5. Focus group discussion guide

6. Interview with Individual community member guide

Appendix 1: List of the Selected Villages

Zone	Village
Jebel Si North East	1. Mela 2. ID Elnabeg 3. Bora 4. Birgi 5. Ish Bara 6. Kulagi
Jebel Si South East	1. Ora Janub 2. Tabkyno 3. Debli 4. Nima Karo
Kebkabyia North West	1. Ganduliat 2. Aramba Omda 3. Jadara 4. Dadi 5. Aramba Ruahl 6. Umlaota
Kebkabyia West	1. Margoba 2. UmHujara 3. Gemiza 4. Galdama 5. Girgo
Kebkabyia South	1. Shoba Mansour 2. Hashaba 3. Fuldong 4. Nomo
Kebkabyia Middle Zone	1. Sarafya 2. Hara 3. Ora Shamal

Appendix 1.a. Some Key Characteristics of the Selected Villages

Zone	Village	Location	Terrain	Date of village Establishment	The context of the establishment
JNE	**AishBara**	Jebel Si	Up land	1410	The Fur Sultanate
JSE	**NemaKur**	Jebel Si		1500	
JNE	**Id Elnabeg** N13.40 E24.19	Jebel Si		Fur Sultanate	
KS	**Fuldong** N13.448, E23.903	Kebkabiya	Low land	Fur Sultanate	
KS	**Nomo** N13.448 E24.039	Kebkabiya		Fur Sultanate	
KNW	**Dadi**	Kebkabiya	Low Land	1890	1. The Mahdia Era
KNW	**Jeddara** N13.36 E24.00	Kebkabiya		1899	
JNE	**Bora**	Jebel Si	Up land	1890	
JNE	**Kulagi**	Jebel Si		1900	2. Death of Faqhi Senin of Mahdi by Ali Dinar. 3. the rise of Ali Dinar to power in Darfur
JNE	**Birgi**	Jebel Si		1900	
KNW	**UmLa'ota** N 13.697, E 224.013	Kebkabiya	Low land	1900	
KS	**Shoba Mansour**	Kebkabiya		1900	
KM	**Elhara**	Kebkabiya		1913	
KW	**Girgo** N 13.618, E23.874	Kebkabiya	Low land	1920	1. Political stability and the move of the Fur down hill 2. Dry spell of the end of the 1940s
KM	**Ora Shamal**	Kebkabiya		1920	
JSE	**Debli**	Jebel Si	Up land	1922	
JSE	**Tobkyno**	Jebel Si		1933	
KW	**Margoba** N13.687 E23971	Kebkabiya	Low land	1948	
JSE	**Ora Janub**	Jebel Si	Low land	1949	
JNE	**Mela**	Jebel Si		1950	
KNW	**Gandouliat**	Kebkabiya	Low land	1960	The drought of the 1960s and the move of the Zahawa and the Arab North Darfur into the area.
KM	**Serifya** N13.614 E24.071	Kebkabiya		1960	
KS	**Hashaba Elzawia** E13.45 N23.11	Kebkabiya		1960	
KW	**UmHugara**	Kebkabiya		1963	
KW	**Jeldama**	Kebkabiya		1963	
KNW	**Aramba Elomda**	Kebkabiya		1969	
KNW	**Aramba Ruhal**	Kebkabiya		1969	
KW	**Gimaiza** N13.38 E23.57	Kebkabiya		1969	

Appendix 2: Location of the pastoralist's fariqs

No.	**Fariq**	**GPS location at the time of the field visit**		
		N	**E**	**Elevation (m)**
1.	Id Elkokaya	13.49077	24.17199	1246
2.	Boremaleigh	13.57401	24.19095	1181
3.	Jadara Amar	13.82879	24.02871	1058
4.	Sieh Jenna (Tura)	13.76609	24.12749	1113
5.	Rejil Elmaita Badiat Zakaria Abdalla Ishag			
6.	Dara			
7.	Tobkayno area			
8.	Abdango			

Appendix 3: Interviews with the Sheikhs

Interviewer: Agric zone and location: Date: 01/ /2010

I. the Administration set up

Where is the village located?

1.1. a. Sheikh

Who is the sheikh of the village?

1.1. b. Representatives of the village

Who are the representatives of the village in the locality/state?

1.1. c. Formal institutions

What are the formal institutions in the village and what is their role?

1.1. d. Informal Institutions

What are the informal institutions in the village?

2. History of the Village and population Movement

When was the village established?

2.1. a. Settlement in the village

What was the first group and families settled in the village?

2.1. b. Changes in the tribal composition

What is the tribal composition of the village and how that changed over time?

2.1. c. Changes in population size

What is the total number of households in the village?

Currently:

2000:

1985:

2.1. d. Size of the household

What is the average size of the household?

2.1. e. Trends of migration from and into the village

Was there any migration of the groups out of or into the village from 1970 to 2003? Where they move to and the reasons for movement out or into the village?

3. Land use and productivity

What are the different types of land and land use in the villages?

3.1. a. Land productivity

What is the quality and productivity of the different types of land? Please put the different type of lands mentioned above according to their importance to the people in the village?

4. Land ownership and Control

What are the types of control and ownership of the different types of land: Individual, grant, communal…etc

4.1. a. proportion of the different type of ownership

What is the percentage of each type of land ownership in the village?

4.1. b. Land acquisition

How people without land from the village or outside the village acquire land in the last five years?

4.1. c. Differences in Land acquisition

Is there any difference in the way people acquire the different types of land in the village

4.1. d. Gender difference in land acquisition

Are there any differences in the way men and women acquire land and how?

4.1. e. Land payments and dues

What are the different types of payments or dues associated with the different type of land ownership (rent, taxes, customary dues, etc.) in the past and how that changed over time.

4.1. f. Land inheritance

Could the different types of land be inherited and how this work out

5. Land Sale

Are lands subject to transactions of sale and buy?

5.1. a. Land mostly subject to sale

What is the most types of land that are subject to sale?

6. Idle lands in the village

What usually happen to the land of the individuals and families who leave the village? How this changed over time?

6.1. a. availability of Idle lands in the village

Is there any land being idle in the village? If yes for how big is its total area?

6.1. b. Acquisition of idle land

Could this idle land be acquired on the basis of the traditional Ras Elfas right?

7. Irrigated Agriculture

What are the different types of irrigated agriculture in the village?

7.1. a. Household farm size

What is the size of the farm per family?t

7.1. b. The area grown vegetables and orchards in the village

What is the total area of gardens and orchards in the village and its development over time?

	Vegetables	Orchards	Fodder
Currently			
2000			
1990			

7.1. c. Types of land ownership and the proportion of each type in the village

What are the t*ypes of land ownership of the winter agriculture and the percentages of each type of ownership?*

8. Agricultural technology and operations

What are the different agricultural operations involved in the different stages of irrigated agriculture? (land preparation, seeding, seedling, weeding, fertilization, infest control, harvest, transportation and marketing of the harvest? How that changed over time?

	Current	2000	1990
Land preparation			
Weeding			
Fertilizers			
Pesticides			
Irrigation			
Harvest			
Transportation to house			
Transportation to the Store			

Transportation to market			
Marketing place			

8.1. a. Timing and cost of the agricultural operations

What is the timing and cost of the different agricultural operation per Mkhamas?

8.1. b. Agricultural labor and its cost

Is there any labor from outside family needed in irrigated agriculture? When is it needed and how is it secured and how much it costs for the mkhamas of onion?

9. Irrigation technology

What are the different types of irrigation technology in use and its source, how that changed in the last five years? What are the sources of these technologies?

9.1. a. Water depth

What is the Water depth and well depth?

9.1. b. skilled labour

What is water lifting technologies in use in the village and how that changed over time?

9.1 c. Water pumps

What is the total number of the water pumps in the village, their types and source?

9.1. d. Introduction of water pumps in the village

When was the first water pumps introduced into the village?

9.1. e. Water shifting technology

Where the skilled labor needed to run and maintain these pumps come from?

10. Rain-fed Agriculture

What is the total area the rain fed agriculture for the village, the average area cultivated by household and how that changed over time?

10.1. a. Farm size

The area cultivated by the household and how that changed over time?

10.1. b. Types of rain fed cultivation

What are the types of rain fed cultivation practiced in the village?

11. Land ownership

Types of land ownership of the rain fed agriculture and the percentages of each type of ownership?

11.1. a. Idle Land

Of the rain fed lands, is there any land being idle in the village?

11.1. b. Acquisition of idle land

Could this idle land be acquired on the basis of the traditional Ras Elfas Right?

11.1. c. sale of rain fed lands

Could one acquire rain fed lands by purchase?

12. Agricultural operations and technology

What are the technologies used in the different agricultural operations involved in the different stages of rain-fed agriculture? How that changed over time?

	currently	2000	1990
Land preparation and plough			
Sowing			
Weeding			
Fertilizers			
Pesticides			
Irrigation			
Harvest			
Transportation of the harvest to the house			
Transportation of the harvest to the Store			

13. Cash crops

Of the rain fed crops what are the ones marketed and where are they marketed currently and before 2003?

14. Crop Residues

What are the uses of the crop residues?

14.1. a. Availability of the crop residues

Are there any leftover in the field or are all of them taken home?

14.1.b. Use of left over in the fields

What is the use of those left in the field?

14.1. c. The manuring system of the rain fed agriculture

What is the mauring system for rain fed agriculture, the sources of the manure and how that changed over time?

15. Livestock

What are the different types of livestock and breeds raised in the village and how that changed over time?

Type	cattle	Sheep	Goats	Camels	Horses	Donkey
Breed						

15. 1.a the main type of animals raised

What are the main types raised by the household and the main purpose of it?

15. 1.b. Herd size

Livestock numbers in the village

	Cattle	Sheep	Goats	Camel	Donkey
current					
2000					
1990					

15.1. c. Livestock Sale

What are the numbers of livestock that is sold by the household?

	Currently	2000	1990
Household			
The whole village			

15.1. d. Animal health

What are the animal health problems, how that has been taken care of?

15.1. e. Veterinary services and its type

What are the veterinary services able and what is source of these services?

16. Animal feeds and concentrates

What are the sources of livestock feed during the different seasons of the year?

16.1. a. animal concentrates

Is there any concentrates used in animal feeding, if yes what is their sources and for what type of livestock used and when?

16.1. b. Storage of animal fodder

How animal fodders are stored?

17. Crop residues

When livestock are allowed to graze the crop residues of

a) The rained agriculture:

b) Irrigated agriculture:

17.1. a. Groups permitted access to graze crop residues

Are there are any groups from outside the village allowed to graze these residues? If yes when and under what conditions?

18. Herding arrangement

What are the groups entrusted by the village to herd their livestock and how that changed over time?

19. Conflicts and Conflict Resolution

What are the kinds of conflicts around cultivation and herding and how are these problems resolved?

19.1. a. Conflict resolution institutions

What are the institution that resolve these conflicts at the

Village level:

Locality level:

19.1. b. changes in mechanisms of conflict resolution

How these ways of conflict resolution have changed over time?

20. "Zaraeiba Elhawa"

What are these enclosures?

20.1. a. Size of the zaraeiba Elhawa

What is the average size of the Zariba?

20.1. b. the use of the zaraeiba Elhawa

What are the uses of these Zaribas?

20.1. c. Disadvantages of the zaraeiba Elhawa

What are disadvantages of these Zaribas?

20.1. d. Zaraeiba Elhawa before 2003

Before 2003, is there any Zariba Elhwa that belongs to a member of the village?

21. Food Security

What does the family do when she has not enough food or enough money to buy food?

Appendix 4: Interview with Conflict resolution expert

Interviewer: Respondent and age: Agric zone: Date: 01/ /2010

1. Land Allocation and administration

Who allocates land in the village?

1. a. Decision on Eligibility to land

Who decides on people legible for land allocation?

1. b. Eligibility criteria

What are the eligibility criteria to land allocation?

1. c. Duties of to land allocated

What are the duties of the person to whom the land is allocated?

1. d. Idle Land

Is there any land being idle in the village that could be claimed by the right of Ras Elfas?

1. e. Land inheritance

Could land in the village be inherited and who is eligible to inherit land?

2. Land Transactions

What are the kinds of land transactions e.g. sales, renting out, renting in allocation of land to village members or outsiders, conversion of land to other uses such as leasehold, etc?

2.1. a. Land sale

When was the last land sale that has taken place in this village and what was the kind of land?

3. Conflicts and their resolution

What are the types of disputes around land within the village, between people from different villages, between people of the village and other livelihood groups?

Within the village:

Between people from different villages:

4. Relations within the village

Prior to 2003 do you think there was an increase in conflicts and tensions within the village, between peoples from the different villages and with other livelihood groups prior to 2003?

4.1. a. Increase in conflicts and tensions

Why was there an increase in conflicts and tensions?

5. Relations with other groups

What are the ways in which they benefit from each other and prior to 2003 and how that changes and why changed if there is any change?

Is there an

6. Land Fertility

y deterioration in the soil fertility and if any what are the symptoms of this deterioration?

6.1. a. Use of fertilizers

Are there any kind of manures or chemical fertilizers people use and when?

6.1. b. Source of fertilizers

What is the source of these manures and fertilizers?

6.1. c. Use of pesticides

If there is any use of chemicals, what are the pesticides/chemicals people uses and what is their source?

7. Other Types of land

Are there any other types of land in the village (state lands, government land, forests, reserves, agricultural schemes).

7.1. a. History, size and use

What is their history, size, use?

7.1. b. Conflicts over land

Are there any conflicts around these lands?

8. Water sources

What are the various water sources in the village?

8.1. a. Users of the water sources

Who are the users of these water sources domestic users (irrigation users, animal)?

8.1. b. Conflict over water resources

Are there conflicts over these sources, how often and who are the groups involved in these conflicts?

Appendix 5: Focus group discussion

Interviewer: Agric. Zone Number and Gender of participants: Date: 01/ /2010

1. Livelihoods strategies

What are the livelihood strategies practiced by the households in the village and the average contribution of each strategy in the overall livelihood of the households?

	cultivation	livestock	Natural resources	trade	Migration	Daily labor	Food aid
Current							
Before the conflict							

2. Irrigated Agriculture

What are the different types of irrigated agriculture practiced by the people in the village e.g. vegetable, orchards, fodders etch?

2.1. a. Contribution of the different types of irrigated agriculture

What is the contribution of the different types of irrigated agriculture to the livelihood from the irrigated agriculture?

	Vegetable	Fruits	Fodder
Currently			
Before the conflict			

2.1. b. Farm size

What is the average size of the farm

	Poor family	Better off	Rich
Currently			
2000			
1990			

2.1. c. Fruit Garden

What is the proportion of the families that have fruit gardens in the village?

2.1. d. Numbers of trees per family

What is the average number of fruit trees per the family and the area of the fruit garden?

3. Land ownership in irrigated agriculture

What are the types of land ownership of the winter agriculture and the percentages of each type of ownership?

3.1. a. Land sale

Could land be acquired by sale?

4. Agricultural technology in irrigated agriculture

What is the technology used in the different agricultural operations?

	Currently	2000	1990
Land preparation			
Sowing and seedling			
Weeding			
Fertilizers			
Pesticides			
Irrigation			
Harvest			

4.1. a. Transportation of the harvest irrigated agriculture

How do you transport the harvest (animal, animal cart, vehicles?)

4.1.b. Animal Plough in irrigated agriculture

When was the first animal plow introduced into the village?

4.1. c. Tractors in irrigated agriculture

Do people in the village use tractors in plowing the land?

Currently	2000	1990

5. The agricultural calendar in irrigated agriculture

What are the sowing and harvest months for the different irrigated agricultural crops?

6. Water and irrigation

What the water depth and well depth?

6.1. a. Permanent wells

What is the number of the permanent wells for irrigated agriculture in the village?

Now	Before the war

6.1. b. Water pumps

What is the number of water pumps in the village?

Now	Before the war	Date when the a water pump used in the village for the first time

6.1. c. Treadle pumps

What is the number of the treadle pumps in the village?

Currently	2000	First time treadle pump used in the village

6.1. d. Bucket Irrigation

What is the number of the households who use the bucket in irrigated agriculture in the the village?

Currently	2000	1990

6.1. e. skilled labor

Where the skilled labor needed to run and maintain these pumps?

Currently	Before the war

7. Gender Differences in Irrigated Agriculture

What is the proportion of farms owned by men and that owned by women?

7.1. a. Difference in technology used

What is the difference in technology used by men and that used by women?

7.1. b. Difference in farm size

What is the average size of the irrigated farm owned by man and woman?

7.1. c. Difference in the marketing of the produce

Where women market their produce and where men market their produce?

8. Rain-fed Agriculture

What are the types of rain-fed agriculture practiced in the village (shift cultivation, continuous cultivation)?

8.1. a. Crops grown – rain fed agriculture

What are the crops in the rain-fed agriculture?

8.1. b. Average size of the household farm – rain fed agriculture

What is the average area of the household farm?

	Poor family	Better off	Rich family
Currently			
2000			
1990			

8.1. c. Families that practice rain fed agriculture

What is the proportion of families that own farms in the village?

9. Land- rain fed agriculture

What are the types of land ownership in the rain-fed agriculture and the percentages of each type of ownership?

9.1. a. Land sale currently – rain fed agriculture

Is there any land sale in the rain-fed agriculture currently?

9.1. b. Land sale before the conflict – rain fed agriculture

Was there land sale in rain fed agriculture before the conflict?

10. Agricultural technology – rain fed agriculture

The agricultural technique in the different agricultural operations

	Currently	2000	1990
Land preparation			
Sowing and seedling			
Weeding			
Fertilizers			
Pesticides			
Harvest			
Transport of the harvest			
Marketing			
Irrigation			

10.1. a. Fertilizers used

What is the manuring system for the rain fed agriculture and the sources of the manure?

11. The Crop Residues

What are the uses of the crop residues?

11.1. a. Availability of crop residues after the harvest

Are there any leftover in the field or are all of them taken home?

11.1. b. Proportion of crop residues taken home

What is the proportion of the part that is usually taken home and how it is usually transported?

11.1. c. Storage of crop residues

How do people store the crop residues and animal fodders?

11.1. d. Use of the left over in the field

If it is left in the field who graze it and when?

12. Gender Differences in the Rain-fed Agriculture

Do women own their own farms?

12.1. a. Difference in type of ownership, size of the farm, technology used in the different operations

What are the differences between women's and men's farms in term of ownership, average area, technology used in the different agricultural operation, and the crop grown?

13. Livestock

What are the different types of livestock/breed/size owned by the household and how that changed over time?

	Cattle		Goats		Sheep		Camels		Donkeys	
	Now	Before 2003	Now	Before 2003	Now	Before 2003	Now	Before 2003	Now	Before 2003
Poor										
Better off										
Rich										

14. Animal feeds

What are the source of livestock feed during the different seasons of the year?

	Currently	Before 2003
Summer		
Rainy season		
Winter		

14.1. b. Animal concentrates

Are there any concentrates that the animal used in animal feeding? If yes what is their sources and for what type of livestock used and when?

15. Crop residues or "*Tallag*"

When livestock are allowed to herd the residues fromrain fed and irrigated agriculture?

15.1. a. Groups allowed access to crop residues

Are there any groups from outside the village allowed to graze these residues? If yes when and under what conditions?

15.1. b. Storage of animal fodders

How animal fodders are stored?

16. Animal health

What are the animal health problems, how that has been taken care of?

16.1. a. Animal vaccination

What are the diseases against which people vaccinate their animals and what is the source of the vaccine?

17. Livestock sale

What is the type and number of livestock that the household sale annually?

	Currently	2000	1990
Sheep			
Goats			
Cattle			
Camel			

18. Herding labor

What are the groups entrusted by the village to herd their livestock and how that changed over time?

19. Gender Differences in Livestock ownership

What is the difference in livestock ownership between males and females in term of size of the herd?

19.1. a. Type of the herd

What is the difference in livestock ownership between males and females in term of size of the herd?

19.1. b. Livestock herding

What is the difference in herding arrangements?

20. Zaraeib Elhawa

What are these enclosures?

20.1. a. size of zaraeib Elhawa

What is the average size of the Zariba?

20.1. b. Uses of zaraeib Elhawa

What are the uses of these Zaribas?

20.1. c. disadvantages of Zaraeib Elhawa

What are disadvantages of these Zaribas?

20.1. d. Zaraeib Elhawa before 2003

Before 2003, was there any Zariba Elhwa that belongs to a member of the village?

21. Food Security

What does the family do when she has not enough food or enough money to buy food?

Appendix 6: Interview with Individual community member

Interviewer agricultural zone Date: 01/ /2010

1. Demographic Information

What is your name?

1.1.a. The village

What is the name of your village?

1.1. b. Respondent age and gender

What is your age and gender?

1.1. c. Respondent tribe

What is your tribe?

1.1. d. Respondent marital status

What is your marital status?

1.1. e. Household size

What is the number of household members and their age?

2. Residence in the village

What is the date of your residence in the village?

2.1. Migration to the village

What are the reasons of migration to or residence in the village?

3. Land

What are the types of lands which you have cultivate and could you please put in order according to productivity?

Currently	1990	1990	1960

3.1. a. Land productivity

What is the productivity of the different lands you cultivate?

3.1. b. Land acquisition

How did you acquire the land you cultivate?

Currently	1990	1970	1960

3.1. c. Land payment and dues

What are the land payments or fees you have paid for the land you cultivate?

Currently	1990	1970	1960

3.1. d. Land and migration

Have you ever gone away of the village?

3.1. e. land after migration

If yes where did you go and what did you do for your land?

3.1. f. Idle land

Is there any part of your land you leave idle?

Currently	1990	1970	1960

4. Irrigated Agriculture

What is the type of irrigated agriculture you practice?

Currently	1990	1970	1960

4.1. a. Farm size in irrigated farm

What is the total area of your irrigated agriculture?

Currently	1990	1970	1960

4.1. b. the area grown vegetables?

What is the total area of the vegetables you grow?

4.1. c. the area grown fodder?

What is the total area of the fodders you grow?

4.1. d. the area grown fruits?

The total area of the fruit trees and what is the type of the fruit trees you grow?

4.1. e. Agricultural Operations

What is the timing of the different agricultural operations for the irrigated crops you grow?

4.1. f. Markets

Where do you market your harvest?

Currently	1990	1970	1960

5. Land acquisition in irrigated agriculture

How did you acquire this land and when?

5.1. a. Land registration?

Is the land or farms you own officially registered?

6. Technology in irrigated agriculture

What is the irrigation technology you use?

Currently	1990	1970	1960

6.1. a. Technology used in the different agricultural operations

What is the agricultural technology you use in:

	current	1990	1970	1960
Land preparation				
Sowing and seedling				
Weeding				
Fertilizers				
Pesticides				
Harvest				
Irrigation				
Transport of the harvest to the market				
Transport of the harvest to the store and home				

7. Water and irrigation

What the depth of the well you use for irrigation?

7.1. a. Water pumps

What is the type of the pumps you use, if any?

7.1. b. Skilled labor for water pumps

Where the skilled labor needed to run and maintain these pumps come from?

8. Crop Residues from Irrigated agriculture

How do you use the crop residues from your farm?

9. Rain-fed Agriculture

What is the area cultivated, type of cultivation, cropping system and crops produced?

	Currently	1990	1970	1960
Area cultivated				
Type of cultivation (shifting, continuous)				
Mono or intercropping				
Type of crops and area of crop cultivated				

10. Agricultural technology in rain fed agriculture

What is the agricultural technology you use in?

	Currently	1990	1970	1960
Land preparation				
Sowing and seedling				
Weeding				
Fertilizers				
Pesticides				
Irrigation				
Harvest				
Transport of the harvest				

11. Cash crops

Are there any parts of the crops you sale and where?

	Currently	1990	1970	1960
The crop				
Place of market				

Means of transporting the crop to the market				

12. Crop Residues

	Currently	1990	1970	1960
How do you use the crop residues such as the stalks				
Do you leave them on the farms or do you take away to somewhere else?				
If you leave it in the farm who graze it				
How do you maintain the fertility of the land				
What is the source of the fertilizer you use				

13. Livestock

What are the type, breed and number of livestock you own?

	Currently	1990	1970	1960
Type				
Breed				
Numbers				

14. Animal feeds and concentrates

What is the source of fodders in the different seasons of the year?

	Currently	1990	1970	1960
Summer				
Rainy season				
Winter				

14.1 Animal concentrates

What are the animal concentrate you use,, its source and the animal to which you feed?

	Currently	1990	1970	1960
Type of concentrate				
Source				
Animals				

15. Livestock Sale and herding

What is the number of livestock you fatten and sale in a year?

Currently	1990	1970	1960

15.1. a. Herding arrangement

What the group that herds your livestock?

Currently	1990	1970	1960

16. Crop residues

When the animals are allowed to graze the residues from the rain-fed and irrigated agriculture?

	Currently	1990	1970	1960
Rain-fed agriculture				
Irrigated agriculture				

16.1. a. Groups permitted access to crop residues

Are there any other groups that you allow to graze the crop residues of your cultivation?

16.1. b. Tribal affiliation of the group you permit to access the crop residues

If the answer is yes who are these groups and under what conditions do you allow them to graze the crop residues?

	Currently	1990	1970	1960
The group				
The conditions				

17. Conflicts and conflicts resolution

Have you ever had any disputes with any one over your land or trespassing on your cultivation?

	Currently	1990	1970	1960
Dispute				
Resolution of the dispute				

18. Cultivation after 2003

Have you cultivated since the eruption of the current conflict in Darfur?

18.1. a. Land cultivated after 2003

If the answer is yes have you cultivated your own land or somebody else land?

18.1. b. Cultivation arrangement if cultivating somebody else land after 2003

If you cultivate somebody else land what is the agreement between you and the owner of the land?

18.1. c. Who is cultivating your land

If you have not cultivated your own land, Is there anybody else who cultivated your land?

18.1. d. Cultivation arrangement between you and the other person cultivating your land

If the answer to question 4 is yes what the agreement between you and the person who cultivated your land?

18.1. e. Reason for not cultivating after 2003

If you did not practice cultivation since the current conflicts erupted what are the reasons that you from have not cultivation?

19. Zaraeib Elhawa

What are these enclosures?

19.1. a. Uses of Zaraiba Elhawa

What are the uses of these Zaribas?

19.1. b. The disadvantages of the Zaraiba Elhawa

4. What are disadvantages of these Zaribas?

19.1. c. Zariba before 2003

Before 2003, was there any Zariba Elhwa that belongs to a member of the village?

Currently	1990	1970	1960

20. Food Security

What does the family do when she has not enough food or enough money to buy food?